



ENVIRONMENTAL IMPACT STATEMENT EVREC Green Energy Hub

Prepared for: Exploits Valley Renewable Energy Corporation



May 2026



May 11, 2026

Eric Watton, Senior Environmental Scientist
NL Department of Environment, Conservation and Climate Change
Environmental Assessment Division
Confederation Building Complex, West Block
PO Box 8700
St. John's, NL A1B 4J6

Dear Mr. Watton,

Re: Environmental Impact Statement
Exploits Valley Renewable Energy (EVREC) Botwood and Area Green Energy Hub
Project (EA# 2327)

Please find enclosed the Environmental Impact Statement for the EVREC Botwood and Area Green Energy Hub (EA# 2327).

The undersigned approves and accepts the contents, as submitted to NL Environment, Conservation and Climate Change, Environmental Assessment Division.

Sincerely,

Dean Comand, Chief Operating Officer
dcomand@abraxaspower.com

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
PART 3 – OUTLINE OF THE EIS		
1.0 Introduction		
1.1 Name of the Undertaking		
This subsection shall provide the name of the Project. The name assigned to the Project by the Department of Environment, Conservation and Climate Change (NLECCC) is the 'Botwood and Area EVREC Green Energy Hub.'	1.0	
1.2 The Proponent		
This subsection shall introduce the Proponent by providing the following pertinent information:	See below	
• name of, and contact information for corporate body; • name of, and contact information for chief executive officer; • principle contact person for the purpose of environmental assessment, and contact information; • key personnel, contractors, and/or sub-contractors responsible for preparing the EIS, and contact information; and • disclosure of any affiliation or partnership with governmental or non-governmental organizations.	Table 1.1	
This subsection shall include a description of the Proponent's history of wind energy generation, solar energy generation, and hydrogen and ammonia production, identifying any previous and current such projects and their associated successes, failures and lessons learned.	1.0, 1.1	
1.3 Overview of the Undertaking		
The intent of the overview is to identify the key Project components, rather than provide a detailed description of the Project.	2.1.4	
The key components of the undertaking shall include but not be limited to:		
a) all wind energy generation areas (wind farms) including turbine locations and associated roads,	6.1.2, Drawings 6.1-2A-E	
b) all solar energy generation areas (solar farms) including solar farm locations and associated roads,	8.1.2, Drawing 8.1-1	
c) transmission lines, collector lines and substations,	6.1.2, 7.1, 8.1.2, Drawings 6.1-2A-E, 7.1-1, 8.1-1	
d) the hydrogen and ammonia production facility, ancillary structures, and auxiliary power sources,	7.1, Drawing 7.1-1	
e) water source(s), and related pipeline(s) and other hydraulic structures,	7.1, Drawing 7.1-2	
f) pipeline(s) and outfall(s) to convey wastewater from the plant to the point of discharge, including process water, sanitary and stormwater waste and any other discharge,	7.1, Drawings 7.1-1, 7.6-4	
g) port facilities for loading and unloading Project components, materials and supplies,	7.1, Drawing 7.1-2	
h) pipeline(s) from the hydrogen and ammonia plant to the marine terminal for the movement of hydrogen and/or ammonia,	7.1, Drawing 7.1-2	
i) laydown areas	6.1, 7.1, 8.1, Drawings 6.1-2, 7.1-1, 8.1-1	
j) mode and route of transport of Project components,	6.1, 7.1, 8.1	
k) mode and route of transport of hydrogen and ammonia from Port of Botwood to markets and/or intermediary facilities (e.g. transshipment terminals),	7.1	
l) location of workforce accommodation camps,	6.1, 7.1, 8.1, Drawings 6.1-2, 7.1-1, 8.1-1	

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EIS Guidelines	EIS Section	Additional Notes
m) location of concrete batch plant(s)	6.1, 7.1, 8.1, Drawings 6.1-2, 7.1-1, 8.1-2	Batch plants to be located within quarries.
2. The Proposed Undertaking		
2.1 Rational for the Undertaking		
The EIS shall describe the rationale for the Project in terms of its need and purpose. The purpose of the Project shall outline what is to be achieved by carrying out the Project. The EIS shall broadly classify the Project (e.g. low carbon energy production) and describe any objectives the Proponent has in carrying out the Project.	2.3	
2.2 Project Description		
The Proponent shall describe the scope of the Project for which the EIS is being conducted, for all phases of the Project including: construction, operation and maintenance, and the decommissioning and rehabilitation of Project sites	6.1, 7.1, 8.1	
2.2.1 General Layout		
The EIS shall provide a graphic description (e.g. maps, aerial imagery, GIS files, site plans and drawings), including dimensions and setback distances where appropriate, of the following physical features of the undertaking:	See below	
a) each wind farm	2.1.4.1, 6.1.1.1, Drawing 6.1-2	
b) each solar farm	2.1.4.3, 8.1, Drawing 8.1-1	
c) the hydrogen and ammonia production facility	2.1.4.2, 7.1, Drawing 7.1-1	
d) port facilities	2.1.4.4, 7.1, Drawing 7.1-2	
e) water supply source(s), alternate water supply, and associated infrastructure to support hydrogen and ammonia production	7.1, Drawing 7.1-2	
f) all effluent and other wastewater streams and associated infrastructure,	7.1, Drawings 7.1-1, 7.6-4	
g) workforce accommodations and associated infrastructure	6.1.2.8, 7.1, 8.1, Drawings 6.1-2, 7.1	
h) concrete production facilities and associated infrastructure	6.1.2.7, 7.1, 8.1, Drawings 6.1-2, 7.1	Concrete production within quarry sites.
i) fuel storage facilities.	6.1.2.9, 7.1, 8.1, Drawings 6.1-2, 7.1-1	
2.2.2. Construction - How will it be built?		
Details of materials, methods, schedule, and locations of all construction activities (including permanent and temporary infrastructure related to physical features) shall be described, including but not limited to, the following:	See below	
a) construction planning and development schedule	2.2, Table 2.2.1	
b) site preparation, clearing, blasting and blast radius for the installation of project components.	6.1, 7.1, 8.1	
c) sources and predicted decibel levels and duration of noise	6.4, 7.4, 8.4	
d) sources and predicted levels of light emissions	4.4.1, 9.4, 15.6.3	
e) water management infrastructure at all construction locations	6.1, 7.1, 8.1	
f) Project structures and infrastructure in protected public water supply areas	3.2.3, 6.6.4, 9.4, 12.3.5	
g) in-water works	3.1, 6.1	
h) the timing and duration of the construction period for in-water works	6.8.7.3, 7.7.7.3	
i) access roads, heavy haul roads and trails associated with the Project and any water crossings and infrastructure associated with water crossings	6.1, 7.1, 8.1	
j) transport, storage, and use of all hazardous materials, fuels and lubricants required during construction,	6.1, 7.1, 8.1	
k) location of proposed primary and alternate quarry sites,	6.1, 7.1, 8.1	
l) the classes (e.g., crushed aggregate, sand, gravel) and estimated quantities of quarry materials,	6.1, 7.1, 8.1	
m) details of exploration or testing activities,	6.1, 7.1, 8.1	

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EIS Guidelines	EIS Section	Additional Notes
n) concrete batch plants, water sources and water management infrastructure,	6.1, 7.1, 8.1	
o) all heavy equipment to be used during construction and an estimate of all emissions during construction	6.1, 7.1, 8.1	
p) emissions inventory and prediction of the dispersion of said emissions	6.3, 7.3, 8.3	
q) details of on-site generators required during construction,	6.1, 7.1, 8.1	
2.2.3. Operation and Maintenance - What does it do and how does it do it?		
All aspects of the operation and maintenance procedures for the undertaking shall be described in this subsection of the EIS, including, but not limited to, the following:	See below	
a) details of each phase of operations	3, 7.1, 8.1	
b) wind turbines at all sites	6.1	
c) solar farms at all sites	8.1	
d) transmission and collector lines, substations, battery energy storage facilities	6.1, 7.1	
e) all access roads and trails	6.1, 7.1, 8.1	
f) description of any regulatory requirements related to the incremental development of the Project,	2.5	
g) port facilities and shipping operations	7.1	
h) pipeline(s) from the hydrogen/ammonia plant to the marine terminal	7.1	
i) predicted decibels, duration, and geographic reach of noise from the operation of Project components	6.4, 7.4, 8.4	
j) lighting emissions and intensity (including solar glare and shadow flicker)	8.5, 6.5	
k) chemicals to be used as part of operations	6.1, 7.1, 8.1	
l) standard operating procedures for water electrolysis	7.1	
m) proposed water source(s), estimated daily and annual volume of water quantity and water quality requirements	7.1	
n) other water withdrawal requirements and sources	6.1, 7.1, 8.1	
o) water crossing infrastructure maintenance	6.1.3	
p) characterization of wastewater effluent from hydrogen and ammonia production	7.1	
q) procedures for regular source water and wastewater quality and quantity monitoring including a list of surface water collections systems	7.1	
r) procedures for regular ambient climate, water quantity and quality monitoring	6.7, 7.6, 8.6	
s) characterization and estimation of annual and daily atmospheric discharges from hydrogen and ammonia production	7.1	
t) emissions inventory and prediction of the dispersion of said emissions	7.2, Appendix E4	
u) sources of dust liftoff	6.1.2.2, 6.2.5.3, 7.2.6, 8.2.5	
v) procedures for, and estimated frequency of flaring and venting of gases	7.1, 7.2, 14.2, 14.3	
w) aboveground and underground storage of hydrogen and ammonia	7.1	
x) anticipated quantity of waste turbine blades and components and solar panels	Appendix Q (ARO)	
y) transport, storage, and use of all hazardous materials, fuels and lubricants	6.1, 7.1, 8.1	
z) market intentions for all end products	7.1	
aa) description of energy use	6.1, 7.1, 8.1	
bb) identification of potential sources of quarry materials	6.1, 7.1, 8.1	
cc) site security and management of public access to Project components	6.1.3.2, 7.1, 8.1.3.2, 9.5.3.1	
dd) a description of operation and maintenance requirements for any dams	N/A	none planned at this time
ee) a description of anticipated vegetation control around Project components	6.1.3.2, 6.9.7.3, 7.1, 7.8.7.3, 8.1.3.2, 8.8.7.3	
2.2.4. Decommissioning and Rehabilitation		
The EIS shall predict the lifespan of the undertaking and present an approach for decommissioning, which sets out a commitment from the Proponent to address:	See below	
a) expected useful life, and life cycle management plans for major Project components and infrastructure.	6.1.3.3, 7.1, 8.1.3.3	

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EIS Guidelines	EIS Section	Additional Notes
b) proposed decommissioning schedule and activities,	6.1.3.3, 7.1, 8.1.3.3	
c) decommissioning and rehabilitation of above ground and underground carbon, hydrogen and ammonia storage facilities	7.1	
d) decommissioning of industrial water supply	7.1	
2.2.5 GHG Emissions		
The EIS shall provide for all phases of the Project, including construction, operation and maintenance, and decommissioning and rehabilitation, according to the following details:	See below	
a) projected annual energy/fuel consumption by type,	6.3, 7.3, 8.3, Appendices E1-E3	
b) identification and annual estimates of any non-combusted and industrial process emissions at the facility	6.3, 7.3, 8.3, Appendices E1-E3	
c) projected annual energy/fuel consumption by type and annual GHG emissions by source for activities outside the Project boundary,	6.3, 7.3, 8.3, Appendices E1-E3	
d) identification of the volume of carbon dioxide emissions that may be emitted and sequestered on-site	6.3, 7.3, 8.3, Appendices E1-E3	
e) GHG emissions, and carbon dioxide sequestered for all phases should be quantified	6.3, 7.3, 8.3, Appendices E1-E3	
2.2.6. Regulatory Framework and Government Oversight		
The EIS shall provide a comprehensive list of permits and regulatory approvals (municipal, provincial, and federal) required for the undertaking. The list shall include, but not be limited to, the following details: • activity requiring regulatory approval; • name of permit, license or regulatory approval; • name of legislation applicable in each case; and • regulatory agency responsible for each permit, license, and approval The EIS shall identify:	2.5, Table 2.5.1	
a) government policies, resource management plans,	6-10	Regulatory context for each VC in each component chapter
b) regulations, codes, standards, guidelines and best industry practices	6-10	Regulatory context for each VC in each component chapter
c) established and evolving developments in hydrogen and ammonia installation, production, storage, handling and transportation codes and standards,	7.1	
d) the land nomination and competitive bidding process for Crown land for wind development,	2	
e) municipal or provincial land use plans, land zoning, community plans, protected road zoning plans and regulations,	9.4	
f) regional, provincial, and/or national objectives, standards, codes and/or guidelines	6-10	Regulatory context for each VC in each component chapter
g) list of development permits required from an Authority within a planning area or protected road as established under the Urban and Rural Planning Act, 2000	2.5, Table 2.5.1, 9.4	
h) list of permits and requirements authorized under the Towns and Local Service District Act	9.4	
i) list of permits required from the Department of Transportation & Infrastructure	2.5, Table 2.5.1, 9.4	
j) any governmental or non-governmental working groups or committees that provide guidance to municipal and or provincial bodies	9.4	

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3.0 ALTERNATIVES		
3.1 Alternatives to the Undertaking		
This subsection shall include a comparative analysis of the environmental effects and technical and economic feasibility of alternatives that led to the selected Project alternative. The Proponent shall consider describing:	See below	
a) functionally different methods of meeting the Project need and achieving the Project purpose; and	2.4.1	
b) market and regulatory circumstances that may have influenced the preferred alternative	2.4	
3.2 Alternative Methods of Carrying Out the Undertaking		
The EIS shall identify and consider the environmental effects of alternative methods of carrying out the undertaking that satisfy the need for the undertaking. The preferred alternatives shall be identified with the selection based on clearly described methods. An explanation shall be included of how environmental factors affect the design and consideration of alternatives. In describing alternative means of carrying out the Project, the Proponent may consider, but not be limited to, a discussion of the following:	2.4.2	
a) sources of energy	2.4.2.1	
b) wind turbine size and type	2.4.2.2	
c) solar energy size and type	2.4.2.3	
d) hydrogen and ammonia process, plant size and type	2.4.2.6	
e) locations, land area requirements and access routes	2.4.2.4	
f) the size, shape, and configuration of areas	2.4.2.4	
g) water source(s) for the Project	2.4.2.7	
h) effluent discharge points	2.4.2.8	
i) order and timelines for construction and operational phases	2.4.2.9	
j) aboveground and underground storage of hydrogen, ammonia and carbon	2.4.2.10	
4.0 ENVIRONMENT		
4.1 Key Issues		
The Proponent shall identify the key issues related to the Project. The issues can be revised and adjusted in relation to the information acquired in the field and during consultations held by the Proponent in the preparation of the EIS.	4.4.1, 5.1	

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4.2 Existing Environment		
The EIS shall describe relevant aspects of the existing environment prior to implementation of the Project, which constitute the reference state of the environment. Using qualitative and quantitative surveys (where applicable). Draft Environmental Impact Statement Guidelines Botwood and Area EVREC Green Energy Project description of the existing bio-physical and socio-economic environment that will be affected or might reasonably be expected to be affected, directly or indirectly, by the undertaking with emphasis on the valued environmental components (VECs). The EIS shall consider three spatial boundaries of study areas to describe the existing, pre-Project environment, as follows: • Project Area: the Project footprint including all temporary and permanent areas associated with the Project; • Local Study Area (LSA): the area beyond the Project footprint where Project effects may extend; and • Regional Study Area (RSA): the larger area around the LSA (delineated by ecological, social, economic or other appropriate boundaries), including the region where cumulative effects may extend. Detailed descriptions shall be developed for, at a minimum, the following VECs:	See below	
a) atmospheric environment;	6.2, 7.2, 8.2	
b) aquatic environment;	6.6-6.8, 7.5-7.7, 8.6-8.7	
c) terrestrial environment;	6.9-6.13, 7.8-7.10, 8.8-8.10	
d) land and resource use;	9.4	
e) traditional, cultural and recreational resources;	10.4	
f) communities; and	12.2	
g) economy, employment and business	11.2-11.4	
4.2.1 Atmospheric Environment		
The EIS shall describe the relevant components of the atmospheric environment within the study areas of the VECs including, but not limited to, the following:	See below	
a) climate information	6.2, 7.2, 8.2	
b) provincial climate change projections for Comfort Cove (nearest regional site) and coastal sea level rise projections for the Northeast coast of Newfoundland	13.1	
c) indications of recent climate change observations and trends	13.1	
d) historical and current provincial GHG emissions	6.3, 7.3, 8.3	
e) ambient noise, vibration and light	6.4, 7.4, 8.4	
f) ambient air quality	6.2, 7.2, 8.2	
g) existing weather radar monitoring in/near the study area	6.2, 7.2, 8.2	
4.2.2. Aquatic Environment		
The EIS shall describe the relevant components of the aquatic environment within the study areas of the VECs including, but not limited to, the following:	See below	

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EIS Guidelines	EIS Section	Additional Notes
a) protected public water supply areas, protected wellhead areas, unprotected public drinking water source areas and private drinking water sources,	6.6, 7.5	
b) industrial water supplies,	9.4	
c) surface and groundwater resources and locations,	6.6, 6.7, 7.5, 7.6, 8.6	
d) surface-water flow, groundwater movement and aquifer recharge zones, and the delineation of drainage basins, including wetlands,	6.6, 6.7, 7.5, 7.6, 8.6	
e) all streams, waterbodies, and wetlands,	6.7, 6.9, 7.6, 7.8, 8.6, 8.8	
f) hydrologic and hydrogeological assessment of the proposed water-supply,	Appendix H3	
g) commercial, recreational, and Indigenous fisheries,	9.4	
h) marine navigation and identification of the marine transportation route for incoming supplies,	7.1	
i) biosecurity at the Port of Botwood and the location of the existing marine terminal,	7.1, Drawing 7.1-2	
j) characterization of fish habitat and fish populations by species and life stage,	6.8, 7.7, 8.7	
k) an assessment of critical and sensitive habitats for spawning, nursing, rearing, feeding, and migration by fish species,	6.8, 7.7, 8.7	
l) an assessment of work windows and sensitive times of the year which are critical for fish populations identified	6.8, 7.7, 8.7	
4.2.3. Terrestrial Environment		
The EIS shall describe the relevant components of wetlands and the terrestrial environment within the study areas of the VECs, including, but not limited to, the following:	See below	
a) terrestrial flora, fauna and unique geology/geomorphology,	6.9, 6.10, 7.8, 7.9, 8.8, 8.9	
b) avifauna,	6.11, 7.10, 8.10	
c) species at risk and of conservation concern and their habitats.	6.8-6.13, 7.7-7.10, 8.7-8.10	
4.2.4. Land and Resource Use		
The EIS shall describe relevant land and resource use within the study areas of the VECs, including, but not limited to, the following:	See below	
a) existing electrical infrastructure,	9.4.1	
b) current and historic land use for mining, mineral exploration, and quarrying activities,	9.4.2	
c) existing land and marine based aquaculture facilities,	9.4.2	
d) commercial, recreational and Indigenous fisheries,	9.4.3	
e) domestic and commercial wood harvesting areas and silviculture areas,	9.4.2	
f) municipal boundaries and local service districts under the Town and Local Service District Act	9.4.1	
g) protected roads / plans / regulations, municipal planning areas / municipal plans / development regulations / interim development regulations under the Urban and Rural Planning Act	9.4.1	
h) land tenure, including, but not limited to, the following:	2	
i. Crown lands;	2	
ii. private land ownership; and	3.3, 9.4	
iii. land and forest tenure under the Petroleum and Natural Gas Act, Mineral Act, Quarry Materials Act and Forestry Act;	9.4	
4.2.5. Traditional, Cultural and Recreational Resources		
The EIS shall describe relevant traditional, cultural and recreational resources in the study areas of the VECs, including, but not limited to, the following:	See below	
a) historic and archaeological resources,	10.4	
b) paleontological resources,	10.4	

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EIS Guidelines	EIS Section	Additional Notes
c) architectural resources,	10.4	
d) burial, cultural, spiritual and heritage sites,	10	
e) natural attractions and recreational activities,	9.4.3	
f) tourism operators, licensed outfitters and guiding operators,	9.4.3	
g) landscapes and viewscales.	9.4.3	
4.2.6. Communities		
The EIS shall describe relevant community elements in municipalities, local service districts and unincorporated communities, and cottage areas in the study areas of the VECs, including the following:	See below	
a) population demographics and health status,	12.2.1	
b) family life, recreation, and culture,	12.2	
c) education and training facilities and programs,	12.2.5	
d) housing, accommodations, and property values,	12.3.2	
e) fire and emergency services,	12.3.7	
f) public health care services and services provided by non-profit and community based organizations,	12.3.4	
g) active municipal, governmental or non-governmental working groups or committees,	N/A	
h) municipal infrastructure or services to be used by the Project and the capacity of the infrastructure and services to support the Project.	12.3.5	
4.2.7. Economy, Employment and Business		
The EIS shall describe relevant economy, employment and business elements in the study areas of the VECs, including the following:	See below	
a) economy of the region,	11.3	
b) existing industries,	11.3	
c) employment and the availability of skilled and unskilled labour in the region and in the province,	11.4.3	
d) employment equity and diversity including under-represented groups and	11.4.4	
e) business capacity relative to goods and services.	11.4.8	

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4.3 Baseline Studies		
Baseline studies shall be developed for specific components of the existing environment to provide a more detailed analysis of existing conditions in biophysical and socioeconomic environments that could be affected by the Project, in the immediate Project vicinity and beyond. The baseline data should be suitable to assess effects within and across the Project area, LSA and RSA. The level of detail shall be sufficient to: • identify and assess any adverse environmental effects that may be caused by the Project; • identify and characterize the beneficial effects of the Project; • develop mitigation measures and monitoring programs where appropriate, to determine the effectiveness of mitigation measures, • provide the data necessary to enable effective follow-up Study outputs shall be proposed by the Proponent. Information and data generated shall be sufficient to establish baseline conditions and adequately predict the effects on VECs and shall meet the following criteria: • all maps are to be presented using Geographic Information System (GIS) and associated shapefiles are to be provided in digital format, • raw data shall be included in the Appendix in electronic tabular form and as digital geospatial data for GIS and • all information sources are to be identified. Baseline studies shall be prepared for various components of the atmospheric, aquatic and terrestrial environments and land and resource use.	See below	
4.3.1. Atmospheric Environment		
The atmospheric environment is defined as air quality and the acoustic and visual environments (e.g., noise, vibrations, solar glare and shadow flicker) within the vicinity of the Project. The baseline study of the atmospheric environment shall be focused on, at a minimum, the following components:	See below	
a) Air Quality;	6.2.4, 7.2.5, 8.2.4, Appendices D1, E1-E4	
b) Noise;	6.4.3, 7.4.3, 8.4.3, Appendices F1-F3	
c) Vibration;	6.4.4	
d) Solar Glint and Glare; and	8.5.4	
e) Shadow Flicker and Night Flicker.	6.5.4, Appendix G1	
4.3.2. Aquatic Environment		
The baseline study of the aquatic environment shall be focused on, at a minimum, the following components: • Water Resources and Use in the Project Study Areas, • Wastewater Discharge, • Fish and Fish Habitat.	6.6.4.2, 6.7.6, 7.6.6, 8.6, Appendix H1 Appendix H4 6.8, 7.8, 8.7, Appendix H2	

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4.3.3 Terrestrial Environment		
The baseline study of the terrestrial environment shall be focused on, at a minimum, the following components:	See below	
• Unique Geology/ Geomorphology;	3.2	
• Non-Avifauna, Non-Flora Species at Risk and Species of Conservation Concern and Relevant Habitat;	6.12, 6.13, 7.9, 8.9, Appendices J1, K1, M2	
• Plants and Lichen and Relevant Habitat;	6.9.6.1, 7.8.6, 8.8.6, Appendix I1	
• Avifauna and Avifauna Species at Risk and Relevant Habitat;	6.11, 7.10, 8.10, Appendix M1	
• Areas of Conservation Concern; and	3.2	
• Wetlands	6.9.6.2, 7.8.6, 8.8.6	
4.3.4. Land Resource Use		
The baseline study of land and resource use shall focus on, at a minimum, the following components:	See below	
• Provincial Road Network;	9.4.1.3, Appendix P1	
• Industrial Land Use;	9.4.2	
• Aquaculture and Fisheries; and	9.4.2	
• Traditional, Cultural and Recreational Resources	9.4.3	
4.3.5. Traditional, Cultural and Recreational Resources		
The Traditional, Cultural and Recreational Land Use component of this baseline study shall identify traditional, cultural and recreation land use in each of the sites proposed for wind and solar energy generation and the hydrogen and ammonia production facility.	10.6	
5. DATA GAPS		
The EIS shall explain any extrapolation, interpolation or other manipulation applied to the baseline data used to describe environmental conditions in the study areas.	6-8	See VC chapters and baseline reports
6. ENVIRONMENTAL EFFECTS		
6.1 Predicted Future Condition of the Environment if the Undertaking Does Not Proceed		
The EIS shall describe the predicted future condition of the environment within the expected life span of the Project if the Project were not to proceed. The predicted future condition of the environment shall help to distinguish Project related effects from environmental change due to natural processes.	6-8, 15	See VC chapters. We evaluate baseline conditions and consider potential non-anthropogenic conditions in our effects assessments. Cumulative effects discusses this as well.
6.2 Predicted Environmental Effects of the Undertaking		
The EIS shall contain a comprehensive analysis of the predicted environmental effects of each Project alternative for the VECs.		
a) The effects of the Project on GHG emissions	6.3.4, 7.3.4.2, 8.3.4.5	
b) The EIS shall assess the effects of all phases of the Project on human health and quality of life,	3.3	
c) The EIS shall assess the effects of the Project on surface water bodies, wetlands and groundwater aquifers,	6.7, 7.5, 6.6.5.3, 8.6.7.3, 7.6.7.3, 7.5.5.3	
d) The effects of the Project on fish, fish habitat (including critical and sensitive habitat) and fish populations by species,	6.8.7.3, 7.7.7.3, 8.7.7.3	
e) The effects of the Project on flora and fauna, and other species at risk and of conservation concern and their habitats	6.9.7.3, 7.8.7.3, 8.8.7.3, 6.10.7.4, 7.9.7.4, 8.9.7.4	
f) The effects of the Project on land and resource use, including effects on the following components:	See below	
• Provincial Road Network;	9.5.3.1	
• Industrial Land Use; and	9.5.3.2	
• Aquaculture and Fisheries.	9.5.3.2	
g) the boomtown effects of the Project on community health and services.	12.4	

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
6.3 Accidents and Malfunctions		
The EIS will identify and describe the potential accidents and malfunctions related to all components of the Project, including an explanation of how those events were identified, potential consequences (including the potential environmental effects), the worst-case scenarios as well as emergency scenarios that can reasonably be expected to occur, and the effects of these scenarios. Potential accidents and malfunctions may include, but not be limited to the following occurrences: a) accidental spills and/or releases of hydrogen, ammonia, chemicals, pesticides or any potentially hazardous substance on land or in air or water; b) fire and explosions, c) traffic accidents, d) dislodging of a wind tower or turbine blade or solar panel(s), e) failure of water supply, f) energy generation/transmission failure, and g) wildlife and habitats emergencies/incidents. The EIS shall assess the likelihood of occurrence and consequence severity of the accidents and malfunctions.	14	
6.4 Cumulative Environmental Effects		
The EIS shall identify and assess the Project's cumulative environmental effects. Cumulative effects are defined as changes to the environment and resident species and their habitat in the area due to the Project and combined with the effects of past, present, and reasonably foreseeable future planned projects and/or developments and activities in the area. Boundaries for assessing the cumulative effects of the Project in combination with other projects and activities that have been or will be carried out will generally be different from (larger than) the boundaries for assessing the effects of the Project, and shall: a) identify and justify the environmental components that will constitute the focus of the cumulative effects assessment. b) present a justification for the geographic and temporal boundaries of the cumulative effects assessment, c) describe and justify the choice of Projects and selected activities for the cumulative effects assessment, d) describe the mitigation measures and determine the significance of the residual cumulative effects.	15	
6.5 Effects of the Environment on the Project		
Environmental changes and hazards that may occur and may affect the Project shall be described (e.g. wind, ocean currents, waves, storm surge, algal blooms, severe precipitation events, flooding, wildfire, ice events, etc.). The EIS shall take into account the potential influence of climate change scenarios (e.g. sea level rise, increased severity and frequency of storms and flooding, changes to precipitation quantity and recharge rates), as well as local knowledge.	13	

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
7.0 Environmental Protection – Mitigations and Plans		
7.1 Mitigations		
The EIS shall identify and discuss proposed measures that will be implemented to mitigate the significant adverse effects and enhance beneficial effects of the Project.	See below	
Trade-offs between costs and predicted effectiveness of the mitigation measures shall be justified.		
a) The EIS shall include an analysis of best available control technologies (BACT) as it relates to GHG emissions.	N/A	Only required if threshold met, Project will follow provincial guidance.
b) The EIS shall describe measures to mitigate adverse effects of the Project on human health and quality of life and services.	18	
c) The EIS shall describe measures that will be undertaken to mitigate the effects of Project operations on water quantity and quality of surface water bodies, groundwater aquifers and wetlands in and adjacent to the Project area.	6.7.8, 7.6.8, 8.6.8, 6.6.6, 7.5.6, 6.9.8, 7.8.8, 8.8.8, 18	
d) The EIS shall describe measures to mitigate the adverse environmental effects of all phases of the Project on fish habitat and fish populations by species.	6.8.8, 7.7.8, 8.7.8, 18	
e) The EIS shall describe measures that will be undertaken to mitigate the effects, direct and indirect, of all phases of the Project on flora, avifauna, fauna and their habitats (including critical and sensitive habitat).	6.9.8, 7.8.8, 8.8.8, 6.11.8, 7.10.8, 8.10.8, 6.10.8, 7.9.8, 8.9.8, 18	
f) The EIS shall describe measures that will be undertaken to enhance beneficial effects and mitigate adverse effects on land and resource use and conflicts, including but not limited to effects on the following components:	See below	
• Provincial Road Network;	9.6.1	
• Industrial Land Use; and	9.6.2	
• Aquaculture and Fisheries	9.6.2	
7.2 Plans		
The EIS shall include plans, either in this subsection or as appendices to the EIS, that describe procedures, equipment and responsibilities that are in place to ensure an efficient and effective response to aspects of the Project that could adversely affect the receiving environment.	Appendix Q	All Management Plans located in Appendix Q
The plans shall be developed for each phase of the Project, including construction, operation and maintenance, and decommissioning and rehabilitation phases and shall include but not limited to, the following plans:		
7.2.1 Emergency Response/Contingency Plan, including Wildlife Response Plan		
The EIS shall include an Emergency Response/Contingency Plan outlining procedures to respond to accidents, malfunctions and emergencies, including, but not limited to, the following:	Appendix Q2	
a) accidental spills and/or releases of hydrogen, ammonia, chemicals, pesticides or any potentially hazardous substance on land or in air or water;		
b) fire, wildfire and explosion (e.g., hydrogen);		
c) traffic accidents;		
d) dislodging of a wind tower or turbine blade;		
e) hurricanes and other natural disasters;		
f) occupational hazards and human injuries;		
g) failure of industrial water supply;		
h) energy generation/transmission failure;		

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
i) flaring and/or venting of hydrogen, ammonia or other gases in the event of a malfunction;	Appendix Q2	
j) wildlife emergencies/incidents (e.g., bird mortality events of 10 or more birds in a single event, or an individual species at risk during a single event due to collisions with wind energy infrastructure);		
k) impacts to private, semi-private or public drinking water systems; and		
l) accidental discovery of historic resources.		
7.2.2 Waste Management Plan		
The EIS shall include a Waste Management Plan that shall describe all liquid and solid waste expected to be generated during construction, operation and maintenance, decommissioning and rehabilitation for all components of the Project, and methods to reduce, reuse, recycle, recover, and/ or manage residual wastes through disposal.	Appendix Q12	
7.2.3 Water Management Plan		
A Water Management Plan must be prepared for Project components and infrastructure including wind farms, solar farms, access roads, transmission lines, hydrogen and ammonia production facilities to evaluate the effects of the Project's construction and operation on streams, waterbodies, and wetlands. This Plan shall include: • all streams, waterbodies, and wetlands within the Project boundary. • Following the detailed Project plan, a comprehensive Water Resources Management Plan must be prepared to manage stormwater drainage from each wind farm, solar farm, and the hydrogen and ammonia production facilities. • All stream crossings within the wind farms and solar farms, which will be used only for the operation and maintenance of the infrastructure, must be designed for a 1 in 50-year climate change flow.	Appendix Q13	
7.2.4 Erosion and Sediment Control Plan		
The EIS shall include an Erosion and Sediment Control Plan (ESCP) to describe the methods and devices implemented to minimize erosion and sediment loss from the site as a result of clearing and soil disturbing activities throughout all phases of construction, operation and maintenance, and decommissioning and rehabilitation.	Appendix Q9	TOC only, until contractors selected and design complete.
7.2.5 Hazardous Materials Response and Training Plan		
The EIS shall include a Hazardous Materials Response and Training Plan that describes how fire fighters and first responders in local areas and along transportation routes will be trained to the appropriate National Fire Protection Association (NFPA) Codes and Standards (e.g. NFPA 1072 Hazardous Materials Technician) and any other related codes necessary to execute a Hazardous Materials Response.	Appendix Q11	

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
7.2.6 Transportation Impact Study and Traffic Management Plan		
The EIS shall include a Transportation Impact Study and Traffic Management Plan that shall assess and report on the potential effects of transporting oversized and overweight Project materials and equipment over existing roadways, during construction, operation, maintenance, modification, decommissioning and rehabilitation phases of the Project, that includes but is not limited to the following information: a) a study of the existing road infrastructure and capacity of the existing roads, bridges, culverts, sign structures, traffic and utility poles to accommodate transportation of oversized and overweight loads during the lifetime of the Project, b) frequency of travel over proposed routes, c) the estimated increased deterioration to the existing road infrastructure (e.g. road surface, roadbed, bridges, culverts, etc.) as a result of transportation of oversized and overweight loads associated with the Project, and the estimated increased maintenance requirements for roads, culverts and bridges due to the proposed work, d) acknowledgement that measures that will be implemented to mitigate any deficiencies in the roads, bridges or infrastructure, including providing alternative access, acknowledging that any engineering design or investigation costs will be at the Proponent's expense, e) traffic management plans for vehicular traffic during transportation of oversized and overweight loads, including municipal requirements and traffic management plans for the transport of oversized and overweight loads through municipal roadways, f) identification of provincial access and right of way permit requirements as expected over the life of the Project; and g) municipal requirements regarding traffic management plans for the municipal road infrastructure.	Appendix P1	Recommendations in Traffic Study are the Management Plan
7.2.7 Engagement and Participation Plan		
The EIS shall include an Engagement and Participation Plan that describes how local communities, cottage owners, recreational users, and interested persons can meaningfully participate in the planning of all phases of the Project (construction, operation and maintenance, decommissioning and rehabilitation) and how they will continue to be engaged throughout the life of the Project, including in the monitoring of environmental effects.	Appendix Q3	

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
7.2.8 Workforce and Employment Plan		
The EIS shall include a Workforce and Employment Plan for the construction, operation and maintenance, decommissioning and rehabilitation phases of the Project, which shall be developed in consultation with the Department of Immigration, Population Growth and Skills. a) National Occupation Classification codes, b) Approximate timelines for each of the positions, c) An indication of whether the positions are full-time equivalent or if they are the actual number of positions, d) An estimate of the number of apprentices and journeypersons required, e) Qualifications, certifications and other requirements, including the need for, location and availability of related training opportunities (e.g., post-journeyperson training) associated with key positions; f) Anticipated source of the workforce, g) A commitment to provide quarterly summary reports, h) A commitment to develop a Benefits Agreement,	Appendix Q14	
7.2.9 Domestic Wood Cutting Consultation Plan		
The EIS shall include a Domestic and Commercial Wood Cutting Consultation Plan with domestic users and commercial operators in the Botwood/Project area to identify and address any concerns with the Project and develop appropriate mitigations, in consultation with the Department of Fisheries, Forestry and Agriculture.	Appendix Q4	
7.2.10 Mineral Resource Industry Engagement Plan		
The EIS shall include a Mineral Resource Industry Engagement Plan reporting on the results of engagement with industry associations, mineral rights holders and other parties engaged in mineral exploration or mining in the region to identify and address concerns with the Project and develop appropriate mitigations, in consultation with the Department of Industry, Energy, and Technology.	Appendix Q5	
7.2.11 Quarry Resources Consultation Plan		
The EIS shall include a Quarry Resources Engagement Plan reporting on the results of engagement with industry associations, quarry rights holders and other stakeholders invested in the viability of quarrying in the region to identify and address concerns with the Project and develop appropriate mitigations, in consultation with the Department of Industry, Energy, and Technology.	Appendix Q6	

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
7.2.12 Environmental Effects Monitoring Programs (EEMPs)		
The EIS shall describe the environmental and socio-economic monitoring and follow-up programs to be incorporated into construction, operation and maintenance, decommissioning and rehabilitation activities. The proposed approach for follow up and monitoring shall be described and shall include: a) the objectives of the follow up and monitoring program and a schedule for collection of the data required to meet these objectives, b) the sampling design, methodology, selection of the subjects and indicators to be monitored, (e.g., climate, water quality, water quantity) and their selection criteria, c) the frequency, duration and geographic extent of monitoring, and justification for the extent, d) reporting and response mechanisms, including criteria for initiating a response and procedures, e) the approaches and methods for monitoring the cumulative effects of the Project with existing and future developments in the Project area, f) procedures to assess the effectiveness of follow-up and monitoring programs, mitigation measures and recovery programs for areas disturbed by the Project; g) a communications plan to describe the results of follow up and monitoring to interested parties and regulatory agencies.	Appendix Q1 through Q14	
7.2.12.1 Groundwater and Surface Water Monitoring Program		
A groundwater and surface water monitoring plan must be described that ensures the long-term security of the groundwater and surface water resources.	Appendix Q10	
7.2.12.2 Avifauna Management Plan		
An Avifauna Management Plan (including Migratory Birds and Species at Risk) should be developed in consultation with Department of Fisheries, Forestry and Agriculture (FFA) and Environment and Climate Change Canada's Canadian Wildlife Service (ECCC-CWS) and included in the EIS.	Appendix Q1	
7.2.12.3 Outfitter Environmental Effects Monitoring Plan		
The EIS shall describe engagement by the Proponent with the Newfoundland and Labrador Outfitters Association (NLOA), concerns expressed by the NLOA and how those concerns are being addressed.	Appendix Q8	
8.0 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE		
Residual effects are those adverse environmental effects which cannot be avoided or completely mitigated through, or that remain after, the application of environmental control technologies and best management practices. The EIS shall list and contain a detailed discussion and evaluation of residual effects, which shall be defined in terms of the parameters outlined in subsection 6.2. The EIS shall contain a concise statement and rationale for the overall conclusion relating to the significance of the residual adverse environmental effects. The EIS will, for ease of review, include a matrix of the environmental effects, proposed mitigations, and residual adverse effects.	16	
9.0 ASSESSMENT SUMMARY AND CONCLUSIONS		
The EIS shall summarize the overall findings of the environmental assessment, with emphasis on the key environmental issues identified.	19	

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
10.0 PUBLIC CONSULTATION		
Under section 58 of the Environmental Protection Act, during the preparation of an environmental impact statement, the Proponent shall provide an opportunity for interested members of the public to meet with the Proponent at a place adjacent to or in the geographical area of the undertaking, or as the minister may determine, in order to: a) provide information concerning the undertaking to the people whose environment may be affected by the undertaking; and b) record and respond to the concerns of the local community regarding the environmental effects of the undertaking.	4	
11.0 ENVIRONMENTAL PROTECTION PLAN		
The Proponent shall prepare an Environmental Protection Plan (EPP) for each construction site for approval by the Minister before commencing Project construction at that site. A proposed Table of Contents and an annotated outline for the EPPs is to be presented in the EIS, which shall address the major construction, operations and maintenance activities, permit requirements, mitigation measures and contingency planning as follows: a) Proponent's environmental policies and provincial and federal environmental legislation and policies; b) environmental compliance monitoring; c) environmental protection measures; d) mitigation measures; e) permit application and approval planning; f) contingency planning for accidental and unplanned events; g) statutory requirements; and h) revision procedures and contact lists.	TBD	TOC in EAR still relevant, final EPP upon final design
12.0 REFERENCES		
The Proponent shall prepare a complete and detailed bibliography of studies used to prepare the EIS. Supporting documentation shall be referenced in the EIS and submitted in separate volumes or attached as an appendix to the EIS.	22	
13.0 PERSONNEL		
The names and qualifications of key professionals responsible for preparing the EIS and supporting documentation shall be included. A description of the qualifications of scientists conducting surveys and scientific studies associated with the undertaking shall be provided.	1	
14.0 COMMITMENTS MADE IN THE EIS		
The EIS is a statement of the Proponent's environmental conclusions and commitments related to the Project and must be explicitly endorsed by the Proponent. The EIS shall provide a list of all commitments made regarding environmental effects mitigation, monitoring and follow-up. Each commitment must be cross-referenced to the Section and subsection of the EIS where it has been made.	18	

Table of Concordance - EIS Guidelines, EVREC Botwood Green Energy (EA2327)

EIS Guidelines	EIS Section	Additional Notes
15.0 COPIES OF REPORTS		
The EIS should be prepared according with the Guidelines and once completed, the Proponent shall submit printed and electronic copies of the EIS to the Department of Environment and Climate Change as specified below: • 3 electronic copies (USB drives); and • 1 paper copy.	3 paper copies (2 public), 1 electronic emailed copy	GIS files sent to government

EXECUTIVE SUMMARY

The Proponent

Exploits Valley Renewable Energy Corporation (EVREC), a joint venture between Abraxas Power (“Abraxas”) and EDF power solutions (EDFps), is building one of the world’s largest energy transition projects, in Botwood, Newfoundland, Canada. Abraxas is a global green energy developer focused on creating a portfolio of assets diversified by geography, technology, and scale. Abraxas consists of experienced management professionals who have significant depth in renewable power, specialty gases, electrical distribution and storage, and large-scale industrial facilities. EDFps brings extensive experience in developing, constructing, and operating grid-scale renewable energy development across North America, including onshore and offshore wind, solar, and battery storage projects.

Together, EVREC consists of a world class team of experienced management professionals with significant depth across a number of disciplines and sectors that will contribute to successful development of one of the world’s largest green hydrogen projects.

Project Description

EVREC is proposing the development of EVREC Green Energy Hub (the “Project”), a 3.5 gigawatt (GW) green hydrogen project in central Newfoundland and Labrador (NL), located near the town of Botwood, NL. The Project includes an approximate 3,500+ megawatt (MW) Wind Project, a 150 MW Solar Project, and an Industrial Facility to process hydrogen and ammonia.

The wind project will consist of up to 534 turbines throughout four Wind Project Areas (WPA). The Botwood WPA (BWPA) is the most easterly located near the town of Botwood and is located west of the Industrial Facility. The Seabrights Lake and Leading Ticks WPAs (SLWPA, LTWPA) are located west and north of Botwood wind area, respectively. The Twin Lakes WPA (TLWPA) is located the furthest west from Botwood, approximately 40 km. The WPAs are connected by a 230 kilovolt (kV) transmission line that will be constructed to support the Project. Although the Project is planned to be fully off-grid, there is an application submitted to Newfoundland Power (NF Power) for up to 50 MW grid connection for construction support and additional backup power to critical systems.

The solar and industrial projects are located approximately 2.5 kilometers (km) from the town of Botwood, excepting the heavy haul road and ammonia pipeline which run along the Port of Botwood. The Solar Project will consist of up to 300,000 solar PV modules over 242 hectares (ha). The industrial Project (1,157 ha) is made up of several integrated component groups. These component groups include the pre-construction support infrastructure and permanent support facilities; the hydrogen plant, including the electrolyzer systems and hydrogen purification, compression, and storage systems; the ammonia plant, including the air separation units, ammonia synthesis trains, refrigeration and steam systems, storage and distribution systems, and flare and control systems; fuel and hazardous-materials storage; the battery energy storage system (BESS); water supply, treatment, storage, stormwater,

wastewater, and effluent infrastructure; solid-waste management infrastructure; and 30 diesel backup generators to provide emergency backup power for safe standby and/or shutdown when wind and solar supply are unavailable.

The Project will require up to 12.64 million litres (L) of water per day from Peters Pond for maximum production. Modelling has indicated that recycling back to Peters Pond may be required periodically through the months of July through October to maintain ecological flow in Peters River. Water will be managed through intake and return lines from Peters Pond to the Industrial Facility. Wastewater will be monitored, treated if required, and discharged to a creek north of the facility. EVREC is planning for shipment of approximately 1,000,000 tonnes of ammonia to the European market each year. The ammonia will be transported by an underground pipeline from the Industrial Facility to the Port of Botwood, in parallel with the location of the heavy haul road. The marine export facilities will be located at the Port of Botwood and will utilize existing port infrastructure upgraded for ammonia service. The heavy haul road will connect the Industrial Facility to Route 350 ("Botwood Highway") and the Port of Botwood, facilitating the transport of equipment and materials. The Port of Botwood jetty physical upgrades (including a portion of the heavy haul road) and shipping are managed by Exploits Valley Port Corporation and captured under separate cover for the purposes of permitting.

Construction is expected to take approximately three years, starting in mid to late 2027 with the Botwood Wind Project Area, the Industrial Facility, the heavy haul road, and water management components. Temporary laydown areas, quarries, and accommodation camps will be placed throughout the Project as construction moves east to west. The Project is expected to have a 33-year operational lifetime, with a minimum of three operational accommodation camps, located at the Industrial Facility and within the Wind Project Area. Decommissioning will involve staged retirement and removal of infrastructure and follow local guidance and legislation at the time, expecting to take about two to three years. The haul road is expected to remain in place and regraded to the town of Botwood requirements.

The Project is considered an undertaking under Section 34 (1f) of the Newfoundland and Labrador Environmental Assessment Regulations, where electrical power generation has a capacity greater than 1 MW and engages in the manufacture of green hydrogen and ammonia. Thus, this Project requires the registration of an Environmental Assessment Registration document. The Registration was submitted in October 2024, and the provincial government decided to request an Environmental Impact Statement (EIS) for the Project. This document is prepared in response to the issued provincial EIS guidelines (April 2025) for this Project, and following the Government of Newfoundland and Labrador Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects.

In 2007, the Province has released a target to reduce Greenhouse Gas (GHG) emissions by 10%, to reach 1990 levels by 2020 and 75-85% of 2001 levels by 2050 in an effort to reach Canada's net zero goal by 2050 (NLECCC, 2019). However, the Province has not reached its interim 2020 goal. The Province adjusted its marker in 2015 to reduce 1990 levels of GHG

emissions by 35-45% by 2030. The development of this Project will support Newfoundland and Labrador in achieving these targets.

EVREC considered alternatives to the Project and alternative methods of carrying out the Project. An off-grid and on-grid analysis was completed with off-grid wind design providing enough power for production stability and economic benefits. Alternative sources of energy, turbine sizes, solar energy sizes, access routes, water sources, effluent discharge points, and above/under ground storage options were evaluated. Project layout, location, infrastructure and technology was based on minimizing impacts to the environment such as footprint, proximity to communities, water quantity, and regulatory process, while providing economic benefits to the region.

Summary of Predicted Biophysical Environmental and Socio-economic Effects

Several valued components were chosen to assess the environmental and socio-economic effects of the Project, including air, greenhouse gases, noise, plants, wildlife, water, fish and fish habitat, historic resources, and the local communities (land use, community infrastructure and employment and economy).

The Project will contribute to provincial Gross Domestic Product (GDP) through employment and income generated by suppliers (by \$9.3 billion over the life of the Project). The Project will support over 4,200 jobs during peak construction and 835 jobs during operations, boosting annual household spending in NL by over \$4 billion and paying municipal tax revenues up to \$507 million. Potential impacts to traffic and accommodations in the community are addressed through the Traffic Impact Study and the camp accommodations strategy for non-resident construction workers (Appendix P.1).

Air quality can be affected by the Project throughout the construction stage for all aspects of the Project, and also during operations of the Industrial Facility. Process emissions from the Industrial Facility (i.e., flares, generators) were considered in an air dispersion model, which showed no exceedances of air contaminants under the NL Air Pollution Control Regulations during modelled operations. Short, intermittent exceedances are predicted to occur during the two-month commissioning phase and during abnormal conditions. Regular maintenance and erosion control methods are expected to mitigate temporary dust emissions from construction..

Construction and operational noise were also modelled for the wind and Industrial Facility components of the Project. Health Canada recommends 45 dBA as the acceptable level in their guidance on human health impacts for sleep disturbance during short term construction. The models reviewed noise impacts to receptors such as residential buildings, remote cabins-titled, remote cabins- untitled, and commercial operations. There are no exceedances for wind and industrial and solar at any residences for the Health Canada guidance following mitigation measures such as enclosed or low noise flares and generators with noise controls. EVREC is committed to using noise suppressants and will develop a complaint response protocol.

Wind turbines can have the potential to create shadow flicker. There is no provincial or federal

guidance on shadow flicker. Many jurisdictions in Canada, including NS and NL, have adapted the limit of 30 minutes of shadow flicker per day and 30 hours per year. Modelling showed that some nearby receptors would be affected. A proportion of the residential and remote cabin (titled and untitled) receptors may be exposed to shadow flicker above the generally accepted thresholds intermittently. EVREC will undertake further modelling of these receptors to determine the actual potential for exceedance with additional information relating to the nature of the receptor (such as reviewing number of, and forward facing, windows in remote cabins) and develop a mitigation plan accordingly to ensure the effects of shadow flicker are adequately addressed. EVREC will also develop a complaint response protocol.

Solar glare from solar projects can be an issue in climates with longer sunshine exposure days. Solar glare was modelled for the nearest receptors for the Solar Project Area (airport, highway intersections, residences). Solar glare can be classified as being in the green zone (low potential), yellow zone (no permanent damage over short exposures), or red zone (permanent damage to unprotected eyes). Solar glare for the Project was classified as yellow glare. Yellow glare may produce a temporary after-image after short exposures but is classified as not posing a risk to human health due to permanent effects on vision.

Potential accidents and malfunctions for the Project include accidental release of ammonia, hydrogen, and untreated liquid effluent, hazardous materials spills, turbine dislodgement, energy failure, failure of water supply, fires and explosions, thermal runaway, traffic accidents, and wildlife incidents. Risks associated with these potential accidents are determined by likelihood of an event occurring as well as the potential consequences the event could have.. EVREC plans to implement a regiment training program for employees, with an on-site emergency response team for the Project. EVREC also commits to regular maintenance and leak detection, as well as emergency alerts and development of critical escape routes. Risks were determined to be low for accidental emission release, dislodgement of turbine/tower, and failure of water supply/energy transmission, and medium for ammonia and hydrogen release, fires, explosions, and traffic accidents.

Potential impacts to land use consider effects on municipalities, industrial and commercial operations (mining, quarries, forestry, agriculture, aquaculture), and recreational (tourism, outfitters, cabin owners) and traditional users.

EVREC will follow municipal and provincial legislation for permitted uses on the Project lands, within municipal planning areas and Crown lands, including application for development zoning and permits. Traffic within the Town of Botwood will increase temporarily, with expected daily traffic on Water St. and the Botwood Highway to increase by 9% and 10.7% during construction. EVREC will use the segregated heavy haul road to reduce traffic and operate a separate dedicated water and sewer system not connected to any municipal infrastructure to minimize potential impacts to nearby municipalities.

Industries in the Project Area include mining, quarries, forestry, and agriculture. While there is some overlap of mineral leases and quarries with the Project Area (PA), EVREC will work with

these industries to avoid infrastructure placement on active resource extraction areas, where possible, to minimize resource availability and land access. Cleared areas are required only during the construction phase and anticipated to return to a forest state through succession over time, resulting in a return to availability for forestry and agricultural users.

EVREC is working with local outfitters to address potential impacts to their business during construction and initial operations. Road densities in the WPA are anticipated to increase by 85%, potentially increasing access for recreational activities. EVREC is working with local trail associations, and the town of Botwood, to determine potential impacts to established trail networks, including the railway alignment along the Port of Botwood. Effects to local cabin owners, including clusters around some lakes in the PA, include shadow flicker, solar glare, and access. EVREC will maintain access throughout the PA, except in areas of critical infrastructure such as electrical substations, solar panels, and the Industrial Facility. EVREC intends to meaningfully engage with these stakeholders regularly, in an effort to develop the Project under good social license.

Ground disturbance can result in loss of historic and cultural resources. A review of the provincial archaeological database didn't identify any paleontological resources within the Project Area. A Historic Resources Impact Assessment (HRIA) was conducted on a representative sample of high potential areas within the Wind Project Area, as well as the planned infrastructure site for the solar and industrial facilities. No archaeological resources were identified within the solar and industrial project areas, with three archaeological resources registered within the Leading Tickles Wind Project Area. EVREC will continue the HRIA throughout the detailed design and construction stage, and also will adhere to the provincial Accidental Finds Procedure. As the region has been disturbed through a long logging history, there is low risk of finding archaeological resources. However, given the documentation around Indigenous groups such as the Beothuk in the area, additional HRIA is warranted.

Impacts to groundwater from the Project were evaluated and it was determined that foundation dewatering will not impact private wells. It is expected that local well levels and water flow to wetlands and streams will be preserved through limited dewatering in the Project Area (PA). Quarry extraction will be above the water table and EVREC has committed to pre-blasting surveys for all structures and wells within the predicted blast zones of influence and as a result, there are no anticipated effects on local groundwater levels from quarry activities.

Surface water may be affected throughout the PA, namely through future stream crossings for access roads and the development of the Industrial Facility infrastructure. A representative number of streams were sampled throughout the PA, including all the scheduled salmon rivers, with fish habitat characteristics documented to support future permit applications. Only four species of fish were identified: Atlantic salmon, American eel, threespine stickleback and brook trout. Road crossings in the PA will require review with DFO to confirm permitting requirements, and the diversion of two streams around the Industrial Facility will require a federal *Fisheries Act* authorization. The proposed road crossing sites will be micro-sited and permitted, once engineering is finalized, to maintain watercourse conditions and fish passage.

Although the availability of fish habitat is expected to be moderately affected, the quality will likely be maintained throughout the PA, not contributing a significant adverse effect on fish.

Water withdrawal for the Project, and the wastewater discharge into the natural environment, has the potential to impact water quality, quantity, and therefore fish habitat. A hydrological model was conducted to assess the impact of the proposed water withdrawal from Peters Pond. The model incorporated data from historical climate conditions, as well as recent low flow conditions in 2025, and concluded that Peters Pond has sufficient water available to accommodate the Project, when treated water is recirculated back to the pond during low flow periods (July to October). Wastewater from the Industrial Facility's stormwater/effluent pond will be monitored, treated if required, and discharged to a creek north of the facility. The treated wastewater is expected to meet Newfoundland and Labrador Environmental Control Water and Sewage Regulations and CCME Water Quality Guidelines for the Protection of Aquatic Life. The impact to fish and fish habitat would be limited because the creek naturally floods during periods of high flow, so the additional water proposed for discharge into this stream will not substantively change flood conditions. EVREC is committed to meeting minimum flow requirements and protecting the ecological flow downstream in Peters River. A groundwater and surface water monitoring program will be developed to manage water quantity and quality for the Project.

Loss of rare plants and habitat is expected to occur through vegetation clearing. The PA is primarily shrub land, with softwood and old growth/late-successional forest stands in the WPA, bogs in the Industrial Project Area (IPA), and barren lands and wetlands being the dominant features in the Solar Project Area (SPA). Field surveys have identified locations of some species at risk (SAR) (e.g., lichen, red pine) within the WPAs. EVREC has sited infrastructure to buffer wetlands by regulatory setbacks and avoid red pine, where stands have been identified. EVREC will microsite the Project during the detailed design stage to continue to reduce impacts to rare species or SAR and minimize footprint where possible. Unavoidable impacts to SAR will be permitted through the NL *Endangered Species Act*.

Risks to wildlife include loss of habitat and mortality, primarily during construction, as well as sensory disturbance from noise. Loss of habitat will occur in the more remote Twin Lakes and Seabrights Lake WPAs, due to the lack of existing road density in those areas. Local animals found throughout the Project included moose, caribou, coyote, hare, and squirrel. No marten were identified through surveys that were conducted. Generally, moose and caribou tend to adapt to infrastructure with developed areas. EVREC is committed to developing a Wildlife Response Plan for the Project that minimizes disturbance to wildlife, including the use of existing roads wherever possible and establishing a wildlife incident reporting protocol.

Caribou may similarly be impacted by habitat alteration, mortality, and sensory disturbance. Caribou habitat was modelled using publicly available data, provincial collared data, and a camera grid system designed to capture caribou movement throughout the PA. The modelling demonstrated habitat suitability, with TLWPA having the highest selection during calving. The WPA overlaps with 9% of the home range of the local Hodges Hill herd but the footprint only

overlaps 1%. The primary activity to result in habitat alteration is clearing activities but these impacts are short-term in nature, and caribou may show reduced avoidance of cleared areas following remediation and completion of construction activities. EVREC will minimize clearing to the footprint required, revegetate areas as quickly as possible, and ensure all staff are trained on the wildlife response plan.

Birds can be affected by turbines, specifically due to loss of habitat and mortality from collisions. Four bird SAR were found throughout the PA. Even with evidence of historical logging activities throughout the region, habitat modelling indicated there is likely sufficient suitable habitat surrounding the Project Footprint (PF) to maintain habitat functionality within the PA. Generally, most birds were detected migrating above turbine height, except for the Leading Tickles area. EVREC has developed an Avifauna Management Plan to address the effectiveness of mitigations and monitoring to be implemented (Appendix Q.1).

Bats can also be affected by turbines through habitat loss and mortality from collisions. During field surveys, only resident bat species were identified. Resident, non-migratory bat species fly shorter distances and at lower elevations, thereby proving less risk of impact to turbines. EVREC has drafted a specific bat adaptive mitigation program to actively monitor and react to any potential concerns. Mortality monitoring will form part of this program.

EVREC has drafted a number of management plans in support of the Project. These include monitoring programs for groundwater, surface water, and avifauna. Additionally, several consultation plans on domestic woodcutting, mineral resources, quarries, and the public will be implemented throughout the life of the Project. Safety concerns are addressed in EVREC's emergency response, traffic management, and erosion control plans. These plans have been drafted or outlined in the EIS, but are considered living documents and will continue to evolve and be updated throughout the life of the Project.

Thirty-two activities were observed within the 10 km buffer assigned for cumulative effects. Activities included cranberry farms, the airport, mink farm, quarries, utilities, and the Port of Botwood. Each activity was assessed by considering potential residual effects from valued components such as air quality, noise, freshwater aquatics, terrestrial and land use. There were no other projects of a similar nature within the cumulative effects buffer. Overall, the cumulative effects assessment for the valued components are expected to be low and not significant and can be managed through Project level mitigation and monitoring.

Engagement

EVREC has consulted with regulators and engaged with Indigenous and public stakeholders regularly throughout the Project planning phase. Recurring meetings were held with the surrounding municipalities, local cabin owners, outfitting operators, Qalipu First Nation, and provincial and federal government regulators commencing in 2024 and continue through 2026. Three open houses were held to inform the public and stakeholders about the Project and provide status updates. EVREC received several letters of support for the environmental assessment registration in 2024 and continues to listen to concerns brought forward by

stakeholders. The Project has incorporated a number of design considerations following these engagements. Engagement will be ongoing throughout the Project as outlined in the consultation plans appended to the EIS.

Conclusion

The Project will have an effect on the environmental and socio-economic conditions in the PA. However, following several mitigation measures, design considerations, engagement follow-up, and regulatory permitting commitments, Considering the temporary nature of the effects from construction, and proposed mitigation measures, adverse residual effects are anticipated to be not significant. To support Project planning and environmental permitting, EVREC worked to understand additional considerations that might limit where turbines and associated infrastructure could be placed within the awarded reserve lands. During the planning process, several setbacks and commitments were made that resulted in a reduction of awarded lands. EVREC is requesting additional Crown lands in addition to those in the EIS PA to support the layout and engineering and mitigation planning advances. The additional lands “mitigation lands” surround Seabrights Lake and Twin Lakes Project Areas. Potential benefits for the communities include reduced disturbance around congested cabin areas, no traffic impacts to Leading Tickles, and no turbines near the community of Northern Arm. Potential adverse impacts from the Project with an adjusted turbine layout can generally be managed through follow up additional studies, existing proposed mitigation measures and monitoring in the EIS.

EVREC is confident that adverse effects from the Project with an adjusted turbine layout within the PMPA as proposed in Chapter 17 can generally be managed through existing proposed mitigation measures and monitoring programs/follow up as described within this EIS. Where this is not possible, EVREC commits to updating mitigation measures as needed during the pre-construction phase when final turbine layout is confirmed, and necessary follow up surveys will be completed and results shared with the province. Should the Project adjust to the proposed turbine layout proposed with the PMPA, EVREC will commit to a caribou collar monitoring program as an additional mitigation measure.

This Executive Summary provides a brief overview of the main findings and recommendations of the environmental assessment. Complete details are provided in the report and the attached Appendices. The statements made in this Executive Summary are subject to the same limitations as described in Section 21.0.

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List of Acronyms and Units

Acronym/Unit	Definition
(A)	Aesthetic
(C)	Contaminant
µA	Microampere
µg/m ³	Micrograms per Cubic Metre
µm	Micrometres
µS/cm	Microsiemens per Centimeter
µΩ	Micro-ohm
2P	Two Modules in Portrait
AAQMS	Ambient Air Quality Monitoring Stations
ABE	Adult Basic Education
ACCDC	Atlantic Canada Conservation Data Centre
ACGIH	American Conference of Governmental Industrial Hygienists
ACSR	Aluminum conductor steel reinforcer
ALARP	As Low As Reasonably Possible
AO	Aesthetic Objectives
APU	Auxiliary Power Unit
AQHI	Air Quality Health Index
ASTM	American Society for Testing and Materials
ASU	Air Separation Unit
ATV	All-Terrain Vehicle
AWG	American Wire Gauge
BESS	Battery energy storage system

Acronym/Unit	Definition
BMPs	Best Management Practices
BOD	Basis of Design
BoG	Boil-off Gas
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
BTU/lb	British Thermal Units per Pound
BWP	Botwood Wind Project
BWPA	Botwood Wind Project Area
CAAQS	Canadian Ambient Air Quality Standards
CaCO ₃	Calcium Carbonate
CBR	California Bearing Ratio
CCME	Canadian Council of Ministers of the Environment
CDR	Census Division
CH ₄	Methane
CHAZOP	Control Hazard and Operability Study
cm	Centimeters
CNA	College of the North Atlantic
CNWI	Canadian National Wetlands Inventory
CNWM	Central Newfoundland Waste Management
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPF	Central Processing Facility
CPI	Corrugated Plate Interceptor
CT	Current Transformer
CVT	Capacitive Voltage Transformer
D	Outer Diameter
dB L _{Aeq}	A-weighted Equivalent Continuous Sound Level
dB/km	Decibels Per Kilometres
dBA	A-weighted decibels
dBA L _{dn}	Day-Night Average Sound Level
DC	Direct Current
DEM	Digital Elevation Model
DFO	Fisheries and Oceans Canada
DI	Deionization
DOC	Dissolved Oxygen Content
DUC	Ducks Unlimited Canada
DWT	Deadweight Tonnage
EARD	Environmental Assessment Registration Document
ECCC	Environment and Climate Change Canada
EDI	Electro-Deionization
EHV	Extra High Voltage
EIS	Environmental Impact Statement
ELC	Ecological Land Classification
EPCM	Engineering, Procurement, and Construction Management
EQS	Environmental Quality Standard
ESA	Environmental Site Assessment

Acronym/Unit	Definition
ESD	Emergency Shutdown
EVREC	Exploits Valley Renewable Energy Corporation (Proponent Name)
FAL	Protection of Aquatic Life
FDS	Fault Detection and Classification System
FEED	Front-End Engineering Design
FRCs	Family Resource Centres
FRI	Forest Resource Inventory
FWAL	Freshwater Aquatic Life
g/s	Grams Per Second
GAN	Gaseous Nitrogen
GHG	Greenhouse Gas
gpm	Gallons Per Minute
GPS	Global Positioning System
GWh	Gigawatt hour
GΩ	Giga-ohm
H ₂ S	Hydrogen Sulphide
ha	Hectares
HADD	Harmful, Alteration, Disruption, or Destruction
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study
HDPE	High Density Polyethylene
HP	High-Pressure
HRIA	Heritage Resource Impact Assessments
HV	High Voltage
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
I&C	Instrumentation and Control
IFC	Issued for Construction
IGF	Induced Gas Flotation
IPA	Industrial Project Area
IR	Insulation Resistance
IT	Information Technology
km	Kilometres
km/h	Kilometres Per Hour
kN	Kilonewton
kPa	Kilopascal
kV	Kilovolts
kWh/year	Kilowatt Hours Per Year
L/day	Litres Per Day
L/min	Litres Per Minute
LA	Lightning Arrester
LCA	Life Cycle Assessment
LiDAR	Light Detection And Ranging
LP	Low-Pressure
LP GAN	Low-Pressure Gaseous Nitrogen
LSA	Local Study Area
LTWP	Leading Tickles Wind Project

Acronym/Unit	Definition
LTWPA	Leading Tickles Wind Project Area
LV	Low-Voltage
m	Metres
m/s	Metres per second
m ²	Metres squared
m ³	Cubic Metres
MAC	Main Air Compressor
MAC	Maximum Acceptable Concentrations
MCM	Thousand Circular Mills
mg/L	Milligrams Per Litre
MGGA	Management of Greenhouse Gas Act
MLPD	Million Litres Per Day
mm	Millimetres
mm ²	Square Millimetre
MOF	Marine Offloading Facility
MP GAN	Medium-Pressure Gaseous Nitrogen
MPa	Megapascal
MPPTs	Maximum Power Point Trackers
ms	Milliseconds
mtpa	Million Tonnes Per Annum
MVA	Megavolt Amperes
MVA	Medium-Voltage
MW	Megawatt
MWh/year	Megawatt hour per year
MΩ	Megaohm
FEED	Front-End Engineering Design
N.L.R.	Newfoundland and Labrador Regulations
N/A	Not Applicable
NFPA	National Fire Protection Association
NH ₃	Ammonia
NL FAL	Newfoundland and Labrador Department of Forestry, Agriculture and Lands
NL TCAR	Newfoundland and Labrador Department of Tourism, Culture, Arts, and Recreation
NLAPCR	Newfoundland and Labrador Air Pollution Control Regulations
NLECCC	Newfoundland and Labrador Department of Environment, Conservation, and Climate Change
NLEECD	Newfoundland and Labrador Department of Education and Early Childhood Development
NLGS	Geological Survey of Newfoundland and Labrador
NLOA	Newfoundland and Labrador Outfitters Association
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
NSNRR	Nova Scotia Natural Resources and Renewables
NTU	Nephelometric Turbidity Units
NWWG	National Wetlands Working Group
Ø	Diameter
O&M	Operations and Maintenance

Acronym/Unit	Definition
O ₃	Ozone
OEM	Original Equipment Manufacturer
OPGW	Optical Ground Wire
OTDR	Optical Time Domain Reflectometer
OWS	Oily Water Sewer
P&C	Protection and Controls
PA	Project Area
PAH	Polycyclic Aromatic Hydrocarbons
PAO	Provincial Archaeology Office
PDSA	Pre-Disturbance Site Assessment
PEM	Proton Exchange Membrane
PF	Project Footprint
PM	Particulate Matter
ppb	Parts Per Billion
PPE	Personal Protective Equipment
ppm	Parts Per Million
ppmv	Part Per Million By Volume
PPWSA	Protected Public Water Supply Areas
pre-FEED	Preliminary Front-End Engineering Design
Project	EVREC Green Energy Hub
PSS	Pathway-Specific Standards
PSV	Pressure Safety Valve
PV	Photovoltaic
QC	Quality Control
RAA	Regional Assessment Area
RBCA	Risk Based Corrective Action
RCMP	Royal Canadian Mounted Police
RFR	Request for Review
RO	Reverse Osmosis
ROI	Radius of Influence
ROW	Right-of-Way
rpm	Revolutions Per Minute
RSA	Regional Study Area
RSF	Resource Selection Function
RTS	Rated Tensile Strength
RTU	Remote Terminal Unit
SAR	Species at Risk
SARA	Species at Risk Act
SCADA	Supervisory Control and Data Acquisition
SLWP	Seabrights Lake Wind Project
SLWPA	Seabrights Lake Wind Project Area
SO	Service Order
SO ₂	Sulfur Dioxide
SOC	Species of Conservation Concern
SO _x	Oxides of Sulphur
SPA	Solar Project Area
SPD	Standard Proctor Density

Acronym/Unit	Definition
SRM	Sound-Reduced Modes
SSAC	Strategic Assessment of Climate Change
STATCOM	Static Synchronous Compensator
t	Tonne
t/hr	Tonnes per hour
TCH	Trans-Canada Highway
TCU	True Colour Units
TDS	Total Dissolved Solids
TES	Trailing-Edge Serrations
TLVs	Threshold Limit Values
TLWP	Twin Lakes Wind Project
TLWPA	Twin Lakes Wind Project Area
TPH	Total Petroleum Hydrocarbons
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UAV	Unmanned Aerial Vehicle
UF	Ultrafiltration
UPS	Uninterruptible Power Supply
UTM	Universal Transverse Mercator
VC	Value Component
VOC	Volatile organic compounds
VT	Voltage Transformer
w%	Weight Percent
w/w	Weight/Weight
WPA	Wind Project Area
WRID	Wind Receptor ID Number
WRMD	Water Resources Management Division
WSC	Water Survey of Canada
WTG	Wind Turbine Generator
XLPE	Cross-linked polyethylene
Ω	Ohm

1.0 INTRODUCTION

Exploits Valley Renewable Energy Corporation (“EVREC”, the “Proponent”) is proposing the development of the EVREC Green Energy Hub (the “Project”) in central Newfoundland and Labrador (NL), Canada. The Project is positioned to be one of the lowest cost green hydrogen and ammonia producers globally, utilizing 100% renewable energy. The Project is planned to have a small grid connection for construction support and critical loads and will be powered by off-grid renewable energy (wind and solar). The facility will produce certified green ammonia that is expected to be utilized predominantly in the Canadian, United States, and European markets. The key applications of green ammonia are for fertilizer production, agriculture, chemical industry, hydrogen carrier, fuel for power generation, fuel for the maritime and shipping industry, and energy.

The Project will involve the development, construction, operations, and decommissioning and reclamation of Wind Projects, a Solar Project, an Industrial Facility and associated water supply for green hydrogen production and ammonia synthesis, including air separation, water treatment, and ammonia storage. The Project will use the existing Port of Botwood for its shipping needs, which has historically served various clients across industrial sectors, for over 100 years.

During 2022 and 2023, EVREC participated in the Wind Nomination Submission and subsequent Land Bid Process conducted by the Newfoundland and Labrador Industry, Energy, and Technology (NLIET). Through this process, EVREC was rewarded as a successful proponent and obtained its wind application recommendation letters granting exclusive rights to pursue the development for wind power generation and green ammonia production near Botwood (NLEM, 2025b). EVREC is working with Newfoundland and Labrador Forestry, Agriculture and Lands (NL FAL) to secure the Crown lands required for the Project.

The Project is required to be registered with the Newfoundland and Labrador Environment, Conservation and Climate Change (NLECCC) pursuant with the Newfoundland and Labrador *Environmental Protection Act* (EPA) and its associated Environmental Assessment (EA) Regulations (Newfoundland and Labrador, 2002a, 2003a). Part 34 of the EA Regulations requires electrical power generation greater than 1 megawatt (MW) to be registered for an EA. The Government of Newfoundland and Labrador has published *Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects* to provide advice for Environmental Assessments (EA) in the province and was used to draft the Environmental Assessment Registration Document (EAR).

To facilitate the environmental permitting activities, EVREC engaged Strum Consulting (“Strum”) with other global specialists to lead the provincial permitting process. Strum is an independent multi-disciplinary team of consultants with extensive experience undertaking EAs throughout Atlantic Canada. Strum prepared and submitted the Project’s EAR in October 2024. NLECC subsequently determined that the Project requires an Environmental Impact Statement (EIS) (NLECCC, 2024g). EIS Guidelines for the Project were released April 2, 2025. This EIS

has been prepared in response to those Guidelines.

1.1 Proponent Information

EVREC, a joint venture between Abraxas Power (“Abraxas”) and EDF power solutions (EDFps), is building one of the world’s largest energy transition projects in Botwood, Newfoundland, Canada.

Abraxas is a global green energy developer focused on creating a portfolio of assets diversified by geography, technology, and scale. Abraxas consists of experienced management professionals who have a significant depth across several disciplines and sectors, including renewable power, specialty gases, electrical distribution and storage; and large scale complex industrial facilities.

EDFps brings extensive experience in developing, constructing, and operating grid-scale renewable energy development across North America, including onshore and offshore wind, solar, and battery storage projects.

Together, EVREC consists of a world class team of experienced management professionals with significant depth across a number of disciplines and sectors that will contribute to successful development of one of the world’s largest green hydrogen projects.

Contact information for EVREC and their consultant is included in Table.1.

Table 1.1.1: Proponent and Consultant Contact Information

Proponent Information	
Project Name	EVREC Green Energy Hub
Proponent Name	Exploits Valley Renewable Energy Corporation (EVREC)
Mailing and Street Address	Stewart McKelvey PO Box 5038 Suite 100 New Gower Street St. John's, NL A1C 6K3

Proponent Information	
Proponent Contact Information for the EA Registration	Ahmad Kaleeq Chief Executive Officer Ahmad.khaleeq@evrec.ca Phone Number: +1.873.589.0063 James Colter Eadie Founder and President jceadie@abraxaspower.com Phone number: +40.736.372.724 Dean Comand Chief Operating Officer dcomand@abraxaspower.com Phone number: +1.416.648.0202
Consultant Information	
Name of Consultant	Strum Consulting
Mailing and Street Address	#E120 – 120 Torbay Road St. John's, NL A1A 2G8
EA Contact and Project Manager	Nicole Thomas Manager, Environmental Assessment and Approvals Email: nthomas@strum.com Phone: 709.765.2917

1.2 Project Team

The Project is being led by Dean Comand, COO of EVREC and Nicole Thomas from Strum is the EA Project Manager responsible for submission of the EIS. Key team members that have provided support for the project are listed in the table below (Table 1.2.1).

Table 1.2.1: Project Team – Key Members & Authors

Team Member	Company	Role	Report
Dean Comand	EVREC	Chief Operating Officer	EIS Final Review
Duncan McEachern	EVREC	Vice President of Development	EVREC Management Plans, EIS Review
Vlad Nicolescu	EVREC	General Manager	Operational Curtailment & Bat Mortality Mitigation, EIS Review
Jared Kassebaum	EVREC	Wind Turbine Layout	Wind Turbine Layouts, Energy Yield Assessments, Mapping Support, Energy Y
Gary Morin	EVREC	Industrial Plant	Mass Balances, Water Balances, Project Description

Team Member	Company	Role	Report
Deirdre Elliott	Approach Archaeological Services	Archaeologist	Historical Resource Impact Assessment
Marilyn Butland	Butland Communications	Engagement Lead	Open House Presentations, Engagement Logs
John Gale	Fracflow Consultants Inc	Wastewater Support	Technical Memorandum: EVREC Discharge Creek Response to Plant Discharge
Nancy Griffiths	GHD	Socio-economic Lead	Socio-economic assessment
Safina Jivraj	io consulting	Industrial Air and Noise Modelling	Air Dispersion Study Report, Construction and Operational Noise Reports, GHG Emissions Inventory Report
David Campbell	Jupia Consultants Inc.	Economic Assessment	Economic Impact Assessment
Brad Eisan	Landmark Surveys & Engineering Ltd	Lands and Survey Support	Mapping Support
Dave Perry	Marine Group of Companies	Engineering (construction)	Quarry locations, Camp locations, Road layout, Material Quantities, Support on GHG emissions
Ahmed El-Samahy	McDermott	Engineering (FEED)	Engineering Drawings
Oliver Davies	OWC Ltd.	Wind Noise Modelling, Shadow Flicker Assessment	Operational Noise Assessment, Shadow Flicker Assessment
Nicole Thomas	Strum Consulting	Environmental Project Manager	EIS Preparation
Meghan Johnston	Strum Consulting	Environmental Project Director	EIS Senior Review
Jim Salmon	Zephyr North Ltd.	Wind Turbine Layout	Wind Layouts, Set Backs, Mapping support

2.0 PROJECT INFORMATION

2.1 Overview of the Undertaking

EVREC is proposing the development of the Project, a 3.5 gigawatt (GW) green hydrogen project in central Newfoundland and Labrador (NL), located near the town of Botwood, NL. The Project includes an approximate 3.5 gigawatt (GW) Wind Project, a 150 MW Solar Project, and an Industrial Facility to process hydrogen and ammonia.

EVREC is proposing to develop, construct and operate the Project on the brownfield former Abitibi lands near the town of Botwood in central Newfoundland. The Project is positioned to be one of the lowest cost green hydrogen/ammonia producers globally utilizing a 100% renewable energy. The Project includes development of an onshore wind project consisting of up to 534 wind turbines, a 150 MW Solar Project and associated offsite infrastructure (export and import terminals, access roads, collector substations, and water pipelines). The Project also includes an Industrial Facility comprised of hydrogen electrolyzers, air separation plant, ammonia plants, electrical energy storage, molecular storage, water purification systems, warehousing, administration buildings and other associated utility infrastructure (switchyards, transformers, pipelines, cooling systems) including an electrical grid connection for critical loads. The facility will be designed to meet the best available technology economically available and have all equipment and operations meet or exceed all regulated safety and environmental standards. The Project nameplate capacity will be 3.5 gigawatts (GW) of electrical power and approximately 1,000,000 tons per year of certified green ammonia. The Project will be commissioned and started in a phased approach.

2.1.1 Green Hydrogen & Ammonia Process

Renewable energy generated predominantly from the wind turbine generators (WTGs) will be transmitted to substations along collector lines. From there, the voltage is transformed and transmitted to the Industrial Facility through high-voltage transmission cables. At the Industrial Facility, the electricity will be used to produce green ammonia and to power auxiliary systems (Figure 2.1.1). The green ammonia will be stored in product storage tanks prior to shipment to end users via specialized sea vessels.

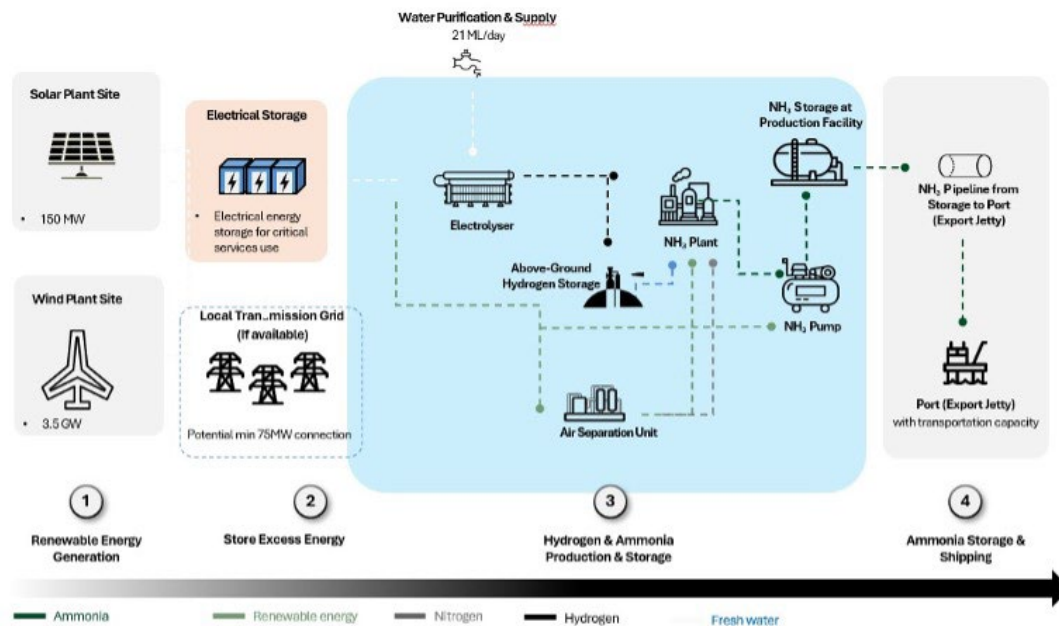


Figure 2.1.1: Green Hydrogen and Ammonia Production Process Flow Diagram

2.1.2 Project Lands

EVREC has worked with NL Department of Energy and Mines (NLEM) and NL FAL since 2022 to confirm the lands required to build the Project. The process has consisted of the securement of initial lands (reserve lands), the securement of additional lands (ancillary lands) to support land requirements for Project considerations (not turbine placement) including the Industrial Facility itself, the Solar Project, transmission and collector lines, service and haul roads, water intake and management, and other smaller components of the Project. An additional package of land has also been requested through Crown application to support the Seabrights Lake Wind Project Area (SLWPA). The lands acquired by EVREC is described in further detail below.

2.1.2.1 Awarded Reserve Lands

Through the Crown lands process, EVREC nominated 3 phases of land and, in the end, was awarded an overall total of 30,712 ha of land under the *Wind Energy Reserve Order* for the development of the Project. These lands are called the awarded reserve lands (Figure 2.1.2 below), and the components of this land assemblage include:

1. The Botwood Wind Site
2. The Twin Lakes Wind Site
3. The Leading Ticks Wind Site
4. The Production Facility Site

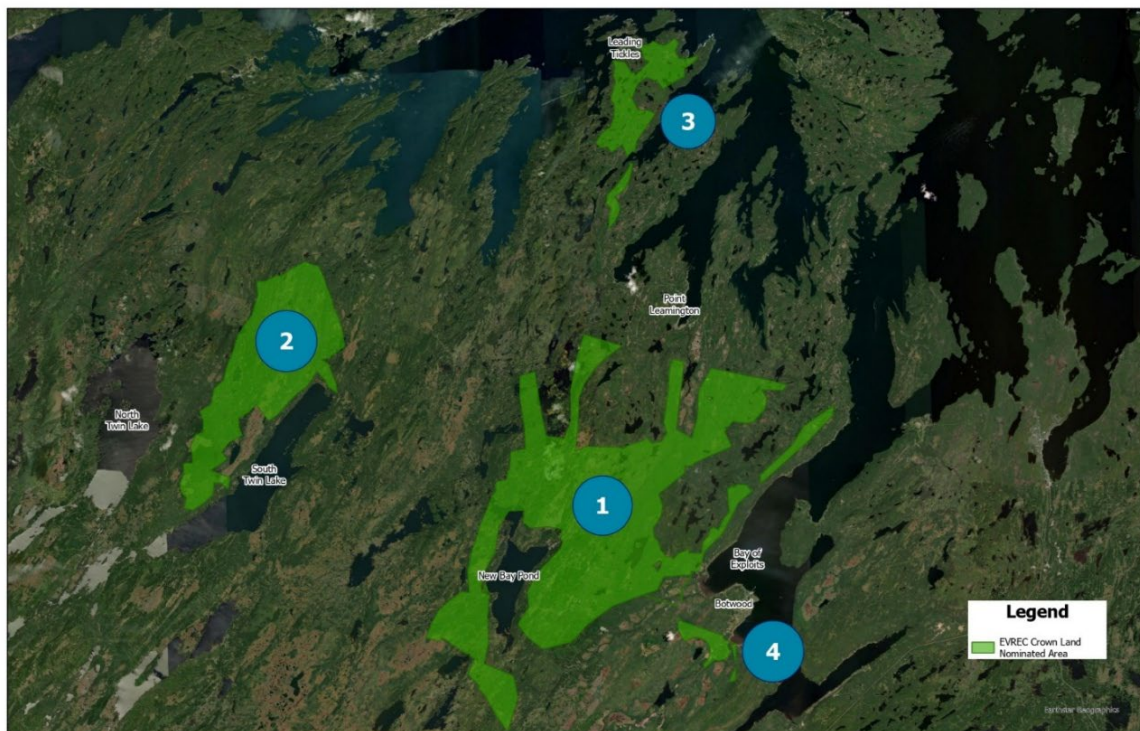


Figure 2.1:2 Awarded Reserve Lands

2.1.2.2 Ancillary Lands

The Crown Lands process stipulated that the Project could apply for additional lands for the Balance of Plant, in addition to the awarded lands. Those ancillary lands may be used for access roads, electrical infrastructure, water supply, temporary facilities and other Project related support infrastructure. EVREC applied for 1,685 ha of ancillary lands (as shown in yellow in Figure 2.1.3). These lands include:

- Areas around the Industrial Facility and Solar Project to form the IPA as presented in the EIS
- Transmission Connector from BWP to TLWP and BWP to LTWP, as presented in the EIS

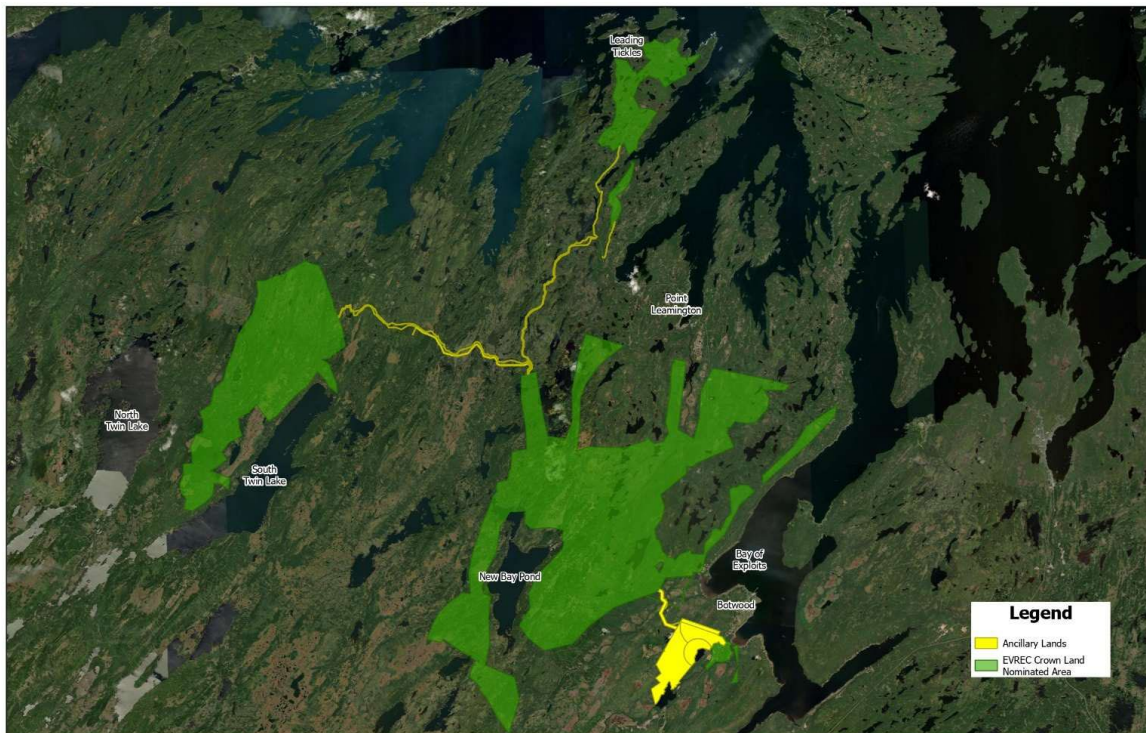


Figure 2.1.3: Ancillary Lands

In addition to the applications submitted to date, the Project anticipates additional ancillary applications when Project infrastructure locations are finalized. At the time of EIS submission, these lands will be required for additional Wind Project service roads, collector lines, quarries, camp locations, and other Project infrastructure that may fall just outside or on the edge the PA. Based on the current layout, the approximate area outside the PA for the roads, collector lines, and quarries that are not currently under application is estimated at approximately 486 ha.

2.1.2.3 Constraints Analysis – Nominated Reserve Lands

As part of the Crown Lands process, EVREC had to apply for the nominated reserve lands within 18 months of receiving the Wind Recommendation Letter. This process incorporated a constraints analysis to determine what areas of the awarded reserve lands were not viable for building a wind project and excluding them from the nominated reserve lands.

The areas that were excluded from the reserve lands are: the regulated water bodies (rivers, lakes, wetlands), 15 m Crown land reservations on waterbodies, and issued land titles (e.g., existing grants, leases and licenses). Without any regulatory setbacks being applied, the result of these exclusions of water and existing issued land titles is an immediate land reduction of 5,378 ha or approximately 18% of the reserve lands.

EVREC's application for the nominated reserve lands was made in February 2025, for

25,333 ha, as shown below in Figure 2.1.4:

- Botwood Wind Site: 16,876 ha
- Twin Lakes Wind Site: 6,673 ha
- Leading Tickles Wind Site: 1,785 ha
- Total = 25,333 ha

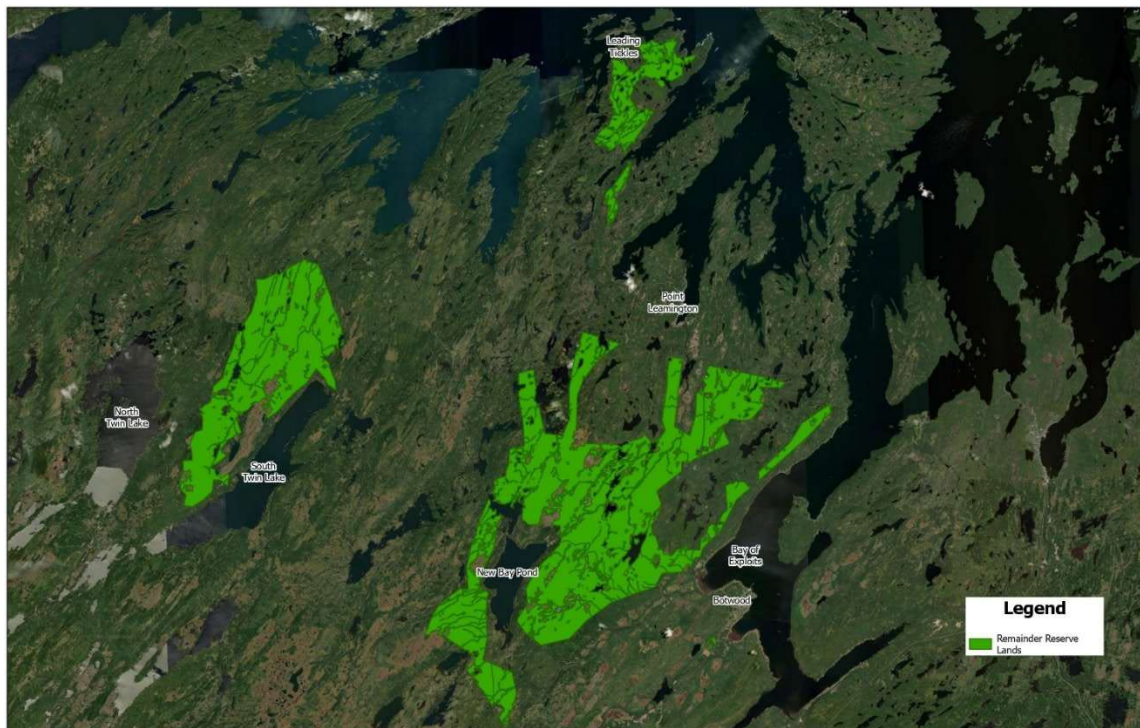


Figure 2.1.4: Nominated Reserve Lands

These nominated reserve lands are Crown lands reserved under the *Wind Energy Reserve Order* that were nominated by EVREC on February 21, 2025 and have been extended to February 28, 2027. Note that the nominated reserve lands were not used for the EIS PA but rather as a constraint analysis for permitting and so were not carried forward into design of the PA.

2.1.2.4 Addition – Seabrights Lake Wind Site (License to Occupy)

Following the nominated reserve lands constraints analysis, additional lands were identified along the road and transmission corridor between the Twin Lakes Wind Site and the Botwood Wind Site that could offset some of the loss of overall hectareage of suitable lands for development between the overall reserve lands and the nominated reserve lands to maintain the generative capacity of the Wind Project. This area was referred to as the Seabrights Lake Wind Site. The Seabrights Lake Wind Site (Figure 2.1.5) includes the road and transmission corridors (already applied for under ancillary lands) and the Seabrights Lake Wind Site

additional area to form the Seabrights Lake Wind Project Area (3,555 ha).

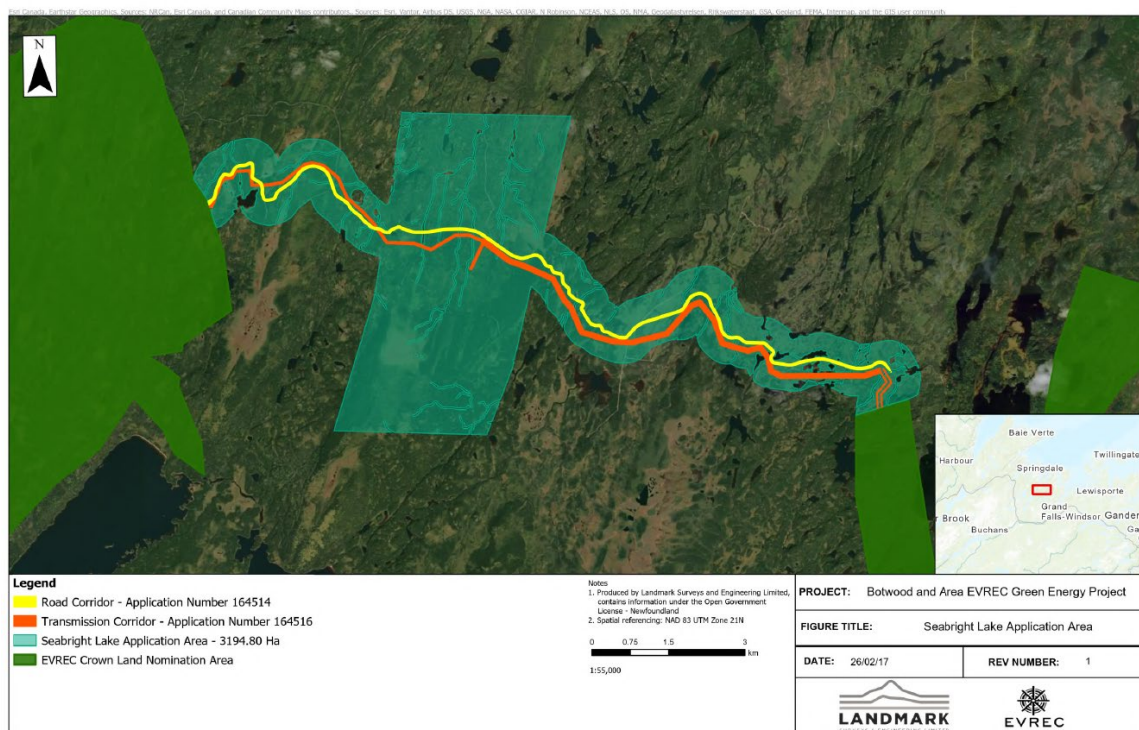


Figure 2.1.5: Seabrights Lake Wind Site

This SLWPA area was then added to the awarded reserve lands and the ancillary lands to form the Project Area (PA) that is presented in this EIS and discussed below.

2.1.3 Project Area

The Project is proposed within the Project Area (PA) consisting of a total of 35,834 ha (30,712 ha of awarded reserve lands, 1,685 ha ancillary lands under application, 486 ha of additional auxiliary lands and 3,555 ha of the SLWPA that will be under Crown land application) in central Newfoundland and Labrador (Drawing 2.1-1, Appendix A).

The Project is centered at 49.161441° N, 55.486669° W. Within the PA, siting of WTGs will be within four areas: Botwood, Twin Lakes, Seabrights Lake, and Leading Tickles. The Industrial Facility and Solar Project, along with associated infrastructure, are co-located on a parcel southwest of the Town of Botwood. The PA has been divided by components into the following:

- Wind Project Area (WPA) consisting of:
 - Botwood Wind Project Area (BWPA)
 - Twin Lakes Wind Project Area (TLWPA)
 - Seabrights Lake Wind Project Area (SLWPA)
 - Leading Tickles Wind Project Area (LTWPA)
- Industrial Project Area (IPA)

- Encompasses the Industrial facility, water supply infrastructure, heavy haul road and ammonia pipeline.
- Solar Project Area (SPA)
 - Nested within the IPA

Within each PA, the footprint of the infrastructure will be much smaller than the full land parcels included in the PA. Table 2.1.1 outlines lands described in the EIS.

Table 2.1.1: Summary of Land Parcels within the Project Area

Land Parcel	Project Component	Project Area Size (ha)	Project Footprint (ha)
Botwood Wind Project Area	Wind	20,802	2,279
Twin Lakes Wind Project Area	Wind	7,686	898
Leading Tickles Wind Project Area	Wind	2,391	480
Seabrights Lake Wind Project Area	Wind	3,555	649
Industrial Project Area	Industrial Facility & Solar	1,157	214
Solar Project Area	Solar	242* within IPA	160
Total		35,834	4,807

This infrastructure layout and associated PAs have largely been constrained to the wind reserve lands for key Project components. However, the final footprint will be updated to reflect the growing knowledge of the PA through the permitting process and an assessment of constructability and wind resources. WTG locations have been constrained to the awarded reserve lands. The Solar Project and Industrial Facility (Drawing 2.1-1, Appendix A) are comprised of lands currently under Crown Land Application (and associated Wind Reserve overlap area).

2.1.4 Project Components

For the purposes of this EIS, the Project has been divided into three main components: Wind Project, Solar Project; and Industrial Facility. The EIS has been completed for the Project as described in the three project description sections (Sections 6.1, 7.1, and 8.1) for Wind, Industrial and Solar and across the area defined as the PA (WPA consisting of the BWPA, TLWPA, LTWPA and SLWPA; IPA, and SPA). Associated road/transmission infrastructure are included within each component. Documentation of baseline conditions, assessment of effects, proposed mitigation measures and follow up monitoring programs, and a description of residual effects have been described in each VC section for the three components of this Project (Wind, Industrial and Solar) based on the project description herein and the PA as described forms the base spatial boundary for the assessment.

The following will give a general overview of the project components. A detailed project description of each component is provided at the start of each effects assessment section.

The transportation of infrastructure, construction equipment, and ammonia from the Port of Botwood to the IPA and WPAs is described in this EIS, including the ship-shore interface of

loading ammonia on tankers at the Port. The Port of Botwood is in the process of revitalizing wharf infrastructure under a separate regulatory process.

2.1.4.1 Wind & Transmission

The Wind Project will consist of up to 534 WTGs (each with a capacity up to 8.0 MW), capable of generating up to 4.27 GW of renewable energy (nameplate capacity). However, the final turbine layout will likely be reduced to meet a 3.5 GW capacity. EVREC is considering several WTG manufacturers but the 8.0 MW turbine model has been selected as the most conservative for assessment in this EIS. The 8.0 MW WTG has a hub height up to 140 m with a 182 m rotor diameter. The wind project consists of the following components:

Wind Components

- Botwood Wind Project (BWP)
 - 273 WTGs (2,184 MW)
 - primary access from the Town of Botwood
- Twin Lakes Wind Project (TLWP)
 - 133 WTGs (1,064 MW)
 - located between North Twin Lake and South Twin Lake
- Seabrights Lake Wind Project (SLWP)
 - 80 WTGs (640 MW)
 - co-located with the high voltage transmission line between the Botwood Wind Project and the Twin Lakes Wind Project.
- Leading Tickles Wind Project (LTWP):
 - 48 WTGs (384 MW)
 - To the north in the Leading Tickles area

Collectively, the wind projects will also require the following supporting infrastructure:

- Approximately 857 kilometres (km) of medium voltage and 128 km of high voltage transmission lines, collection systems, and substations.
- An estimated 53 quarries, gravel borrows pits and excess soil management facilities, with quarries ranging from 2 to 15 ha each
- The total road network for the wind projects is 539 km, of which, 222 km will require upgrades (top dressing and/or widening) and 317 km is new road construction.
- Forty-three (43) laydown areas for construction
- Emergency power and black start generators
- Warehousing and satellite offices/control rooms
- Accommodation Camps: There are four accommodation camps planned for within the WPA (two within BWPA and two within the TLWPA).

Further information on the Wind Project is described in Section 6.1.

2.1.4.2 Industrial Facility

The Industrial Facility is the core processing component of the Project and will convert

renewable electrical energy into green ammonia for storage and export to international markets. The Industrial Facility is expected to produce a nominal output of approximately 1.04 mtpa of green ammonia. This output is expected to require approximately 12,000 to 13,000 GWh of energy per year and an average raw water withdrawal of approximately 3.0 million m³ of raw water withdrawal per year.

The hydrogen plant will form the upstream production component of the Industrial Facility and will convert renewable electricity and treated water into gaseous hydrogen for use as feedstock in the ammonia production process. The hydrogen plant will be located within the Industrial Facility and adjacent to the ammonia plant so that hydrogen can be transferred efficiently to downstream purification, compression, storage, and ammonia synthesis systems. Under the current design basis, the hydrogen plant will use proton exchange membrane (PEM) electrolysis technology, selected to provide a flexible production system capable of responding to variable renewable power input from the energy park while maintaining the hydrogen supply required by the integrated facility.

The ammonia plant will form the downstream conversion component of the Industrial Facility and will produce anhydrous liquid green ammonia using hydrogen from the hydrogen plant and nitrogen from dedicated air separation units. Ammonia will be produced using the Haber-Bosch process, in which hydrogen and nitrogen react at elevated temperature and pressure in the presence of an iron-based catalyst to form ammonia.

The Project will include an electrical energy storage system in the form of a Battery Energy Storage System (BESS) located within the Industrial Facility (Drawing 7.1-1, Appendix A). The BESS is planned as a 106 MW / 1,100 MWh system and forms part of the integrated electrical infrastructure of the Industrial Facility. The majority of electrical power for the Project will be supplied from the Wind and Solar Projects rather than from direct grid import. The role of the BESS within the Industrial Facility is therefore to store excess renewable electricity when production is high and release that energy during periods of reduced renewable output or higher demand from critical plant systems. The BESS is intended to maintain plant stability, maximize production continuity, and provide power for critical and emergency loads rather than routine electrolyzer operation.

Liquid ammonia produced at the Industrial Facility will be exported through a dedicated ammonia transport and marine loading system linking the on-site ammonia storage area to the Port of Botwood. Ammonia will be stored at the central processing facility (CPF) in refrigerated tanks and then transferred to the marine terminal for loading to specialized ammonia carriers. The export system comprises the onshore ammonia storage, the transfer systems, the ship loading system, and the jetty / marine offloading facility (MOF), which together form the physical interface between ammonia production and export shipping.

The marine export facilities will be located at the Port of Botwood and will utilize existing port infrastructure upgraded for ammonia service. These facilities will include a jetty platform, berthing and trestle structures, marine loading equipment, and a marine offloading facility

(MOF) within the water lot. Supporting systems will include transfer piping, venting and isolation systems, emergency response infrastructure, backup power systems, control and administration facilities, and security systems. The port is a deep-water facility capable of accommodating large vessels, with the current design basis anticipating export via ammonia carriers in the range of approximately 50,000 to 80,000 DWT.

Ammonia transport between the CPF and the jetty will be undertaken through dedicated pipeline system. Cooling of the ammonia will be maintained at the CPF in the vicinity of the storage tanks, with the export system functioning primarily as a transfer system between storage and the marine loading facilities.

Water is critical for the Industrial Facility, supporting hydrogen production, ammonia synthesis, cooling systems, fire protection, potable use, and overall site operations. The Project will implement an integrated water management system that includes supply, storage, treatment, distribution, drainage, and effluent handling, designed to ensure reliable operations while protecting surface water, groundwater, and the surrounding environment.

The Project anticipates a total raw water demand of approximately 8.5 ML/day (annual average) and a peak monthly withdraw of 12.64 ML/day, driven primarily by electrolyzer feedwater and ammonia plant boiler make-up requirements. The intake and pumphouse will be designed to meet the peak daily volume which will be approximately 12.64 ML/day, excluding reliability requirements.

Water used to produce hydrogen and ammonia will be sourced from Peters Pond and conveyed to the Industrial Facility through a dedicated water supply system including a new pumphouse and conveyance system. Upon arrival, raw water will be directed to on-site storage and treatment facilities before distribution to plant systems. Overall water demand is driven primarily by electrolyzer feedwater requirements and make-up water for the ammonia synthesis steam system, making water a key utility interface for the facility.

Treated effluent and selected non-contact flows will be directed to the stormwater/effluent pond for reuse or controlled discharge, with all discharges meeting applicable NL regulations and relevant CCME guidelines.

An overview of the industrial components is as follows:

Industrial Components

- Hydrogen Plant and Storage
 - Storage tanks, electrolyzers, and an administration building associated with the hydrogen plant (12 ha)
 - Aboveground hydrogen storage facility (approximately 330 t)
 - Hydrogen electrolyzer plants (total 2.600 MW capacity; ~17000 kT/year product output)

- Ammonia Plant, Storage, and Transport
 - Ammonia plant and associated storage tanks
 - Total nameplate production capacity of 5,000 tonnes per day (tpd) through various ammonia trains are required
 - Minimum of two cryogenic double-walled tanks with a total volume of 125,000 cubic metres (m³), located at the Industrial Facility
- Air Separation Units
 - Units will be installed to provide ~4200 tpd nitrogen plant with potential capability to produce liquid nitrogen for storage and backup
- Molecular Storage
 - Up to 125,000 m³ of above ground hydrogen storage (bullets, spheres, gas collector system)
- Electrical Infrastructure
 - Main switchyard to receive power from all the wind turbine collector stations
 - Grid connection to the Newfoundland grid [132 kilovolt (kV)/230 kV]
 - 150 MW connection applied for with the provincial utility provider, and is not included in the effects assessment in this EIS
 - Electrical energy storage system [capacity up to 1,100 megawatt hours (MWhrs) and a discharge rate of ~100 MW/hour]
 - 230 kV transmission line to BWPA
- Service Facilities
 - Water treatment facilities
 - One raw water retention pond
 - Water treatment facilities as needed for select water processes
 - One evaporation pond, with overflow piping/ditching to the stormwater/effluent pond
 - One stormwater/effluent pond, including monitoring and discharge piping
 - Accommodation camp (4,200 persons during construction, 835 persons during operation), located on the east side of the Industrial Facility. Expected domestic water use is 350 liters per day per person.
 - Quarry on the north side of the Industrial Facility
 - Flares
 - Two at the Industrial Facility (for venting and emergency)
 - One at the jetty at the port for emergency release only
 - Diesel/Hydrogen/Ammonia-fired emergency backup generators to support critical facility load in the event of a power interruption (not normally operated except for monthly reliability testing)
 - Fuel storage
 - central fuel storage facility will be established at the Industrial Facility as

- the primary location for receipt and storage of bulk fuel products.
- Canteens, emergency services, telecommunications, laundry
- Helipads
- Aboveground heat exchangers
- Control building, Administration building and maintenance shops
- Fire suppression stations
- Secure perimeter chain link fencing with two site access points, a main entrance gate, and service gates
- Heavy haul road
 - Construction equipment will be brought to the Project from the Port of Botwood (Port) via a heavy haul road, which runs from the Industrial Facility to the Port (crossing the Botwood Highway), and running parallel to Water St. and the railbed alignment on the Port's lands.
 - Only the portion of the heavy haul road from the Industrial Facility to Water St (Figure 2.1-2E, Appendix A) is included in this EIS
- Ammonia pipeline/shipping
 - Underground, double walled pipeline from the Industrial Facility to the jetty at the Port.
 - Vapour return line from the jetty to the Industrial Facility
 - Ship loading system able to load vessels at a rate up to 2,500 tonnes per hour
 - The entirety of the pipeline and vapour return line (Figure 2.1-2E, Appendix A) are included in this EIS.
- Water Supply (Peters Pond)
 - Water is used for the production of hydrogen (76% of total demand), potable water uses (~3%), cooling water (~8.5% of demand) and make up/auxiliary water (~12.5% of the total demand)
 - Water supply pumphouse at Peters Pond [~12 million litres per day (ML/d)] for electrolyzers and cooling water services
 - Freshwater above ground pipeline [~6 km, twinned - 660-millimetre (mm)] from Peters Pond to raw water retention pond at the Industrial Facility, as well as a return recycled water line back to Peters Pond.
 - Access and service roads
 - Emergency generators
 - Satellite office/ control rooms

A detailed description of the Industrial Facility Project component is described in Section 7.1.

2.1.4.3 Solar Project

EVREC is planning the installation of a 150 MW solar array and a collector substation, collectively, the Solar Project (Drawing 2.1-1, Appendix A). The Solar Project will be used to support critical operating loads and charge batteries at the Industrial Facility. By providing an

alternative means of power production to supplement low wind production periods, the Solar Project will reduce the total battery storage facility size required and will provide sustainable power for critical electrical loads at the Industrial Facility.

The Solar Project will consist of a 150 MW (DC), fixed-tilt PV array with n-type TOPCon modules, and is based on the use of modern, utility-scale PV modules in the ~650 W class. On this basis, a 150 MW installation would require approximately 230,000 modules. The Solar Project is currently designed with 34 PV array blocks, each served by a dedicated central inverter station.

Interconnecting DC cables (strings) between PV modules will be routed above ground along the racking system beneath the modules, meeting at string combiner boxes. Medium-voltage (34.5 kV) cables will connect the central inverter stations to the Solar Project collection substation, and will be buried. The routing is intended to be via trenching adjacent to internal access tracks, and appropriate spacing has been allowed for within the design to accommodate the number of circuits required for the electrical characteristics of the design.

An overhead MV line will be installed above ground on wooden/metal poles to connect the Solar Project to the main Project substation located in the Industrial Park. This approximately 3 km run will comprise three parallel MV feeders, north-northeast from the northernmost point of the Solar Project, generally following the western side of the indicated main access roads with appropriate setbacks. Final routing is to be refined during detailed design.

The Solar Project will also have auxiliary buildings, a perimeter road and maintenance pathways, and a chain link security fence along the perimeter of the site.

A detailed description of the Solar Project component is described in Section 8.1.

2.1.4.4 Transshipment Terminal

The Project will be utilizing existing port facilities that have historically serviced various clients (forestry, mining, aquaculture, newsprint) for over 100 years, with ships varying in size over 25,000 DWT. The port facilities are under the care and control of Exploits Vally Port Corporation. The Port is a deep-water port capable of berthing large ships. The navigational channel into the Port is over 1000 m x 2000 m, allowing ample room for vessels to navigate.

EVREC has entered into a lease arrangement with the Exploits Vally Port Corporation. As the Port and associated infrastructure are under the care and control of the Town and Exploits Vally Port Corporation, any future modernization are undergoing a separate regulatory process. Only the portion of the heavy haul road from the Industrial Facility to Water St is included in this EIS, but the entirety of the pipeline and vapour return line are included. The Project is however, fulsomely described in this EIS including ammonia transport to the Port and the loading process.

2.2 Project Schedule

Early works will commence one month after financial investment decision in Q2 of 2027. For the duration of 2027 teams will mobilize at the site, laydown areas will be prepared, camps will be erected and some road works will take place to enable the first installations to take place in the BWP. In addition, port infrastructure and heavy haul road will be prepared for the arrival of equipment. Starting from Q1 2028, turbine deliveries are being expected, with the anticipation that BWP will be built first (with the first collector substation, MV lines connecting the first strings of wind turbines to the collector substation and the HV lines connecting the collector substation to the production facility, followed by TLWP and the corridor & LTWP. Between Q2/Q3 of 2027 and Q3/Q4 of 2028, works will also commence at the production facility with the first electrolyzer blocks and ammonia train installed, first ammonia storage tank, together with the whole extent of the Solar Project, electrical energy storage system, as well as the hydrogen storage system and the ammonia jetty to the port. First molecule production expected in Q3/Q4 2028. During 2029-2030 construction will continue at the Wind Projects as well as the production facility to reach maximum rated output, by Q3/Q4 of 2030.

The Project schedule is presented in Table 2.2.1. Further breakdowns are provided in individual project descriptions (Sections 6.1, 7.1, 8.1).

Table 2.2.1: Project Schedule

Project Activity	Timeline
EIS Submission	May 2026
Permit Submissions	2026 - 2027
Site Preparation and Construction – Wind Projects	March 2027 – September 2030
Site Preparation and Construction – Industrial Facility	February 2028 to August 2030
Site Preparation and Construction – Solar Project	April 2028 – March 2029
Operations – Wind Projects	July 2029 – January 2062
Operations – Industrial Facility	February 2028 to August 2030
Operations – Solar Project	March 2029 - 2062
Decommissioning – Wind Projects	January 2062 – January 2064
Decommissioning – Industrial Facility	January 2062 – January 2064
Decommissioning – Solar Project	2062 – 2063

2.3 Rationale for the Undertaking

Demand for green hydrogen and ammonia is expected to grow substantially within the next few years, with a global drive towards decarbonization, energy independence, and security. Being at the forefront of these developments will position Newfoundland and Labrador and Canada as global leaders in producing green hydrogen and ammonia. Central Newfoundland has a world-class onshore wind resource, abundant fresh water supplies, numerous deep-water ports, and low shipping costs to key Canadian, United States and European markets. Newfoundland and Labrador's unique geography, vital onshore wind resource, and proximity to large centres of demand will make it a globally competitive green hydrogen-production region. End-use applications of green ammonia include maritime fuel, electricity generation, industrial feedstock (steel, mining extraction for metals, crude oil refining, and acid neutralization),

transportation energy source, and industrial fuel.

Newfoundland and Labrador has Canada's second-highest renewable energy mix and the highest amount of renewable energy (undeveloped wind, forestry, and solar resources) per capita (NLEM, 2021b) (Government of NL, 2021). NL Hydro expects to replace isolated diesel-powered electricity systems with renewable energy sources. The provincial Renewable Energy Plan (NLEM, 2021a) and the Way Forward on Climate Change in Newfoundland and Labrador (NLECCC, 2019) include actions to build opportunities for renewable energy. The province has reserved several Crown land areas as being available for wind projects, and this Project was submitted and successful in a bid process to use a portion of the identified parcels. As part of the initial development, the Project maintains the support of NLEM through the nomination process with the issuance of a Wind Application Recommendation Letter for the Project. EVREC remains the only proponent of the four awarded bids that is still actually pursuing the Project as the other three projects have not been extended the opportunity to continue the Crown lands under the Wind Energy Lands Reserve Order.

EVREC has signed non-disclosure agreements with several European off-takers and has also executed an offtake agreement subject to permitting approval. EVREC continues to progress in developing local offtake customers within the Canadian industrial markets and with maritime operators to support fuel bunkering development.

A third-party analysis of the EU regulations relevant to the Project was carried out to assess the likelihood that the Project would produce RED II compliant Renewable Fuel of Non-Biological Origin (RFNBO) and to address the associated mandatory market in Europe. A preliminary assessment of potential compliance-related risks was conducted based on current technical and operational hypotheses associated with Project design and evaluated against the CertifHy™ Voluntary Scheme requirements for RED II RFNBO compliance.

This assessment process was carried out in a two-step approach:

1. A preparatory analysis conducted by Hincio identified suitable scenarios for the Project business and design case to set the audit scope for both on renewability and GHG emissions assessment.
2. The completion of an audit exercise conducted by Bureau Veritas, which is a certification body recognized under the CertifHy™ Voluntary Scheme.

Based on the work conducted to date, and assuming the Project will be built and operated as per the designs and documents provided, the audit exercise concluded that the ammonia produced from the Project would meet RED II RFNBO requirements and there is an overall net benefit on emission reductions from the Project. As such, the Project was pre-certified through the audit exercise conducted by Bureau Veritas certification body recognized under the CertifHy™ Voluntary Scheme.

EVREC has also obtained significant support from a variety of stakeholders including several

municipalities in the Exploits Valley (e.g., the Town of Botwood). Additionally, a Memorandum of Understanding (MOU) and support letters have been obtained from the Qalipu First Nation (QFN), the Port of Botwood, various associations, and several local contractors that contemplate future cooperation and support between the parties. The Project has also completed an Economic Benefit Analysis and presented it to stakeholder groups and the outlying communities.

The federal and provincial governments have announced several clean technologies and clean hydrogen investment tax credits to support sustainable energy transition projects. A key driver of the increased demand for the green ammonia energy market in Europe over the past 18 months is the Repower EU Plan (EC, 2026), which targets 10 million tonnes of green hydrogen imports by 2030. The EU Renewable Energy Directive specifies that electrolysis-derived hydrogen must be based on new renewable electricity sources that provide energy above grid needs. EVREC's plan to build purpose-built Wind and Solar Projects to produce green ammonia aligns with this Directive. Canada recently signed an MOU with Germany to establish transatlantic supply corridors for green ammonia, with eastern Newfoundland providing an advantageous location to meet this target. Delegations from the Netherlands, Belgium, and Denmark have also continued to demonstrate cooperation with Canada.

Canada introduced the Hydrogen Strategy of Canada in December 2020 that would see 30% of the country's energy coming from hydrogen by 2050, allowing the government to reach zero carbon emissions by 2050 (Natural Resources Canada, 2020). Canada is already established as a significant ammonia producer (4.7 million metric tonnes in 2021) and the world's fourth-largest natural gas producer (Natural Resources Canada, 2020).

An economic impact assessment was conducted for the Project (Appendix (O)). Locally, the Project and its supporters believe that its existence will stimulate the local economy and provide economic and social benefits to the region and the province. The impacts of the Project are expected to be long-lasting on both the local and provincial economies as the Project is committed to being a model citizen as it enters into Project benefits agreements with various stakeholders. The Project will contribute to the provincial GDP by \$9.3 billion over the life of the Project, through jobs and income. The Project will support over 4,200 jobs during peak construction and 835 jobs during operations. The Project is also poised to increase benefits that will flow to the province through royalties, taxes, employment, innovation and skill development (approx. \$507 million in municipal tax revenues).

2.4 Alternatives

2.4.1 Alternatives to the Undertaking

EVREC reviewed other locations for this type of project globally and within the province. EVREC selected the Botwood location through the nomination process based on the area's strong wind resources and undervalued ports with Crown-owned land in low-density populated areas. The Project makes effective use of the province's renewable resources and adds economic benefits to a central part of the province.

An off-grid and on-grid comparative analysis was completed with an off-grid wind design overbuild (for spill and shortages scenarios) to be incorporated in the base design. This strategy ensures a competitive design that can compete in the global marketplace while also providing some additional economic and social benefits to the local community and the province. Utilizing the renewable wind generation with a relatively high-capacity factor, combined with solar power, will ensure enough power for production and operability stability.

2.4.2 Alternative Methods of Carrying Out the Undertaking

Alternative methods for carrying out various components of the project were considered including:

1. Sources of energy
2. Wind turbine size and type
3. Solar energy size and type
4. Locations, land area requirements and access routes
5. Size, shape and configuration of areas
6. Hydrogen and ammonia process, plant size and type
7. Water source
8. Effluent discharge points
9. Order and timelines for construction and operational phases
10. Above ground and underground storage of hydrogen, ammonia, and carbon

2.4.2.1 Sources of Energy

An off-grid and on-grid comparative analysis was completed to determine the best option for power for the Project. The concepts for the project are built around three different power utilization strategies with wind power being the primary source of power for all three of the concepts:

- Concept 1 - Wind power only
- Concept 2 - Wind power & base load power from the grid
- Concept 3 - Wind power plus solar power (**Preferred Option**)

The off-grid wind design overbuild (for spill and shortages scenarios) was incorporated in the base design. This strategy ensures a competitive design that can compete in the global marketplace while also providing some additional economic and social benefits to the local community and the province. Utilizing the renewable wind generation with a relatively high-capacity factor, combined with solar power, will ensure enough power for production and operability stability. The Project will require a grid connection to provide construction power to the Industrial Facility during early works, site preparation, and the main construction period. The Project is evaluating a dedicated interconnection using the existing Botwood-area electrical system, which is supplied through the Stony Brook–Bishop Falls–Botwood 138 kV transmission system. Final interconnection arrangements, available capacity, and utility requirements will be confirmed through ongoing discussions with Newfoundland Power and

Newfoundland and Labrador Hydro, and through subsequent interconnection studies and detailed engineering and associated permitting.

2.4.2.2 Wind Turbine Size and Type

Preferred Option: 8.0 MW turbine (140 m hub height), 3.2 GW renewable energy selected for the rationale provided below.

1. Capacity

At the outset of the project's planning, the design concept called for approximately 675 turbines at 4.5 MW each, aiming to meet the initial power requirement of around 3 GW. However, subsequent techno-economic and wind resource assessments indicated the need for approximately 3,256 MW of wind capacity—leading to a review of turbine sizes and overall plant design to ensure the necessary installed capacity could be delivered efficiently.

2. Spacing

To minimize environmental impacts, reduce infrastructure costs, and limit the overall land disturbance, the project team analyzed the benefits of higher-capacity turbines (e.g., 6–8 MW range). By selecting 8 MW machines, the total number of turbines can be reduced significantly compared to smaller-capacity models—lowering the cumulative footprints of roads, crane paths, and electrical connections.

3. Vendor Selection

A detailed Request for Proposals (RFP) was issued to several global wind turbine manufacturers. After evaluating critical factors such as cost, supplier reliability, technical suitability, and track record, the project chose an 8 MW turbine as the preferred option—balancing proven design with competitively priced supply and services.

4. Hub Height

The project initially sought 150 m hub heights for optimal wind capture, but the 8 MW model at that tower height would require a hybrid concrete–steel tower, adding complexity and cost. A 110 m steel tower alternative was considered to avoid logistics challenges, yet the 10+ m tree canopy and a 182 m rotor diameter posed risks of blade-to-canopy proximity. This could reduce wind yields and introduce structural concerns due to turbulence near the treetops. Ultimately, 140 m emerged as the highest steel tower option feasible for the 8 MW platform—resolving forest clearance issues, maintaining robust annual energy production, and streamlining logistics (e.g., port handling and road transport).

2.4.2.3 Solar Energy Size and Type

Preferred Option: 150 MW, located near Botwood was selected for the rationale provided below:

1. Seasonal Considerations

Data revealed markedly lower wind speeds during the summer months, causing reduced overall power output. Relying on wind alone would necessitate a larger battery or hydrogen storage capacity to cover the wider seasonal production gap, increasing capital and operational costs.

2. Feasibility Study

The project team simulated multiple solar PV capacities to determine how much solar power could cost-effectively address the seasonal shortfall without overburdening total CAPEX.

- Key Variables Assessed:
 - CAPEX and OPEX for solar PV installations
 - Savings in battery or hydrogen storage infrastructure
 - Annual load factor improvements
 - Integration with existing grid and production facility

3. Capacity

Modeling confirmed that a 150 MW solar PV array provided the best balance of investment cost and seasonal generation support, alleviating the pressure on energy storage during low-wind periods. Higher solar capacities offered diminishing returns—marginal gains in production did not sufficiently outweigh additional capital costs. Smaller solar arrays yielded less meaningful offset of the seasonal dip in wind generation, underutilizing the potential synergy between wind and solar.

4. Site Selection

After examining a parcel of land near the main hydrogen facility, the current location (southwest of Botwood) was chosen for its proximity (reducing transmission losses), generally flat terrain, and relative ease of access. Environmental/topographical factors included:

- Minor flood zones and wetland areas required setbacks.
- Moderate slopes (~2–5%) introduce some row-to-row shading, accounted for in the final layout.
- High-latitude location and significant winter snow load made more complex tracking systems less attractive.

5. Technology

- Fixed Tilt: Lower capital and O&M complexity, more robust performance under high wind loads and snowy conditions, and sufficient energy capture for the project's needs. Single-Axis Trackers were evaluated but deemed less cost-effective given the region's climate (high winds, snow accumulation) and moderate solar resource.
- n-Type TOPCon (tunnel oxide passivated contact) technology chosen for its higher

- efficiency, slower degradation, and proven bankability.
- Bifacial, Half-Cut Cells: Added rear-side energy capture (especially beneficial on snow-covered ground), plus better resilience to shading.
- Two Modules in Portrait (2P) at 20° Tilt – Balances land use efficiency, manageable snow loading, and ease of maintenance.
- Central Inverters + Medium Voltage Skids chosen for lower upfront cost and simpler substation architecture.

2.4.2.4 Locations, Land Area Requirements, and Access Routes

EVREC selected the Botwood location through the nomination process based on the area's strong wind resources and undervalued ports with Crown-owned land in low-density populated areas. The Project makes effective use of the province's renewable resources and adds economic benefits to a central part of the province.

Project Location

A major alternative explored was the possibility of locating the project in regions further afield from Botwood, for example, near the Buchans Mine area or south of Grand Falls-Windsor. While these areas may offer wind resources that are slightly superior to those in the Botwood region, the decision ultimately favored the Botwood vicinity for the following reasons:

1. Proximity to Existing Deepwater Port
 - Botwood has a long-established, ice-free port capable of year-round ship traffic, as well as one of the shortest distance deep water ports in North America to Europe.
 - This key logistical advantage supports ammonia export operations without requiring major new port infrastructure.
2. Strong, Though Not Maximum, Wind Resource
 - The wind resource in the Botwood region remains robust and well within the technical feasibility window for a large-scale wind-to-hydrogen project.
 - Although some alternative sites may have marginally higher wind speeds, the advantage does not outweigh other considerations (e.g., transport or infrastructure needs).
3. Compact Project Footprint
 - The proposed wind turbines, electrolyzer, ammonia production facility, and supporting infrastructure are all planned within a roughly 20 km radius.
 - Such geographic concentration helps minimize environmental disruption, reduce social impacts, and streamline construction logistics.
4. Brownfield Repurposing
 - Much of the chosen area is a former industrial site previously associated with the Abitibi pulp and paper mill.
 - Reusing existing logging roads and cleared land significantly lowers environmental disturbance, reduces costs, and aligns with sustainable land-use practices.

5. Regional Economic Revitalization

- Botwood has a historical role as an industrial center, exporting products such as paper and gold for over a century.
- Establishing a renewable-energy-driven hydrogen and ammonia facility in this location extends that legacy, bringing new economic opportunities and infrastructure investments to the region.

Collectively, these factors make Botwood the preferred location despite marginally more favorable wind speeds elsewhere. In balancing logistics, community and environmental impacts, and the potential for regional economic development, the Botwood area offers a uniquely strategic combination of advantages for the project's success.

Land Area Considerations

In the early planning stages of the project, approximately 30 wind turbines were proposed in proximity to Northern Arm. From a technical and logistical perspective, this location was appealing due to the following factors:

1. Favorable Wind Resource

- Preliminary resource assessments indicated that the Northern Arm area offered sufficient wind speeds and wind frequency to support economically viable power generation.

2. Close Proximity to Production Facility

- By siting turbines near the proposed hydrogen and ammonia production facilities, infrastructure requirements (e.g., access roads, transmission lines) could be minimized, leading to potentially lower capital expenditures per turbine.

Despite these advantages, the decision was made to remove the turbines planned near Northern Arm. The primary reason was to avoid potential adverse impacts on local communities along the Bay of Exploits, in particular Northern Arm itself. These impacts included:

1. Shadow Flicker

- The rotating blades of wind turbines can cast moving shadows in areas where sunlight is partially blocked, an effect that can cause disturbance or annoyance to nearby residents.

2. Noise Concerns

- Wind turbines, especially in larger concentrations, generate operational noise. Even if noise levels remain within regulatory limits, the proximity to populated areas heightened the potential for community disturbance.

3. Construction-Related Disruption

- The addition of a cluster of turbines close to Northern Arm would have led to a more concentrated construction footprint in a smaller radius. This could result in increased heavy vehicle traffic, dust, and noise during the build-out phase, directly affecting local quality of life.

Following further engagement with local stakeholders and additional environmental and social impact assessments, it was concluded that maintaining turbines in such close proximity to Northern Arm might produce unacceptable impacts for community members. Consequently, the turbines initially planned for that perimeter were removed from the layout. This decision reflects the project's commitment to minimizing adverse effects on nearby populations, even if it necessitates additional infrastructure or siting considerations elsewhere.

2.4.2.5 Size, Shape and Configuration of Areas

A layout alternative considered during the initial land nomination phase was dispersing the turbines over a larger geographic area. This approach aimed to reduce potential wake losses—where wind turbines placed too closely can reduce one another's output by disturbing airflow—by spacing them out more widely. However, this alternative presented significant trade-offs:

1. Wake Loss Mitigation vs. Overall Project Footprint

- *Pros:* Spreading turbines over a broader area could reduce aerodynamic interference, potentially increasing individual turbine performance.
- *Cons:* Expanding the project boundaries would increase the total land area affected, raising ecological and community concerns.

2. Infrastructure Requirements

- *Pros:* Fewer turbines would be placed closely together, reducing localized construction impacts.
- *Cons:* More extensive road networks and additional transmission lines would be required to reach widely spaced turbines. This would mean higher capital investment, more land disturbance, and greater complexity in permitting.

3. Environmental and Social Impacts

- *Pros:* Isolated turbines might reduce noise and shadow flicker in any one location if carefully sited.
- *Cons:* A more expansive footprint has the potential to affect a wider range of habitats, wildlife corridors, and communities, thus complicating environmental assessments and stakeholder engagement.

Balancing these factors, the project elected to consolidate turbines in more focused areas. While marginally higher wake losses may occur, the advantages of minimizing land disturbance, reducing the length of roads and transmission corridors, and concentrating potential environmental and social impacts outweighed the benefits of maximizing turbine spacing. This decision aligns with the project's overarching strategy of managing

environmental risks and infrastructural demands while still meeting its power generation targets.

2.4.2.6 Hydrogen and Ammonia Process, Plant Size and Type Preferred Configuration and Justification

1. Two × 5,000 t/day Casale Ammonia Trains
 - High throughput, proven catalysts, robust performance under dynamic hydrogen flow.
 - Licensor's track record of successful large-scale reference plants.
2. Storage
 - Refrigerated, Atmospheric Tanks sized for ~89,000 tonnes total (2 × ~65,000 m³).
 - Balanced capital cost, safety standards, and global acceptance for maritime export.
 - Seamless integration with the project's cooling utilities to maintain ammonia at 33°C.
3. Key Benefits
 - Facilitates straightforward scale-up.
 - Maintains operational flexibility matching intermittent renewables.
 - Aligns with industry norms for shipping ammonia in ocean-going carriers.

Alternatives Considered

As part of the licensor selection for ammonia production and storage, multiple industry-standard technologies and providers were assessed from all key global vendors. The objective was to identify a proven, efficient, and scalable process suited to green hydrogen feedstock. Key alternatives examined included:

- Conventional Haber-Bosch Variants from leading licensors such as KBR, Haldor Topsoe, ThyssenKrupp, and Casale.
- Novel Low-Pressure or Modular Concepts potentially offering efficiency gains or reduced footprint.
- Storage Options: large-scale refrigerated tanks (atmospheric pressure), pressurized bullet tanks, and emerging chemical-carrier methods.

1. Licensor Selection Process
 - Technical and Operational Criteria
 - Reliability and Technology Readiness Level (TRL) for processing hydrogen from a variable, renewable power source.
 - Scalability to meet the project's target of 2 × 2500 tonnes per day (5,000 t/day total).
 - Experience with carbon-free (green) hydrogen feedstocks.
 - Robust track record in large-scale ammonia plants and proven references worldwide.

- Economic Evaluation
 - Capital expenditure (CAPEX), including cost of proprietary equipment, catalyst systems, and potential custom integration with green hydrogen.
 - Operating expenditure (OPEX) tied to energy efficiency, maintenance intervals, and catalyst lifecycles.
 - Licensor fee structures and commercial terms.
- Environmental and Safety Considerations
 - Strict compliance with local environmental regulations and global safety standards.
 - Minimizing water consumption, effluent, and emissions (e.g., NOx, ammonia slip).
- Outcome
 - Casale was selected based on its well-established Haber-Bosch platform for large-scale, clean hydrogen-based ammonia. Its references and proposal aligned with the project's throughput, operational flexibility, and cost requirements.

Reasons for Rejecting Other Approaches:

- Novel / Low-Pressure Technologies: While some next-generation processes offered theoretical efficiency gains, they lacked the commercial operating history required for a facility of this scale (1 million tonnes per year of ammonia).
- Other Major Licensors: KBR, Haldor Topsoe, ThyssenKrupp, etc. each presented robust solutions but did not match Casale's specific combination of CAPEX, OPEX, and integration advantages (e.g., flexible load operation to handle wind-power intermittencies).
- Alternative Storage Methods:
 - Pressurized bullets: Feasible at smaller scales but become cost-inefficient and complex for ~180,000 t/year hydrogen feeding ~1 million t/year ammonia output.
 - Innovative Chemical Carriers: Not yet proven at the scale envisioned for sustained export or shipping logistic requirements.

2.4.2.7 Water Withdrawal Requirements and Water Source

Preferred Option: Peters Pond - located approximately 6 km from the production facility, was historically used as the Town of Botwood's water supply. It is no longer in active use, making it available for industrial applications.

1. Key Advantages

- Adequate Volume: Hydrological studies confirm that Peters Pond can provide the required freshwater volumes year-round, ensuring stable electrolyzer operation.
- Proximity: Being relatively close to the project site minimizes infrastructure needs (e.g., shorter pipelines, reduced land disturbance).

- **Water Quality:** Preliminary testing indicates that the pond's water quality is high, suggesting lower treatment costs prior to hydrogen production processes.

2. Rationale for Selection

- The combination of reliable supply, logistical efficiency, and potential cost savings in water pre-treatment positioned Peters Pond as the strongest candidate.
- Environmental and social impacts are relatively manageable given the existing road access and the pond's prior use for municipal supply.

Peters Pond was chosen due to its demonstrated ability to reliably supply the necessary water volumes, its proximity to the production facility, and its high water purity—together providing a balanced solution that meets technical, economic, and environmental criteria. While seawater and New Bay Lake were both technically feasible, the higher costs, larger infrastructure footprint, and more pronounced environmental or social concerns made these options less favorable.

Alternatives Considered:

1. Seawater (Desalination)

- *Pros:* Effectively unlimited supply, allowing for scalable production.
- *Cons:* High capital and operational costs for desalination technology; disposal of brine effluent can pose additional environmental and regulatory challenges; more energy-intensive treatment.

2. New Bay Pond

- *Pros:* Sufficient water quantity and decent quality.
- *Cons:* Significantly longer distance from the production facility, requiring additional infrastructure (pumping stations, pipelines) and potentially greater environmental impacts.
- Social concerns also emerged regarding the increased footprint of draw points and potential disturbance around an area already used for recreation and cabin development.

Water Volumes

During the development of the project's water supply strategy, the team conducted a detailed Cooling Medium Study to evaluate how different cooling approaches would impact overall water consumption. Initially, an open-loop evaporative cooling system was considered, but this approach would have required large volumes of water make-up to offset evaporation losses—significantly adding to the project's annual water withdrawal needs.

By choosing licensors whose packages incorporate self-contained cooling solutions, the project can substantially reduce water demands compared to an evaporative cooling tower or once-through cooling arrangement. This not only alleviates pressure on local water sources but also mitigates potential environmental impacts related to water withdrawal rates.

Closed-Loop Cooling

1. Lower Water Consumption

- Closed circuits recirculate water multiple times, cutting down on raw water withdrawal and effluent discharge volumes.

2. Technical Feasibility

- Proven licensor technologies for large-scale electrolysis and ammonia production already include optimized cooling modules, streamlining integration.

3. Environmental Stewardship

- Minimizing withdrawals from local water bodies supports aquatic ecosystem health and reduces community concerns over potential water-use conflicts.

2.4.2.8 Effluent Discharge Points

Preferred Option: Discharge is planned from the stormwater/effluent pond to the north into Wc15-104, once discharge water meets applicable guidelines. EVREC has completed a technical study (Appendix H.4) which indicates that the receiving environment (Wc15-104) is able to manage the discharge flow without adverse impact to fish and fish habitat, the geomorphology of the creek, or downstream users. For more information on these locations please see Section 7.1.

The Project examined several water discharge points which included, direct water discharge to the Bay of Exploits, water discharge into Peters Pond, discharge water in to into Wc 15-104, and discharge water into other water courses in the vicinity of the facility.

Direct discharge to the Bay of Exploits provided the potential advantage of a large receiving environment with substantial dilution capacity and reduced sensitivity to localized flow changes. However, this option would have required significantly longer pipeline infrastructure, increased marine permitting requirements, potential impacts to marine habitat and coastal environments, additional shoreline construction activities, and more complex marine monitoring and regulatory approvals. This option was also associated with higher capital costs and greater construction complexity due to the required marine outfall infrastructure.

Discharge to Peters Pond was considered due to its proximity to portions of the Project infrastructure and its role within the Project's raw water supply system. However, this alternative was not preferred because Peters Pond functions as a key freshwater supply source for the Project, and introducing treated effluent into the same waterbody could create additional regulatory, operational, water quality management, and public perception concerns. Potential cumulative effects on the pond's hydrology, water quality, and downstream flow management were also considered during the assessment process.

The Project also evaluated discharge into other nearby watercourses within the PA. While some of these alternatives offered shorter routing distances or reduced initial infrastructure requirements, several were determined to have lower flow capacity, greater environmental

sensitivity, more constrained geomorphology, or a higher potential for seasonal flow limitations and habitat interaction concerns. Certain alternative watercourses were also considered less suitable from an operational monitoring and long-term compliance management perspective.

Based on the technical, environmental, and operational assessments completed to date, discharge into Wc 15-104 was identified as the preferred option. The selected discharge location provides an appropriate balance between hydraulic capacity, environmental protection, constructability, operational reliability, and regulatory feasibility. Technical studies completed by EVREC indicate that the receiving environment can manage the proposed discharge volumes without adverse impacts to fish and fish habitat, downstream users, or the geomorphological stability of the watercourse, while also minimizing the need for extensive marine infrastructure or interaction with the Project's raw water supply source.

2.4.2.9 Order and Timelines for Construction and Operational Phasing

Preferred Option: Single, Continuous Construction Phase

- **Project Scale and Timelines**
 - The large project capacity (~3,256 MW of wind, 2.1 GW electrolyzer, 2 × 2500 t/day ammonia trains) already necessitates a robust and coordinated construction effort. Splitting it into multiple phases would prolong the total development window, increasing complexity.
- **Cost Efficiency**
 - By permitting and developing all project components in one go, economies of scale in procurement, construction mobilization, and workforce planning are maximized. Repeated mobilizations for separate phases would inflate costs.
- **Revenue Acceleration**
 - A unified construction schedule accelerates the time to reach full operational capacity. This brings forward revenue from hydrogen and ammonia sales, improving the project's financial metrics (e.g., net present value, internal rate of return).
 -
- **Regulatory Streamlining**
 - Conducting a single, comprehensive environmental assessment and permitting process for the entire project reduces duplicative efforts. It also fosters clearer stakeholder engagement, since local communities and regulators can review the full scope at once rather than piecemeal.
- **Reduced Execution Risk**
 - By avoiding multiple discrete project starts, the consortium can better coordinate logistics (e.g., large turbine and electrolyzer equipment shipments) and manage labor, thus minimizing scheduling uncertainty.

Alternatives Considered

- Two-Phase Approach
 - *Rationale:* Spread out permitting, FEED work, and construction into two sequential phases (e.g., Phase 1 for initial capacity, followed by Phase 2 for expansion).
 - *Pros:*
 - Staged capital investment, potentially lower upfront risk.
 - Ability to incorporate lessons learned from Phase 1 into Phase 2.
 - *Cons:*
 - Extended overall timeline—delaying realization of full production capacity and revenue.
 - Potentially higher cumulative permitting and mobilization costs.
 - Duplication of some procurement, engineering, and construction activities.

2.4.2.10 Aboveground and Underground Storage of Hydrogen, Ammonia, and Carbon

The Project is forecasting 85,000 to 125,000 m³ of aboveground hydrogen storage. The Project analyzed several alternatives for the storage of gaseous hydrogen, including aboveground storage in spherical tanks, aboveground storage in prefabricated bullet tanks, aboveground storage in purpose-built pipeline storage systems (preferred), hydrogen storage in underground piping systems (line pack), liquid hydrogen storage, and underground storage in purpose-built caverns. Each alternative presented different technical, commercial, geological, environmental, safety, and operational considerations which were evaluated as part of the Project development and risk assessment process.

The Project's preferred design is aboveground storage utilizing a purpose-built pipeline storage system. This approach can provide short-duration balancing capacity between hydrogen production and consumption, helping stabilize electrolyzer operations and downstream ammonia synthesis processes. The system has been designed to safely store hydrogen and incorporates appropriate safety, isolation, pressure control, monitoring, and venting systems consistent with applicable industry standards and best practices.

For the Project, this proven storage approach demonstrated several advantages over the other alternatives considered, including greater schedule certainty, operational flexibility, ease of inspection and maintenance, scalability, and lower geological and execution risk. Although the system may have a slightly higher capital cost and larger physical footprint compared to certain underground storage alternatives, it is expected to have significantly lower environmental and subsurface disturbance impacts than underground cavern development and substantially lower energy consumption requirements than liquid hydrogen storage systems. The selected approach also supports phased implementation and provides greater operational control and reliability during both normal operations and maintenance activities.

2.5 Regulatory Framework

Various approvals are required from the federal, provincial, and/or municipal regulators to construct and operate the Project (Table 2.5.1).

A federal impact assessment is not required for the Project as it is not listed as a physical activity that constitutes a designated project as listed in the Physical Activities Regulations, SOR/2019-285, under the *Impact Assessment Act* (Canada, 2019b).

The Project is subject to section 34 and Section 41 of the Environmental Assessment Regulations, N.L. Reg. 54/03 under the *Environmental Protection Act* (Newfoundland and Labrador, 2002a). As such, this submission has been prepared per the Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Plants (NLECCC, 2023a). An EARD is a formal record required to initiate an environmental review process for a proposed project. It typically serves as the first step in assessing potential environmental impacts and ensuring that they are properly considered before a project proceeds. The EARD for the Project was submitted in October 2024. NLECCC determined that an EIS is required for this Project in December 2024. Approved EIS Guidelines were issued to EVREC April 2025.

Table 2.5.1: Government Regulatory Requirements

Name of Permit, License or Regulator Approval	Applicable Legislation	Regulatory Body	Activity Requiring Regulatory Approval	Status/Comments
Federal				
Aeronautical Obstruction Clearance	<i>Aeronautics Act</i> R.S.C., 1985, c. A-2 and the Canadian Aviation Regulations	Transport Canada	Aeronautical Assessment Form	To be submitted following detailed design phase as part of Transport Canada aeronautical assessment, including lighting plan.
Electromagnetic Interference (EMI) consultation and radio communication layout authorization		Various		Notification will be provided to applicable regulatory agencies with the object of receiving letters of non-objection.

Name of Permit, License or Regulator Approval	Applicable Legislation	Regulatory Body	Activity Requiring Regulatory Approval	Status/Comments
DFO Approval, HADD, or Fisheries Act Authorization	<i>Fisheries Act</i> , R.S.C., 1985, c. F-14	Fisheries and Oceans Canada (DFO)	If the Project is determined to have the potential to impact fish or fish habitat (water alterations).	If, during the detailed design phase, the Project is determined to have the potential to impact fish or fish habitat, the Proponent will submit a Request for Project Review to DFO.
Compliance Legislation	<i>Species at Risk Act</i> , S.C. 2002, c. 29 (SARA)	Environment and Climate Change Canada (ECCC), DFO	If the Project is determined to have the potential to impact SAR.	Compliance legislation – there is no expectation that a SARA permit will be required.
Compliance Legislation	<i>Migratory Birds Convention Act</i> (MBCA)	ECCC	If the Project is determined to have the potential to impact migratory birds (vegetation clearing during nest seasons).	Compliance legislation – permits will be applied for should they be required during monitoring programs.
Temporary Blaster's Licence or Blaster's Permit	<i>Explosives Act</i>	NRCAN	Licence to store or handle explosives.	To be submitted, following final project design, during construction stage.
Compliance Legislation	<i>Transportation of Dangerous Goods Regulations Act</i> and Regulations	Transport Canada	Shipping anhydrous ammonia.	Compliance legislation – will be monitored and permits validated when required.
Provincial				
Body of Water Alteration Permit	<i>Water Resources Act</i>	NL Environment, Conservation, and Climate Change (NL ECCC)	Water alteration activities such as culverts, bridges, fording, stream alterations.	Alteration applications, if required, will be submitted to NL ECCC following EA approval.

Name of Permit, License or Regulator Approval	Applicable Legislation	Regulatory Body	Activity Requiring Regulatory Approval	Status/Comments
Water Use Licence	<i>Water Resources Act</i>	NL ECCC	Water use licence for water supply to the Industrial Facility and construction activities.	Water use licence application will be submitted to NL ECCC following EA approval, for supply of freshwater to the Industrial Facility and the batch plants.
Certificate of Approval	<i>Environmental Protection Act</i>	NL ECCC	Required for the operation of industrial facilities with air emissions and/or effluent discharge.	An application for a Certificate of Approval will be submitted to NL ECCC following EA approval for all stages of the project.
Compliance Legislation	<i>Endangered Species Act (ESA)</i>	Newfoundland and Labrador Forestry, Agriculture and Lands (NL FAL)	If the Project is determined to have the potential to impact SAR, a permit to engage in economic activity will be applied for.	Compliance legislation – there is no expectation that an ESA permit will be required.
Licence to Occupy, Grants, Leases	<i>Lands Act</i>	NL FAL	Required for the use and occupation of provincial Crown lands.	Application submitted. In progress.
Operating Permit	<i>Forestry Act</i>	NL FAL	Required for logging or industrial operations during Forest Fire season on Crown or private lands.	Permits will be applied for throughout the Project with consideration given to all applicable operations during fire season.
Compliance Legislation	<i>Wild Life Act</i>	NL FAL	Permit to Control Nuisance Wildlife	Application for permits will be made on a as-needed basis.

Name of Permit, License or Regulator Approval	Applicable Legislation	Regulatory Body	Activity Requiring Regulatory Approval	Status/Comments
Historic Resources Impact Assessment (HRIA) Permit	<i>Historic Resources Act</i>	Provincial Archaeology Office (PAO), NL Tourism, Culture, Arts, and Recreation	Required for confirmation of historic resources within the Project footprint.	Application to be filed, if required, following a desktop review of potential historic resources.
Quarry Permit	<i>Quarry Materials Act</i>	NL Energy and Mines (NLEM)	Construction and operation of quarries.	Quarry permit application will be submitted to NLEM following EA approval, for supply of quarry material for construction.
Highway Access Permit	<i>Works, Services and Transportation Act</i>	NL Transportation and Infrastructure, NL Government Services	Construction of an access to a highway that is classified as a Protected Road requires the prior approval of the Department of Transportation and Infrastructure and/or the Government Service Centre.	Highway access permit application will be submitted following EA approval, for construction of all accesses to Protected Roads.
Fuel Storage Tank Registration	<i>Environmental Protection Act, Storage and Handling of Gasoline and Associated Products Regulations, 2003</i>	NL Government Services	Fuel tank storage greater than 2,500 liters require registration.	Application will be made pre-construction, following EA approval.
Water and Sewage Works Approval	<i>Water Resources Act</i>	NL ECCC	Required for operation of water treatment and/or sewage operations.	Wastewater and water system permit application will be submitted to Government Services following EA approval.

Name of Permit, License or Regulator Approval	Applicable Legislation	Regulatory Body	Activity Requiring Regulatory Approval	Status/Comments
Municipal				
Compliance legislation	<i>Urban and Rural Planning Act, Town and Local Services District Act, SNL2023, c T-6.2</i>	NL Government Services, Municipalities (Botwood)	Applicable zoning and development regulations for the development (including local municipal plans)	Permit applications will be submitted following detailed design and will be updated following EA approval.

The facility will be designed to meet the best available technology economically available and meet or exceed regulated safety and environmental standards. The Project will be positioned to meet all European requirements to have its output certified as green ammonia and meet the necessary standards of a world class facility of this nature.

The facility will adhere to all relevant regulations and permits regarding ammonia production, safety standards, environmental impact, and other legal requirements. The Project will continue to monitor the development of regulations and standards, noting that the definition and certification of green ammonia may vary by region. Close collaboration with regulatory bodies and compliance with industry guidelines will be crucial to ensure smooth operations and avoid any legal complications.

3.0 EXISTING ENVIRONMENT

3.1 Geographical Location

The Project is proposed within the PA consisting of a total of 35,834 ha (30,712 ha of awarded reserve lands, 1,685 ha ancillary lands under application, 486 ha of additional auxiliary lands and 3,555 ha of the SLWPA that will be under Crown land application) in central Newfoundland and Labrador (Drawing 2.1-1, Appendix A).

Broadly, the Project is on the northern coast of the island of NL, within the Atlantic Coast of mainland Canada. This location has been chosen for the Project due to its favourable wind resource, deepwater, ice-free harbour, and proximity to shipping lanes connecting Europe and the eastern seaboard of North America. The area experiences a climate with mean annual temperature of 5.8°C and mean annual precipitation of 876.8 mm. The most prevalent wind direction observed is from the southwest.

The Project is located south of Point Leamington and Leading Tickles, west and south of Northern Arm, north of Peterview, and within the municipal boundaries of Botwood and is centered at approximately 49.161441° N, 55.486669° W. Generally, the Project is located in rural area within the Exploits Valley region of central NL, north of Grand Falls-Windsor.

3.1.1 Ecoregions

The Project is within two of Newfoundland's nine ecoregions: the Central Newfoundland Ecoregion (33,312 ha of the PA) and North Shore Forest Ecoregion (2,522 ha of the PA) (Drawing 3.1-1, Appendix A).

The Central Newfoundland Ecoregion is heavily forested, and is characterized by lowlands, wetlands, and an abundance of rivers, streams, ponds, lakes, and bogs (S. J. Meades, 1990b; PAANL, 2008a). Fires are common in this ecoregion, with stands of trembling aspen often forming after fires in the central and northern portions of the ecoregion (S. J. Meades, 1990b). The natural distribution of red pine in Newfoundland is mainly restricted to the Central Newfoundland Ecoregion where it occurs on dry sites (Roberts & Bajzak, 1996).

The North Shore Forest Ecoregion borders the Labrador Sea and is largely forested with exposed rocky barrens along coastal areas, and elevations are generally below 130 m above sea level (masl) (S. J. Meades, 1990b; PAANL, 2008b). The North Shore Forest Ecoregion is dominated by black spruce and balsam fir. White spruce is more abundant than in the Central Newfoundland Ecoregion, and trembling aspen (*Populus tremuloides*) is less common (PAANL, 2008b). The North Shore Forest contains coastal species such as alpine bilberry (*Vaccinium uliginosum*), Swedish bunchberry (*Cornus suecica*), and bunchberry (*Cornus canadensis*). Forest fires regularly occur due to reduced moisture levels and high summer temperature (S. J. Meades, 1990b), and vegetation cover is influenced by the proximity to the ocean, with stunted trees a common feature (PAANL, 2008b). This region supports several large seabird colonies, including Leach's storm-petrel (*Hydrobates leucorhous*), and several gull species. Wildlife commonly occurring across the Island (e.g., moose, caribou, fox, etc.) is

also present within the North Shore Forest and the Northcentral Subregion.

The portions of the PA, specifically the SPA, IPA and WPA, that occur in two ecoregions are presented in Table 3.1.1 and Drawing 3.1-1 (Appendix A).

Table 3.1.1: Ecoregions and Project Areas

Ecoregion	PA (ha)	IPA (ha)	SPA (ha)	WPA (ha)
Central NL	33,312	1,157	242	31,913
North Shore Forest	2,522			2,522
Total	35,834	1,157	242	34,434

3.1.2 Surficial Geology and Groundwater

3.1.2.1 *Surficial Geology*

Surficial geology in the PA primarily consists of glacial till with areas of bedrock which is either exposed at surface or concealed by vegetation (Drawing 3.1-2, Appendix A) Glacial till in the PA consists of unsorted to poorly sorted sediments ranging from clay to boulders. Glacial till (deposited directly by glacier ice with minimal water-related sorting, occurs throughout the PA as plains, gullies and channels, knobs, mounds, and ridges of varying thickness.

Small bog areas (i.e. poorly drained accumulations of peat, peat moss, and other organic matter) are present in the WPA. Glaciofluvial deposits of fine-grained sand to coarse-grained cobbly gravel are present in small areas at the BWPA, SPA, and IPA. Alluvium, consisting of silt and clay to bouldery gravel, deposited by fluvial action is present in a small area at the TLWPA and marine sediments consisting of clay, silt, gravel, and diamicton with some sand is present in a small area at the LTWPA.

3.1.2.2 *Bedrock Geology*

Bedrock geology within the PA consists of various rock units of Cambrian to Ordovician age from the Exploits Subzone of the Dunnage Tectonic Zone with volcanic and sedimentary overlap sequences of Silurian age and volcanic intrusive rocks of Silurian to Jurassic age (Drawing 3.1-3, Appendix A). The Dunnage zone is characterized by Cambrian to Middle Ordovician submarine volcanic rocks and Early Ordovician ophiolite suites. In the Exploits Subzone, volcanic rocks are associated with thick sedimentary units and are overlain by black shales of Middle or Late Ordovician age. The black shales pass upwards into Late Ordovician to Early Silurian turbidite deposits, which are overlain by shallow marine and non-marine Silurian strata (Colman-Sadd et al., 2000).

Bedrock geology at the TLWPA, SLWPA and LTWPA generally consist of tuff and tuffaceous sandstone, greywacke, argillite and chert from the Wild Bight Group with intrusive igneous rocks of a younger age (i.e., Silurian to Jurassic age). The LTWPA also contains grey to black greywacke and silty argillite known as the Point Leamington Greywacke (MacLachlan, 1999).

Bedrock geology at the BWPA is primarily a mix of sedimentary (i.e., shale, siltstone, argillite,

sandstone, greywacke, conglomerate, and chert) and volcanic (i.e., pillow lavas, pillow breccia and flows, agglomerate and tuff) rocks from various groups and formations including the Frozen Ocean Group, Point Leamington Greywacke, Shoal Arm Formation, Wild Bight Group, and New Bay Formation (MacLachlan, 1999). The bedrock geology in the area of the IPA and SPA consists of Silurian aged red, brown and green micaceous sandstone, siltstone, and quartzite with minor pyroclastic rocks and vesicular basalt from the Wig Wam Formation in the Botwood Group (MacLachlan, 1999).

With respect to paleontology bivalves, articulate brachiopods, bryozoa, cephalopods, conodont microfossils, corals, crinoids, gastropods, graptolites, ostracodes and trilobites are commonly found in marine-deposited conglomerate, limestone, sandstone, shale and slate of Ordovician and Silurian age (Boyce & Williams, 1995). However, based on a search of online data bases (Fossilspot, 2008), no significant fossil assemblages were identified in the rocks in the PA.

3.1.2.3 Groundwater and Wells

The hydrogeology of the region is described in the regional hydrogeological study of central Newfoundland by AMEC (2013). This desktop study summarized the physical characteristics of major geological units in relation to groundwater occurrence, availability, and quality, utilizing provincial water well records for 3,080 drilled wells including 132 wells from nine communities in the vicinity of the WPA and 26 wells from three communities in the vicinity of the IPA to categorize areas into hydrostratigraphic units.

Information from water well records in the vicinity of the IPA, coupled with the presence of multiple streams and standing water, suggests groundwater levels are generally shallow and are a subdued reflection of the topography in the area. These levels are typically within 6 m of the ground surface.

Based on the regional dataset, which includes analytical results for up to 177 samples depending on the specific parameter, groundwater in Central Newfoundland exhibits a range of results, with several parameters exceeding the Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada, 2025). Analytical results for pH range from 5.89 to 8.47, with a median of 6.66, which is below the aesthetic objective range of 7.0 to 10.5. Aesthetic parameters including color (maximum 340 TCU), turbidity (maximum 22 NTU), and total dissolved solids (TDS) (maximum 852 mg/L) show localized elevations exceeding guidelines. Concentrations of metals also exhibit exceedances. Concentrations of iron and manganese are measured at levels up to 2.40 mg/L and 0.59 mg/L, respectively, exceeding their applicable aesthetic and health-based guidelines. In addition the regional data indicate that lead (maximum 0.029 mg/L) and copper (maximum 5.43 mg/L) concentrations exceed applicable guidelines in specific locations.

3.1.3 Watersheds and Protected Water Areas

The Project is within the Exploits River and the Southwestern Notre Dame Bay primary watersheds (Drawing 3.1-4, Appendix A). Both watersheds are characterized by rural landscapes with varying land use, including forestry, outfitting, and recreation. The Exploits

River watershed is the largest on the island of Newfoundland and Labrador, with the main river valley being home to the towns of Bishop's Falls and Grand Falls-Windsor, with the town of Botwood located near the mouth of the river on the coast.

Several Protected Public Water Supply Areas (PPWSA) are present directly adjacent to the PA, all of which are related to domestic water supply (Drawing 3.1-4, Appendix A). Indian Cove Pond, Dogberry Brook, and Muddy Hole Pond are all north of Northern Arm, Little Pond is just south of Port Leamington, and Northern Arm Lake is to the west of Bishop's Falls and north of Grand Falls-Windsor. Land leases for the Project are adjacent to these Protected Water Areas and do not overlap with proposed new infrastructure. However, some existing roads within the protected areas will be used as part of the Project's road network. All intake locations for these PPWSAs are located outside of any proposed infrastructure. Little Pond PPWSA intake is located approximately 2 km from a turbine in the BWPA and Cook's Pond PPWSA intake is approximately 200 m from a turbine and road proposed in the LTWPA.

There are no protected water supplies within the PA; however, there are six PPWSAs areas adjacent to the PA boundaries (Drawing 3.1-4, Appendix A). Northern Arm Lake PPWSA is located south of the BWPA and is the public water supply for Botwood and Northern Arm. There are 31 drilled wells and 11 dug wells within a 500 m buffer of the WPA, with no wells identified in the IPA or SPA.

3.1.4 Sensitive Areas and Species

The Project has potential to interact with lands, flora species, and their associated habitats that may be protected under federal and/or provincial legislation and regulatory guidelines. Legislation relating to wildlife, fish, vegetation and wetlands includes:

Federal Legislation

- *Species At Risk Act* (SARA) (Canada, 2002b)

Provincial Legislation

- *Endangered Species Act* (NL ESA) (Newfoundland and Labrador, 2001)
- *Lands Act* (Newfoundland and Labrador, 1991)
- *Water Resources Act* (Newfoundland and Labrador, 2002c)

Species at Risk Act, S.C. 2002 c. 29

The objective of SARA is to prevent species from becoming lost or extinct, to provide for the recovery of species designated Endangered or Threatened, and to prevent species of Special Concern from becoming further at risk. Individual protection of SAR is granted under Section 32(1) of SARA, which states that "no person shall kill, harm, harass, capture, or take an individual of a wildlife species that is listed as an Extirpated species, an Endangered species or a Threatened species". It is also prohibited to "damage or destroy the residence of one or more individuals of a wildlife species that is listed as an Endangered species or a Threatened species" under Section 33 of SARA.

Habitat protection for species listed in Schedule 1 of SARA (i.e., species designated as Extirpated, Endangered, or Threatened) is granted through the identification and designation of Critical Habitat. Critical Habitat is defined as habitat that is critical to the survival of a species and for flora SAR, applies to federal lands.

Endangered Species Act S.N.L. 2001, c. E-10

Species designated as Threatened, Endangered, or Extirpated receive individual protection from harm under Section 16 of NL ESA which states that a person may not, “disturb, harass, injure, or kill an individual of a species designated as threatened, endangered or extirpated” (Newfoundland and Labrador, 2001). NL ESA also prohibits disturbing or destroying the residence of any of these species.

Habitat protection for designated species may be established through a Critical or Recovery Habitat order under Section 28 of NL ESA. Critical Habitat refers to areas that are critical to the survival of a species, and Recovery Habitat refers to areas that are necessary for the recovery of a species. These areas are identified in species recovery plans developed for Threatened and Endangered species.

The Minister may issue a permit to engage in an activity that affects a designated species, its residence, or Critical Habitat, as described in Section 19 of NL ESA.

Lands Act, S.N.L. 1991, c. 36

The *Lands Act* (Newfoundland and Labrador, 1991) designates Crown Reserves and Special Management Areas. This legislation may be used to grant temporary protection to an area of land.

Under Section 7(1) of the *Lands Act* (Newfoundland and Labrador, 1991), Crown lands grants, leases, and licenses do not include the 15 m area around lakes, ponds, rivers, seashore, or foreshore (i.e., the shoreline reserve), unless an exception is issued by the Minister.

Water Resources Act, S.N.L. 2002, c. W-4.01

The use and modification of wetlands is regulated under the *Water Resources Act* (Newfoundland and Labrador, 2002c). Under Section 48 of the Act, a permit is required to undertake certain activities in wetlands, which are further described in the Policy for Development in Wetlands (NLECCC, 2001).

The *Water Resources Act* (Newfoundland and Labrador, 2002c) defines “wetlands” as land that has the water table at, near, or above the land surface and includes bogs, fens, marshes, swamps and other shallow open water areas. Wetland development is defined in the Policy for Development in Wetlands (NLECCC, 2001) as, “the carrying out of an activity or operation which includes the construction of ditches, mechanical disturbance of the ground, alteration of normal water level fluctuations, infilling, drainage, dredging, channelization, and removal of vegetation cover and/or organic matter on a wetland for social or economic benefits, or the making of any change in the use or the intensity of use of any wetland which affects its

hydrologic characteristics or functions". Certain developments may be permitted in wetlands with the written permission of the Minister of Environment, Conservation and Climate Change.

3.1.4.1 Sensitive Species

The region supports the presence of provincial and federal Species at Risk (SAR) species and important habitats within and near the PA. SAR species that may occur regionally are provided in Table 3.1.2.

Table 3.1.2: Species at Risk and Provincial

Species	SARA Schedule 1 Status	NL ESA Status
Caribou (<i>Rangifer tarandus</i>) - Newfoundland pop.	Special Concern	Not listed
American marten – Newfoundland pop. (<i>Martes americana atrata</i>)	Special Concern	Vulnerable
Little brown myotis (<i>Myotis lucifugus</i>)	Endangered	Not listed
Northern Myotis (<i>Myotis septentrionalis</i>)	Endangered	Not listed
Atlantic Salmon (<i>Salmo salar</i>)	Not listed	Not listed
Evening grosbeak (<i>Coccothraustes vespertinus</i>)	Special Concern	Not listed
Newfoundland Grey-cheeked thrush (<i>Catharus minimus minimus</i>)	Not listed	Threatened
Olive-sided flycatcher (<i>Contopus Cooperi</i>)	Special Concern	Vulnerable
Red crossbill (percna) (<i>Loxia curvirostra percna</i>)	Threatened	Threatened
Rusty blackbird (<i>Euphagus carolinus</i>).	Special Concern	Vulnerable
Red pine (<i>Pinus resinosa</i>)	Not listed	Threatened
Blue felt lichen (<i>Pectenium plumbea</i>)	Special Concern	Vulnerable
Boreal felt lichen (<i>Erioderma pedicellatum</i>) – Boreal Pop	Special Concern	Vulnerable

These species and their habitats are further described in Sections 6.8, 7.7, 8.7 (fish and fish habitat); Sections 6.9, 7.8, 8.8 (Vegetation); Sections 6.10, 7.9, 8.9 (Terrestrial Fauna); Sections 6.11, 7.10, 8.10 (Avifauna); Section 6.12 (Bats) and Section 6.13 (Caribou).

3.1.4.2 Core and Critical Habitats

The Province of Newfoundland and Labrador does not designate "critical habitat" under provincial legislation; therefore, there is no provincially designated critical habitat within the Province.

While there are no sensitive wildlife areas directly interacting with the Project, the closest wildlife areas of interest are a collection of core caribou areas approximately 31 km south of the BWPA and east of Grand Falls-Windsor (Drawing 3.1-5, Appendix A). The nearest natural area is the Crooked Bog Natural Area, approximately 27 km southwest of TLPA (Newfoundland and Labrador, 2025b). There is also a Swan Island natural area, located approximately 25 km northeast of the PA (Newfoundland and Labrador, 2025b).

Northern Arm Brook, New Bay River, Northwest Arm Brook, and West Arm Brook are scheduled salmon rivers that fall within the WPA, whereas the Exploits River, and Charles Brook are scheduled salmon rivers that occur outside the WPA but within a 5 km buffer.

3.1.5 Important Bird Areas

The nearest Important Bird Area (IBA) to the Project is the Bay du Nord Wilderness Reserve and Middle Ridge Wildlife Reserve (NF018), approximately 75 km southeast of the Project (Drawing 3.1-5, Appendix A).

Important Bird Area NF018 is characterized by the presence of the largest Caribou herd on insular Newfoundland, where calving takes place; however, classification of these Reserves as an IBA is due to the presence of Rock Ptarmigan (*Lagopus muta*), as they are thought to breed in the higher elevation areas of these reserves. The Newfoundland subspecies (*spp. welchi*) is a restricted range subspecies as defined by the IBA program, triggering this classification of the reserves as an IBA. Other avifauna are abundant in the lakes and wetland of the area, including common migratory species such as Canada Goose (*Branta canadensis*), American Black Duck (*Anas rubripes*), Green-winged Teal (*Anas carolinensis*), Common Goldeneye (*Bucephala clangula*), and Common Merganser (*Mergus merganser*).

The province of Newfoundland lies within the Atlantic Flyway (American Bird Conservancy, 2022). Flyways represent broad, general pathways used by birds during migration. Specific portions of flyways used by migratory birds are dependent on the species' breeding and wintering locations. High concentrations of shorebirds and waterfowl use the Atlantic Flyway during migration, to take advantage of feeding opportunities associated with mud flats and salt marshes (American Bird Conservancy, 2022). Species that use the Atlantic Flyway generally have a stronger presence along the North Atlantic Coastline (La Sorte et al., 2014) with passage through the central region of Newfoundland being less frequent. Migrants tend to fly at lower heights in coastal areas compared to central regions (Horton et al., 2016).

3.1.6 Parks and Protected Areas

There are no provincial or national parks that overlap the PA. The two national parks within Newfoundland are Terra Nova National Park and Gros Morne National Park which are approximately 110 km southeast of the PA near the community of Terra Nova, and 120 km west, near the town of Rocky Harbour, respectively. The nearest provincial park is T'railway Provincial Park, which runs approximately 1 km north and parallel to the TransCanada Highway approximately 4 km southeast of the IPA (Drawing 3.1-5, Appendix A).

The nearest protected area is the Notre Dame Provincial Park, approximately 22 km east of the IPA (Newfoundland and Labrador, 2025b). One marine protected area is located north of the LTWPA along the coast of Leading Tickles (Newfoundland and Labrador, 2025b). The closest turbine within the LTWPA is located approximately 160 m from the marine protected area.

3.2 Human Use

The Project is located within Census Division Numbers 8 and 6. The population for

the municipalities of Botwood, Point Leamington, and Leading Ticks were 3,648 in 2021 and show trend declines, similar to the province. Health care and retail make up the majority of the labour force within these census divisions. The nearest airport is Gander International. There are two schools in Botwood, one in Leading Ticks, and one in Point Leamington. The College of the North Atlantic is the closest post-secondary college to the PA, located in Grand Falls-Windsor. The town of Botwood has one health centre offering long-term care and some emergency services, with the main regional emergency services hospital located in Grand Falls-Windsor. There is an RCMP detachment in Grand Falls-Windsor and a volunteer fire department in Botwood, Northern Arm, Peterview, Bishop's Falls, and Point Leamington.

The area has a long history of historical logging throughout, primarily overlapping the WPA. The town of Botwood, which hosts part of the proposed heavy haul road, pipeline, and jetty infrastructure, has a history of hosting a variety of commercial industries, including Irving Oil and the former Abitibi Consolidated Inc. The Port of Botwood is owned and operated by the Exploits Valley Port Corporation.

There are 19 quarry permits that overlap the PA and 15 active mineral licences overlapping the PA. There is one historical mine near Point Leamington, outside the PA. Saltwater Homestead is an agriculture area located southwest of LTWPA, with a cluster of farms also located near Bishop Falls, south of the PA. There are also existing mussel and oyster farms in Green Bay and Notre Dame Bay outside the PA. More detail is provided in Section 9.0.

3.2.1 Recreation Use

Recreational activities throughout the PA include fishing, hunting, trapping, ATV/snowmobile use, and outfitting (See Section 9.0 for more detail). There are a number of cabin owners (including the New Bay Cabin Owners Association within the BWPA) that use the extensive network of forest resource roads within the PA. Local outfitters include Hideaway Lodge near New Bay (BWPA), A1 Hunts (TLWPA), and Oceanside Country Lodge.

Recreational activities undertaken for sustenance (i.e., hunting, trapping, berry-picking, and recreational fishing) are an important component of Newfoundland and Labrador's cultural identity and local food practices, and are regulated under the *Fisheries Act*, *Wildlife Act*, and Migratory Birds Hunting Regulations. Hunting and trapping is an essential component of Newfoundland and Labrador, both as a source of self-sufficiency and upholding traditional outdoor pursuits for physical and mental wellbeing (NLFAL, 2025e). Big game animals of Newfoundland include woodland caribou, black bear, and moose, with the hunting season and management differences between each species. Management areas overlapping the Project include the Moose Management Area (MMA) 15-Twin Lakes and the Black Bear Management Area (BBMA) 15-Twin Lakes. Additionally, the Central Moose Reduction Zone is located south of the Project along the Trans-Canada Highway. This management area is a maximum of 6 km wide, excluding the traveled portion of the highway, and borders the highway between Grand Falls-Windsor to Gander (NL FAL, 2025a). See Section 9.0 for more detail.

Small game management within the Project is governed by season dates and bag limits

associated with the "Remainder of the Island" for ptarmigan, snowshoe hare, red squirrel and island-wide dates and limits for grouse (NLFAL, 2025g). Recreational use is further discussed in Section 9.0.

3.2.2 Transportation Corridors

The Trans-Canada Highway (TCH) is the primary corridor for vehicle and freight traffic across the island of NL from Channel-Port aux Basques to the capital city of St. John's. It follows the Exploits River from Grand Falls down to the Bay of Exploits, just south of the town of Botwood, skirting along the southern extent of the Project at the same time (Drawing 3.1-5, Appendix A).

The primary road network used to access the Project include Highway 350 (locally known as Botwood Highway), which runs from the TCH off Bishops Falls to Leading Tickles. There are two areas within the protected road zone between Bishops Falls and the town of Botwood but neither road is located within the PA. No project activities and infrastructures are expected to directly impact and occur on these protected road portions. The haul road that runs from the Industrial Facility to the Port will be used to deliver construction materials and later, during operations, for staff maintenance access from the Botwood Highway (Drawing 2.1-2, Appendix A). A traffic study (Appendix P) was conducted to determine impact of the Project on the Botwood Highway and Water St. These are further described in Section 9.4-9.5 but increased traffic is expected at both locations during construction and only the Botwood Highway during operations. There is a portion of road (approximately 5 km) that runs through the northwest section of the BWPA but is not expected to be impacted due to the required setbacks from highways (60-100 m depending on the development and access intersection). There is another portion of the Botwood Highway that will be adjacent to the 230 kV transmission line from Southern Lake, approximately 10 km from Point Leamington, running north for approximately 9km to the edge (and into) the LTWPA. Within the LTWPA, the closest substation is 160 m from the Botwood Highway, quarry at 451 m, and turbine at 343 m. All infrastructure will be adjusted during final engineering to ensure regulatory road setbacks are met, including those setbacks indicated in Section 2.0 respecting turbine distances to roads.

There are multiple trails near the PA that have the potential to bring additional recreational users and tourists to the region. T'Railway Provincial Park is a linear Provincial Park stretching across the island of NL, featuring a trail built on the historical railbed of the Newfoundland railway. Near the BWPA, there is the Killick Island trail in Botwood and the Pendragon trail in Northern Arm, both providing easy access to the areas' views of the Bay of Exploits. There are two trails in Point Leamington, which are accessible by Highway 350 and is north of the BWPA. On Cull Island, north of the LTWPA, there are two trails and one lookout location that provide coastal views from the island.

The PA contains a broad network of maintained and unmaintained ATV and snowmobile trails. They primarily consist of historic resource roads developed within the region by the forestry industry, that have been maintained by local residents, primarily within the BWPA and SLWPA. There is little trail network within the TLWPA and virtually no trails within the LTWPA or the Industrial Facility footprint of the IPA. The NL snowmobile federation maintains and grooms two

snowmobile trails in the region which intersect the WPA. The Frozen Ocean Trail runs through the BWPA and an unnamed trail runs through the IPA along the Industrial Facility. Further details are described in Section 9.4.3. Additionally, the heavy haul road and the underground ammonia pipeline are located within the old railway trail, locally used by ATV and snowmobile riders, and named the Exploits Valley and Beothuk Trail (Trail) on google maps (Drawing 9.4-12, Appendix A). This Trail is under the management and control of the town of Botwood in the Botwood MPA and the Exploits Valley Port Corporation along Water St.

3.2.3 Indigenous Uses

The island of NL is the ancestral and unceded territories of the Beothuk and Mi'kmaq. There are two First Nation Bands on the island, the Miawpukek First Nation (MFN) and Qalipu First Nation (QFN).

The nearest indigenous community to the Project is the MFN, a Mi'kmaq reserve located at the mouth of the Conne River in south-central NL (approximately 165 km from the Project).

QFN is a band established under the *Indian Act* whose traditional territories stretch over a large portion of Atlantic Canada. Representing 67 traditional Mi'kmaq communities, it is one of the largest bands in Canada. QFN has offices across central and western NL, with a central administrative office in Corner Brook.

The area of Notre Dame Bay and the Exploits Valley have evidence of pre-contact Indigenous habitation dating back roughly 5,000 years, including the Maritime Archaic, Groswater and Dorset Pre-Inuit, Beothuk, and Cow Head Complex/Middle Woodland people. Mi'kmaq sites are known from about 300 years ago onward. European explorers, settlers, fishers and trappers began moving into the Exploits River Basin in the early eighteenth century, with late 19th/early 20th century logging camps and other infrastructure possible throughout the PA.

It is assumed that indigenous people have used the land upon which the Project is located for food, social, ceremonial or other purposes over the course of history, though no specific current use has been reported through engagement with indigenous organizations. Refer to Section 4.0 for additional engagement details.

3.2.4 Residences and Receptors

Potential receptors were identified within and up to 2 km from the PA through review of aerial imagery and a Crown title search of the Land Use Atlas and some manual reconciliation of these (Drawing 3.2-1, 3.2-1A through AZ Appendix A). Non-titled cabins were located from high resolution imagery and LiDAR. Outfitters visited all identified sites to document nature of the occupation on the ground. Some errors may be present in the categorizing of the dataset. Receptors can include full-time residences, remote seasonal occupancy (further defined below), municipal boundaries, and other recreational or commercial development (ex. campground, agricultural lands, mineral quarries, airstrips). Receptors have been broken down by Project component (wind, solar, industrial) to support the evaluation of effects to these receptors. The following sections describe the receptors for each Project component. A

complete list of receptor coordinates is found in Appendix B.1.

3.2.4.1 Wind Project Component Receptors

Receptors for the WPA were classified as:

- **Residential Occupation** – receptors which were understood to comprise of ‘permanent’ residential occupation (referred to as **residential**).
- **Remote Occupation (Crown title/Expected crown title)** – receptors that are considered to be legal occupation, however not permanent or full-time residential occupation, typically seasonal use (referred to as **remote-titled**).
- **Remote Occupation (No Crown title found)** – receptors that are noted to be unlicensed temporary occupations and unoccupied under the crown lands licensing process (referred to as **remote-untitled**).

Drawings 3.2-2A-AZ shows receptors relative to the WPA (Appendix A). Note that the use of the term residential differs from the one often used by Newfoundland and Labrador, which is to define a “residence” as a permanent, institutional, or seasonal residence, which also includes cottages, tourist lodges, hotels, motels, and hostels (Newfoundland and Labrador, 2024a). The distinction between residential and remote occupation is made to differentiate between buildings occupied year-round, and those where seasonality may affect whether people are impacted by shadow flicker at certain times of the year. ‘Remote Occupation (No crown title found)’ receptors are separated from the main analysis results.

There were 871 residential, remote-titled and remote-untitled receptors within or within 2 km of the WPA (with 8 duplicates for a total of 879). Totals are shown by type and WPA in Table 3.2.1

Table 3.2.1: Receptors within 2 km of WPA

Wind Project Area	Residential Occupation	Remote Occupation (Crown title)	Remote Occupation (No Crown title)	Total Receptors
SLWPA	0	1	0	1
TLWPA	0	3	0	3
LTPWA	228	82	7	316
BWPA	322	234	22	559
Total	550	320	29	879*

*Note: There are overlap of receptors between WPAs including notably WRID836 is within 2km of all three components of the WPA.

Seabrights Lake Wind Project Area Receptors

SLWPA only has one receptor within 2 km. This receptor (WRID836) is a remote-titled cabin on a lake approximately 930 m east of the SLWPA (Drawing 3.2-2K, Appendix A). WRID836 is within 2 km of SLWPA, LTWPA and BWPA components of the WPA

Twin Lakes Wind Project Area Receptors

TLWPA has three receptors within 2 km. WRID690 is a remote-titled cabin just south of Marks Lake along one of the planned turbine access roads. WRID688 and WRID689 are remote-titled cabins on South Twin Lake just outside the TLWPA (Drawing 3.2-2A, Appendix A). The three receptors in Twin Lakes are approximately 600 m, 700 m, and 1.3 km from the nearest turbine, respectively.

Leading Tickles Wind Project Area Receptors

LTWPA has 228 residential receptors including two main clusters:

- Cluster of 185 residential receptors in Leading Tickles and South Leading Tickles north of the LTWPA (Drawing 3.2-2B, Appendix A).
- Cluster of 45 residential receptors on Glovers Harbour (1 within LTWPA and 44 outside)(Drawing 3.2-2E, Appendix A).

There clusters of remote occupation receptors as follows:

- One remote-titled and one remote-untitled cabins opposite Glovers Harbour road on a lake along Hwy 350 (Drawing 3.2-2E)
- Cluster of 17 remote-titled receptors on Mill Cove (Drawing 3.2-2F)
- Cluster of 33 remote-titled receptors on Mill Pond along Hwy 350 (Drawing 3.2-2G).
- Cluster of 20 remote-titled receptors on Southern lake along Hwy 350
- Cluster of 12 remote-titled receptors on West Arm off Hwy 350 on Osmonton Arm Resource Road.

All but one residential receptor are over 1 km from a turbine in LTWPA. (WRID508 is the closest at approx. 770 m from WTG 14).

Botwood Wind Project Area Receptors

There are 559 receptors within or up to 2km from the BWPA. Some of the main clusters are described below along with specific Drawing references for Appendix A.

- New Bay Cottage Area and other receptors on New Bay Pond (Drawing 3.2-2S-U)
- Cluster of 21 remote-titled receptors around Indian Pond (Drawing 3.2-2AF)
- Cluster of seven remote-titled at Gallagher Pond and the pond just north of it (Drawing 3.2-2AH)
- Cluster of 8 remote-titled receptors south of Lewis Lake (Drawing 3.2-2AH)
- Cluster of five remote-titled receptors around Gull Pond and small ponds to the east (Drawing 3.2-2X)
- Cluster of six remote-titled and one remote-untitled at Lion Lake (Drawing 3.2-2AB)
- Cluster of six remote-titled receptors and two remote-untitled at Rowsells Pond

(Drawing 3.2-2AD-AE)

- Cluster of 11 remote-titled receptors at Askells Lake (Drawing 3.2-2J)

There are 212 residential receptors along Hwy 352 from Point of Bay to the town of Northern Arm (at the top of IRID44) that were included in initial receptor scoping as they are within 2 km of the EVREC awarded lands but through ongoing public engagement, infrastructure was moved out of this area and these receptors no longer fall within 2 km of the planned infrastructure in the BWPA.

The closest receptor to a turbine is a remote-untitled receptor within 250 m (211m - WRID 867) (Drawing 3.2-2X, Appendix A) in the BWPA. There are seven remote receptors less than 500 m from a turbine in the BWPA but only three of those are remote-titled with the other four being remote-untitled receptors.

All residential receptors in the BWPA are greater than 500 m from a turbine, with only seven residential receptors less than 1 km from a turbine.

A complete list of wind receptors and their coordinates is found in Appendix B.1 and labelled on Drawings 3.2-2A-AZ (Appendix A).

3.2.4.2 Industrial Facility Component Receptors

Receptors within 2km of the IPA are described in Table 3.2.2 and shown on Drawings 3.2-2AR-AY (Appendix A). Industrial receptors included residential receptors within the town of Botwood and Peterview, and commercial receptors such as a campground, existing quarry, and an agricultural farm.

The Industrial receptors also included polygons to encompass larger clusters of residences within the towns of Botwood, Peterview, and Northern Arm (Drawings 3.2-2AR-AY, Appendix A). It is noted in Table 3.2.2 where these polygons overlap with some of the wind receptors. This overlap is because of the different use cases for evaluating the effects of the Project components on the residential receptors.

Table 3.2.2: Industrial Receptors

Industrial Receptor ID	Description	Receptor Type
IRID1	Municipal lands/Possible former Dump Site	Municipal
IRID2	Ultramar	Commercial
IRID3	Ultramar gas pumps	Commercial
IRID4	Shawnadithit Campground and RV park	Commercial
IRID5	Shawnadithit Campground and RV park	Commercial
IRID6	Shawnadithit Campground and RV park	Commercial
IRID7	Shawnadithit Campground and RV park	Commercial
IRID8	Shawnadithit Campground and RV park	Commercial

Industrial Receptor ID	Description	Receptor Type
IRID9	Shawnadithit Campground and RV park	Commercial
IRID10	Cranberry Farm	Agricultural
IRID11	Exploits Meadow Farms	Agricultural
IRID12	Exploits Meadow Farms	Agricultural
IRID13	Exploits Meadow Farms	Agricultural
IRID14	Exploits Meadow Farms	Agricultural
IRID15	Jigg's Fun Farm	Agricultural
IRID16	Jigg's Fun Farm	Residential
IRID17	Jigg's Fun Farm	Residential
IRID18	Jigg's Fun Farm	Residential
IRID19	Jigg's Fun Farm	Residential
IRID20	Jigg's Fun Farm	Residential
IRID21	Jigg's Fun Farm	Residential
IRID22	Jigg's Fun Farm	Residential
IRID23	Jigg's Fun Farm	Residential
IRID24	Jigg's Fun Farm	Residential
IRID25	Jigg's Fun Farm barn	Agricultural
IRID26	Jigg's Fun Farm	Secondary
IRID27	Jigg's Fun Farm	Secondary
IRID28	Jigg's Fun Farm	Secondary
IRID29	Jigg's Fun Farm	Secondary
IRID30	Kings Transport	Commercial
IRID31	Kings Transport	Residential
IRID32	Kings Transport outbuilding	Unknown
IRID33	Kings Transport	Residential
IRID34	St. John the Baptist Roman Catholic Church	Institutional
IRID35	Quarry and Cranberry Farm Operation	Commercial
IRID36	Residence on corner of Pumphouse Rd and Water St	Residential
IRID37	Pumphouse Rd Residence and Outbuildings	Residential
IRID38	Outbuilding of 37	Secondary
IRID39	Outbuilding of 37	Secondary
IRID40	Sunshine Investments Inc Livestock Farm Barn	Agricultural
IRID41	Sunshine Investments Inc Livestock Farm Barn	Agricultural
IRID42	Sunshine Investments Inc Abattoir	Agricultural
IRID43	Livestock Farm Residence	Agricultural
IRID44 (polygon)	Town of Northern Arm Residence Cluster (included WRID 202, 204, 205, 206, 207, 208, 209, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245,	Residential

Industrial Receptor ID	Description	Receptor Type
	246, 247, 248, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 281, 281, 283, 284, 285, 286, 287, 288, 289, 291, 502)	
IRID53 (polygon)	Swanee Pool Rd (Oasis Motel and Hideaway Bar)	Residential
IRID54 (polygon)	Swanee Pool Rd Residence Cluster 1	Residential
IRID55 (polygon)	Swanee Pool Rd Residence Cluster 2	Residential
IRID56 (polygon)	Pumphouse Rd Residence Cluster (included SRID 12, 13, 14)	Residential
IRID57 (polygon)	Shawnadithit Campground and RV park (Included SRID 10, 13 and IRID 4, 5, 6, 7, 8, 9)	Recreational
IRID45 (polygon)	Treeview Dr Sunset Dr Residence Cluster (included WRID 210, 211, 212, 213, 214, 215, 215, 220, 221, 222, 496, 497, 498, 499, 500, 501)	Residential
IRID46 (polygon)	Northern Arm Residence Cluster 1 (included WRID 493, 494, 495)	Residential
IRID47 (polygon)	Mill Rd Residence (Included WRID 217, 218, 219)	Residential
IRID48 (polygon)	Cole's Parts-n-Things and Residences on Market Place (included WRID 492)	Residential
IRID49 (polygon)	Northern Arm Residence Cluster 2 (included WRID 488,490, 491)	Residential
IRID50 (polygon)	Northern Arm Residence Cluster 3 (included WRID 487, 489)	Residential
IRID51 (polygon)	Town of Botwood Cluster	Residential
IRID52 (polygon)	Main St, Peterview Cluster	Residential

The closest residence to the Industrial Facility is IRID37, a house along Pumphouse Road which is 962 m from the Industrial Facility boundary. The heavy haul road and underground ammonia pipeline travel from the Industrial Facility to the jetty along the railway trail that is managed by the town of Botwood and Exploits Valley Port Corporation. The heavy haul road and ammonia pipeline cross Water St. after crossing the Botwood Highway and then travels north along the east side of Water St. along the railway trail. The closest this heavy haul road and pipeline approaches residents in the town of Botwood is approximately 12 m on the south side of Water St. before the jetty (within IRID51). The Shawnadithit campground and RV park is located over 2 km from the SPA and is approximately located within 400 m from a road and 900 m from a camp within the IPA.

3.2.4.3 Solar Project Component Receptors

Solar receptors included both building receptors and modelling receptors presented in Table 3.2.3 and Table 3.2.4 respectively. The building receptors included 15 buildings (residential, secondary buildings and commercial) within 3 km of the solar array area (Drawing 3.2-2AV-AZ, Appendix A). The evaluation of Solar Glare (see Section 8.5) also considered a suite of modelling receptors that are beyond these residential receptors. Modelling receptors included the airstrip 5 km south of the SPA and several intersections along Hwy 350 to the east of the SPA (Drawing 3.2-2AV-AZ, Appendix A). No receptors were located within 800 m of the Solar PA.

Table 3.2.3: Solar Building Receptors

Solar Receptor ID	Description	Receptor Type
SRID1	Jigg's Fun Farm	Building
SRID2	Residence Hwy 350 across from Jigg's Fun Farm	Building
SRID3	Kings Transport	Building
SRID4	Kings Transport	Building
SRID5	Remote residence	Building
SRID6	Shawnadithit Campground and RV park	Building
SRID7	Shawnadithit Campground and RV park	Building
SRID8	Swanee Pool Rd Residence	Building
SRID9	Swanee Pool Rd Residence	Building
SRID10	Pumphouse Rd Residence	Building
SRID11	Pumphouse Rd Residence	Building
SRID12	Pumphouse Rd Residence	Building
SRID13	Pumphouse Rd Residence and Outbuildings	Building
SRID14	St. John the Baptist Roman Catholic Church	Building
SRID15	Ultramar	Building

Table 3.2.4: Solar Glare Modelling Receptors

Solar Receptor ID	Description	Receptor Type
SGM1A	(Highway 1A)	Modelling
SGM1B	(Highway 1B)	Modelling
SGM1C	(Highway 1C)	Modelling
SGM1G	(Highway 1G)	Modelling
SGM2A	(Highway 2A)	Modelling
SGM2B	(Highway 2B)	Modelling
SGM2C	(Highway 2C)	Modelling
SGM2G	(Highway 2G)	Modelling
SGM3A	(Highway 3A)	Modelling
SGM3B	(Highway 3B)	Modelling
SGM3C	(Highway 3C)	Modelling
SGM3G	(Highway 3G)	Modelling
SGM4A	(Highway 4A)	Modelling
SGM4B	(Highway 4B)	Modelling
SGM4C	(Highway 4C)	Modelling
SGM4G	(Highway 4G)	Modelling
SGM5A	(Highway 5A)	Modelling
SGM5B	(Highway 5B)	Modelling
SGM5C	(Highway 5C)	Modelling
SGM5G	(Highway 5G)	Modelling
SGMA1	1 (Airstrip)	Modelling
SGMA2	2 (Airstrip)	Modelling
SGMA3	3 (Airstrip)	Modelling
SGMA4	4 (Airstrip)	Modelling
SGMA5	5 (Airstrip)	Modelling
SGMA6	6 (Airstrip)	Modelling
SGMA7	7 (Airstrip)	Modelling

4.0 PUBLIC & INDIGENOUS ENGAGEMENT, & REGULATORY CONSULTATION

4.1 Introduction

EVREC is committed to maintaining transparency and fostering meaningful engagement with the public and stakeholder groups throughout the development of Project. Since coming to the province in 2022, EVREC has and continues to engage with the public on all aspects of the Project. Plans for the Project have been made public since the initial project registration on October 7, 2024, when the company introduced the Project to all levels of government, key regulatory agencies and local communities. Following a review period, the provincial minister of NLECCC determined on December 5, 2024, that the Project would require an EIS.

The Guidelines for the Botwood and Area EVREC Green Energy Project EIS (Section 10) state:

“Under Section 58 of the Environmental Protection Act, during the preparation of an environmental impact statement, the Proponent shall provide an opportunity for interested members of the public to meet with the Proponent at a place adjacent to or in the geographical area of the undertaking, or as the minister may determine, in order to:

- a) provide information concerning the undertaking to the people whose environment may be affected by the undertaking; and
- b) record and respond to the concerns of the local community regarding the environmental effects of the undertaking.

Under Section 10 of the Environmental Assessment Regulations, the Proponent shall notify the minister and the public of a meeting scheduled with the public under section 58 of the Act not fewer than 7 days before that scheduled meeting.”

EVREC, in consultation with NLECCC, developed a Project Public Participation Plan (Appendix Q.3) to address Section 10 of the EIS Guidelines for the Project (NLECCC, 2025), which aligns with Section 58 of the Environmental Protection Act¹. The overall purpose of the Plan was to clearly establish the approach and methods to conduct and document the findings of public, Indigenous group, and stakeholder engagements during the EIS process. In April 2025, the Plan was submitted as draft to the Environmental Assessment Committee (EAC) for review. The Plan is considered a “living” document given the regular feedback received during engagement that led to an adaptive approach to engagement.

This section describes the approved Public Participation Plan and summarizes the engagement activities and public feedback collected since December 2024.

¹ <https://www.assembly.nl.ca/legislation/sr/statutes/e14-2.htm>.

4.2 Engagement Objectives and Principles

EVREC is committed to transparent, consistent engagement with stakeholders, including local communities, government agencies, Indigenous groups, environmental organizations, employees, investors, and the media. A primary goal of EVREC and its representatives is to foster transparency, build trust, address concerns, and ensure smooth project execution while minimizing conflicts and disruptions. EVREC will continue to ensure that stakeholders are informed, involved, and engaged in a manner that aligns with both EVREC's objectives and social responsibility goals. EVREC's commitment to early and continuous engagement allows all groups with an active interest in, or who are impacted by, the Project to engage, ask questions, express opinions, and contribute meaningful dialogue throughout the Project's lifecycle.

Insights gained through public engagement will continue to guide the Project thought development, construction, and commissioning phases, and ultimately the day-to-day facility operations. EVREC expects to build strong, long-term relationships with stakeholders, reduce risks associated with misunderstandings or protests, and ensure that the Project contributes positively to both the local community and the environment. Transparent, inclusive, bi-directional, and consistent communication will be key throughout the Project's lifecycle.

The following are the principles that EVREC adopted:

- **Resource:** Provide the appropriate personnel, resources, and procedures to conduct and document meaningful, responsive engagement with the public, Indigenous groups, and stakeholders.
- **Identify:** Understand who is interested in the Project and seek to build relationships with those key groups, to create a trusted process for engaging in productive and collaborative discussions about managing potential effects and maximizing potential benefits.
- **Clarity:** Communicate in plain language, in a clear and understandable manner with those most interested in or directly affected by the Project.
- **Materials:** Provide concise multi-media communication materials that educate, inform, and motivate.
- **Opportunity:** Engage people early in the process and maintain regular and open dialogue throughout the life of the Project, to understand public, community, and Indigenous issues and to identify mutually acceptable approaches to address key concerns.
- **Availability:** Provide substantial opportunities to receive feedback and exchange ideas, with appropriate adaptations to access opinions across demographic groups (age, gender, etc.), that will help minimize conflict and build constructive consensus.
- **Attentiveness:** Listen to and carefully consider concerns and ideas, recognizing that diversity of opinions will contribute to fair and informed decisions and will result in the most appropriate project design and operation.
- **Punctuality:** Communicate decisions in a timely manner and respond to information requests as fully and as quickly as possible.

The Project Public Participation Plan (Appendix Q.3) was created and outlined a range of activities undertaken by EVREC to maximize outreach and promote meaningful public participation. These activities provided multiple opportunities for engagement, including in person, in writing and online. The engagement approach and methods were intentionally designed and implemented to provide accurate and timely information about the Project to interested and potentially affected people and organizations. Participants were given the opportunity to ask questions, identify issues and concerns, and share local knowledge and perspectives about the Project and its surrounding environment. EVREC considered their feedback, insight, and information for the EIS, and will continue to consider this in on-going Project planning and implementation.

The plan focused on key engagement activities. It directed core information and development of messages to be concise, in plain language, and accessible. Materials included maps, illustrations, animations, audio-visual and virtual reality materials, scientific/technical and topic-specific information, banners, information display boards, summary sheets, and signage to accompany discussions and to facilitate an understanding of the Project and the EIS.

4.3 Public and Stakeholder Engagement Plan

As the Project is located near Botwood, EVERC has an office within the town to support Project development and remain established within the community. EVREC personnel and consultants travelled extensively throughout the Exploits Vally and Botwood areas, and to most communities from Grand Falls-Windsor to Botwood and north to Leading Tickles to provide information about the Project and listen to community questions and concerns. EVREC actively engaged with commercial outfitters, outdoor recreation groups, cabin owners, and key stakeholders including towns and the Exploits Port Corporation during on-going baseline operations and during preparation of the EIS. EVREC met with QFN and MFN on December 5, 2023, to provide information on the Project and to ask how these communities would like to be engaged through the EA process. During this meeting, MFN indicated that they would respect QFN taking the lead on engagement for this Project. EVREC frequently engaged QFN leadership and executive, and regional members, and with Industry development groups such as Energy NL and Econext.

EVREC participated in several national and international hydrogen industry events, often in the company of Newfoundland and Labrador organizations and government officials. While Botwood and nearby towns and local communities were the focal point of Project engagements, EVREC developed a province-wide approach and hosted stakeholder meetings throughout the province through virtual meetings and online platforms.

Table 4.3.1 Identifies the public and stakeholder groups that EVREC has engaged with to date. A more detailed summary is provided in Appendix C.1, which documents the frequency of meetings with the public and stakeholders since 2024.

Table 4.3.1: Public and Stakeholder Groups Engagement Log (May 2024 - February 2026)

Group	Sub-Group	Department/Association
Stakeholder Groups	Academic Groups	College of North Atlantic (CNA)
		Memorial University of Newfoundland (MUN) and Marine
		Professional Engineers and Geoscientists Newfoundland and Labrador
		Marine Institute (MI)
	Businesses	Exploits Valley Port Corporation
		Corner Brook Pulp and Paper
		Shalloway Family Practice Network
	Indigenous First Nations (IFN)	Qalipu First Nation (QFN)
		Miawpukek First Nation (MFN)
	Outfitters/Local Groups	New Bay Pond Cabin Association
		Newfoundland and Labrador Outfitters Association
		Newfoundland Association of Hunters and Anglers
		Newfoundland and Labrador Snowmobile Federation (Central)
		Oceanside Country Lodge
		Hideaway Lodge
		A1 Hunts
	Towns/Communities	Town of Botwood
		Town of Northern Arm
		Town of Point Leamington
		Town of Grand Falls-Windsor
		Leading Tickles
		Bishop Falls
		Peterview
		Point of Bay
		Local Service District - Phillips Head
		Local Service District - Pleasantview
		Local Service District - Glovers Harbour
	Interested Public	Respondents to advertisements for meetings; Open Houses
	Municipalities	Grand Falls (Water Treatment Plant)
		Botwood Fire & Rescue
	Industry	Newfoundland Power
		Energy NL
		Econext
		Newfoundland & Labrador Hydro

4.3.1 Information Materials

Information and print materials were made available in EVREC office located in Botwood to respond to inquiries and provide a point of contact for local residents. The materials were also distributed by the EIS team in public activities and meetings.

4.3.2 Project Website

EVREC's Project website (<https://evrec.ca/>) provides core sections related to the Project and EIS process. Detailed information maps, summaries, reference materials, frequently asked questions, news releases, and contact information to submit questions and comments are included on the website (Appendix C.1). Key topics include information about EVREC, the Project, Community, Environment, Product, Suppliers, News, and FAQ.

4.3.3 Social Media Accounts

Social media accounts on Facebook and LinkedIn provided updates and encouraged participation. Facebook social media posts including EVREC's existing social media accounts (Facebook and LinkedIn) were used to post Project updates and notifications, including notices about the EIS process, and requests to participate in Public Meetings (Appendix C.1). These platforms also provided methods for feedback during the EIS process and were a proactive means of notifying the public.

4.3.4 Botwood Project Office

EVREC has operated a project office in Botwood since August 2023, that has been staffed part-time. It is used for stakeholder meetings, and is open to the public to drop in, to review project information boards, ask questions, and provide information including resumes and expressions of interest in business and procurement.

4.3.5 Project Mailing List

A Project mailing list was developed as part of its registry of stakeholders to provide updates and notifications to people who registered at public information sessions, in meetings, and online. It was initially compiled from a preliminary contact list of local interest groups, relevant agencies, and community contacts. Throughout the EIS process, EVREC actively engaged in identifying additional stakeholders. The mailing list was updated and maintained throughout the Project to send Project updates and notifications, as well as to encourage questions, comments, concerns and statements of support.

4.3.6 Public Advertisements and Notices

Public notices (Appendix C.1) were developed for the public information sessions and distributed through the following sources as outlined in the EIS guidelines (NLECCC, 2025):

- Posters displayed in prominent community locations
- Proponent, community websites, etc.
- Social media
- Local radio public service announcements

- Direct mail inserts or household drop offs to local residents
- Other sources available in the area

There were no community and local newspapers available in the region. Posters were displayed in high traffic public and commercial areas in Botwood; posted on EVREC's website; and shared by on EVREC's social media accounts.

4.3.7 Public Meetings

During the EAR process, EVREC held several open houses, with the final one held on April 25, 2024, in Botwood with approximately 300 attendees from various communities including Bishop Falls, Leading Tickles, and Grand Falls-Windsor.

For the EIS, EVREC held two public information sessions in Botwood. Organized in the format of an Open House, the first in-person public meeting was held in the Royal Canadian Legion (after being moved from the school due to its weather-related closure that day and evening) on December 16, 2025. A second open house was held at Botwood Collegiate on February 25, 2026. Approximately 100 people attended each event.

The format of these open houses included an introductory overview, posterboard displays, and information stations. Representatives of EVREC and the EIS team were available to provide information and respond to questions, concerns, and expressions of support. Several industry suppliers and organizations were also present to provide information about their role in the Project and with EVREC operations. The key objectives were to provide information to the public about the Project and to document the concerns/feedback of local communities adjacent to the PA.

Information regarding how to submit feedback was announced and displayed throughout the virtual and Open House sessions. The posterboards that were on display at both sessions and used for one-on-one discussions and in response to individual questions are included in Appendix C.1.

Over 200 individuals connected in the Public Information Session, online, at the Botwood office and in meetings.

4.3.8 News Media

During the public open houses, the news media was welcomed. The December 16, 2025 session was attended and covered province-wide by NTV in news reports. While the story incorrectly noted that QFN pulled support (Lewis, 2025a), subsequent discussions with Qalipu Chief Brake confirmed consultations and discussions will continue about an MOU.

NTV also aired a second story about the Exploits Valley Port Corporation's interests in the Project (Lewis, 2025b).

4.4 Public and Stakeholder Engagement Results

4.4.1 Key Questions and Concerns Addressed within the EIS

Through the engagement process from both the EAR and EIS, EVREC has addressed the issues and interests raised through its engagement initiatives and the information provided to the public. Both in-person and virtual stakeholder engagement sessions generated constructive dialogue; however, concerns persist and these concerns were considered in the development of the EIS.

The main interests and concerns identified through these engagement sessions were compiled into a series of questions and answers and presented on the project website as Frequently Asked Questions. In addition, all concerns and feedback raised through public consultations and other channels have been compiled, carefully considered in the development of EVREC's project commitments, and reflected throughout the full EIS.

Key Issues and concerns raised by the public and Indigenous have been grouped into broader categories and reference to the relevant section of the EIS in which the concern is addressed. Table 4.4.1 summarizes these key issues and concerns.

Table 4.4.1: Key Issues and Concerns Addressed

Key Question/Concern	EVREC Response	Section of the EIS
Project		
Who is EVREC?	EVREC is a green energy project development company with goals aligned to those of the Canadian Government to set the country on a path to meet climate change goals of net-zero greenhouse gas emissions by 2050 (NRCAN, 2024c).	1.1
What is the EVREC Project?	The EVREC Project is a large-scale Project in the central Newfoundland region that will generate clean electricity for its use from an onshore wind farm to produce zero-carbon hydrogen and ammonia at scale. The Project will contribute to positioning Canada as a global leader in clean hydrogen production, use, and export.	2.0
What are the Project's components?	The Project consists of four Wind Project Areas (Botwood, Seabright's Lake, Twin Lakes, Leading Ticks), an Industrial Facility for hydrogen and ammonia production, and a Solar Project just south of the Industrial Facility. Lands have been awarded through the provincial wind bid reserve process.	2.0
Where is the Project located?	The Exploits Valley Area. EVREC will develop, construct, and operate a wind-to-green ammonia project on the brownfield site of the former Abitibi logging lands near Botwood, in Central Newfoundland.	2.0
How much is this project costing the Province of Newfoundland & Labrador	The company is funding the construction and operation using its own funds, as well as funds raised from investors and lenders. The product being produced is green ammonia which will be sold to an international customer, not the province of Newfoundland & Labrador.	1.0
Why Green Hydrogen?	Green hydrogen is a highly sought after commodity in international energy supply. Newfoundland and Labrador have the opportunity to be a leading global jurisdiction to supply renewable energy.	2.0
Will the Project use energy from the grid?	No, the EVREC Project is designed to use 100% renewable energy that we generate. The Project is planning to utilize a grid connection to draw power (if available) for critical loads or to provide power to support the local and provincial grid in times of need.	2.0 and 6.0
How much crown land will be used?	The awarded reserve lands from the Crown Lands process was approximately 30,712 ha. Subsequent discussions with the province allowed for the EVREC Project to exchange certain unbuildable lands for additional lands in the area between the Botwood and Twin Lakes area and ancillary lands for supporting infrastructure.	2.0

Key Question/Concern	EVREC Response	Section of the EIS
Wind Project		
How many wind turbines will there be?	Up to 534 turbines	6.1.2.1
How is maintenance handled on a wind turbine?	Wind turbines undergo routine maintenance (visual inspections, lubrication of moving parts, monitoring of key performance indicators) to identify and address minor issues before they escalate. Predicative monitoring systems are often installed in turbines to continuously assess the condition of critical components. This includes vibration monitoring, oil analysis and other sensors that provide real-time data on the health of the turbine. During the life of the turbine, periodic inspections, both internal and external, are scheduled to assess the condition of components that may not be easily visible during routine maintenance. These inspections help identify wear and tear and potential issues that may require corrective action.	6.1.3.2
How much noise do wind turbines create?	Modern wind turbines typically produce sound levels between 40-50 decibels at a distance of 500 meters; comparable to the noise level of a refrigerator.	6.4.4.4
Will wind turbines cause light pollution?	Wind turbines often have subtle blinking lights at the top of the tower as a safety precaution for nearby aircraft (i.e., similar to the lights on local cell towers). These create much less light pollution than most industries or communities (e.g., car headlights, streetlights, business signage, light emitted from local residences).	9.5.3.3

Key Question/Concern	EVREC Response	Section of the EIS
How could shadow flicker affect surrounding areas?	Shadow flicker can occur when rotating blades cast flickering shadows during times of direct sunlight. The magnitude of shadow flicker is determined by the position and height of the sun, wind speed and direction, geographical location, time of year, cloud cover, turbine hub height, rotor diameter, and proximity to the turbine. Model results demonstrate that under both the worst- and realistic-case scenarios, there are receptors that exceed thresholds for acceptable duration of shadow (exceeding 30 hours per year). The following conditions must all occur for shadow flicker to be experienced by a receptor: • The sun must be shining with no or minimal cloud cover. • There must be no fog or low-altitude inclement weather that would obstruct the sun's direct rays (diffuse light such as on a cloudy day does not generate shadow flicker). • There must be no vegetation between the sun and the receptor that would screen the shadow flicker effect. • The wind must be blowing between the cut-in and cut-out speeds. • Turbine blades must be oriented approximately perpendicular to the line between the receptor and the sun. • Receptors must have windows in the direction of the turbines that are in a state to allow light inside (i.e., no curtains or shades blocking light). • Receptors must be occupied at the time of effect. If any of the above variables are not met, shadow flicker may not occur at all, or its effect may be greatly minimized in duration or intensity. Shadow flicker is not associated with negative physiological health effects. Additional modelling will be undertaken following investigation at receptors with predicted exceedances to determine the actual potential for exceedance, and the nature of the receptor.	6.5
What is the lifespan of a wind turbine? What happens at the end of the useful life of a wind turbine?	The lifespan of a turbine (anywhere from 20 to 30 years or more) is influenced by the quality of the equipment, its operating environment and advancements in technology. The major components of a wind turbine are a tower, nacelle, blades, hub, gearbox, generator, and control systems. Each of these components has a specific lifespan, with some components potentially requiring replacement or major overhaul during the turbine's operational life. As turbines are dismantled, the components are repurposed, recycled, or disposed of in an environmentally responsible manner. Under the Crown Land Application, EVREC has the obligation of decommissioning all assets.	6.1.3.3

Key Question/Concern	EVREC Response	Section of the EIS
Hydrogen/Ammonia Production Facility		
How is green ammonia produced?	Green ammonia is produced using renewable energy sources- in EVREC's case, wind turbines and solar will fuel the process. This electricity powers an electrolyzer, which splits water (H ₂ O) into hydrogen (H ₂) and oxygen (O ₂). This process is known as electrolysis and results in the production of green hydrogen. This green hydrogen is then combined with nitrogen (extracted from the air) in a process known as air separation. The hydrogen and nitrogen are then combined to create green ammonia by a process (Haber-Bosch) which has been used for over 100 years and now has been adapted to be powered by sustainable energy.	7.1
Will there be pollution from hydrogen/ammonia production facilities?	Hydrogen-ammonia production facilities, especially those powered by renewable energy like wind and solar, generate minimal greenhouse gas emissions.	7.2, 7.3
How does green ammonia contribute to the decarbonization of the ammonia industry?	Ammonia production is highly energy intensive and has traditionally been produced using fossil fuels. In 2020, global ammonia production created approx. 450 million metric tons of carbon dioxide into the air- all of which can be eliminated by producing it using green renewable energy.	7.3
What applications does green ammonia have?	The key applications of green ammonia are for fertilizer production, agriculture, chemical industry, hydrogen carrier, fuel for power generation, fuel for the maritime and shipping industry, energy.	1.0
Is ammonia safe to handle and ship?	Ammonia has been produced, handled, and shipped safely for over a century. It plays a critical role in agriculture as a key component of fertilizers, as well as in refrigeration and industrial processes. Ammonia is a commonly shipped good with 20 megatons per year typically shipped globally and in 2020 there were 120 ports with ammonia trading facilities. Thanks to its long history of use, robust safety standards have been developed to mitigate risks, making ammonia transport and handling routine in global industries.	14.0
Will there be any constant odours associated with the operation of the project?	Under normal operating conditions, there should not be any constant odours associated with the ammonia pipeline. The facility is intended to operate as a closed system, meaning ammonia and other products are fully contained from the Industrial Facility to the marine loading area. In addition, the design includes measures to manage boil-off gas and vapour, including a parallel vapour return system, and flares. Any ammonia odour would therefore be unexpected and would indicate an abnormal event, upset condition, or leak requiring immediate response.	7.1.2.8

Key Question/Concern	EVREC Response	Section of the EIS
Ammonia Pipeline		
What happens in case of a spill?	In the event of a spill or leak, the system is designed to rapidly isolate the affected section and initiate emergency shutdown procedures. Detection and monitoring systems would be used to identify abnormal pressure, flow, or ammonia concentrations, and remotely operated isolation valves would shut in the line to limit the release. Emergency response procedures would then be activated, including site alarms, restricted access, notification of emergency responders, and implementation of public safety measures if needed. The intent of the design is to minimize the quantity released, contain the hazard as much as possible, and protect workers, the public, and the environment. EVREC will implement an Emergency Response Plan that outlines these procedures.	14.3, Appendix Q.2
What are the design features of the pipeline?	The ammonia pipeline is being designed as a dedicated industrial transfer system with multiple layers of protection. Key design features are expected to include appropriate material selection for ammonia service, corrosion protection, continuous monitoring and control, pressure management, emergency shutdown systems, and strategically located isolation valves. The liquid ammonia line is also paired with a vapour return line that routes boil-off gas back to the plant for reliquefaction, reducing pressure build-up and avoiding routine venting. The design basis also includes compliance with applicable engineering codes, hazard studies, and safety reviews to confirm wall thickness, routing, separation distances, and emergency systems.	7.1
What is the risk to the local town, houses and buildings?	The risk to nearby homes, buildings, and the local town is intended to be kept very low through routing, engineering design, and emergency planning. Pipeline routing and facility siting are selected to maximize separation from residences and public areas wherever practicable, and detailed hazard assessments are used to evaluate potential release scenarios, consequence distances, and required mitigation measures. While ammonia must always be treated as a hazardous substance, the Project design process is specifically intended to ensure that the risks to the public remain within accepted regulatory and industry safety criteria. In practical terms, this means the pipeline is not expected to create an ongoing danger to the community during normal operation, and abnormal events are addressed through prevention, detection, isolation, and emergency response measures.	14.0

Key Question/Concern	EVREC Response	Section of the EIS
Economic		
Will there be jobs for local talent?	Yes. Jobs will become available as the project moves through different stages. As of right now, its anticipated that the project construction and operation will require the following: • Project and construction managers • Engineers (electrical, mechanical, civil, design, HVAC, chemical, process, laboratory) • Control room operators • Environmental specialists • Crane and heavy machinery operators • Wind techs (The College of the North Atlantic is offering this certification) • Welders • Electricians • General Labour	11.0
What opportunities will be created for local businesses?	Local businesses can benefit from servicing hydrogen production facilities through: Material: Local suppliers can provide materials, equipment, and services required for the construction and maintenance of hydrogen plants. This includes everything from raw materials to specialized machinery and technical services. Logistics and Transportation: Companies involved in logistics and transportation may find opportunities to transport hydrogen, associated products like ammonia, or the equipment needed for production and distribution. Technical and Professional Services: Engineering firms, IT services, and environmental consultancies could see increased demand for their expertise in supporting hydrogen production projects.	11.0
Environmental		
Does the Project require freshwater?	Yes, the Project requires water for electrolysis and cooling. It is currently believed that the Project will require similar levels of water consumption to those used historically on the Project site and will be drawn from Peters Pond.	7.1
What is the amount of water to be used by the project to create hydrogen?	The Industrial Facility will require approximately 3.0 million cubic metres (m ³) of water per year. Daily water demands are expected to vary from 0.59 million litres per day (0.0068 m ³ /s) to 13.68 million litres per day (0.158 m ³ /s).	7.1

Key Question/Concern	EVREC Response	Section of the EIS
What are the impacts to Peters Pond?	To determine the impact of water withdrawal from Peters Pond, a hydrological assessment was conducted using an industry-standard modelling system and the latest climate and hydrologic data (including 2025). Overall, the model predicts that Peters Pond has sufficient water available to accommodate the proposed Project withdrawal, and that water levels are expected to remain stable (average monthly decrease of 0.7cm). Adaptive management strategies like water recirculation and real-time monitoring will be implemented to ensure that flows from the pond's outlet and downstream fish habitat are maintained during low-flow events.	7.6
Will there be negative effects to the nearby fish and fish habitat?	Through the environmental assessment process, a full desktop review and field surveys were completed to identify fish and fish habitat. Wherever feasible, Project infrastructure has been located to avoid direct interaction with fish habitat. Construction of the Industrial Facility will require the removal of two freshwater streams. Their flows will be redirected around the facility using via ditching. This work will require authorization and associated offsetting under the federal <i>Fisheries Act</i>. During detailed design, all fish habitats will be field-verified to ensure that other Project components (e.g., turbines, quarries, accommodations) continue to avoid sensitive areas. Road crossings will be designed to maintain fish passage and protect habitat connectivity. Water withdrawal and discharge requirements of the facility are not anticipated to result in negative effects to fish and fish habitat with the implementation of water quality and quantity mitigation and monitoring measures.	7.7
What is the stormwater management?	Stormwater and process water will be collected on site, monitored and treated prior to release to a discharge stream north of the facility from a pipe in the perimeter ditch. This stream continues to Botwood Harbour. The discharge will be monitored to meet provincial guidelines and fish habitat requirements.	7.1
How is wildlife impacted by the construction of wind farms?	Through the environmental process, a full desktop review and extensive field surveys have been completed to identify the presence of wildlife and wildlife habitat, vegetation communities, species at risk, waterbodies, and areas of scientific or natural interest. Project infrastructure has been sited to avoid sensitive features.	6.10, 7.9, 8.9

Key Question/Concern	EVREC Response	Section of the EIS
Are wind turbines hazardous to birds?	Ongoing research and monitoring efforts focus on developing best practices to enhance turbine operation while protecting birds and demonstrating a commitment to balancing renewable energy needs with wildlife conservation. Canada has strict environmental guidelines that EVREC must follow to plan and operate a wind project. Additionally, modern wind turbines are very tall to significantly reduce the risk to bird species that fly at lower altitudes. Technological advancements in turbine design, such as larger blades and improved siting strategies, further minimize interactions with wildlife.	6.11
Are there risks to people, wildlife or the environment from ice throw?	Modern turbines are equipped with sensors to detect ice buildup, and they can automatically shut down to prevent ice throw. Additionally, turbines are typically sited far from residential areas. Ice can also be detected on wind turbine monitoring systems. De-icing of the turbine blades prior to operation eliminates risks of ice-throw and limits production losses. De-icing is available in two variations: Passive systems: Using ice resistant coatings or paint; Active systems: Using thermal pads, or internal circulation of heated air for de-icing.	13.2.3
Waste Management		
How is waste disposed of during construction and operation?	Waste materials will be removed and managed through licensed waste disposal pathways. A Waste Management Plan has been prepared for the EIS	Appendix Q.12.
Accidents and Malfunctions		
What happens in the event of an explosion?	The Industrial facility has been designed with appropriate engineering controls to be in place to mitigate accidental release/malfunctions. Furthermore, emergency plans including communication protocols, evacuations, etc. will be developed, meeting all regulatory requirements.	14.8
Local Life		
Will there be any road closures related to construction and operation?	EVREC is developing a haul road, that will travel from the Port of Botwood to the Industrial Facility that will be partially located along the railway alignment between Botwood and Grand Falls Windsor that was formerly used by Abitibi.	9.0

Key Question/Concern	EVREC Response	Section of the EIS
What will happen to areas frequented for berry picking, hunting, hiking, and other recreational activities?	Wind turbines have coexisted with human activities since the 1970's. EVREC will work with communities to develop common-use agreements so areas used for these purposes remain accessible. During construction, access to active construction areas may need to be restricted to protect public safety. Hunting regulations regarding proximity to industrial installations will be in effect. There will be fences around electrical substations, but generally, fences will not be in place around turbines or access roads. Fencing will be installed surrounding the solar facility and main Industrial Facility, substations, high voltage areas, pump house and critical port and pipeline areas.	9.0
Fire/Emergency services	EVREC has developed an Emergency Response Plan that outlines the capacity that will be available to the project and the coordination and training that will be provided to the other communities within the Exploits Valley region to address all levels of emergencies at the facility and the ability to support the existing emergency response capabilities in the Exploits Valley region.	Appendix Q.2
Will there be more outreach to the communities?	More public engagement, Indigenous engagement and information sharing is planned as the Project progresses. EVREC will implement a Project Public Participation Plan.	Appendix Q.3
Overlap with mineral resources, quarries, outfitters.	EVREC has developed engagement plans with resource users in the area to communicate schedule and work on micro-siting to avoid interactions where feasible. EVREC is working with the outfitters in the PA to understand and outline the impacts to the outfitters during construction and operation so they can retain their business opportunities. EVREC will implement an Outfitter Environmental Effects Monitoring Plan, Mineral Resource Industry Consultation Plan and a Quarry Resource Consultation Plan.	Appendix Q.5 Appendix Q.6 Appendix Q.8

4.4.2 Support Letters Received

Letters of support for EVREC and the Project are found in Appendix C.1.

4.5 Government and Regulatory Consultation

EVREC has met with government entities and officials representing federal, provincial, and municipal jurisdictions. Table 4.5.1 outlines the different groups and departments and associations that EVREC has been in contact with during the EAR and the EIS process.

Table 4.5.1: Government and Regulatory Engagement Log (May 2024 – April 2026)

Group	Sub-Group	Department/Association
Government	Federal	Fisheries and Oceans Canada (DFO)
		Royal Canadian Mounted Police (RCMP)
		Canadian Coast Guard
		Canadian Military
		Nav Canada
		Natural Resources Canada (NRCAN)
		Atlantic Canada Opportunities Agency (AOCA)
		Transport Canada (TC)
		Environment and Climate Change Canada (ECCC)
	Provincial	NL Department of Forestry, Agriculture and Lands (NL FAL)
		NL Department of Fisheries and Aquaculture (NL FA)
		Municipal and Provincial Affairs / Municipal and Community Affairs
		NL Department of Tourism, Culture, Arts and Recreation (Provincial Archeology Office)
		NL Department of Energy & Mines
		Member of the House of Assembly (MHA) Exploits
		Environment, Conservation, and Climate Change (NL ECCC)
	Municipal	Community Mayors, Councils and Staff (Throughout the Exploits Valley Central Newfoundland and Botwood Area, including the Towns of Botwood, Northern Arm, Leading Tickles, Point Leamington, Peterview, and Grand Falls-Windsor)

Following the drafting of the EIS guidelines, EVREC has met with the Environmental Assessment Committee (EAC) for the Project on multiple occasions. The Project team met with individual departments to review survey design, discuss results and provide summary of the analysis for the EIS and garner feedback.

4.5.1 Review of Government Concerns

Federal regulators, including Natural Resources Canada, Impact Assessment Agency of Canada, and Fisheries and Oceans Canada have focused on higher-level, strategic considerations for the EVREC Project. Key areas of concern include the location and footprint of major infrastructure in relation to federal lands and waterways, marine and port interface

risks, and potential impacts to fish habitat and navigable waters. The departments are also assessing environmental effects, alignment with national climate objectives, Indigenous consultation obligations, and overall compliance with potential federal funding programs such as the Clean Fuels Fund, Input Tax Credits including project readiness and value-for-money.

Provincial regulators, such as NL Department of Environment, Conservation and Climate Change and Newfoundland and Labrador Department of Energy and Mines have concentrated on Project-specific and execution-related matters. These discussions have emphasized environmental impacts and mitigation measures, the adequacy of baseline surveys and field methodologies across VCs, and Indigenous and public engagement. Additional focus areas include socio-economic impact, Project timelines, permitting sequencing, as well as the detailed siting and design of infrastructure, ensuring that development aligns with provincial land use priorities and can be delivered efficiently and responsibly.

4.6 Ongoing Engagement

EVREC is committed to continuing to work to address any concerns raised by stakeholders, Indigenous groups and members of the public over the duration of the Project's life. As outlined in the Project Public Participation Plan (Appendix Q.3), EVREC has and will continue to work diligently to ensure stakeholders and Indigenous groups are kept up to date on the Project and the EIS process. The company will continue to listen and seek out concerns and feedback and then demonstrate and describe how each issue and concern, and opportunity, will be addressed and mitigated as required.

Ultimately, this feedback will continue to support how the Project will be advanced through construction, development, and operation. Furthermore, it will shape the continued development of EVREC's ongoing engagement.

5.0 EFFECTS ASSESSMENT METHODOLOGY

An EA is a planning tool used to predict the environmental effects of a proposed project, identify measures to mitigate adverse environmental effects, and predict the significance of any effects after the application of mitigation measures.

The EA focuses on Valued Components (VC). VCs are specific components of the biophysical and human environments that, if altered by the Project, may be of concern to regulators, stakeholders, and/or the public. The scope of the EIS for this Project includes:

- Identify VCs with which the Project may interact with (by activity and phase) within established spatial and temporal boundaries.
- Establish the existing conditions for VCs.
- Identify potential interactions between the Project and the VCs.
- Assess the potential pathways of effects that could occur from the interaction.
- Identify, where possible, mitigation measures to reduce or eliminate those pathways of effects based on existing industry best practice.
- Evaluate the significance of the residual environmental effects after the implementation of mitigation measures using VC-specific criteria.
- Identify monitoring or follow-up programs to verify predictions and/or evaluate the need to implement adaptive management, if required.

5.1 Identification of Valued Components

The following VCs were identified based on the experience of the Project Team and through engagement with Indigenous groups, local communities, regulators, stakeholders, and the public. Given that not all VCs are relevant to all Project Components, a list of VCs and relevant components is provided in Table 5.1.1. Four VCs are evaluated at the Project level instead of individual Project Components (as noted in Table 5.1.1) due to the more universal interactions between these VCs and the Project as a whole.

Table 5.1.1: Valued Components and Relevant Project Components

Valued Component	Project Component		
	Wind & Transmission	Solar	Industrial Facility
Air Quality	X	X	X
Greenhouse Gases	X	X	X
Sound	X	X	X
Shadow Flicker	X	-	-
Solar Glare	-	X	-
Groundwater	X	-	X
Surface Water	X	X	X
Fish and Fish Habitat	X	X	X
Flora and Vegetation Communities	X	X	X
Terrestrial Fauna	X	X	X

Valued Component	Project Component		
	Wind & Transmission	Solar	Industrial Facility
Avifauna	X	X	X
Bats	X	-	-
Caribou	X	-	-
Land and Resource Use	X		
Heritage and Cultural Resources	X		
Economy, Employment and Business	X		
Infrastructure and Community Services	X		

5.2 Spatial and Temporal Boundaries

5.2.1 Spatial Boundaries

Spatial boundaries are considered separately for each VC and for each Project Component and are typically based on natural system boundaries or administrative/political boundaries, as appropriate. The following spatial boundaries have been established for the effects assessment:

- **Project Area (PA):** The total area bounded by the project, plus additional lands as outlined in Drawing 5.3-1 (Appendix A). The PA for the Project is one singular PA that encompasses all three Project Components. It is subdivided into three component project areas; the Wind Project component is further subdivided into four individual Wind Project Areas:
 - Solar Project Area (SPA)
 - Industrial Project Area (IPA)
 - Wind Project Area (WPA):
 1. BWPA
 2. TLWPA
 3. LTWPA
 4. SLWPA
- **Local Study Area (LSA):** The area which represents the maximum extent of predicted or measurable direct and/or indirect effects of the Project. The LSA is VC-specific and defined in each VC chapter.
- **Regional Study Area (RSA):** The area encompasses Project-related effects including diffuse or long-range effects. This area is larger than direct and indirect effects and will be used to support the assessment of cumulative effects, and accidents and malfunctions. The RSA varies between VCs and will be defined (where necessary) in each VC chapter.

In addition to the PA, each component will have a defined Project Footprint (PF), which represents the direct physical disturbance area where Project Infrastructure is proposed.

5.2.2 Temporal Boundaries

The temporal boundaries in Table 5.2.1 apply to all VCs unless otherwise stated in the individual chapters.

Table 5.2.1: Temporal Boundaries

Project Phase	Temporal Boundary
Site Preparation and Construction	3 years
Operation and Maintenance	33 years
Decommissioning and Rehabilitation	2 years

5.3 Potential Project-Valued Component Interactions

The potential interactions between the Project and the VCs, by phase, are presented in the individual VC chapters (Sections 6.0 to 12.0), following a description of existing conditions. Potential strategies for mitigation, avoidance, or compensation are proposed in instances where existing best management practices have been identified within the industry. Where possible, mitigation measures are incorporated into Project design to eliminate or reduce potential adverse effects.

5.3.1 Effects Assessment Criteria

During the EA process, the significance of the effects after mitigation is determined using defined criteria and will be further evaluated during the EIS. Most criteria will be consistent across VCs (Table 5.3.1); however, the magnitude criteria are VC-specific and are provided in the individual chapters.

Table 5.3.1: Effects Assessment Criteria

Rating Criteria	Rating
Magnitude The amount of change in measurable parameters or the VC relative to existing conditions	VC-specific as outlined in individual chapters
Geographic Extent* The geographic area in which an effect occurs	PA – residual effects are restricted to the PA LSA – the area where direct and/or indirect Project-related effects can be predicted or measured for assessment unless impacts are widespread. RSA – the area where widespread Project related effects can be predicted or measured for assessment (if/where applicable)
Likelihood* Considers the probability of the residual effect occurring	Unlikely – the residual effect is unlikely to occur Possible – it is possible that the residual effect will occur Likely – it is likely that the residual effect will occur Almost Certain – it is almost certain that the residual effect will occur

Rating Criteria	Rating
Duration The time required until the measurable parameter or VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	Short term – residual effect restricted to no more than the duration of the construction phase Medium term – residual effect extends through the operation and maintenance phase Long term – residual effect extends beyond operations into the decommissioning and rehabilitation phase
Frequency Identifies how often the residual effect occurs and how often in a specific phase	Single event – occurs once Intermittent – occurs occasionally or intermittently during one or more phase of the Project Continuous – occurs continuously
Reversibility Describes whether a measurable parameter or the VC can return to its existing condition after the activity ceases	Reversible – the residual effect is likely to be reversed after the activity is completed Irreversible – the residual effect is unlikely to be reversed Partially Reversible – the residual effect will be partially reversed after the activity is completed.

* Criteria used for describing context of the effect; however, these criteria do not factor directly into the significance definition.

Table 5.3.2 outlines the approach to determine the significance of effects from the Project on VCs. Significance is based on the category (e.g., high, moderate, low, or negligible) for each characterization (e.g., magnitude) per VC. Certain combinations of categories will result in a determination of a significant adverse effect, while other combinations will not. For example, a VC with a high magnitude, almost certain likelihood, permanent duration, continuous frequency, and irreversible impact will result in a significant adverse effect.

Table 5.3.2: Definition of Significant Residual Environmental Effect

Magnitude	Duration	Frequency	Reversibility	Significance
Negligible	All	All	All	Not significant
Low	All	All	All	Not significant
Moderate	All	Single event Intermittent	All	Not Significant
	Long Term	Intermittent Continuous	Irreversible	Significant
High	Short term Medium Term	Single event Intermittent	Reversible Partially Reversible	Not significant
	Medium Term Long term	All	Irreversible	Significant

An evaluation has been completed to determine the significance of residual effects (based upon significance criteria) for each VC resulting in the interaction from Project activities once appropriate mitigation has been implemented. Potential effects, mitigation, and residual effect for each VC are summarized in Sections 16.0 and 18.0.

5.4 Monitoring and Follow-up

Follow-up programs and monitoring, in some cases developed in conjunction with regulators, may be recommended to verify predictions and/or assess effectiveness of mitigation measures and the need to implement adaptive management. Proposed follow-up programs and monitoring will be presented, as necessary, in individual VC chapters of the EIS.

6.0 WIND PROJECT & TRANSMISSION EFFECTS ASSESSMENT

6.1 Project Description

6.1.1 Geographical Location

6.1.1.1 Siting Locations

The WPA spans 34,434 ha of Crown land in northcentral Newfoundland near the Town of Botwood (population of approximately 3,000). The WPA was divided into four regionally based sub-wind project areas given the size of geographical area it encompassed (Drawing 6.1-1A-E, Appendix A), consisting of the BWPA, TLWPA, LTWPA, and SLWPA.

A PF was established within each of the sub-project areas (Drawings 6.1-2A-F, Appendix A), which included the area of direct physical disturbance. The PF included required infrastructure such as turbines, road networks, collector and transmission systems, quarries and borrow pits, concrete production batch plants, accommodation camps, warehousing and maintenance buildings, and fuel stations.

EVREC is requesting additional Crown lands to support the optimization of the Project's wind layout and associated balance-of-plant infrastructure (e.g., access roads, collector/gathering lines, and transmission corridors) as detailed engineering and mitigation planning advance. This includes an expanded service/utility corridor and an additional parcel to provide siting flexibility and constructability options while maintaining regulatory buffers and community setbacks. The intended outcomes are to enable a more efficient, socially responsible, and regulatorily compliant layout—reducing overall civil and electrical works where possible, improving energy performance and reducing losses, and providing opportunities to shift turbines away from more sensitive or higher-conflict areas (e.g., cabin concentrations and certain northern communities) while still meeting the Project's renewable generation and green ammonia production objectives. This proposed mitigation strategy is described in Section 18.0. The analysis presented within the EIS is for the EIS PA and its associated road and turbine layout.

6.1.2 Physical Components

Energy generated by the four Wind Projects (collectively consisting of up to 534 WTGs) will be transmitted to the Industrial Facility using a collector and transmission system. Roads and bridges will be upgraded or developed to facilitate logistical and access requirements. Quarries and borrow pits will be established to source material required for the construction of roads and foundations. Concrete production batch plants, accommodation camps, warehousing and maintenance buildings, along with fuel stations will also be developed.

Core components of the four Wind Projects are summarized in Table 6.1.1.

Table 6.1.1: Physical Components within each Wind Project Area

Component	BWPA	TLWPA	LTWPA	SLWPA	Total
WPA (ha)	20,802	7,686	2,391	3,555	34,434
WTGs	273	133	48	80	534
Installed Capacity (MW) (at 8 MW per WTG)	2,184	1,064	384	640	4,272
Access Roads					
New Roads (km)	143	100	38	36	317
Road Upgrades (km)	160	39	4	19	222
Total Roads (km)	303	139	42	55	539
Electrical System					
69 kV Collector ROW (km)	297	117	53	76	543
69 kV Collector Lines (km) ⁽¹⁾	590	70	73	124	857
230 kV Transmission ROW (km)	12	5	20	19	56
230 kV Transmission Lines (km) ⁽¹⁾	72	6	20	30	128
Collector Substations	2	1	1	1	5
Substation Footprint (ha)	12	6	6	6	30
Accommodation Camps, Quarries/Borrow Pits, and Laydown Areas					
Proposed Quarries/Borrow Pits	22	16	10	5	53
Quarry Size Range (ha)	2 to 15	4 to 11	3 to 7	4 to 9	2 to 15
Accommodation Camps	2	2	0	0	4
Accommodation Camp Footprint (ha)	16	9	0	0	25
Construction Laydown Areas	20	10	5	8	43

⁽¹⁾ Length of the actual lines exceeds the length of the ROWs because the ROWs contain multiple collector and/or transmission lines.

6.1.2.1 Turbines

Collectively, the four Wind Projects will consist of up to 534 WTG (each with a rated capacity of up to 8.0 MW) capable of generating up to 4.27 GW of renewable energy (nameplate capacity), however, the turbine layout will likely be reduced to meet a 3.5 GW capacity.

Each WTG is comprised of the following components:

- Foundation
- Tower
- Rotor and blades
- Nacelle (including the rotor shaft, brake, gearbox system, and generator)
- Concrete pad for a step-up up transformer (33/69 kV)
- Cleared gravel pad surrounding the WTG

EVREC is currently considering several WTG manufactures and models; general specifications for the WTG under consideration are provided in Table 6.1.2.

Table 6.1.2: Wind Turbine Generator Technical Specifications

WTG Component	Specifications
Rated Capacity (MW)	Up to 8.0
Rotor Diameter (m)	Up to 182
Hub Height (m)	Up to 140
Cut-in Wind Speed (m/s)	3
Cut-out Wind Speed (m/s)	Up to 26
Swept Area (m ²)	Up to c. 26,000
Nominal Rotor Speed (rpm)	Approximately 10
Generator	6-pole Doubly-fed Induction or Medium Speed Permanent Magnet Generator
Brake System	Aerodynamic Brake Plus Disc Brake
Remote Monitoring	Supervisory Control and Data Acquisition (SCADA)
Lighting Requirements	Per Transport Canada TC621 Requirements
Materials	Tubular Steel with Glass/Carbon Fiber Reinforced Plastic Rotors
Color	Based on Manufacturer Specifications and Regulatory Requirements

6.1.2.2 Access Roads

A road network of approximately 539 km is required across the four Wind Projects, of which, 317 km (59%) will be new road construction and 222 km (41%) is existing road requiring upgrades. Road network requirements for each of the four Wind Projects are summarized in Table 6.1.3 and presented on Drawings 6.1-2A-D (Appendix A). Additional road access and upgrades will be determined as part of the detailed design of the Wind Projects.

Table 6.1.3: Road Network Requirements per Wind Project

Wind Projects	New Roads (km)	Existing Roads (km)	Total Road Network (km)
BWP	143	160	303
TLWP	100	39	139
LTWP	38	4	42
SLWP	36	19	55
Total	317	222	539

All roads will be constructed or upgraded (as required to safely transport the turbines) to provide appropriate turning radii and support construction activities in compliance with local and provincial guidelines/requirements. The construction of new roads will be required to access proposed turbine locations; however, EVREC is leveraging the network of existing roads to the greatest extent feasible. Measures to avoid or minimize adverse effects to sensitive habitats, such as wetlands, watercourses, and rare species, will be considered as part of civil design.

Access roads will have a 7 m to 9 m wide road surface with additional drainage ditching and grading for a total estimated width of 17 m to 20 m. Wider roads (12 m road surface) are required for heavy equipment to move from WTG to WTG, and narrower roads (8 m road

surface) will be utilized in areas in which smaller loads can be managed.

Dust generated during construction activities (e.g., vegetation clearing, earthworks, quarrying, vehicle traffic on unpaved roads, and material handling) will be managed as temporary fugitive emissions that are expected to occur primarily during the construction period. EVREC will implement a dust management program using industry-standard best practices to minimize dust generation and off-site transport, with controls selected to suit local weather and site conditions. Measures may include application of approved dust suppressants where appropriate, speed limits and traffic management on unpaved roads, routine road grading and maintenance, limiting disturbed areas and stabilizing exposed surfaces, covering or otherwise managing stockpiles and hauled materials, and additional controls during extended dry or windy periods. Dust control methods will be adapted as needed based on field observations and complaints, and will be implemented with appropriate setbacks from waterbodies and other sensitive receptors.

6.1.2.3 Power Collector Systems, Collector Substations, and Transmission Lines

Power Collector Systems

Power generated by the WTGs will be collected through a series of aboveground 69 kV collector lines which connect to centralized collector substations. Typical wind development collector systems are run underground, however, due to the geology and the remoteness of the Project, EVREC has elected to proceed with an aboveground collector system.

The collector system layout for each of the four Wind Projects (Drawing 6.1-2-A-D, Appendix A) was designed based on the installation of WTGs with an individual capacity ranging between 6.6 to 8.0 MW. Assuming each collector string carries up to 10 WTGs, approximately forty-five (45) 69 kV collector feeder circuits will be required to deliver power from the WTGs to the collector substations. This number would be higher if a 34 kV system is adopted. Should a larger conductor be available and feasible, the number of collectors may be reduced (which will be determined as part of detailed design). Collector system requirements for each of the four Wind Projects include:

- 23 collector strings gathering from 273 WTGs at the BWP. The collector strings will connect into the two BWP substations.
- 11 collector strings gathering from 133 WTGs at the TLWP, which will connect into a single substation within the TLWPA.
- Four collector strings that will gather from 48 WTGs at the LTWP, which will connect into a single substation within the LTWPA.
- Seven collector strings gathering from 80 WTGs at the SLWP, which will connect into a single substation within the SLWPA.

The configuration of the feeders consists primarily of overhead distribution lines with underground cables from the WTGs connecting to the overhead collector. Final configurations will be confirmed as part of detailed design.

Each collector line will consist of single pole design with collector circuits utilizing aluminum conductor steel reinforced (ACSR) conductors arranged in a parallel circuit configuration. Composite or steel poles are anticipated to range from 15.2 m to 22.9 m in height; pole foundations are anticipated to consist of normal burying with log anchors, guying with some cribbing, and rock anchors as needed. A typical 69 kV tangent structure layout is illustrated in Figure 6.1.1.

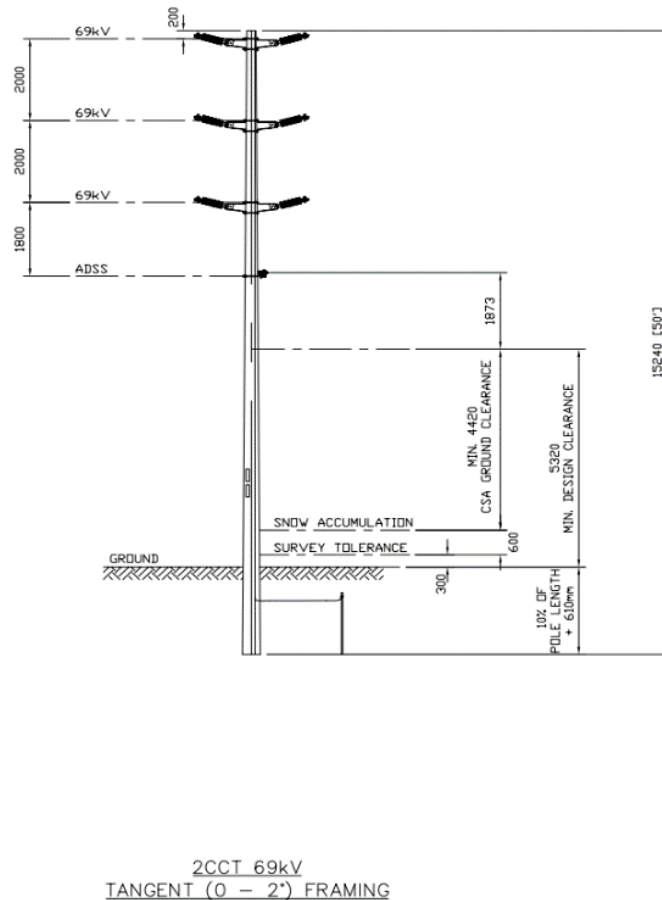


Figure 6.1.1: Schematic Diagram of a Typical 69 kV Tangent Structure Layout

In addition, an optical fiber cable will be located below the circuit neutral to provide high-speed communications between the WTGs and the control room at the terminal station. The configuration will be finalized during detailed design.

Collector Substations

The purpose of the collector substations is to collect the generated power from 69 kV collector system and transition (or step-up) the power to 230 kV for transmission. Another purpose of the collector substations is to house the battery energy storage systems (BESS), which has the purpose to provide black-start capability and maintain grid stability through the operational

lifetime of the Wind Projects. The number of collector substations required for each of the four Wind Projects consist of:

- Two 4-transformer substations for the BWP. One substation will collect power from the southern portion of the BWPA and the other from the northern portion of the BWPA.
- One 4-transformer substation for the TLWP.
- One 4-transformer substation for the LTWP.
- One 4-transformer substation for the SLWP.

A similar overall design and physical footprint (4 ha each) will be used for the collector substations.

The collector substations will include up to 14 three-phase main power transformers (69 kV/230 kV), each rated up to 550 megavolt amperes (MVA). Depending on system requirements, up to four synchronous condensers may be installed, if needed. The collector substations will also include:

- Associated electrical equipment for protection, isolation, and control such as surge arrestors, circuit breakers, disconnect switches, capacitor banks, insulators, voltage and current transformers, and a control building with relays and WTG control system.
- Civil and structural design includes station grading, drainage, fencing, grounding, structure foundations, yard gravel, and steel structures for the installation of the collector substation equipment and dead-end structures for the transmission circuits.

The initial design of the substations is a breaker and a half configuration (Figure 6.1.2). A breaker and a half configuration have two buses that are energized during normal operation. For every two circuits there are three circuit breakers with each circuit sharing a common center breaker. Any breaker can be removed for maintenance without affecting the service on the corresponding exiting feeder. In addition, a fault on either bus can be isolated without interrupting service to the outgoing lines.

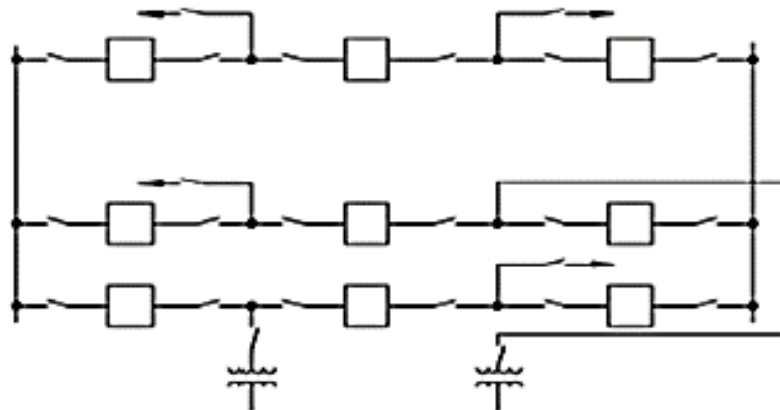


Figure 6.1.2: Schematic Diagram of a Breaker and a Half Configuration

Depending on the load assumptions, this design may be reduced to a ring bus configuration (which will be determined during detailed design).

Transmission Lines

A system of 230 kV high-voltage transmission lines will connect the collector substations associated with each of the four Wind Projects to the Industrial Facility's substation. Wherever practical, transmission poles will be designed to carry two circuits to minimize ROW clearance and environmental disturbance. An overview of the 230 kV transmission system routing for each of the four Wind Project's is provided below and is illustrated on Drawing 6.1-2A-D (Appendix A):

- The TLWP transmission line will travel east and south from the TLWP collector substation to the westernmost BWP collector substation.
- The SLWP transmission line will travel from the SLWP collector substation north to join with the TLWP transmission line.
- Similarly, the LTWP transmission line will travel south from the LTWP collector substation to join with the TLWP transmission line (approximately 8 km east of the SLWP collector substation).
- A transmission line will also travel from the easternmost BWP collector substation west to the westernmost BWP collector substation.
- From the westernmost BWP collector substation, energy collectively generated from each of the Wind Projects will travel south along a single corridor to the Industrial Facility substation in Botwood, NL.

The total length of the 230 kV transmission line ROWs for the Wind Projects will be approximately 56 km, with a 35 m to 40 m ROW for the two-circuit systems and 70 m to 80 m ROW for the 4-circuit systems. Transmission line ROWs (also known as easements) vary in width depending on the operating voltage and design of the infrastructure. Generally, higher voltage transmission lines require wider easements. Typical widths of transmission line ROWs based on voltage class are presented in Figure 6.1.3 (Rural Utilities Services, 2015). The proposed permanent easement for EVREC's 230 kV transmission lines is approximately 80 m.

Voltage Class	Right of Way Width							
	69kV	115kV	138kV	161kV	230kV	345kV	500kV	765kV
meters	24	27	29	30	38	53	61	69

Figure 6.1.3: Typical Right of Way Widths Based on Voltage Class

The 230 kV transmission lines are proposed to consist of monopole steel structures (Figure 6.1.4). Conductors will be equipped with overhead shield ground wire or overhead optical ground wire for lightning protection and control. In addition, guy wires will be installed where required for additional support. The proposed transmission line design may be adjusted as part of detailed design, depending on the final transmission line routing and proximity to adjacent residential areas.

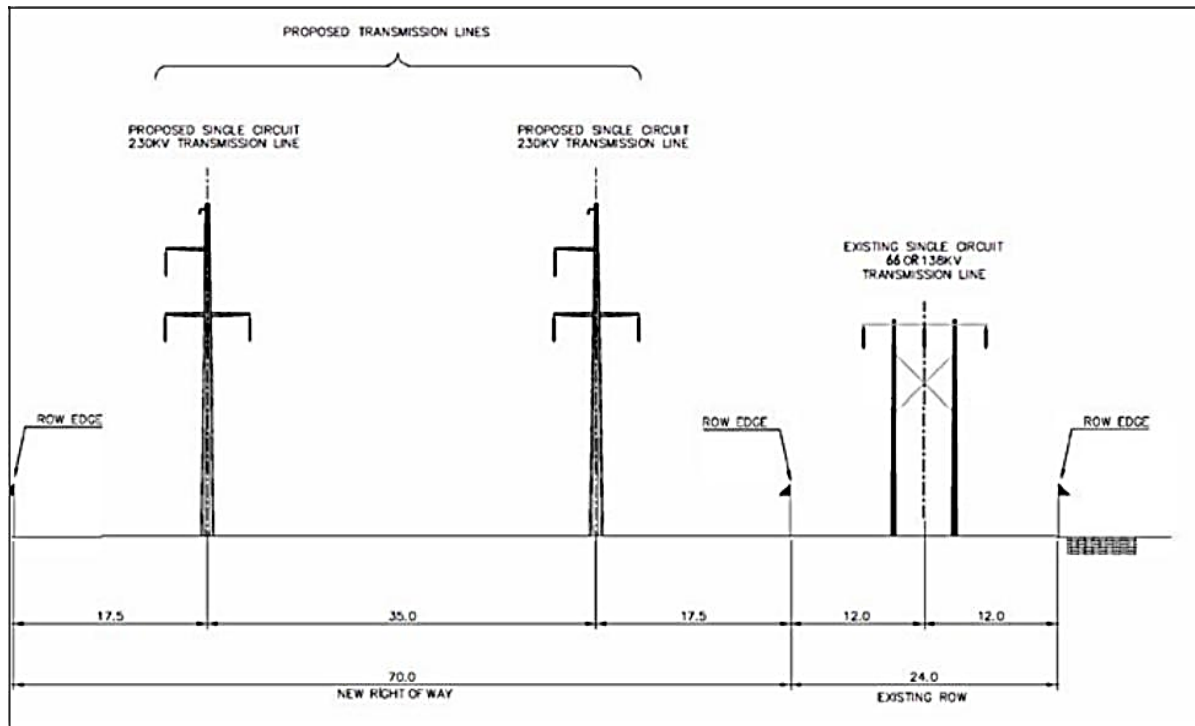


Figure 6.1.4: Proposed 230 KV Transmission Line Design

Overall, the proposed routing of the transmission lines takes into consideration existing transmission corridors, private property boundaries, existing access roads, and the need to reduce routing through populated areas and environmentally sensitive areas. The current route planned for the transmission lines follows the road network where possible, avoiding waterbodies, potential bogs, and identified sensitive areas, where possible. At this stage, a preliminary detailed analysis has been completed for the proposed routes. The selection of the routing was optimized to reduce environmental and social impact as well as optimize construction costs and mitigate execution risk.

6.1.2.4 Grid Connection

The Project is engaging Newfoundland Power (NF Power) regarding a connection into the existing Stony Brook – Botwood 138 kV Transmission Line and the Botwood Substation. This interconnection would allow the Industrial Facility to draw power from NF Power to support plant construction. EVREC has made two applications for power: the first to NF Power that will be used for construction power and the second to Newfoundland and Labrador Hydro (NL Hydro) for interruptible power to support critical loads. The process is ongoing, with NF

Power and NL Hydro assessing the available power supply. If received, EVREC anticipates the purchase of power for the construction phase and if available, power for the operation primarily for use in emergency systems and balance of plant needs.

6.1.2.5 Black Start BESS

The Project will incorporate approximately 1.5 GWh of lithium-ion BESS distributed across the wind project's collector substations (Drawing 6.1-2A-D, Appendix A). The BESS will be used primarily as an operational support system to enhance reliability and grid performance, including providing black-start capability to support orderly restart of Wind Project electrical infrastructure following a shutdown or disturbance, and supplying fast-acting stabilizing services (e.g., synthetic inertia and frequency/voltage support) to help maintain grid stability during transient events. The distributed arrangement at substations reduces response times, improves resilience, and allows the system to be operated in a modular manner consistent with the Project's overall electrical design and operating philosophy.

6.1.2.6 Quarry and Borrow Pits

The Project has identified 53 potential quarry locations within the WPAs to provide aggregate material requirements for road construction and concrete mix (Drawing 6.1-2A-D, Appendix A). The Project will use excavated materials from the road network to minimize the need for quarries. For the BWP, 22 potential quarry locations have been established throughout the BWPA, ranging in size from 2 ha to 15 ha. The TLWP has 16 proposed quarry locations, ranging in size from 4 ha to 11 ha. For the LTWP, 10 proposed quarry locations are established, ranging in size from 3 ha to 7 ha. An additional five quarry locations are proposed for the SLWP, ranging in size from 4 to 9 ha.

Quarries, when in operation, will have one immobile crusher and an associated concrete production batch plant. Main quarries will be determined upon final engineering design. Access will be controlled in main quarry locations with chain link fences. The main quarries will also have visibility berms surrounding the footprints and vegetation will be maintained to prevent line of sight into the quarries. In large areas of cut for road construction, a mobile crusher may also be used at the blasting location for local aggregate production. Cuts in road corridors for extra material will be sloped for drainage and stability.

Where feasible, material will be directly pushed from the quarry areas adjacent to roadways into the road network footprint. As haul distance progresses, excavators and loaders may be used to load haul trucks for transport to the placement areas.

Quarries will be fitted with fuel caches to store diesel enough to power diesel generators, to minimize fuel movement.

Quarrying near waterways will be avoided to prevent harm to aquatic life; however, crushers will require the use of water from nearby ponds. The exact withdrawal locations and waterways to be used will be determined and applied for through the Water Resources Management Division with NLECCC.

Drainage and stormwater management around the quarries will be designed to manage suspended sediment to avoid impact to receiving waters and aquatic life.

Most quarry operations will be within the construction footprint and stemming will be used to reduce noise in areas closer to communities and cabins. Stemming is a blasting term that refers to the upper part of the drill-hole being tightly packed with an inert material (to act as a plug, usually consisting of crushed stone, drill cuttings, or a sand-cement mix) after explosives are loaded into a drill-hole. The plug traps expanding gases (energy is driven into fracturing the rock instead of venting), cuts down air-blast overpressure and ground vibration (main sources of off-site noise/structural rattling), and suppresses fly-rock and dust. By sealing the drill-hole, stemming lowers air-blast noise by 15 dBA to 25 dBA and is the primary noise mitigation control for blasting near receptors. Typical practices for wind development civil works (road cuts, pad levelling, borrow pits) are summarized in Table 6.1.4.

Table 6.1.4: Typical Stemming Practices for Wind Development Civil Works

Parameter	Typical Practice
Stemming Length	Top 0.8 to 1.0 × hole diameter per metre of charge (e.g., 1 m stemming in a 115 mm hole)
Material	6 mm to 12 mm crushed, angular stone or drill cuttings screened to <20 mm
Placement	Shovel or sand-pump in 150 mm lifts, tamped with a non-sparking rod
Water/Ice Conditions	Use stemming bags or a 6% bentonite–sand mix to prevent slumping

Power for crushing activities will be provided by local diesel generators. The generators will have a containment liner and granular cover installed prior to commissioning and will be removed after construction is complete.

6.1.2.7 Concrete Production Batch Plants

The Project will utilize concrete for foundations, separations walls, buildings, bridges, pipe rack construction, roadways, floors, catwalks, etc. The Project plans to produce the concrete on-site by combining local aggregate with cement. Cement will be imported to the Port of Botwood, where temporary dry storage facilities will be erected for the cement storage. Cement will later be distributed to the batch plants by truck and kept in dry storage. Each batch plant will be designed to facilitate dry cement storage.

EVREC will produce the aggregate for the concrete from the on-site quarries (as discussed in Section 6.2.4) and/or existing quarries in the area. Concrete will be manufactured using mobile concrete production batch plants. Up to six mobile concrete production batch plants will be situated at the main quarries to reduce the transportation of off-site materials, minimizing potential environmental impacts. These concrete production batch plants will be powered by diesel generators which will have containment liners and granular cover installed prior to commissioning and will be removed after construction is complete. Batch plants will be fitted with fuel caches that will store diesel to power the generators. Typical mobile batch plant depictions are illustrated in Figures 6.1.5 to 6.1.7.

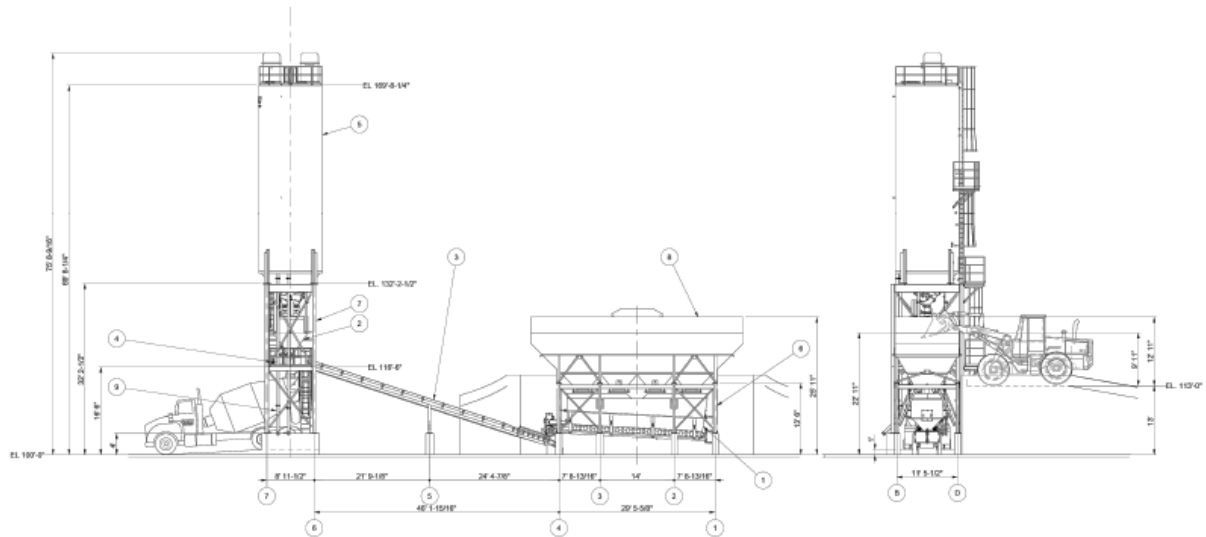


Figure 6.1.5: Concrete Production Batch Plant Schematic 1

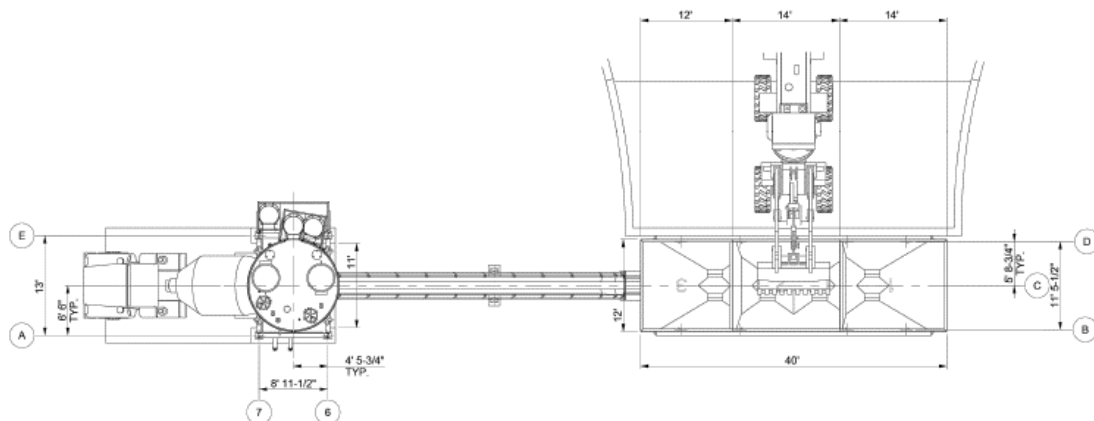


Figure 6.1.6: Concrete Production Batch Plant Schematic 2

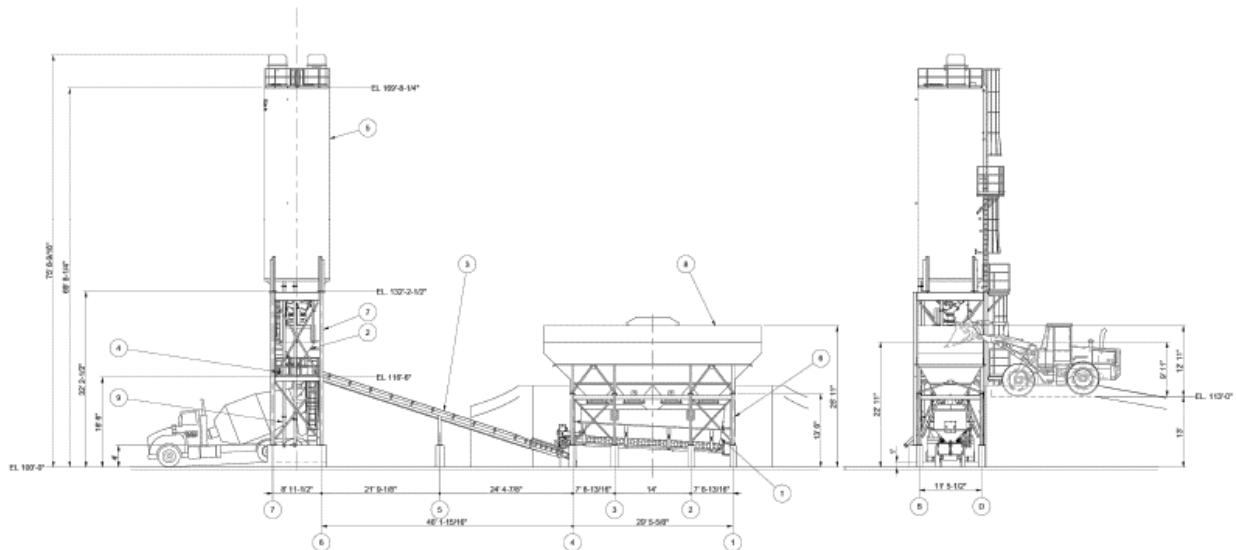


Figure 6.1.7: Concrete Production Batch Plant Schematic 3

6.1.2.8 Accommodation Camps

The Project plans to establish an accommodation strategy that will provide a high level of safety and wellness for the workforce while considering the social impacts on the community. Throughout the early pre-construction stages of the Project, workforce accommodation will be provided using cabin rentals, outfitter camps, and local hotels.

The Project expects to construct both temporary and long-term worker accommodations that include:

- Accommodation
- Recreational facilities
- Canteen services
- Benefit services
- Laundry
- Transportation to and from site
- Utility services (e.g., emergency power, water, waste management, telecommunications)

Four temporary accommodation facilities for the WPA will be located within the BWP and TLWP (approximately 500 units each) to reduce the logistical impact of the Project. The two BWP accommodation camps will cover approximately 8 ha each while the two TLWP

accommodation camps will span approximately 4 and 5 ha. Each accommodation camp is expected to have its own water supply, water treatment, and wastewater system installed to provide the necessary potable water requirements (estimated at 350 litres per day per person). Transportation to and from work sites will be minimized by sharing vehicles and using busing services.

Potable water is anticipated to be from local groundwater sources and wastewater will be discharged in compliance with the Environmental Control Water and Sewage Regulations, 2003, N.L.R. 65/03. Power supply to the accommodation camps will be provided by diesel generators where grid power is not available.

6.1.2.9 Warehousing and Maintenance Buildings and Fuel Stations

The Project will develop temporary and permanent warehousing and laydown on each of the Wind Projects to ensure that materials, parts, and equipment are stored and handled efficiently. The Project plans to have warehousing areas located within the footprint of the temporary accommodation camps and quarry locations to minimize transportation, security, and environmental impacts. The warehousing buildings will consist of steel-clad buildings that facilitate access, storage, and maintenance activities. Consumable equipment, high turn-over rate materials, and low-value spare parts will be housed in the on-site warehousing, and other critical components will be warehoused at the Industrial Facility.

The warehouses will be equipped with racking systems for different types of components, internet, offices, security, and emergency response equipment. Each warehouse will also be designated as a muster point to allow for evacuation and critical response protocols to be conducted.

The receiving and inspection of the equipment stored in the warehouses will follow the inventory management systems of the Industrial Facility. These warehouses will also be used as staging areas for equipment such as cranes, forklifts, ATVs, drone equipment, and other service equipment (graders, backhoes, snow clearing equipment) that will be required to maintain the Wind Projects infrastructure.

Fuel storage will be located at the various warehouses for light-vehicle mobile fleets. Mobile fuel trucks will be used to fill various large-scale mobile equipment, generators, and various fuel-fired heaters.

The warehouses and fuel stations will have access control measures to restrict unauthorized entry. The areas will be fenced and monitored with appropriate levels of security, including alarms. Petrol and diesel storage capacity will be 100,000 L at the main site and 25,000 L per fuel truck. The EVREC will also ensure compliance with local regulations and standards related to warehousing, including the implementation of waste management practices to handle packaging materials, damaged items, and other waste products responsibly.

6.1.3 Project Phases

The Wind Projects will include three phases:

- Site preparation and construction
- Operations and maintenance
- Decommissioning

Activities associated with each phase are discussed in Sections 6.1.3.1 to 6.1.3.3, with timelines presented in Table 6.1.5.

Table 6.1.5: Wind Projects Timeline

Phase	BWP	TLWP	LTWP	SLWP
Site Preparation and Construction	March 2027 to July 2029 (28 months)	May 2028 to July 2030 (26 months)	May 2028 to September 2030 (28 months)	May 2028 to September 2029 (16 months)
Operation	July 2029 to January 2062 (33 years)	July 2030 to January 2062 (32 years)	July 2030 to January 2062 (32 years)	July 2030 to January 2062 (32 years)
Decommissioning	January 2062 to July 2063 (18 months)	January 2062 to January 2064 (2 years)	January 2062 to January 2064 (2 years)	January 2062 to January 2064 (2 years)

6.1.3.1 *Site Preparation and Construction*

Site preparation activities for the Wind Projects include:

- Land surveys for placement of roads, collector/transmission lines, WTGs and pads, substations, and associated works.
- Geotechnical investigations.
- Demarcating boundaries of environmentally sensitive features and applying appropriate buffers.
- Placement of erosion and sedimentation control measures.
- Clearing of trees.

General construction activities for the Wind Projects include:

- Grubbing, excavating, grading and compacting for construction.
- Installation of access road infrastructure (upgrading existing and new construction).
- Laydown area and turbine pad construction.
- Transportation of turbine components, equipment, and materials.
- Traffic control measures.
- Foundation excavation and construction, including blasting, if required.
- Materials preparation and storage (e.g., crusher and storage areas).
- Turbine and infrastructure assembly.
- Waste management.

- Dust control and management.
- Construction of collector system and substation.
- Grid connection for construction power.
- Removal of temporary works and site restoration.
- Commissioning.

As part of site preparation, surveyors will clearly mark the perimeter of all areas to be developed and adequate buffers will be designated near wetlands and sensitive areas, as directed by NLECCC. Rare plant surveys will be conducted in accordance with NL FAL direction.

All merchantable timber will be salvaged, and non-merchantable timber will be disposed of off-site. Once clearing activities are completed, roots and stumps will be removed and shredded/mulched on-site, and topsoil/organic matter will be left in place where appropriate.

An Erosion and Sediment Control Plan will be developed and implemented as described in Section 7.2 of the EIS Guidelines. Soil conservation practices will be encouraged and considered throughout the site preparation and construction activities for use in site rehabilitation. Boulders and similar objects near excavation sites will be removed or secured to ensure safety of workers and machinery. Suitable construction material will also be substituted for existing unsuitable soils such as overburden. Adequate bearing capabilities will be achieved by placing and compacting fill materials over the proof-rolled subgrade.

Should blasting be required for the WTG foundations or other infrastructure, a certified blasting contractor (holding a valid blasters certificate issued by the NLECCC) will be contracted to develop a blast design for review and approval prior to carrying out the work. The blast design will be required to meet vibrational limits at appropriate distances from existing infrastructure, buildings, and fish habitat. Should a temporary explosives storage facility be required, it will meet government regulations including required separation distances as regulated by the Explosives Regulatory Division of Natural Resources Canada, with explosives and accessories stored at the approved explosive storage facility. If blasting is required, an explosives and blasting management plan would be developed by the licensed blasting contractor to provide direction for the safe storage, handling, and use of explosives and explosive components, to address the safety of Project personnel, the public, and the environment.

Equipment

Equipment that will likely be required for site preparation and construction activities across the Wind Projects is detailed in Table 6.1.6. Additional equipment may also be required based on site access and conditions at the time of construction.

Table 6.1.6: Construction Equipment Requirements for the Wind Projects

Equipment	Roads/ Buildings	WTG Pad	WTG Assembly	Electrical Infrastructure
Excavators/ Backhoes	X	X		X
Dump Trucks	X	X		X
Articulating Trucks		X		X
Bulldozers	X	X		X
Brush Clearing	X			
Roller/Compactors	X	X		
Skidders/Mulchers	X	X		
Graders	X	X	X	X
Crushers	X	X	X	
Concrete Trucks		X		X
Pump Trucks		X		X
Light Trucks	X	X		X
Float/tractor Trailers	X			X
Pile Drivers/Augers	X			
Air Compressors	X			
Vacuum Trucks	X			
Drill Rigs	X			X
Welders	X			
Generators	X	X	X	X
Light Towers	X	X	X	X
Manlift/bucket trucks	X		X	X
Water pumps	X	X		X
Off road vehicles	X	X		X
Power Tools and Hand Equipment	X	X	X	X
Main Crane Units			X	
Light Cranes	X			X
Assembly Cranes			X	X
Manufacturer Support Vehicles			X	

Access Road & Laydown Area Construction

Roads will be constructed from clean fill sourced from quarries and borrow pits. Construction of new roads will be minimized to the extent possible by prioritizing the shortest routes. Ditching will be designed to follow the natural ground slope, providing positive drainage and reducing disturbance to natural drainage patterns. Ditches will be lined to reduce erosion in the areas where flow velocity is high. Fill requirements and ROW widths will be included in the selection of road gradients, to maximize road use and meet design parameters. Access roads will have a 7 m to 9 m wide road surface with additional drainage ditching and grading for a total estimated width of 17 m to 20 m. Wider roads (12 m road surface) are required for heavy equipment to move from WTG to WTG, and narrower roads (8 m road surface) will be utilized in areas in which smaller loads can be managed.

Construction of the access roads and temporary laydown areas will involve the removal of topsoil, grading, and placement of granular materials. Laydown areas for construction materials will also serve as parking areas during construction.

Access road construction and upgrades will require water crossings in some locations, which will undergo water crossing surveys prior to development. Water crossing locations have been identified through a desktop analysis, comparing potential watercourse features (identified using existing satellite imagery and topographic mapping) against proposed infrastructure. In-water or near-water works may include culvert installation and/or bridge foundation installation. Some minor fording may also be required. The duration of in-water works will be minimized and conform to timelines established by DFO, where possible. Changes to natural flow regimes will be reduced through careful detailed design. Removal of stream-side vegetation will be limited to the footprint of crossing abutments and revegetated as soon as works are completed if possible. Culvert sizing will be determined during detailed design, along with potential inclusions of embedded or bottomless arch culverts for fish-bearing watercourses. Detailed design assessments will be performed to specify appropriate use of materials, aggregates, slope armouring, and vegetative cover, along with spatial requirements for exact location, length, diameter, and slope of the crossing infrastructure.

During construction, roads will be maintained with additional gravel or periodic grading. Any excess material removed for road construction will be feathered, stored, or disposed of in accordance with regulations and best practices for road construction. Any material storage will be managed with appropriate erosion and sedimentation control measures or reused.

Removal of temporary works following completion of construction will include the removal of temporary access road crossing infrastructure and rehabilitation, as well as reclamation and revegetation of temporary laydown and infrastructure support areas.

Turbine Pad Construction

General activities during the construction of the WTG pads, foundations, and associated laydown areas (located at the base of the turbines for the storage of equipment) may include:

- Delineation of work areas and installation of erosion and sedimentation control measures.
- Removal of vegetation and site grading.
- Removal of overburden and soils.
- Blasting/breaking of bedrock (to be determined, based on geotechnical conditions and foundation design).
- Pouring and curing of concrete foundations (complete with reinforcing steel).
- Placement of competent soils to bring area to grade.
- Compaction of fill or soils.
- Trenching and installation of aboveground electrical collector systems and fibre optic communication systems.

Depending on the WTG foundation requirements, foundations may be approximately 18 m in diameter and extend to a depth of 3 m to 5 m below grade. Each WTG pad and laydown area will be approximately 150 m by 100 m which includes clearing limits and overburden management. The exact arrangement of each WTG pad and crane pad will be designed to suit the specific requirements of the WTG and the surrounding topography during detailed design. To reduce environmental footprints associated with the road works and WTG laydown areas, EVREC is investigating the use of integrated crane pads as part of the WTG mounting foundations. Self-erecting tower cranes are planned to complete the installation of the WTG support structure, nacelle, and blades reducing the need for over-built roads and large laydown areas during both construction and operations. Construction of a typical WTG pad (from clearing to final preparation for erecting the WTG) is expected to take one to five months, depending on weather, soil, and construction vehicle access.

Foundation installation involves the transport and fixing of the WTG foundation in position. Ground investigations and site preparation works, such as geotechnical calculations, boreholes, and laboratory sample testing will be completed prior to the removal of soils and foundation construction. WTG foundations are generally divided into two types:

- Gravity foundations, which rely on the mass of foundation concrete, steel reinforcing, and larger bearing area to provide a solid foundation for the WTG.
- Rock anchor foundations, which use a combination of concrete mass, steel reinforcement, and anchor rods drilled and grouted into the rock.

As local geotechnical conditions dictate the optimal foundation style, it is anticipated that both foundation types will be required for the Project. WTG foundations will include an envelope of engineered gravel to provide positive drainage away from the foundation. Surface grading will provide positive runoff and avoid ponding of rainfall. Construction activities will seek to reduce the excavation of materials, minimizing potential environmental interactions such as effects on water resources and effects of drainage on vegetation.

In addition, each WTG will have a buried grounding grid around the perimeter of the foundation, which will be interconnected to the collector neutral wire. The ground wire will be at the base and perimeter of the foundation within the foundation's excavation limits. Grounding protection and the final ground wire configuration for each WTG will be determined by a detailed grounding study. Typically, the ground wire is located 30 cm outside of the foundation and within the foundation excavation. This ground wire will be connected to the ground conductor (in the buried collector system cables) and linked to the generator tie line ground wire.

Turbine Delivery and Assembly

Flatbed trucks and specialized haulers will deliver equipment from the main laydown area at the Industrial Facility to the laydown areas at the wind turbine locations. Delivery will be along purpose-built transportation corridors that avoid public roadways to minimize deterioration to

current provincial infrastructure. The WTG components will require cranes to offload the equipment at each WTGs laydown area.

The WTG assembly includes tower sections, the nacelle, the hub, and three-blade rotors. The tower sections will be erected (in sequence) on the WTG foundation, followed by the nacelle, hub, and rotors. Rotors are usually attached to the hub on the ground prior to lifting. This assembly will occur with the use of dedicated cranes. Erection will depend on the weather, specifically wind and lighting conditions. The typical assembly duration per WTG is expected to be between 10 and 15 days.

Collector System Construction

The Wind Projects collector systems will be comprised of 34.5 kV/69 kV overhead collector lines along a typical 30 m ROW or the existing road allowance. Due to the geology and the remoteness of the Wind Projects, the Project has elected to proceed with an aboveground, rather than belowground, collector system. The collector line allowance will also be used for access roads to the various WTGs and for connecting the WTGs to the collector substations. Access corridors will be cleared where necessary for the construction of the collector lines and to provide for line maintenance following construction.

A summary of site preparation and construction activities for the 34.5 kV/69 kV collector system is provided in Table 6.1.7.

Table 6.1.7: Site Preparation and Construction Activities for the Wind Projects 34.5 kV/69 kV Collector System

Activity	Typical Crew and Equipment	Key Deliverables and Controls
Route reconnaissance & staking – Geographical Positioning System (GPS)-flag centerline, angle points, structure numbers.	Two surveyors, ATV/GPS tablets.	Survey file, environmental flagging for wetlands, heritage avoidance tags.
Clearing and grubbing – fell timber, merchantable salvage, chip slash; grub stumps ≤15 cm, blade side ditches.	Feller-buncher, skidder, chipper, D6 dozer, brush mulcher.	15 to 20 m clear ROW; slash removed/stacked; erosion-control wattles installed.
Temporary access and swamp mats – ice roads or log corduroy if winter works; geotextile and rock topping on soft ground.	Excavator, rock trucks, low-ground-pressure tractor.	All-weather access with ≤6% gradient; wetland matting log.
Structure foundation excavation – auger or back-hoe drill 1.2 m diameter (Ø) by 3 to 4 m deep holes; dewater if required.	Auger truck, dewatering pump, spoil truck.	Hole plumbness ≤2%; spoil stockpiled for reuse; groundwater turbidity <25 Nephelometric Turbidity Units (NTU).
Anchor and pole setting – set laminated wood or steel monopoles; backfill with native/spoil +4% cement stabilizer or crushed rock.	80 ton (t) crane, pole claws, concrete truck (if micro-piles).	Poles plumb ± 0.5°; embedment depth chart; backfill compacted to 95% Standard Proctor Density (SPD).
Anchor guy installation – helical or grouted rock anchors; tension to spec.	Anchor truck, hydraulic torque wrench.	Min pull test 1.5 × design load; Quality Control (QC) records.

Activity	Typical Crew and Equipment	Key Deliverables and Controls
Cross-arm and insulator assembly – ground assemble for wood poles, lift into place.	Bucket truck, line hands.	Torque verification, anti-rot washers fitted.
Grounding and bonding – 25 mm copper-clad rod at every 2nd pole; exothermic welds.	Earthing crew, compression gun.	Ground resistance ≤ 25 ohms (Ω); test sheet filed.
Stringing pilot line (drones or messenger) – install pilot rope through travelers.	Unmanned aerial vehicle (UAV) or puller truck, three to four line workers.	Pilot rope in place, travelers locked.
Conductor & Optical Ground Wire (OPGW) pull & tension – 477 thousand circular mils (MCM) ACSR phases + 48-strand OPGW at 25% rated tensile strength (RTS); maintain mid-span sag table.	80 kilonewton (kN) tensioner & puller, brakes, reel stands, six to eight linemen.	Conductor clipped, sag/tension certified; OPGW spliced, Optical Time Domain Reflectometer (OTDR) test < 0.35 decibels per km (dB/km).
Spacer-damper and marker install – fit dampers at calculated spans, bird diverters near wetlands.	Bucket truck, line hands.	Damper spacing per vendor chart, diverters every 10 m in bird zones.
Hot stick live work (if back-feed) – tie-in jumpers, cut-out installs.	Live-line crew, insulated bucket.	Arc-flash procedures followed; completion certificate.
Commissioning & energization – insulation resistance, phasing, point-to-point SCADA check.	Protection & control techs, commissioning engineer.	Recorded insulation resistance (IR) ≥ 500 Megaohms (M Ω) at 5 kV; control SCADA verified.
ROW restoration – regrade ruts, seed with native mix, install wildlife gates.	Rehab crew, hydro-seeder.	Slope $< 4:1$, seed germination $\geq 70\%$ at 12 weeks.

Collector Substation Construction

A summary of site preparation and construction activities for the collector substations is provided in Table 6.1.8.

Table 6.1.8: Site Preparation and Construction Activities for the Wind Projects Collector Substations

Activity	Typical Crew and Equipment	Key Deliverables and Controls
Geotechnical survey and layout – boreholes, CBR tests, stake earth-grid limits & building corners.	Drill rig, surveyors.	Soil resistivity log, stake-out report, drawing IFC-S20.
Site clearing, grubbing, and rough grading – clear approximately 4 ha pad; cut/fill to ± 0.1 m.	Dozers, grader, scraper.	Sub-grade 98% SPD; ditch profiles to stormwater plan.
Sub-surface drainage & oil-water interceptor – 200 mm perf pipe, geotextile, manholes, 50 m ³ oil-separator tank.	Excavator, pipe crew.	Invert elevations per DWG C-104; hydro-test < 0.5 litre 10 min ⁻¹ .
Grounding grid installation – 1/0 bare copper at 0.6 m depth, 7 m by 7 m mesh; exothermic welds.	Ground crew, backhoe.	Ground resistance < 0.5 Ω ; continuity test record.

Activity	Typical Crew and Equipment	Key Deliverables and Controls
Concrete foundations and equipment piers – building raft, transformer plinths (2 × 450 cubic meters [m³] each), breaker pads.	Formwork carpenters, pump truck, concrete techs.	28-day strength ≥ 40 megapascals (MPa); anchor-bolt template tolerance ±2 mm.
Oil-containment basins – high density polyethylene (HDPE) liner, crush rock, underdrain; 110% transformer volume.	Liner crew, skid-steer.	Vacuum test at – 50 kilopascals (kPa), no leaks 30 minutes.
Control building erection – prefabricated 20 m × 35 m steel frame; insulated panels; heating, ventilation, and air conditioning (HVAC).	Ironworkers, electricians.	Fire-rating 3 hour; HVAC redundancy N+1.
Power transformer delivery and set – 185 t units off-load, jack and slide onto plinths; dry-out at 90°C.	400 t gantry, oil-processing plant.	Core insulation resistance ≥2 giga-ohms (GΩ); fault detection and classification system (FDS) curve logged.
High voltage (HV) equipment install – 230 kV breakers, disconnects, capacitive voltage transformers (CVTs), lighting arresters (LAs), station service voltage transformer (VT).	HV crew, 60 t crane.	Contact resistance <50 micro-ohms (μΩ); polymer sheds undamaged.
Cable trenching and HV/extra high voltage (EHV) duct banks – 3 × 350 mm² cross-linked polyethylene (XLPE) for each phase, fibre ducts.	Trencher, cable crew.	Bend radius ≥ 12 outer diameter (D); sheath test 15 kV direct current (DC).
Secondary wiring, remote terminal unit (RTU), comms and SCADA – control cables, marshalling panels, RTU configuration, OPGW termination.	Instrumentation and control (I&C) techs, fibre splicers.	Point-to-point check sheet, OTDR <0.35 dB km⁻¹.
Protection and relay testing – line diff, transformer diff, bus / breaker fail, synch-check.	Protection and controls (P&C) engineers, test sets.	Trip times <50 milliseconds (ms); end-to-end latency <10 μs.
Pre-commissioning – functional checks, AC/DC hipot, overall grounding touch-&-step audit.	Original equipment manufacturer (OEM) + EPC Cx team.	HV hipot 300 kV DC: leakage <50 μA.
Energization and performance testing – cold-charge, load ramp, Static Synchronous Compensator (STATCOM) dynamic test.	NL Hydro Service Order (SO), commissioning director.	Voltage regulation ±1%; harmonic distortion <1.5%.
Final grading and landscaping – crush-rock surfacing, security fence, seeding outer berms.	Civil crew, fence installers.	Rock layer 150 mm; fence 2.4 m + barbed wire; vegetative cover ≥70% 12 wk.

Transmission Line Construction

Site clearing and construction activities for transmission lines will include grading, drainage, fencing, and laying of structure foundations (further detailed in Table 6.1.9). During construction, an additional temporary easement would be secured.

The current route planned for the transmission lines follows the road network where applicable. Final routing will be confirmed following further surveys and analysis and will seek to optimize

construction costs while minimizing environmental and social impacts. The transmission line will be constructed to IEEE standards for a utility transmission line.

Table 6.1.9: Site Preparation and Construction Activities for the Wind Projects 230 kV Transmission System

Activity	Typical Crew / Equipment	Key Deliverables & Controls
Final survey, light detection and ranging (LiDAR) terrain model and geo-tagging – verify structure coordinates, conductor clearances.	Surveyors, UAV LiDAR.	Geo-ref issued for construction (IFC) model; clearance report.
Access road upgrades and bridge installs – widen to 8 m running surface, load rating for 100 t cranes.	Grader, compactor, bridge crew.	Road compaction ≥98% SPD; bridge load test certificate.
ROW clearing – mechanical felling, stump removal, windrow burning (where permitted).	Feller-buncher, excavator, burning crew.	Debris piles outside fuel breaks; smoke permits logged.
Foundation construction	Civil crew, excavators, drill rigs, concrete crews, dump trucks, pitmen, pull rigs	Excavation to design depth; geotechnical verification; foundation installed per IFC drawings; inspection and sign-off prior to backfill
Drilled pier excavation – 2 m to 3 m Ø × 10 m to 15 m deep concrete shafts; use slurry or casing.	Bauer BG drill, tremie pump.	Base clean (<25 mm sediment); verticality ± 1:150.
Rebar cage and anchor bolts install – pre-tied cage, template for bolt circle.	Crane, steel fixers.	Rebar cover 75 mm; bolt projection within +0/-5 mm.
Concrete placement – C40/45, winter admixture if <5°C; vibrating, slump 180 ± 20 mm.	Pump truck, concrete tech.	Cylinder strength ≥40 MPa at 28 days.
Monopole / H-frame erection – tandem cranes, section stack, flange bolt tensioning.	200 t + 100 t cranes, riggers.	Bolt torque per ASTM A325; survey as-built tilt <0.2°.
Wire-pull infrastructure – install travelers, stringing pads, kicker poles, pulling anchors.	Puller-tensioner set, dozer.	Pads levelled; environmental matting under tensioners.
Pilot rope installation – drone or helicopter to install synthetic pilot across spans up to 600 m.	UAV/helicopter crew.	Pilot in travelers, no fouling.
Conductor and OPGW stringing – twin “Drake” 477 MCM ACSR bundle per phase, 96-fibre OPGW at top.	180 kN puller, 120 kN tensioner, brake blocks, 10-to-12-line workers.	Sag within ±2% design; bundle spacing spacers every 65 m; OPGW splice boxes sealed.
Spacer, damper, vibration controls – armor rods, stockbridge dampers; aviation marker balls.	Line crew with bucket or heli platform.	Damper pattern installed; marker balls every 60 m within 5 km of airport.
Grounding and counter-poise – 1/0 AWG copper counter-poise in ROW, bonding jumpers at every structure.	Puller, ground crew.	System resistance ≤10 Ω; test record.
Protection & energization – current transformer (CT) / VT install, line differential relays, high-pot test at 275 kV, phase acceptance.	P&C team, commissioning engineer.	High-pot leakage <50 µA; relays trip within 50 ms.
ROW reclamation and erosion control – de-compact, slope armour, hydro-seed with low vegetation; remove temp strip.	Rehab crew, hydro-seeder, straw blower.	Bare soil cover ≤10% after 1 year; sediment fences removed.

Activity	Typical Crew / Equipment	Key Deliverables & Controls
As-built survey and turnover – drone orthophotos, structure cards, operations and maintenance (O&M) manual hand-over.	Surveyor, doc-control.	Signed energization certificate; O&M package issued.

In addition, EVREC has an exclusion zone to enable suitable activities within easements, while providing a safe clearance area around transmission lines and structures to protect public safety and the network. The total width of the transmission line 230 kV ROW varies from 50 to 200 m.

Commissioning

Once construction has been completed, all temporary works will be removed and appropriately restored to meet the operational requirements. Components will be commissioned in a phased manner once construction of a subsystem has been completed.

A series of quality checks will be conducted as part of its pre-commissioning and commissioning program for each of the subsystems. The pre-commissioning process for each individual subsystem and electrical infrastructure will ensure that each system and subsystem is safe for start-up. Once these tests are completed, each system and subsystem will then undergo another series of tests for mechanical, electrical, and operational controls as part of the commissioning process and unit start-up sequence. Once these are completed, the units will be put into operations and retested prior to initiating full load performance tests.

Operations will commence in a phased approach, with early systems being identified in the construction sequence, completed, and brought into operation, while other systems remain in the construction, pre-commissioning, and commissioning phase. A ramp-up schedule that provides early operation of common systems and transition into early production of ammonia upon completion of base production systems will be implemented. This staged start-up will allow the Project to de-risk the start-up and provide early stability in the operations.

6.1.3.2 Operations and Maintenance

Turbine Operations and Maintenance

The operational lifespan of the Project is estimated to be a minimum of 30 years. During the operations phase, energy generated by the Wind Projects will be utilized to produce green hydrogen and green ammonia in a safe and environmentally friendly manner. The WTGs will operate under typical operational criteria, with low wind speed cut-in at approximately 3 metres per second (m/s) and high wind speed cut-out at 24 m/s, with maximum power delivery is expected to occur at wind speeds greater than 12.7 m/s. While some WTGs may not be in operation at wind speeds below 3 m/s, other areas may be experiencing adequate wind speeds for production. There will also be cases when wind speeds are around the maximum permitted levels, allowing the Wind Projects to optimize the production of power.

In addition, all turbines will be affixed with obstacle marking and lighting in compliance with

NAV Canada and Transport Canada Standard 621 (2021) requirements for aviation during their operational life.

The Wind Projects will be remotely monitored and controlled 24 hours/day from a control room within the Project. Trained personnel will monitor control software including alarm callouts. Servicing of WTGs (e.g., replacement of worn components, lubricants, and drone inspection of turbine blades), and electrical components (e.g., inspection of components, transformer oil, periodic replacement of minor components, and testing) will be conducted at manufacturer recommended intervals and as determined by monitoring equipment.

During the lifespan of the Wind Projects, appropriate maintenance activities will be conducted on all assets. EVREC plans to utilize internal workforce and enter into long-term service agreements with qualified contractors for critical equipment that requires specialized skillsets (such as WTG, compressor, catalyst, etc.). These agreements are expected to be 15-year terms with options to extend the period in 5 to 10-year extensions. Vendor agreements for technology and engineering support will also be part of the maintenance strategy. Maintenance activities will conform to manufacturer's equipment specifications, industry BMPs, and standard operating procedures. Maintenance work will be carried out on a proactive, periodic, and as needed basis. Maintenance work may also require the use of various cranes for brief periods to replace blades or other WTG repairs.

The Project will rely on internal resources, local contractors and service groups to provide maintenance support and will be a key economic benefit to the local region. These third-party operation and maintenance contracts will be implemented through the development of the operational readiness planning that the Project will develop during the FEED process. Identifying and developing these supply chains is also part of the community benefits program.

Access Road Maintenance

Throughout the lifespan of the Wind Projects, access roads will be used to access the WTGs by staff and maintenance personnel. The roads will be maintained with additional gravel and grading, as required in certain areas, and low-level natural vegetation will be allowed to grow in other areas and maintained accordingly. The Project intends to minimize the amount of snow clearing in the winter months and only clear highly travelled roads. Plowing, sanding, and/or salting will be used as required for safe driving. Access to low travelled areas will be done via all-terrain vehicles (snowmobiles, off road vehicles) in attempts to minimize on-going disturbance.

Access roads and WTG locations remain clear of vegetation. Timing of vegetation management will depend on site-specific conditions and requirements by EVREC and/or their operations and maintenance contractors.

Due to the potential for public access to the Wind Project, signage will be affixed and maintained on access roads to provide essential safety information such as emergency contacts and telephone numbers, speed limits, and the hazards associated with being in

proximity to the turbines. These signs will be maintained during the life of the Project.

Electrical System Maintenance

Substations will be remotely monitored and controlled 24 hours per day using dedicated SCADA and video surveillance systems. Trained and qualified operators are notified and dispatched (when required) to address issues such as protection trips, equipment operating parameters exceeded, and unauthorized substation entry.

The 230 kV transmission lines and 34/69 kV collector systems will require scheduled and emergency maintenance along with periodic inspections. Maintenance activities will be carried out by qualified specialists. Typical preventative maintenance would include earth wire integrity, guying integrity, checking for missing or broken hardware, proper operation of isolation switches, and ROW clearing of encroaching vegetation. Vegetation management activities (through application of herbicides and manual cutting of brush) will be conducted in accordance with the Pesticide Control Regulations under the NL EPA and are subject to approval from the NLECCC Pesticide Control Section. In the event of equipment failure, emergency repairs may be required. Emergency and preventative maintenance will follow detailed protocols and maintenance plans will consider equipment manufacturer recommendations and International Electrical Testing Association standards.

6.1.3.3 Decommissioning and Rehabilitation

Project infrastructure for the Wind Projects is expected to last a minimum of 30 years, with most of the WTGs being recycled, recovered, or salvaged upon decommissioning. An Asset Retirement Plan has been drafted that outlines options for decommissioning and rehabilitation for the Project. This plan considers all factors of the lifecycle of the components, including social, and environmental impacts, and will be confirmed upon final design. Elements of the plan have also been incorporated in the design of the Wind Project to mitigate further risks and challenges.

The Asset Retirement Plan will include the following:

- Isolate and secure all components.
- Place equipment in zero energy states.
- Complete a full inventory of assets.
- Complete a risk assessment.
- Obtain all necessary approvals.
- Sell all surplus equipment and spares.
- Dismantle and remove equipment in a stage manner.
- Decommission assets as per the conditions of the land lease agreement minimizing any further environmental impacts.
- Remove, recycle (where possible), and dispose of materials.
- Remove all other equipment and reinstate and stabilize land.

It is anticipated that these activities will take approximately three years from date of shutdown

to complete, with certain planning, valuation, and equipment marketing activities scheduled prior to plan execution.

Prior to the start of decommissioning, the plan will be submitted to the NLECCC Director of Regulatory Compliance. The submitted plan will identify and discuss the proposed decommissioning activities and schedule for the WTGs, collector system, transmission system, collector substations, and all appurtenant facilities constructed as a part of/or because of the Project.

The decommissioning and demolition activities will comply with all applicable laws, ordinances, regulations and standards, and should not result in any significant adverse environmental impacts.

According to the Canadian Renewable Energy Association (CanREA, n.d.), up to 90% of WTG blades can be recycled. Additional components, such as the steel from the towers, copper cables, and electrical equipment, can also be recycled or reused. Materials that cannot be recycled may be reused in other applications, such as filler in construction materials. Recent innovations in fiberglass recycling have used various chemical and mechanical means to prepare the material for reuse in other applications (Power Technology, 2024). At the time of decommissioning, it is anticipated that newer technologies will allow for improved recycling or reuse of the end-of-life turbine materials. Any material that cannot be recycled or reused, will be sent for final disposal at an approved disposal facility.

6.2 Air Quality

6.2.1 Overview

The assessment of the atmospheric environment will incorporate weather and climate, as well as ambient air quality considerations. Weather and climate baseline conditions have been obtained from regionally available meteorological data. Ambient air quality baseline conditions have been collected from a local ambient air quality monitoring station in Grand Falls-Windsor.

6.2.2 Regulatory Context

Relevant legislation includes:

- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)
- Air Pollution Control Regulations (2022)
 - Air Quality Standards
 - Air Quality Standards for Air Zone Management

Relevant standards include:

- Canadian Ambient Air Quality Standards (CAAQS) (CCME, n.d.-b)

6.2.3 Desktop Assessment Methodology

The assessment was completed through a review of the following resources:

- ECCC Canadian Climate Data (ECCC, 2026)
- NL Ambient Air Quality Data (provided by NLECCC)

6.2.4 Desktop Assessment Results

6.2.4.1 *Weather and Climate*

Local temperature and precipitation data were obtained from the Gander International Airport, meteorological station (Climate ID 8401703) located approximately 64 km southeast of the Wind Project. Data obtained was analyzed to generate seasonal climate parameters for temperature and precipitation (Table 6.2.1; ECCC, 2026).

This analysis considered data collected over the three-year period from 2022 to 2024. Although there are closer climate stations to the WPA, the data obtained from the Gander International Airport meteorological station provided the most complete dataset for assessment (io consulting, 2026a).

Table 6.2.1: Climate Data from the Gander International Airport Meteorological Station (2022-2024)

Time Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (°C)													
Daily Avg.	-4.9	-6.1	-2.0	2.1	6.7	13.2	19.7	18.3	13.9	8.7	1.7	-1.2	5.8
Daily Max.	-0.9	-2.1	1.3	6.0	11.9	18.5	25.0	23.2	18.2	12.8	4.5	1.7	10.0
Daily Min.	-8.9	-10.0	-5.3	-1.8	1.5	7.8	14.2	13.3	9.4	4.5	-1.2	-4.1	1.6
Extreme Max.	10.7	9.9	12.2	15.8	23.4	33.3	32.2	31.4	27.9	22.2	18.4	14.7	21.0
Extreme Min.	-19.2	-21.5	-15.5	-9.0	-2.2	-1.0	8.3	6.5	2.0	-2.2	-10.9	-12.8	-6.5
Precipitation (mm)													
Precipitation	55.8	64.1	51.8	39.1	70.8	89.3	60.0	71.7	73.7	76.4	154.8	69.4	876.8

(ECCC, 2026)

Between 2022 and 2024, the mean annual temperature was 5.8°C, with a mean daily maximum of 10.0°C and a mean daily minimum of 1.6°C. January and February were the coldest months (mean daily average of -4.9°C and -6.1°C, respectively), while the warmest months were July and August (mean daily average of 19.7°C and 18.3°C, respectively). The mean annual precipitation was 876.8 mm, with June and November having the highest precipitation (89.3 mm and 154.8 mm, respectively; ECCC, 2026).

Wind speed and direction data were also obtained from the Gander International Airport meteorological station (Table 6.2.2) for the three-year period from 2022 to 2024.

Table 6.2.2: Wind Data from the Gander International Airport Meteorological Station (2022-2024)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Hourly Speed (km/h)	110	100	113	94	84	80	73	77	99	73	101	100
Most Frequent Direction	SW	NW	NW	NE	NE	SW	SW	SW	NW	SW	NW	SW

(ECCC, 2026)

The maximum hourly wind speeds recorded at the Gander International Airport meteorological station ranged from 73 km per hour (km/h) in July and October to 113 km/h in March. The most prevalent wind direction observed is from the southwest. Wind directions will vary; and, the direction during calm wind flows is not recorded at the meteorological station (ECCC, 2026).

A windrose plot of the annual wind speed and direction at Gander International Airport from 2022 to 2024 was generated by io consulting (2026a) (Figure 6.2.1). Calm to moderate wind speeds (0 m/s to 10.80 m/s) were predominant in the southwest (Appendix D.1).

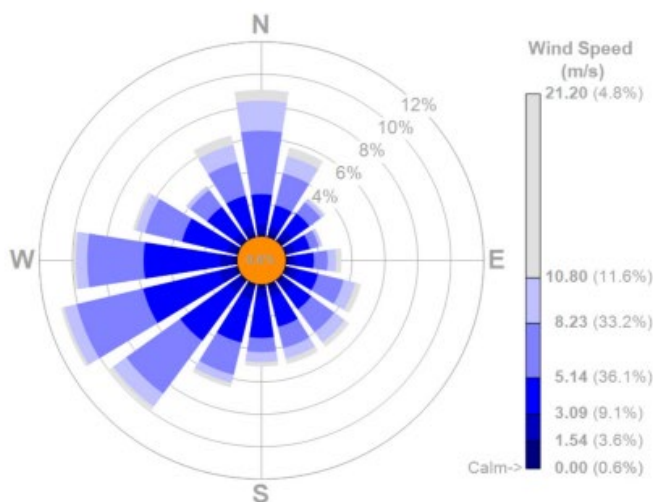


Figure 6.2.1: Windrose Plot – Annual Wind Speed and Direction 2022 to 2024 (Appendix D.1).

6.2.4.2 Air Quality

The Government of NL has legislated the Air Pollution Control Regulations (Newfoundland and Labrador, 2022b) (NLAPCR), under the *Environmental Protection Act* (Newfoundland and Labrador, 2002a). The air quality standards published (Schedule A, Table I) in the NLAPCR set the maximum permissible ground-level concentration limits. In addition, the NLAPCR also sets air quality standards for air zone management (Schedule A, Table II), which provide air quality limits for larger airshed management. These are similar to those targets set out by the Canadian Council of Ministers of the Environment (CCME) for the CAAQS (Table 6.2.3).

Table 6.2.3: Summary of Regulations Pertaining to Ambient Air Quality in NL

Contaminant ⁽¹⁾	Averaging Period	Regulatory Threshold			Unit
		NLAPCR (Schedule A, Table I)	NLAPCR (Schedule A, Table II)	CAAQS	
Ammonia	24-hour	144	-	-	ppb
CO	1-hour	30,582	-	-	ppb
	8-hour	13,107	-	-	ppb
H ₂ S	1-hour	11	-	-	ppb
	24-hour	4	-	-	ppb
NO ₂	1-hour	213	42	42	ppb
	24-hour	106	-	-	ppb
	Annual	53	12	12	ppb
PM _{2.5}	24-hour	25	25	27 ⁽²⁾	µg/m ³
	Annual	8.8	8.8	8.8 ⁽²⁾	µg/m ³
PM ₁₀	24-hour	50	-	-	µg/m ³
Particulate matter (total)	24-hour	120	-	-	µg/m ³
	Annual	60	-	-	µg/m ³

Contaminant ⁽¹⁾	Averaging Period	Regulatory Threshold			Unit
		NLAPCR (Schedule A, Table I)	NLAPCR (Schedule A, Table II)	CAAQS	
SO ₂	1-hour	344	65	65	ppb
	3-hour	229	-	-	ppb
	24-hour	115	-	-	ppb
	Annual	23	4.0	4.0	ppb

Air Pollution Control Regulations, 2022, N.L.R. 11/22

ppb = Parts per billion

µg/m³ = Micrograms per cubic metre

⁽¹⁾ The summary shows only the most relevant contaminants, as applicable to the Project.

⁽²⁾ Values are shown as the 2020 numerical value.

NL monitors air quality at seven ambient AAQMSs throughout the province (NLECCC, 2024a). Measured parameters vary by location and may include the following:

- PM_{2.5} – Particulate Matter less than or equal to 2.5 microns
- PM₁₀ – Particulate Matter less than or equal to 10 microns
- O₃ – Ozone
- NO – Nitric Oxide
- NO₂ – Nitrogen Dioxide
- NO_x – Oxides of Nitrogen
- CO – Carbon Monoxide
- SO₂ – Sulfur Dioxide
- VOC – Volatile Organic Compounds

The NO₂, O₃, and PM_{2.5} values from five of the seven AAQMSs are used to calculate a score on the AQHI. The AQHI is a scale from 1 to 10+, whereby scores represent the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+; Meteorological Service of Canada, 2026).

The closest AAQMS to the Wind Project with available data is the Grand Falls-Windsor station, 35 km southwest of the WPA. The baseline maximum ambient air quality conditions observed at the Grand Falls-Windsor AAQMS from 2022 to 2024 were compared to the current NLAPCR Schedule A, Table I, as these air quality standards are the maximum permissible ground-level concentration limits (Table 6.2.4).

Table 6.2.4: Maximum Ambient Air Quality Conditions Observed at Grand Falls-Windsor (2022 to 2024)

Parameter	Averaging Period	NO ppb	NO ₂ ppb	NO _x ppb	O ₃ ppb	SO ₂ ppb	CO ppm ⁽¹⁾	PM _{2.5} µg/m ³	PM ₁₀ µg/m ³	TSP ⁽²⁾ µg/m ³	H ₂ S ppb	NH ₄ ppb
Grand Falls-Windsor AAQMS	1-hour	60.6	23.2	81.8	53.7	2.0	0.8	154.7	1189.7	-	-	-
	3-hour	40.4	22.9	57.8	52.5	2.0	0.7	130.0	541.2	-	-	-
	8-hour	25.2	22.9	35.9	51.5	1.9	0.6	84.4	303.8	-	-	-
	24-hour	9.9	5.9	14.6	50.7	1.7	0.3	45.4	185.4	-	-	-
	Annual	0.9	1.9	2.7	29.3	0.6	0.1	5.2	15.7	-	-	-
NLAPCR (Schedule A, Table 1)	1-hour	-	213	-	-	344	30.58	-	-	-	11	-
	3-hour	-	-	-	-	229	-	-	-	-	-	-
	8-hour	-	-	-	-	-	13.11	-	-	-	-	-
	24-hours	-	106	-	-	115	-	25	50	120	4	144
	Annual	-	53	-	-	23	-	8.8	-	60	-	-
Fraction of NLAPCR (Schedule A, Table 1)	1-hour	-	10.9%	-	-	0.6%	2.7%	-	-	-	-	-
	3-hour	-	-	-	-	0.9%	-	-	-	-	-	-
	8-hour	-	-	-	-	-	4.2%	-	-	-	-	-
	24-hours	-	5.5%	-	-	1.5%	-	181.5%	370.9%	-	-	-
	Annual	-	3.5%	-	-	2.8%	-	59.1%	-	-	-	-

Data provided by NLECCC

Values calculated as maximum values from rolling arithmetic averages of hourly data.

Shaded values denote exceedances of NLAPCR.

⁽¹⁾ Parts per million

⁽²⁾ Total suspended particulates, otherwise known as total particulate matter.

Per Table 6.2.4, existing air quality conditions (i.e., ambient air quality conditions at Grand Falls-Windsor; 2022 to 2024) indicate that most of the measured contaminants are well below their respective NLAPCR Schedule A, Table 1 limits. However, the maximum 24-hour concentrations of PM_{2.5} and PM₁₀ exceeded the NLAPCR 0.5% and 2.4% of the time, respectively based on the existing air quality data provided by NLECCC and compiled by Strum. The single maximal values observed were 45.4 µg/m³ (PM_{2.5}) and 185.4 µg/m³ (PM₁₀) during a rolling 24-hour period (Table 6.2.4).

6.2.5 Effect Assessment

The Wind Project activities will interact with the atmospheric environment through fugitive dust and exhaust emissions from light- and heavy-duty equipment, and quarrying (Table 6.2.5), primarily during the construction phase. There are no air emissions associated with the operation of the WTGs.

Table 6.2.5: Potential Project-Air Quality Interactions – Wind Project and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X

Project Phase	Potential for Interaction
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

6.2.5.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries include air emission regulations, as described in the regulatory context section above, which informs the development of construction and operational air emission assessment.

Technical Boundary

The determination of air quality impacts was completed based on a qualitative assessment of anticipated construction and operational impacts.

Spatial Boundary

The LSA for the atmospheric environment is the WPA (Drawing 6.1-1A-E, Appendix A). The RSA for atmospheric is the Newfoundland Air Zone.

Temporal Boundary

Temporal boundaries would include the timelines of each Wind Project phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

6.2.5.2 Assessment Criteria

The assessment criteria provided in Section 5.0 apply to the atmospheric environment. The VC-specific definition for magnitude is as follows:

- Low: Air quality is expected to remain less than or equal to the maximum permissible

- ground-level concentrations as defined by the NLAPCR.
- High: Air quality is expected to exceed the maximum permissible ground-level concentrations as defined by the NLAPCR.

6.2.5.3 Effects

Fugitive dust emissions consist of PM and may be generated from open-air activities (e.g., moving earth/disturbing soil, wind erosion, and increased traffic). Fugitive dust emissions are composed mainly of soil minerals, but can also contain salt, pollen, spores, and tire particles. PM is measured as TSP and is defined as the mass of airborne particles having a diameter of less than 100 micrometres (μm) (though measured concentrations are typically dominated by particles $<45 \mu\text{m}$). There are two forms of PM that pose the greatest concern for human health: PM with a diameter of $10 \mu\text{m}$ or less (PM_{10}) and PM with a diameter of $2.5 \mu\text{m}$ or less ($\text{PM}_{2.5}$).

Depending on its composition, concentration, and proximity to a human receptor, fugitive dust can affect lung and heart functions when it enters the atmosphere. Particulate matter has been linked to premature death (due to lung and/or heart disease), non-fatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms such as irritation of the airways, coughing, or difficulty breathing. People with underlying lung and heart disease, children, and the elderly are the most susceptible to particulate pollution exposure (US EPA, 2024b).

Fugitive dust may also affect visibility and cause environmental damage. Fine particles are the leading cause of reduced visibility in many cities, national parks, and wilderness areas. In addition, fugitive dust particles can be carried over long distances (via wind), deposited in other locations, and within surface water features. Some of the potential effects of particulate deposition may include the following (US EPA, 2024b):

- Increasing lake and stream acidity
- Altering coastal water and large river basin nutrient balance
- Depleting soil nutrients
- A variety of effects on flora (described further in Section 6.9)
- Affecting ecosystem diversity
- Contributing to acid rain effects

Anticipated sources of fugitive dust emissions from the Wind Project will be primarily associated with the Wind Project's construction and may include the following activities:

- Soil disturbance during site preparation (i.e., clearing/grubbing, grading, etc.)
- Wind erosion from soil or rock stockpiles during grading
- Construction of quarries and borrow pits
- Increase in traffic on roadways from travel by Wind Project personnel (to/from the site)
- Management of on-site materials transfers (i.e., loading/unloading)

The assessment of air quality addresses Project-related effects on human receptors. The receptors used for the analysis of air effects were the wind receptors (WRIDs) as presented in Section 3.2.

The distance particles can travel is influenced by factors such as the height at which they are released, their deposition velocity, wind speed, and the degree of atmospheric turbulence. Fugitive dust was not modelled for but expected to increase during construction of the quarries, access roads, turbine pads, transmission line infrastructure, accommodation camps. Impacts during the construction phase are considered short-term, intermittent, and within the LSA.

The LSA is presently well vegetated, which is anticipated to help reduce the travel distance of fugitive dust emissions from the WPA where the vegetative barriers are found (US EPA, 2014).

Table 6.2.6: Nearest Identified Receptors

Wind Project Subcomponent	Receptor ID	Minimum Distance to Receptor (m)
WTGs (BWF)	839	253
WTGs (TLWF)	690	588
WTGs (LTWF)	760	560
WTGs (SLWF)	836	963
Transmission Line (230 kV)	726	67
WPA Road	140	13
Quarry	766	133
Worker Camp (Accommodation)	792	241

The closest receptor is approximately 13 m from the WPA Road, as listed in Table 6.2.6. For receptors located near Wind Project infrastructure where fugitive emissions may be generated, EVREC will implement construction mitigation measures (e.g., watering of roadways, reduce roadway speeds), as required, to minimize potential effects on nearby receptors related to fugitive emissions.

In addition to fugitive dust, construction may increase combustion residuals and/or exhaust tailpipe emissions, primarily PM, NO_x, SO₂, and CO from vehicles (i.e., travel by Wind Project personnel, transport/delivery activities) and heavy equipment. Exhaust emissions are primarily anticipated to be associated with road construction, upgrades, equipment transfer and delivery, and travel within the WPA. For receptors located near Wind Project infrastructure where exhaust emissions may be generated, EVREC will implement construction mitigation measures (e.g., restrict idling or reduce roadway speeds), as required, to minimize potential effects on nearby receptors related to fugitive emissions.

While the entire construction phase of the Wind Project is anticipated to last three years, construction at any single area will not occur continuously. Therefore, fugitive dust and exhaust emissions are considered short-term and intermittent and mitigation measures will be employed.

6.2.6 Mitigation

Measures to minimize and mitigate the creation and emission of pollutants, including fugitive dust and exhaust emissions, will be implemented for the Wind Project (particularly for the construction phase). General mitigation measures for fugitive (dust) emissions include:

- Minimize the footprint of disturbance to the extent practicable.
- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust and airborne particles.
- Compact and/or ridge disturbed soil, as practicable, to prevent dust formation.
- Implement dust control measures during dry periods (i.e., during drought) when winds are high, where practical.
- Wet aggregate and soil stockpiles with water to control dust, as required.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Limit use of approved dust suppressant to control road dust and minimize airborne emissions, where required.
- Establish and implement speed limits to minimize dust and potential collisions.
- Tie down, cover, and/or store loose site materials and/or products prior to inclement weather and wind events to prevent materials from becoming airborne.
- Wash down vehicles and equipment with water to remove accumulated mud/dirt on undercarriages, tracks, wheel wells, etc. on vehicles that will be utilizing public roadways.
- Require that Wind Project personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) in the event of significant fugitive emissions events (i.e., windstorms, dust storms).

General mitigation measures for exhaust emissions include:

- Require that equipment meets all applicable provincial and air quality regulations and emissions standards.
- Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.
- Remove malfunctioning equipment and/or equipment generating excess amounts of smoke, odour, or noise from service until an assessment and necessary repairs can be completed.
- Remove construction equipment with improperly functioning emissions control systems from service.
- Restrict the idling of equipment where feasible.

6.2.7 Monitoring

No monitoring is recommended.

6.2.8 Conclusion

The predicted residual effects of the Wind Project on the atmosphere and ambient air quality (after mitigation) are characterized in Table 6.2.7.

Table 6.2.7: Air Quality Residual Effects – Wind Project and Transmission

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Fugitive Emissions Increased level of airborne particulate	Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust. Apply water as a dust suppressant as required.	A	L VC interaction causes direct increase of fugitive emissions	LSA	ST Effects are expected throughout construction and decommissioning	I Effects may occur during the Project's construction and decommissioning phases, but only intermittently.	R	Not significant
Exhaust Emissions Increased level of combustion related emissions	Maintain equipment and limit idling where feasible.	A	L VC interaction causes a direct increase of exhaust emissions	LSA	ST Effects are expected throughout construction and decommissioning	I Effects may occur during the Project's construction and decommissioning phases, but only intermittently.	R	Not significant

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term MT – Medium Term, LT – Long Term

Frequency: SE – Single Event, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

6.3 Greenhouse Gases

6.3.1 Overview

Climate change refers to long-term, detectable changes in weather patterns and conditions, often including alterations to temperature and precipitation regimes. Climate change typically involves changes in average conditions and variability. Greenhouse gases (GHGs) from anthropogenic sources are the main contributors to climate change. Since GHGs disrupt natural heat transfer processes within the Earth's atmosphere, a build-up of these gases has enhanced the natural greenhouse effect. These human-induced enhancements are especially of concern since ongoing GHG emissions have the potential to warm the planet to levels that have yet to be experienced (ECCC, 2019d).

The Wind Project's impact on climate change is described in terms of GHG emissions from wind energy produced by the Wind Project.

The impacts of climate change on the Wind Project are assessed separately under Section 13.0.

6.3.2 Regulatory Context

The climate change assessment considered the following Acts and Regulations:

- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)
- *Management of Greenhouse Gas Act* (MGGA) (Newfoundland and Labrador, 2016)
- *Management of Greenhouse Gas Regulations* (Newfoundland and Labrador, 2018a)
- *Canadian Environmental Protection Act* (Canada, 1999)
 - *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations* (Canada, 2010)
 - *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations* (Canada, 2013)
 - *Ozone-depleting Substances and Halocarbon Alternatives Regulations* (Canada, 2016)

6.3.3 Desktop Assessment Methodology

The objectives of this assessment include the following:

- Establish Project-related GHG sources.
- Quantify baseline and Project-generated GHG emissions.
- Mitigate and minimize GHG generation from Project-related activities.

Sources of GHG emissions were identified through a review of Wind Project phases, components, and equipment.

Project-generated GHGs were quantified in accordance with the specifications described in the International Standard ISO 14064 (2019, p. 14) and the NLECCC Guidance Document for

Reporting Greenhouse Gas Emissions for Large Industry in Newfoundland and Labrador (2017).

All emissions, unless otherwise stated, are reported in tonnes of carbon dioxide equivalents (tCO₂e).

6.3.3.1 Sources of GHG Emissions

The main GHGs of concern include:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- N₂O
- Halocarbons
- Water vapour

GHGs may be natural or anthropogenic in origin, except halocarbons, which are human-made (ECCC, 2019a). The following subsections describe the GHGs and their contributors (sources) as anticipated during each Project phase. Given that decommissioning will occur in the future, potentially under improved technologies that could reduce GHG emissions, its emissions inventory remains uncertain. To ensure a conservative assessment, emissions during the construction phase are used as a proxy for decommissioning.

Methane

Primary sources of anthropogenic CH₄ include landfills, sewage, and the incomplete combustion of fossil fuels with insufficient oxygen (ECCC, 2019a). The Project's construction phase requires different heavy- and light-duty equipment, contributing to CH₄ emissions.

Nitrous Oxides

The primary sources of anthropogenic N₂O are related to the use of nitrogen-based synthetic fertilizers and manure. These sources have added significant amounts of reactive nitrogen to Earth's ecosystems. Other contributors include the release of N₂O into the atmosphere during the combustion of fossil fuels and biomass (e.g., trees or wood-based fuels) and from some industrial sources (ECCC, 2019a).

The Project's construction phase requires heavy- and light-duty equipment, which can contribute to N₂O emissions. Land restoration activities (i.e., fertilizers) following construction will also contribute to N₂O emissions. Overall, the production of N₂O in association with the Wind Project is anticipated to be minimal, in relation to other sources of GHGs.

Halocarbons

Halocarbons are a group of synthetic chemicals containing a halogen group (e.g., fluorine, chlorine, and bromine) and carbon (ECCC, 2019a). They are typically used in refrigerants, fire-extinguishing agents, and solvents (ECCC, 2013b). There are various industrial sources, but the main contributor is aluminum production (US EPA, 2024a).

During the construction phase, the primary source of halocarbon emissions would likely be accidental releases or leaks (losses) associated with coolants in air conditioning units found in vehicles, portable construction buildings (i.e., trailers), and equipment. Fire-extinguishing agents (containing halocarbons) may also be used in the event of an emergency which requires a fire-fighting response. Overall, halocarbon release is anticipated to be minimal and not considered further.

Water Vapour

Water vapour is the most important naturally occurring GHG. Human activities do not directly influence the amount of water vapour in the atmosphere, as it is a function of the atmosphere's temperature. The atmosphere can hold approximately 7% more water vapour for every additional degree Celsius in air temperature. When the air becomes saturated with water vapour, the water vapour condenses and falls as rain or snow, leading to climate change effects (i.e., variations in weather patterns).

As climate-warming gases (i.e., CO₂, CH₄, N₂O) increase in the atmosphere, the temperature rise increases water evaporation from the Earth's surface and increases the atmospheric water vapour concentrations. This increased water vapour, in turn, amplifies the warming from the initial GHGs, causing the cycle to repeat and temperatures to keep rising (ECCC, 2019a).

Project activities contributing to GHG emissions are not expected to affect water vapour concentrations in the atmosphere, and this is therefore not considered further.

Carbon Dioxide Equivalent (CO₂e)

The primary source of anthropogenic CO₂ is burning carbon-containing fossil fuels (i.e., coal, oil, and natural gas) and deforestation/land clearing activities.

Site preparation and construction for the Wind Project will include several activities that are likely to produce CO₂, including, but not limited to:

- Use of heavy equipment (excavators, dozers, cranes, etc.).
- Use of light-duty vehicles and equipment (pick-up trucks, generators, etc.).
- Land clearing, including the decay of cut foliage (which slowly releases CO₂).
- Cement production heats limestone, which releases CO₂ (ECCC, 2019a).

6.3.4 Desktop Assessment Results

6.3.4.1 *Quantification of the GHG Baseline Conditions*

The GHG baseline is a reference to sources, sinks (removing), and reservoirs (storing) occurring in the Project's absence and is used to compare pre- and post-Project conditions. The baseline demonstrates the quantity of CO₂e emitted from current electricity production methods for the same electrical generating capacity as the Project.

The Project consists of up to 534 turbines capable of generating up to 4.27 GW of renewable

energy (nameplate capacity); however, the turbine layout will likely be reduced to meet a 3.5 GW capacity. That said, this assessment considers the 4.27 GW capacity, and reducing the overall capacity will not change the conclusions.

Based on the WTG design capacity and an anticipated net capacity factor of 39% (provided by EVREC), the Wind Project will be capable of producing approximately **14,594,860,800** kilowatt-hours per year (kWh/year). The Wind Project's lifespan is estimated at a minimum of 33 years.

Quantifying GHGs in terms of tCO₂e requires using current electricity-generating practices. In 2021 (most recent statistics), electricity generated in Newfoundland was produced from the following fuel sources (CER, 2026):

- Hydropower (97%)
- Petroleum (2%)
- Natural Gas (0.6%)
- Wind (0.4%)

In 2022, the GHG intensity of the NL electricity grid was 17 grams of CO₂e/kWh (gCO₂e/kWh) (CER, 2026). Once operational, the Wind Project will not directly generate any GHG emissions (i.e., from energy generation), except for maintenance activities, which are considered negligible. Therefore, when applied to the energy output of the Wind Project **14,594,860,800 kWh/year**, the Project is anticipated to reduce **248,112.63 tCO₂e/year** (Appendix E.1).

GHG Emissions Quantification – Construction Phase

Access Roads and Laydown Areas

The construction and upgrading of new and existing roads will require the removal of vegetation and overburden, creating fugitive dust and GHG emissions. Laydown areas are intended to store equipment temporarily, the WTG pad foundation, and the crane pad. Construction activities and equipment associated with developing laydown areas may generate fugitive dust and GHG emissions.

However, fugitive dust and GHG contributions from these activities, which are temporary and short-term, represent a small incremental addition to the overall Wind Project emissions and therefore were not quantified. Section 6.2 (Atmosphere and Air Quality) discusses fugitive dust and air emissions as they relate to the Wind Project.

Foundations

A concrete tower foundation and pedestal will be required for each WTG, as well as for electricity towers, substations, and worker accommodations. As such, the Wind Project will require a large quantity of concrete and steel to be produced and delivered to each WTG location. The quantification of the GHG emissions requires the following inputs:

- The vehicle size and fuel type used to transport the materials.

- The distance travelled to and from the concrete/steel supplier to the foundation site.
- The freight and weight associated with each trip (to and from each foundation location).
- The quantity of concrete and steel produced for the foundation.

EVREC provided the anticipated concrete quantities for each tower foundation, including footings, pedestals, and crane pads (912 m³) per WTG. Strum assumed that each WTG foundation would also require 146 tonnes of steel (rebar and anchor cage). The anticipated concrete quantities for the electrical towers (69 kV and 230 kV), the substation, and worker accommodations were also provided by EVREC and are assumed not to require significant rebar. The volumes of concrete for each subcomponent (per foundation) are as follows:

- WTG: 912 m³ (534 foundations)
- Electrical Tower (69 kV): 7.1 m³ (12 poles per kilometre of line)
- Electrical Tower (230 kV): 19.6 m³ (8 poles per kilometre of line)
- Substation: 800 m³ (5 substations)
- Accommodations: 1,800 m³ (4 accommodations)

The total volume of concrete required for the Wind Project when all foundations are constructed is approximately 1,330,413.30 tonnes, in addition to 77,964 tonnes of steel for the WTG foundations.

The concrete will be provided to the Wind Project by several mobile batch plants located at the main quarry sites. EVREC has indicated that a concrete truck is anticipated to require, on average, 30 km (round trip) to transport concrete to a WTG or other foundation. The steel supplier has not yet been identified for this stage of the Project; therefore, for this assessment, transportation distances are based on a nearby steel supplier located approximately 35 km from the WPA. Heavy-duty diesel concrete trucks and heavy-duty haulers will be required to transport concrete and steel to the Wind Project.

It is assumed that each concrete truck will carry approximately 20.25 tonnes of concrete per delivery for a total of 65,700² concrete deliveries for the Wind Project. Similarly, it is assumed that each heavy hauler would carry no more than 38 tonnes of steel per truck, for a total of approximately 2,052³ deliveries.

Table 6.3.1 summarizes the GHG emission factors for the different components used for concrete- and steel-related activities.

² $1,330,413 \text{ tonnes} \div 20.25 \frac{\text{tonnes}}{\text{truck}} = 65,700 \text{ trucks}$

³ $77,964 \text{ tonnes} \div 38 \frac{\text{tonnes}}{\text{truck}} = 2,052 \text{ trucks}$

Table 6.3.1: Concrete Manufacturing and Transportation Emission Factors

Component	Emission Factor
Concrete Production	2.63×10^{-4} tCO ₂ e/kg
Concrete Truck/ Heavy-Duty (Diesel) with Freight	1.35×10^{-4} tCO ₂ e/tonne-km
Concrete Truck/ Heavy-Duty (Diesel) without Freight	1.106×10^{-3} tCO ₂ e/km
General Steel Production	1.5 tCO ₂ e/tonne

Emission Factors: (Hammond & Jones, 2011; Squared Consultants Inc, 2025)

Given the travelling distances, the quantity of concrete and steel required for the Wind Project, and the emission factors (Table 6.3.1), the CO₂e emissions for constructing all the foundations are expected to be approximately **471,166.94 tCO₂e**.

Detailed CO₂e calculations are provided in Table 2A (Appendix E.1).

WTG Production

The Wind Project will require WTGs to be manufactured and delivered to the WPA. This assessment considers an 8.0 MW WTG model.

A manufacturer-specific life cycle assessment (LCA) for a representative 8.0 MW WTG model was used to assess GHG emissions. The specific turbine model has not yet been selected and will be determined at a later stage; however, the LCA is considered representative of an 8 MW turbine and appropriate for this assessment.

The LCA was based on a construction scenario in Miombo, Tanzania, and included construction, transportation, and the baseline energy mix for Tanzania. As such, only the upstream module of the LCA was used for this assessment, which focused on WTG production at the assembly factory, including the transport, recycling, and disposal of waste materials.

The LCA determined that the production of the 8.0 MW WTG accounted for 2.35 gCO₂e/kWh (EPDItaly, 2025). Based on the anticipated net production capacity of the Wind Project, the construction emissions for the WTGs are anticipated to be 1,131,831.46 tCO₂e over the Wind Project's life. Although there are some uncertainties regarding the assumptions used for the LCA and their applicability to this Wind Project, it is expected that the Wind Project's larger size, compared to the LCA scenario, would lead to a conservative estimate of GHG emissions in this assessment. The LCA transportation and construction-related emissions were not used; instead, a site-specific emissions inventory was created.

To quantify GHG contributions from the transportation of these turbines from the factory to the Project Footprint, the following items were assessed:

- The turbine transportation distances from the manufacturer to the intended wind turbine laydown.
 - Where the specific turbine model has not yet been selected, assumptions were made to include some travel distances.
- The vehicle size and fuel type used to transport the wind turbines.

For quantification purposes, the assessment assumed the following:

- Manufacturing Location: Dafeng District, Yancheng, Jiangsu Province, China
- Nearest Shipping Port: Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China
- Nearest NL Shipping Port: Port of Botwood, NL, CA

EVREC has provided that the following principal components will be transported in sections via a single heavy-duty hauler:

- Blades: 3
- Nacelle: 1
- Rotor: 1
- Tower: 4

Therefore, each WTG requires nine heavy-duty haulers for its transportation.

For this assessment, the WTGs are assumed to be manufactured at a manufacturing facility (model to be chosen later) in Dafeng District, Yancheng, Jiangsu Province, China, which is a massive wind power equipment district. The WTGs will travel to the Dafeng Port in Yancheng by heavy diesel hauler (transport), where they will be shipped via diesel cargo vessel to the Port of Botwood. Table 6.3.2 summarizes the transportation distances from the manufacturer to the Wind Project. Where the manufacturer locations are unknown at this time, a land distance from a manufacturer to the Dafeng Port was assumed based on previous GHG assessments for similar projects.

Table 6.3.2: WTG Transportation Distances

Originating Destination	Final Destination	Distance (km)
Manufacturing Facility Dafeng District, Yancheng, Jiangsu Province, China	Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China	63 (Land)
Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China	Port of Botwood, NL	23,300 (Marine)
Port of Botwood, Newfoundland	Various turbine locations	Varies (Land)

To determine the travel distance for a WTG, the following assumptions were made:

- Each component will be individually transported via a single diesel heavy hauler.
- 9 components per WTG to travel from a manufacturing facility in Dafeng District, to the Dafeng Port in Yancheng.
- 9 components per WTG to travel from the Port of Botwood, NL, to the WTG location (distance will vary from one WTG location to another).
- Each WTG (in its entirety) will be transported via a single diesel cargo vessel (marine).

Based on the land distance from the manufacturer to the individual WTG locations, the total land transportation distance (not including marine transportation) is approximately **505,318 km**. The total marine transportation distance associated with getting the WTGs from the Dafeng Port to the Botwood Port is **12,442,200 km**. The distances travelled reflect travel only from the manufacturer to the WPA; an equivalent return distance is not considered, as hauling companies have commitments to other clients, and those GHG emissions would not be attributable to the Wind Project.

GHG emission factors for the different components of WTG transportation are provided in Table 6.3.3.

Table 6.3.3: WTG Transportation Emission Factors

Component	Emission Factor (tCO ₂ e/tonne·km)
Heavy Duty Truck (Diesel) with Freight	1.35x10 ⁻⁴
Marine Cargo and Container Vessel (Diesel) with Freight	1.51x10 ⁻⁵

Emission Factors: (Squared Consultants Inc, 2025)

Given the land transportation distances required to deliver the WTGs to the WPA and the emission factors (Table 6.3.2), the CO₂e emissions from land transportation of the WTGs are expected to be approximately 7,276.58 tCO₂e. In addition, the marine transportation distances required to deliver the wind turbines from China to Canada will contribute **180,362.13 tCO₂e**.

Detailed CO₂e calculations are provided in Table 2A (Appendix E.1).

Electrical Tower Transportation

The Wind Project will require low-voltage (69 kV) and high-voltage (230 kV) electrical towers to connect the individual WTGs to the Industrial Facility.

EVREC provided the anticipated number of heavy-hauler trucks required to transport these towers into place, as well as the anticipated fuel consumption and distance required for transportation.

The GHG emissions are expected to be approximately **6,141.41 tCO₂e**.

Detailed CO₂e calculations are provided in Table 2A (Appendix E.1).

Construction Equipment

The Wind Project will employ both mobile and stationary equipment during construction (e.g., roads and turbine pads).

EVREC provided a list of equipment anticipated for use in the Wind Project construction, including the number of required pieces of equipment, anticipated hours of operation, and anticipated fuel consumption.

This equipment includes:

- Excavators
- Loaders
- Dozers
- Haul Trucks
- Concrete Trucks
- Harvesting Equipment
- Generators

While the Wind Project construction phase will last three years and may operate 24-hours per day, seven days per week, it is not anticipated to operate continuously. Therefore, for the GHG emission calculations of the mobile equipment, it was assumed to operate 21 hours per day, six days per week, during the construction period. It was further assumed that the construction period would occur over 1.5 years (continuously), and the associated roadworks would occur over a 2-year period (continuously).

For the stationary equipment, GHG emissions were calculated using assumed usage scenarios provided by EVREC. Diesel generators are assumed to be required for worker accommodations, small machinery, and mobile concrete batch plants. The assessment assumes eight 350 kW diesel generators operating continuously (for two years) at 80% capacity, for worker accommodations. It is also assumed that twenty-three 100 kW diesel generators (80% capacity) are used across the WPA to operate small machinery, and one 130 kW diesel generator is used per mobile concrete batch plant, for a total of six 130 kW generators (90% capacity). The 100 kW and 130 kW generators are assumed to operate to the same schedule as the roadwork mobile equipment (21 hours per day, six days per week) for two years.

Finally, the Wind Project will require explosives to quarry and construct the WPA. EVREC provided assumed weights and carbon content for ammonia nitrate fuel oil (ANFO) explosives.

GHG emission factors for the different components of WTG transportation are provided in Table 6.3.4.

Table 6.3.4: Equipment List Emission Factors

Parameter	Emission Factor
Diesel Fuel	2.66 (kgCO ₂ e/L)
Ammonia Nitrate Fuel Oil (ANFO) (Explosive)	0.187 (kgCO ₂ e/kg)

Emission Factors: (NLECCC, 2017), ANFO carbon content provided by EVREC

Given the proposed equipment usage for the construction of the Wind Project, and the emission factors, CO₂e are expected to be approximately **435,743.24 tCO₂e**.

Detailed CO₂e calculations are provided in Table 2B (Appendix E.1).

For the construction phase of the Wind Project, the anticipated GHG emissions and fuel consumption are summarized in Table 6.3.5 for each consumption type (i.e., on-site mobile equipment, on-site stationary equipment, off-site marine transport).

Table 6.3.5: Construction Phase – Estimated Fuel Consumption

Consumption Type	Fuel Type	Emission Factor (tCO ₂ e/L)	Total GHG Emissions (tCO ₂ e)	Annualized GHG Emissions (tCO ₂ e)	Fuel Consumption (L)	Annualized Fuel Consumption (L)
On-site Mobile Equipment	Diesel	2.66E-03	403,005.20	134,335.07	151,304,751.72	50,434,917.24
Off-site Mobile Equipment	Diesel	2.66E-03	4,826.20	1,608.73	1,811,955.47	603,985.16
On-site Stationary Equipment	Diesel	2.66E-03	43,951.11	14,650.37	16,501,056.00	5,500,352.00
Off-Site Marine Cargo and Container Vessel	Marine Diesel	2.89E-03	180,362.13	60,120.71	62,409,041.94	20,803,013.98

Note: Concrete trucks and heavy haulers are assumed to require diesel fuel.
Emission Factors: (BCMOE, 2014; NLECCC, 2017)

Note that Table 6.3.5 includes only those emissions provided through the combustion of fuels. A detailed GHG inventory is provided in Table 2A (Appendix E.1), which lists GHG emissions associated with the production of steel, concrete, and the WTGs, as well as those related to explosives.

GHG Emissions Quantification - Operations Phase

Following the construction phase, the WTGs will be operational, and the reduction of GHG emissions will begin. Based on the design capacity, the Wind Project will produce approximately **14,594,860,800 kWh/year**. Therefore, the renewable energy produced will offset power generation from fossil fuels and from more intensive generation methods described under baseline conditions (Section 6.3.4).

According to Padey et al. (2012), maintenance activities are the only contributors of GHGs during the operations phase. The maintenance typically includes replacing approximately 15% of the nacelle components and one blade during the WTG's lifetime. According to a submission by Number Three Wind LLC (2018) to the New York State Department of Public Services, a wind turbine blade weighs approximately 18,688 kg, while the nacelle weighs approximately 76,204 kg (excluding the drive train). This replacement rate is equivalent to approximately 18,688 kg of blade material and 11,431 kg of nacelle material. Assuming these components are fabricated of steel, the total emission from the replacement material for all the Project's wind turbines is **24,125.32 tCO₂e** (Appendix E.1).

6.3.4.2 Effects Assessment

Table 6.3.6: Potential Project-GHG Interactions – Wind Project and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Control measures	X
Tree Clearing and Grubbing	X
Excavating, grading, and compacting soils for construction	X
Construction of temporary works – Quarries, Batch Plants, Accommodations	X
Access road upgrades and construction	X
Laydown yard and Turbine Pad construction, including foundation excavation, construction and blasting where necessary	X
Transportation of Turbine Components	X
Turbine Assembly	X
Collection System and Substation Construction	X
Transmission System Installation and Commissioning	X
Removal of Temporary Works & Site Restoration	X
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	X
Environmental Monitoring	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

6.3.4.3 Assessment Boundaries

Administrative Boundary

Administrative boundaries include GHG reporting considerations, as described in the regulatory context section above and in regulatory guidance documentation (NLECCC, 2017), which informs the development of construction and operational GHG assessments.

Technical Boundary

The determination of climate change impacts was completed based on estimated construction impacts (e.g., shipments and materials) and the current NL energy grid. Where detailed construction methodologies are not yet determined, reasonable estimates for construction materials, suppliers, and transportation distances were used.

Spatial Boundary

The Local Study Area (LSA) for GHG emissions is the province of NL. The Regional Study Area (RSA) for GHG emissions is the global environment.

Temporal Boundary

Temporal boundaries would include the timelines of each Project phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

6.3.4.4 Assessment Criteria

The MGGA stipulates that facilities with annual emissions exceeding 15,000 tCO₂e must report their emissions annually. The MGGA also sets a GHG reduction target for industrial facilities that emit 25,000 tonnes or more of GHGs per year. The 15,000 tCO₂e benchmark has been compared with the NL GHG emissions of 8,600,000 tCO₂e (in 2022), representing approximately 0.2% of total grid emissions (CER, 2026). This comparison is used to assess the magnitude of Project-related GHG emissions.

The VC-specific definition for magnitude is as follows:

- **Negligible:** GHG emissions are expected to change by $\leq 0.2\%$ annually of the 2022 NL GHG Emissions.
- **Low:** GHG emissions are expected to change by $> 0.2\%$ and $\leq 2\%$ annually of the 2022 NL GHG Emissions.
- **Moderate:** GHG emissions are expected to change by $> 2\%$ and $\leq 20\%$ annually of 2022 NL GHG Emissions.
- **High:** GHG emissions are expected to change by $> 20\%$ annually of the 2022 NL GHG Emissions.

6.3.4.5 Effects

The Project is expected to have a moderate effect on the GHG environment (Table 6.3.7).

Table 6.3.7: Wind Project GHG Emission Summary

Component	Emissions (tCO ₂ e)
Baseline	
NL Electricity Generation GHG Intensity	248,112.63
Total	248,112.63
Construction Phase	
Foundation Production and Transportation	471,166.94
Wind Turbine Manufacturing	1,131,831.46
Wind Turbine and Electrical Tower Transportation	193,780.12
Construction Works	435,743.24
Total	2,232,521.76
Operations Phase	
Electricity Generated from Wind	0
Wind Turbine Maintenance	24,125.32*
Total	24,125.32

The values in this table may differ from those presented in Appendix E.4 due to rounding errors; however, these errors are negligible and do not change their representation.

*Project lifespan emissions (single event)

As mentioned, the current GHG emissions for the quantity of electricity required by the Wind Project, using the NL electrical generation emission intensity, amount to **248,112.63 tCO₂e**.

The Wind Project's construction phase will generate the greatest GHG emissions from the manufacturing and transportation of WTGs, the production and transport of concrete and steel for various infrastructure foundations, and the operation of required mobile and stationary equipment. The total GHG emissions from the construction phase are 2,232,521.76 tCO₂e, or 744,173.92 tCO₂e per year of construction (3 years in total). The annual construction-related GHG emissions will account for approximately 8.7% of NL GHG emissions, meaning that the construction phase of the Wind Project will generate a moderate magnitude of emissions.

The operations phase will generate GHGs from the WTG's maintenance (i.e., part replacements) as a one-time (Project lifespan) occurrence of 24,125.32 tCO₂e.

Following the Wind Project commissioning, the annual GHG emission reduction is expected to be 248,112.63 tCO₂e. A one-time 24,125.32 tCO₂e (GHG emissions from WTG maintenance) may be subtracted from any annual reduction; however, the annual reduction rate will be applied for the Wind Project's lifespan (33 years). The GHG emission reduction over the Wind Project's lifespan (33 years) is up to 8,163,591.59 tCO₂e.

The assumptions considered in this assessment propose a conservative estimate of GHG emissions, which may be lower if WTG and steel supplier locations are closer to the Wind Project (or travel routes are optimized to reduce travel distances) and manufacturing materials are less than assumed. The exact value of GHG emissions which will be offset by the Wind Project is difficult to determine accurately. Despite this uncertainty, the Wind Project will offset GHG emissions and have a positive effect on Climate Change.

6.3.5 Mitigation

Mitigation measures to reduce the Wind Project's contributions to GHG emissions, reducing the overall impact on climate change, include:

- Incorporate the shortest construction/transport routes where possible to minimize the use of fossil fuels during construction.
- Recover and recycle construction and demolition waste, where possible.
- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations.
- Require equipment to meet all applicable provincial and air quality regulations and emissions standards.
- Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.
- Remove malfunctioning equipment or equipment generating excess amounts of smoke, odour, or noise from service until an assessment and necessary repairs can

be completed.

- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Require preventative maintenance and inspections (e.g., leak testing) of equipment containing coolant (i.e., air conditioning units).
- Train Project personnel (as appropriate) in the proper disposal of halocarbon-containing materials.
- Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements.
- Require that trucks removing waste from or bringing materials to the WPA are filled to the maximum allowable capacity where practical (dependent on the truck size and load weight) to reduce transportation requirements and limit the number of trips.
- Implement an anti-idling policy to limit GHG emissions from vehicles and equipment and limit the use of fossil fuels, where feasible.

6.3.6 Monitoring

No monitoring programs are proposed.

6.3.7 Conclusion

The predicted residual effects of the Wind Project on GHGs (after mitigation) are characterized in Table 6.3.8.

Table 6.3.8: GHGs Residual Effects – Wind Project

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Construction Burning of fossil fuels	Use of locally sourced materials, where possible, to reduce CO ₂ , CH ₄ , and NO _x emissions associated with transport.	A	M VC interaction causes direct combustion of fossil fuels and indirect emissions from the supply chain.	LSA	ST Effects are expected throughout the construction and decommissioning phases.	C	PR	Not significant
Operation Reduction in GHG emissions	N/A	P	M VC interaction directly reduces GHG emissions.	RSA	MT Effects are expected throughout the operational phase.	C	PR	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

6.4 Noise

6.4.1 Overview

The assessment of sound/noise considered both construction and operational-generated noise from the WPA. During construction, heavy equipment, machinery, and light vehicles will emit sound to the surrounding environment from activities associated with the development of WTG pads, roads, quarries, accommodations, the transmission interconnection and grid connection, along with the subsequent assembly of WTGs. To quantify potential impacts, sound levels of equipment anticipated to be used for the Project's construction were used to calculate sound levels at set distances from the WPA in consideration of nearby receptors. Sound generated during decommissioning activities will be similar to construction, based on the same process/activities (except for dismantling the infrastructure). Therefore, for this assessment, construction sound/noise and associated Project interactions will act as a proxy for the decommissioning phase of the Project.

During the operational phase of the Project, WTGs will emit sound to the surrounding environment from mechanical equipment operation and the WTG interaction with the surrounding air (aerodynamic sound). Design and engineering of WTG components (e.g., anti-vibration products) have reduced, but not eliminated, mechanical and aerodynamic sound and its associated impacts. To quantify the potential effects of WTG-generated noise on nearby receptors and the impacts of mitigation measures, detailed sound modelling was completed for operational noise.

6.4.2 Regulatory Context

Changes to the acoustic environment during construction and operational activities could result in annoyance and interference with communication, sleep, or working efficiency.

Table 6.4.1: Summary of Sound/Noise Level Regulations and Guidelines

Regulated/ Considered By	Regulation/Guidance	Sound Level (dBA)	Criterion/Note
For Residential Receptors			
Health Canada	Human Health Considerations when Assessing Noise Impacts Related to Wind Turbine Projects (Health Canada, 2024)	45	Sleep Disturbance: Indoor sound levels should not exceed 30 dBA (45 dBA outdoor noise) for continuous noise events to reduce impacts on sleep.
	Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada, 2023)*	45	Short Term Construction: Outdoor sound levels should not exceed 45 dBA for continuous noise events to reduce impacts on sleep.

Regulated/ Considered By	Regulation/Guidance	Sound Level (dBA)	Criterion/Note
		47	Mitigating Short-Term Construction Noise Exposure: Outdoor noise should not exceed 47 dBA L_{dn} for quiet suburban or rural receptors.**
For Occupational Safety			
Newfoundland and Labrador Occupational Health and Safety.	Occupational Health and Safety Regulations, 2012 N.L.R. 5/12, American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs)	85	8-hour maximum, 40-hour work week, without hearing protection.

* Health Canada (2023) provides an estimated outdoor-to-indoor transmission loss of 15 dBA for noise.

** Quiet rural and suburban receptors as defined in Health Canada (2017) and based on population density.

dBA = A-weighted decibels, L_{dn} = day-night sound level

There are no municipal or provincial regulations related to operational WTG noise in NL. However, Health Canada (2023, 2024) has developed considerations and guidance for noise related to WTG operation, which recommends operational noise remain below 45 dBA at receptors.

6.4.3 Baseline Ambient Sound

A baseline sound assessment was conducted in 2024 within the WPA, and the maximum modal 1-hour value was 37 dBA (Strum Consulting, 2025). This is less than the Health Canada (2023) estimated L_{dn} value for a quiet rural area (≤ 45 dBA), which can be used to characterize the WPA based on its sparse population density.

Sounds associated with the WPA include recreational and local traffic, which increases ambient sound levels from cars, ATVs, snowmobiles, and other vehicles along roads and trails. In addition to anthropogenic sources, there are also natural sources of sounds originating from wildlife, wind, water, and vegetation where no anthropogenic infrastructure is currently found.

The baseline sound assessment was conducted to determine baseline sound levels for use in possible post-construction sound and noise assessments.

6.4.4 Effects Assessment

Table 6.4.2: Potential Project-Sound/Noise Interactions – Wind Project and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Control measures	X

Project Phase	Potential for Interaction
Tree Clearing and Grubbing	X
Excavating grading and compacting soils for construction	X
Construction of temporary works – Quarries, Batch Plants, Accommodations	X
Access road upgrades and construction	X
Laydown yard and Turbine Pad construction, including foundation excavation, construction and blasting where necessary	X
Transportation of Turbine Components	X
Turbine Assembly	X
Collection System and Substation Construction	X
Transmission System Installation and Commissioning	X
Removal of Temporary Works & Site Restoration	X
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	-
Environmental Monitoring	-
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

6.4.4.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries include Health Canada (2023, 2024) considerations, as described in the regulatory context section above, which are used for the development of construction and operational noise assessments.

Technical Boundary

Technical constraints for assessing sound/noise effects include simplified noise emissions calculations concerning point source construction activities and limited information on the construction equipment to be used.

Spatial Boundary

The LSA for sound includes the maximum modelled extent for operational noise (Drawing 6.4-1, Appendix A). The RSA is not applicable for sound/noise.

Temporal Boundary

Temporal boundaries would include the timelines of each Project phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

6.4.4.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to sound/noise. The VC-specific

definition for magnitude is as follows:

Construction Sound

- Negligible: sound levels from Project activities are expected to always be indiscernible at receptor locations.
- Low: sound levels from Project activities are discernible and may exceed 47 dBA L_{dn} but are expected to be ≤ 45 dBA at receptor locations during evening and overnight hours (19:00 to 07:00).
- High: sound levels from Project activities are expected to exceed 45 dBA at receptor locations during evening and overnight hours (19:00 to 07:00).

Operational Sound

- Negligible: sound levels from Project activities are expected to always be indiscernible at receptor locations.
- Low: measurable sound levels predicted at receptor location(s), but results are below Health Canada (2024) Guidance (45 dBA).
- High: sound levels predicted to exceed Health Canada (2024) guidance at receptor locations (45 dBA).

6.4.4.3 Modelling Methodology

The assessment of sound/noise is based on desktop studies and addresses Project-related effects on human receptors. The receptors used for the noise modelling assessments were the wind receptors (WRIDs) as presented in Section 3.2. Remote occupations receptors (remote-untitled) are unlicensed and may sometimes be classified as unoccupied and were not considered when determining threshold exceedances.

Construction Sound

The assessment of construction sound/noise is based on desktop studies and addresses Project-related effects at known receptors. The objectives of the assessment aim to achieve the following:

- Establish the anticipated construction sound/noise levels produced by the Wind Project.
- Identify nearby receptors that may be exposed to construction sound produced by the Wind Project.
- Assess potential effects to receptors.
- Mitigate impacts experienced by nearby receptors, if required.

Note, sound levels and impacts from blasting activities have not been included in this assessment. If blasting occurs during construction, EVREC will notify NLECCC and apply for any required permits and approvals. Any potential impacts, mitigation, and subsequent required monitoring will be described in a Project-specific Blasting Plan.

Operational Sound

To understand the Project-related impacts on noise emission from the operational WTGs, OWC conducted a noise modelling assessment in 2025, which was developed based on the WTG specifications and the WPA layout provided by EVREC (OWC, 2025) (Appendix F.1). The OWC report was completed with the following objectives:

- Identify and assess comprehensive sound levels at the exterior of identified receptors.
- Complete a low-frequency sound/noise assessment
- Propose mitigation of Project-generated sound on nearby receptors, if required.

The sound assessment was completed using the WindPRO version 4.0.547 software package, using the DECIBEL module.

Although the final WTG models have not been selected, a vendor specific 8.0 WTG was used for modelling purposes since it is expected to have the highest maximum sound power level among the WTGs currently being considered, thus representing the worst-case scenario. Note that the WTGs were modelled with trailing-edge serrations (TES) on all the blades, which help reduce noise emissions as the blades move through the air.

The modelling approach taken by OWC followed ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method and calculations, and was based on the following input information:

- Universal Transverse Mercator (UTM) coordinates for the WTGs.
- 1/3 Octave band sound power level data, provided by the manufacturer for the WTGs.
- UTM coordinates for receptors.
- A wind speed of 10 m/s.
- Topographic data for the surrounding area.

The ISO 9613-2 calculation method assumes meteorological conditions that are ideal for noise propagation, including a height of receptor of 1.5 m, zero meteorological correction, and various air absorption coefficients based on frequency. A ground factor of 0.7 was applied to the model, representing predominantly porous ground (i.e., capable of vegetative growth), interspersed with hard surfaces (e.g., water).

OWC also completed an assessment of low-frequency sound/noise. Low-frequency sound refers to frequencies below 200 Hz. Although it is not often perceived by the human ear, it can create vibrations in structures that may increase noise-induced annoyance. The low-frequency assessment was conducted in WindPRO using the Finnish code variation of the ISO 9613.2 standard. Modelling results were mapped and presented as iso-lines demonstrating the sound levels with respect to distance (OWC, 2025) (Appendix F.1).

6.4.4.4 Modelling Results

Construction Sound

During construction activities, sound will predominantly be generated through the operation of construction equipment and heavy machinery such as cranes, backhoes, excavators, dump trucks, graders, and transportation vehicles. A summary of sources and anticipated volumes of sound produced during the Wind Project's construction has been provided in Table 6.4.3.

Table 6.4.3: Decibel Limits of Construction Equipment Required for the Project

Equipment	Average Noise Level Ranges (in dBA)
Road, Transmission Line, Grid Connection, Turbine Pad, and Accommodation Development	
Backhoe	85-104 ¹
Concrete Truck/Pump	103-108 ²
Dozer	89-103 ¹
Dump Truck	84-88 ¹
Excavator	97-106 ²
Harvesting Equipment (log truck, manual faller, etc.)	85-103 ³
Roller	95-108 ²
ATV	97 ⁴
Loaders	88 ³
Pickup Trucks	95 ⁴
Tracked Dump Truck/Decks	91 ⁶
Tracked Man Lift/Bucket Machines	85 ⁶
Tracked Radial Boom Derricks/Cranes	93-98 ^{2/6}
Grader	83-85 ⁵
Haul Truck	90-100 ⁶
Quarrying	
Tracked Drilling Units	91-107 ⁵
Blasting	115-136 ⁹
Screeners and Crushers	76-107 ⁸
Turbine Assembly	
Crane	78-103 ¹
Handheld Air Tools	115 ²
Compressor (drilling, pneumatic tools, etc.)	85-104 ⁷

Note that measurements shown are relevant to the decibel level ranges within close proximity (i.e., less than 15 m of distance) between a receptor and the relevant piece of equipment.

Note that noise as a result of blasting (quarry operations) will be completed in accordance with

Sources: ¹ WorkSafe BC (2019)

² Transport Scotland (2018)

³ WorkSafe BC (2016)

⁴ Government of Oregon (n.d.)

⁵ The Driller (2005)

⁶ SCE (2015)

⁷ IHSAA (2022)

⁸ (Bauer & Babich, 2007)

⁹ (Siskind & Summers, 1974)

Overall, the range of decibels anticipated for the Wind Project's construction activities is between 76 dBA and 136 dBA (from a single piece of equipment within 15 m from the source).

The receptors nearest to the infrastructure were assessed as they are expected to be the most affected by the sound produced by the construction of the Wind Project subcomponents (Drawing 6.4-2, Appendix A). The distance to a receptor from each subcomponent is provided in Table 6.4.4. It should be noted that none of the identified receptors are considered sensitive (e.g., daycares, schools, hospitals, etc.).

Table 6.4.4: Nearest Identified Receptors

Wind Project Subcomponent	Receptor ID	Minimum Distance to Receptor (m)
WTGs (BWF)	WRID 839	253
WTGs (TLWF)	WRID 690	588
WTGs (LTWF)	WRID 760	560
WTGs (SLWF)	WRID 836	963
Transmission Line (230 kV)	WRID 726	67
WPA Road	WRID 140	13
Quarry	WRID 766	133
Worker Camp (Accommodation)	WRID 792	241

Operational Sound

The pre-mitigation modelling run identified a total of 863 receptors, which exceeded the 30 dBA iso-line from the WTGs. A total of 97 receptors exceeded the recommended guidance of 45 dBA cumulative sound in the sound/noise modelling, with the highest predicted sound level at any receptor being 58.8 dBA.

OWC recommended a series of mitigations, which, when modelled, eliminated all receptor exceedances for residential and remote-titled receptor classifications. The mitigations proposed by OWC include the use of one of four sound-reduced modes (SRMs) for the 8.0 WTG, which reduces the sound power level of the WTG at the expense of maximum rated power. OWC proposes the use of SRMs at 69 WTGs. In addition, OWC proposes the removal of seven WTGs from the proposed layout (Appendix F.1) (Drawing 6.4-3, Appendix A).

The sound power levels were also entered into a Finnish low-frequency model using WindPRO software to produce the maximum low-frequency noise at each receptor. Noise emissions did not exceed at any receptor using the Finnish low-frequency model; therefore, low-frequency sound is not anticipated to be of concern (Appendix F.1).

6.4.4.5 Effects Summary

The construction of the Wind Project will require the use of industrial machinery and equipment that will increase sound levels within the LSA. Decibel levels above 45 dBA at receptor locations can disrupt sleep during nighttime hours. Eight of the nearest receptors to the Wind

Project subcomponents were identified as most likely to receive the greatest potential effects from the Wind Project construction noise. The nearest receptor is located along a road at 13 m (Table 6.4.4); however, most are located more than a couple of hundred meters away from a Wind Project subcomponent.

Sound tends to attenuate at a standard rate of 6 dBA per doubling in distance from a given point source (WKC Group, 2024). Additionally, soft ground cover (e.g., forest floor) can absorb sound, while hard ground cover (e.g., exposed bedrock) can reflect sound. A broken line of sight, as with topographic relief (e.g., hills), forested areas, or buildings, can further reduce sound from a source. Forested buffers alone can reduce noise by up to 8 dBA per 30 m of vegetated buffer. When relief (e.g., hills) is incorporated, this noise reduction can reach 15 dBA per 30 m of buffer (USDA, n.d.-a). The receptors identified in Table 6.4.4 are surrounded by varying degrees of forest, vegetation or topographic relief, which is anticipated to obscure the line of sight between the receptor and the Wind Project subcomponent, and they are therefore anticipated to experience reduced noise levels relative to the equipment anticipated to be used for the construction of the Wind Project.

The Wind Project's construction phase will last three years; however, work at any specific area or Project component will not take three years to finish, and construction near any given receptor is not expected to be continuous. Construction-related sound is therefore considered a temporary and intermittent source of noise generated by the Wind Project. Activities that generate higher sound levels, such as handheld air tools or blasting at a quarry, will be less frequent and of very short duration. Nonetheless, additional noise mitigation (e.g., temporary screening) should be considered as part of construction planning once further engineering design of the Wind Project is complete and detailed construction works have been confirmed.

Furthermore, while the Wind Project construction phase may operate 24 hours a day, seven days per week, some of the noisier construction activities (e.g., blasting) will operate during daytime shift hours (where required) to minimize impacts on nearby receptors. Additionally, EVREC will operate all quarries according to the Environmental Guidelines for Mineral and Quarry Materials Exploration (NLEM, 2022).

Modelled operational sound at receptor locations is predicted to exceed the 45 dBA guidelines adopted for wind projects (Health Canada, 2024) at 97 receptors (considering all three receptor classifications, Section 6.2.3.3). OWC recommended a series of mitigations (SRMs at 69 WTGs, and removal of seven WTGs), which, when modelled, eliminated all receptor exceedances for Residential Occupation and Remote Occupation (Crown title/Expected Crown title) receptor classifications, but twelve exceedances for Remote Occupation (no Crown title) remain (OWC, 2025) (Appendix F.1). Therefore, when mitigated, noise levels for the operation of the WPA are not anticipated to exceed regulatory guidance, as Remote Occupation (no Crown title) are considered unlicensed and at times unoccupied.

6.4.5 Mitigation

To minimize construction sound/noise and the potential disturbance of receptors during the

construction phase of the Project, the following mitigation measures will be implemented, as required:

- Use noise controls (e.g., mufflers) on machinery and equipment, where applicable, to limit disturbance.
- Limit unnecessary vehicle idling.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Conduct noisier construction activities (e.g., drilling or blasting) within daytime shift hours to the greatest extent possible.
- Consider additional noise mitigation (e.g., temporary screening, rehousing) where necessary, as part of a construction noise management plan.
- Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.

To minimize disturbance from sound/noise during operation, the following mitigations will be implemented:

- Regular maintenance of turbines to ensure they are in good working order and continue to comply with sound level standards.
- Upon final selection of turbine manufacturer and detail design, operate of the 8.0 WTG in one of four SRMs for 69 WTGs, if necessary. (Appendix F.1).
- Removal of seven WTGs from the proposed layout (Appendix F.1).

The Project will develop a “good neighbour program”, to register and respond to concerns, which will consider complaints and outline a process to investigate complaints. Mitigation to resolve complaints, if determined to be necessary, will be completed on a case-by-case basis in consultation with the affected complainant. Improved baseline noise monitoring will be incorporated as part of this process to assess ambient and operational noise levels in areas of concern.

6.4.6 Monitoring

No monitoring programs are recommended at this time.

6.4.7 Conclusion

After mitigations, predicted residual effects on sound/noise are characterized in Table 6.4.5.

Table 6.4.5: Sound/Noise Residual Effects – Wind Project and Transmission

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Construction Sound/Noise Impacts to residential receptors	Conduct construction activities within the recommended daytime hours of 07:00 to 19:00 to the greatest extent possible.	A	L	LSA	ST	I	R	Not significant
Operational Sound/Noise Impacts to residential receptors	Remove specific WTGs, and operate select WTGs in SRMs.	A	L	LSA	MT	C	R	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA - Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term, MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

6.5 Shadow Flicker

6.5.1 Overview

Shadow flicker can occur when rotating blades cast flickering shadows during times of direct sunlight. The magnitude of shadow flicker is determined by the position and height of the sun, wind speed and direction, geographical location, time of year, cloud cover, turbine hub height, rotor diameter, and proximity to the turbine.

For shadow flicker to occur, the following criteria must be met:

- The sun must be shining and not be obscured by clouds/fog.
- The source turbine must be operating.
- The wind turbine must be situated between the sun and the receptor.
- The wind turbine must be facing directly towards, or away from, the sun such that the rotational plane of the blades (i.e., rotor plane) is perpendicular to the azimuth of incident sun rays. For this to occur, the wind direction would have to be parallel to the azimuth of the incidental sun rays throughout the day.
- The line of sight between the turbine and the shadow receptor must be clear. Opaque obstacles such as vegetation or tall structures between a turbine and receptor may prevent all or some shadow flicker from occurring at the receptor.
- The shadow receptor must be close enough to the turbine to be in its rotor shadow.

6.5.2 Regulatory Context

The Government of Newfoundland and Labrador has published *Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects* to provide advice for EAs in the province. However, the guidance does not specify compliance criteria regarding shadow flicker assessment, so additional guidance has been sought out.

There are no federal regulations that explicitly limit the production of shadow flicker affecting receptors. Nova Scotia has established in the Minimum Planning Requirements Regulations (Nova Scotia, 2025) a limit consistent with guidelines in many Canadian jurisdictions, including Newfoundland, of 30 hours of shadow flicker per year and 30 minutes of shadow flicker on the worst day of the year at residential receptor. These thresholds are referenced as the standard in many jurisdictions for limiting shadow flicker's effects and originate from a German federal and state working group on immission control (LAI, 2020). These guidelines have also been applied to other projects in Newfoundland including the Port au Port-Stephenville Wind Power and Hydrogen Generation Project. The Port au Port-Stephenville Wind Power and Hydrogen Generation Project Release Order (Newfoundland and Labrador, 2024a) required the Port au Port-Stephenville Wind Project to ensure that no residential receptor (including both permanently and seasonally inhabited buildings) received more than 30 minutes per day or 30 hours per year.

6.5.3 Desktop Modelling Methods

The shadow flicker assessment was completed by OWC (Appendix G.1) through modelling to achieve the following objectives:

- Identify receptors that may potentially experience shadow flicker from the Project's operation.
- Quantify the expected duration and frequency of shadow flicker for receptors over a calendar year and during the modelled worst day.
- Assess whether applicable guidelines are expected to be met.
- Propose mitigation should shadow flicker levels exceed the guideline levels.

This modelling was conducted using the wind receptors (WRIDs) outlined in Section 3.0. A series of maps of receptors relative to the site area are shown in Drawing 3.2-2A-AZ (Appendix A). The distinction between residential and remote-titled receptors is made to differentiate between buildings occupied year-round, and those where seasonality may affect whether people are impacted by shadow flicker at certain times of the year. Remote-untitled receptors are separated from the main analysis results.

Shadow flicker modelling was conducted using the SHADOW module in WindPRO (EMD International, n.d.-b). The following assumptions were made as part of the astronomical worst-case scenario, representing a highly simplified and improbable case in which key mitigating variables were omitted from consideration:

- The skies are always clear and sunlight is unobstructed by precipitation, fog, or clouds.
- The rotor plane is always perpendicular to the line from the turbine to the sun.
- The turbine is always operating at speeds sufficient to cause a flickering effect.
- The receptor building is a 'greenhouse', comprising windows on all exterior surfaces.
- There are no line-of-sight obstacles (e.g., trees, vegetation) between turbines and receptors.

Additional model parameters can be found in the shadow flicker report prepared by OWC (Appendix G.1). The period in which shadow flicker could be expected was calculated in minutes per day and cumulative hours per year for each receptor.

In addition to the astronomical worst-case scenario, a realistic scenario was also modelled to simulate more realistic assumptions that should better predict actual shadow flicker from the Project. Additional variables considered are:

- **Estimates of actual sunshine hours**
Cloud cover, precipitation, and fog can all reduce or eliminate the shadow flicker effect depending on the opaqueness of cover and scattering of the sun's rays. Weather data from St. John's was used to determine average daily sunshine hours by month as no data were available for weather stations closer to the Project.

- **Wind speed and direction**

Turbines will not spin if wind speed is below cut in or above cut out, and the axis of the blades will not always be perpendicular to the line between the receptor and the sun. Integrating wind data allows for an approximation of the timing and directionality of wind that will reduce the duration of shadow flicker.

- **Viewplane obstructions**

The PA has a high proportion of forest cover, much of which is tall enough to partially or completely obstruct views of the Project from many receptors. High resolution canopy height data was used to incorporate vegetative shading, although this was applied conservatively to account for unknowns about the actual shading capability of the canopy.

Because some of these assumptions are based on probabilistic values for weather conditions and are aggregated by month, it is not possible to model the realistic-case outputs at a daily timestep. Therefore, the realistic-case outputs are in hours per year only, and not minutes per day.

It is noted however there are still several conservative assumptions and limitations to this analysis:

- All receptors are based on a 'greenhouse mode' which assumes that shadows from WTGs in any direction from the receptor could impact the property. Shadows from directions where there is a line of sight from the window to the WTG will impact the receptor.

6.5.4 Desktop Modelling Results

Model results are presented graphically as a raster on the landscape, showing the amount of time experiencing shadow flicker. These graphics are presented for the worst-case scenario both for hours per year and minutes per day (Appendix G.1) on the day that the most shadow flicker would be expected for a given receptor (i.e., the maximum shadow minutes per day).

6.5.5 Effects Assessment

Project activities related to the Wind Project operations have the potential to create shadow flicker, and modelling predicts that this flicker may affect nearby receptors (Table 6.5.1). This effect is limited to periods when turbines are installed and operating. A flickering shadow is not likely during construction or decommissioning as turbine rotors should be locked in place at this time (Table 6.5.1).

Table 6.5.1: Potential Project-Shadow Flicker Interactions – Project Wind Component

Project Phase	Potential for Interaction
Site Preparation and Construction (2 years)	
Clearing and Grubbing	
Access Roads, Electrical Lines, Laydown Yards, Turbine Pads, Site Preparation	
Temporary works – Quarries, Batch Plants, Accommodations	
Turbine Assembly, Erection, and Commissioning	
Solar Assembly, Installation, and Commissioning	
Substation Assembly, Installation, and Commissioning	
Industrial Facility Installation, and Commissioning	
Operations and Maintenance (30 years)	
Turbine Operation	X
Solar Project Operation	
Industrial Facility Operation	
Water Withdrawal	
Inspection and Maintenance	
Decommissioning and Rehabilitation (3 years)	
Infrastructure Removal	
Site Reclamation	

In the absence of the Project, no natural features on the landscape would produce a similar steady, slowly flickering effect on stationary objects. While swaying trees and reflections off water can produce a flickering effect, they lack the regularity of wind turbines and are often more controllable by those affected by them. A frequently reported flickering phenomenon is experienced when driving by regularly spaced trees that block the sunlight, creating rapid flashes that may cause problems for individuals with epilepsy, but this effect is not comparable to wind turbines, due to the difference in flickering frequency (Knopper et al., 2014) and the stationarity of receptors for wind turbine-caused shadow flicker.

To further understand the magnitude of the shadow flicker and its potential effects on receptors, the WindPRO results were examined in the context of the vicinity of the WPA and literature on the subject. The assessment on the potential effects on human health informs the nature and necessity of mitigation recommendations.

6.5.5.1 Assessment Boundaries

Administrative Boundary

There are no broadly applicable regulations in Newfoundland and Labrador pertaining to shadow flicker, however the province has adopted an industry standard in project-specific regulations (Newfoundland and Labrador, 2024a) and generally expects the German standard (LAI, 2020) to be applied in wind projects. Therefore, 30 minutes per day on the worst day and 30 hours per year were used as thresholds for non-compliance with the guideline.

Technical Boundary

Modelling conducted with the WindPRO Shadow module (EMD International, n.d.-b) used a variety of required data sources and some additional variables in the production of a realistic-case scenario. Certain data constraints of both scenarios led to the model results likely being more conservative than experienced effects as caused by the Project once operational. These assumptions include modelling receptors as greenhouses (i.e., all windows), conservative estimates of vegetative viewplane obstruction, and more. For a complete list of constraints, see the OWC report (Appendix G.1).

Weather data from St. John's was used in modelling due to a lack of local weather stations, which may have an unknown bias on the estimates of weather's effects on shadow flicker. A key limitation in modelling is the inability to model a realistic-case scenario at the daily timestep, which would allow for a minute-per-day assessment. This is not possible when using monthly weather averages and means that the minutes-per-day threshold cannot be assessed using a scenario other than the worst case.

Nighttime shadow flicker was not analyzed due to the relative dimness of the Moon compared to the Sun, and the moon's low luminance of objects at ground level. Further complicating modelling lunar shadow flicker is the predictable but irregular path the Moon takes through the sky as it orbits the Earth while the Earth in turn both spins and orbits the Sun (Ratcliffe, 2006). For these reasons, lunar shadow flicker is not typically modelled nor a concern for effects on receptors.

Spatial Boundary

The following spatial boundaries were used to evaluate the Project shadow flicker effects and interactions (Drawings 6.5-2, Appendix A):

- The WPA, with all four subsections modelled using the same methods.
- The LSA constitutes a 2 km buffer on the WPA to encompass the outputs of shadow flicker modelling in WindPRO and the WRID receptors.

Temporal Boundary

The temporal boundaries for the shadow flicker effects assessment include only the operations and maintenance phase of the Project. Turbines must be spinning to create shadow flicker, and they will not be allowed to spin until the Project enters the operational phase. Similarly, no turbines will spin once the decommissioning phase begins.

The shadow flicker created by turbines' blades was modelled year-round to simulate the effect of changing angles of incoming solar rays.

6.5.5.2 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for shadow flicker. The VC-specific definition for magnitude is as follows:

- Negligible: no shadow flicker is experienced at any residential or remote-titled receptors.
- Low: shadow flicker is experienced at some or many of the residential or remote-titled receptors, but neither worst-case nor realistic scenario results exceed established thresholds.
- Medium: shadow flicker is experienced at some or many of the residential or remote-titled receptors, and worst-case scenario results exceed established thresholds, but realistic scenario results do not exceed established thresholds.
- High: shadow flicker is experienced at some or many of the residential or remote-titled receptors, and both worst-case and realistic scenario results exceed established thresholds.

6.5.5.3 Effects

Model results demonstrate that under both the worst- and realistic-case scenarios, there are receptors of all three types that exceed thresholds for acceptable duration of shadow flicker (Table 6.5.2). The number of non-compliant receptors (exceeding 30 hours per year) does decrease markedly between the worst-case and realistic-case scenarios. Due to limitations in modelling methods employed in the realistic-case scenario (discussed above), realistic-case scenario results are not available in minutes per day. Realistic-case scenario is shown on Drawing 6.5-2 (Appendix A) with the residential receptors. Although the number of non-compliant receptors in the worst-case scenario is similar between daily and annual scenarios for remote and non-crown title receptors, markedly more receptors in the residential class are non-compliant in the minutes per day than hours per year metric. These results suggest that proportionally more distant residential receptors are likely to be at the extreme edge of where exceedances are expected for only limited periods of the year, for example at the summer solstice when the sun sets the furthest south in the sky.

Table 6.5.2: Exceedances of Shadow Flicker Thresholds

Threshold	Number of Receptors Exceeding the Threshold		
	Residential	Remote-titled	Remote-untitled
Hours/year (worst case)	13	242	26
Hours/year (realistic case)	4	66	14
Minutes/day (worst case)	31	241	24

The exceedances at residential receptors have been mapped on Drawing 6.5-3 A-AH (Appendix A). The residential receptors impacted under the realistic-case scenario are WRID 279, 280, 503 and 504 – a cluster of four residences along Hwy 350 on the edge of the BWPA (Drawing 6.5-3 AE, Appendix A).

The realistic-case scenario, designed to provide a better indication of the duration of effects, has key limitations and makes conservative assumptions that likely lead to an overestimation of the effect as it would be experienced on the ground. The experience of shadow flicker is unique to every receptor, and a variety of factors may contribute to mitigate the effects on each receptor. The OWC report (Appendix G.1) acknowledges that the probabilistic analysis that

integrates sunshine probabilities, wind data, and vegetative screening includes several conservative assumptions. The following conditions must all occur for shadow flicker to be experienced by a receptor:

- The sun must be shining with no or minimal cloud cover.
- There must be no fog or low-altitude inclement weather that would obstruct the sun's direct rays (diffuse light such as on a cloudy day does not generate shadow flicker).
- There must be no vegetation between the sun and the receptor that would screen the shadow flicker effect.
- The wind must be blowing between the cut-in and cut-out speeds.
- Turbine blades must be oriented approximately perpendicular to the line between the receptor and the sun.
- Receptors must have windows in the direction of the turbines that are in a state to allow light inside (i.e., no curtains or shades blocking light).
- Receptors must be occupied at the time of effect.

If any of the above variables are not met, shadow flicker may not occur at all, or its effect may be greatly minimized in duration or intensity.

Shadow flicker is not associated with negative physiological health effects. Flashing lights can be problematic for people with epilepsy, but the frequency of turbines' blades spinning is not fast enough to trigger these concerns (CMOH, 2010). Shadow flicker can cause substantial annoyance, especially for those who have pre-existing negative opinions of wind turbines, and can be a detriment to quality of life for those who are subjected to frequent and lasting shadow flicker (Health Canada, 2012).

6.5.6 Mitigation

To minimize potential impacts from shadow flicker the following mitigation measures will be implemented, as required:

- Updated shadow flicker modelling once detailed engineering is completed, with further on-site investigations performed if exceedances are noted through analysis or the complaint response protocol.
- Upon final selection of turbine manufacturer and detailed design, conduct an updated shadow flicker assessment to reduce impacts to nearby receptors.
- Other mitigation can include monitoring for shadow flicker at affected receptors. Given that several of the remote receptors are not understood to be permanent residences, it is likely that shadow flicker impacts will be heavily reduced. Should complaints be received, additional mitigation measures at the property can be introduced.

Additional modelling will be undertaken following investigation at receptors with predicted exceedances to determine the actual potential for exceedance, and the nature of the receptor. This will include an examination of the location, orientation, and size of windows to provide a more accurate measure of potential effect on receptors than the highly conservative

greenhouse method employed. Receptor investigation will also help determine the pattern of habitation for each receptor and may help rule out certain receptors (especially those classified as remote) as problematic to inhabitants from a shadow flicker standpoint. Camps or cottages may only be seasonally occupied, eliminating concern for shadow flicker caused during periods of habitual non-occupation. For example, camps used as a base for hunting will be more likely to be occupied in the fall, winter, and early spring, coinciding with the hunting season for mammals and birds and outside of summer breeding and rearing seasons (NLFAL, 2025a). In this use pattern, the long shadows cast by turbines as the summer sun rises and sets in the northeast to northwest may not affect inhabitants at more distant receptors.

A “good neighbour program” will be developed to report and respond to concerns related to shadow flicker and outline a complaint investigation process. During all phases of the Project, including operations, contact information for an EVREC point of contact will be made available and displayed publicly should the public have any questions, inquiries, or complaints. The EVREC representative will respond to each communication accordingly. Each question, inquiry and complaint will be logged electronically with contributor identifying information, if provided, and the response given, date of response, and any follow-up, as required. Mitigation to resolve complaints, if determined to be necessary, will be completed on a case-by-case basis in consultation with the affected landowner and may include the provision of screening, the development of a turbine-specific curtailment plan, or a negotiated form of compensation.

To mitigate the modelled effects of shadow flicker on receptors, EVREC will undertake more detailed modelling as described above, in conjunction with receptor investigation, to better understand the effects of shadow flicker on receptors. Understanding receptor configuration and use will help characterize the nature of the effect and determine whether other measures are necessary to avoid exceeding guidelines and regulations from other jurisdictions, or from other projects.

6.5.7 Monitoring

No monitoring programs are recommended.

6.5.8 Conclusion

With recommended mitigation measures implemented and resulting shadow flicker at each residential (permanent or seasonal) receptor meeting the recommended guidelines or provision of a negotiated form of compensation, the residual effects are considered not significant (Table 6.5.3).

Table 6.5.3: Shadow Flicker Residual Effects – Project Wind Component

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Shadow flicker	Additional, more refined modelling, complaint resolution protocol, curtailment if required.	A	H Several expected exceedances of the threshold values in the shadow flicker model as run	LSA	MT Effects are expected to start with Wind Project commissioning and cease following decommissioning	I Regular depending on time of year and weather	R Temporarily reversible with cessation of rotor spin, permanently reversible with removal of turbines	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA - Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term, MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

6.6 Groundwater

6.6.1 Overview

Groundwater resources are identified as a VC for the Wind Project due to their significance to ecological, social, and economic systems. Ecologically, groundwater supports surface water flows and sustains the hydrologic function of wetlands. Socioeconomically, it serves as a primary source of potable water for private residential wells within the LSA. Project activities, including excavation dewatering, blasting, and potable groundwater supply for the accommodations camps, have the potential to directly affect the quantity (availability) and quality (chemistry) of this resource for local users.

The objective of the hydrogeology assessment was to collect the information necessary to assess potential interactions between the Wind Project and groundwater resources. This was accomplished using the following approach:

- Identify potential hydrogeological features within the WPA using desktop resources.
- Use the information collected to identify potential Project interactions and inform possible mitigation measures

6.6.2 Regulatory Context

Management and protection of groundwater resources are provincially regulated in Newfoundland and Labrador. Legislation relevant to groundwater resources includes:

- Water Resources Act (Newfoundland and Labrador, 2002c), overseen by the NLECCC's Water Resources Management Division (WRMD)
- Environmental Protection Act (Newfoundland and Labrador, 2002a)

6.6.3 Desktop Assessment Methodology

The characterization of existing groundwater conditions within the WPA was established through a review of relevant literature, publicly available provincial datasets, and reported water use information. While no Project-specific field studies were conducted, the assessment utilized a combination of historical and current records to define the hydrogeological baseline.

A literature review was performed to define the geological setting and regional hydrogeological conditions. These publications are listed in Section 3.0. Key data sources included:

- AMEC Earth & Environmental Ltd. (AMEC, 2013). Hydrogeology of Central Newfoundland.
- The provincial Drilled Water Well Database (NLECCC, 2008), supplemented by consultation with NLECCC-WRMD representatives; and
- The provincial Water Rights/Water Use License database (NLECCC-WRMD, 2025).

There were no previous hydrogeological assessment reports available specifically for the WPA.

Several data limitations exist regarding the provincial well records. Although Well Drilling Regulations have required the submission of construction records since 1981, data for wells drilled prior to this date relies on individual drilling company files and may be incomplete. Consequently, the Drilled Water Well Database may not capture all existing wells in the region. Additionally, the publicly available database only contains records up to 2008. As such, a formal request was submitted to the NLDECC-WRMD for supplemental records of wells drilled in the vicinity of the Project since that time.

Furthermore, spatial data within the provincial database is often limited; geographic coordinates for many older records are either unavailable or incorrectly referenced. As a result, the exact locations of the identified wells are not confirmed and would require field verification to establish precise proximity to Project infrastructure.

Based on the information provided by the province, a total of 31 drilled wells and 11 dug wells were identified within 500 m surrounding the WPA (Drawing 6.6-1A-J, Appendix A).

6.6.4 Desktop Assessment Results

6.6.4.1 *Groundwater Flow Conditions*

Hydrostratigraphy

The hydrogeology of the WPA is described in the regional hydrogeological study of central Newfoundland by AMEC (2013). This desktop study summarized the physical characteristics of major geological units in relation to groundwater occurrence, availability, and quality, utilizing provincial water well records for 3,080 drilled wells including 132 wells from nine communities in the vicinity of the WPA to categorize areas into hydrostratigraphic units. Analysis of these water well records allowed for the subdivision of surficial deposits into two hydrostratigraphic units and the identification of five bedrock hydrostratigraphic units, three of which are present in the assessment area. Groundwater yields varied significantly, from low (<1 L/min) to high (>650 L/min), a variance that correlates with the encountered surficial deposits and bedrock types. Table 6.6.1 provides a summary of the hydrostratigraphic units defined in AMEC (2013) that are present in the WPA.

Table 6.6.1 Surficial Deposits and Bedrock Hydrostratigraphic Units in the WPA

Hydrostratigraphic Unit	Lithology	Number Of Wells (Regional Study)	Well Yield Characteristics (L/min)		Well Depth Characteristics (m)	
			Average	Median	Average	Median
Surficial Deposits						
Unit A Moderate Yield Till Deposits	till	46	29	18	17	15
Unit B Moderate to High Yield Sand and Gravel Deposits	sand & gravel	99	102	50	23	22
Bedrock						
Unit 2 Low to Moderate Yield Sedimentary Strata	siltstone, conglomerate, argillite, greywacke, with minor volcanic flows and tuff	1,403	20	7	51	46
Unit 3 Low to Moderate Yield Volcanic Strata	basic pillow lava, flows, breccia and tuff	723	22	9	50	46
Unit 5 Low to Moderate Yield Plutonic Strata	granite, granodiorite, diabase, and diorite intrusions	688	22	9	44	37

(AMEC, 2013)

Surficial deposits in the WPA are subdivided into two broad hydrostratigraphic units, including one comprised of till deposits (Unit A), and the other predominantly of glaciofluvial sand and gravel deposits (Unit B). The till deposits in the WPA generally occur as a thin veneer less than 1.5 m thick and are not considered a significant hydrostratigraphic unit due to their shallow thickness. However, till blanket deposits with more significant thickness up to 20 m occur locally in the TLWPA and BWPA and may support viable aquifer systems. AMEC (2013) reported Unit A as having moderate well yield potential with yields from 46 well records averaging 29 L/min (ranging from 2 L/min to 136 L/min) and well depths averaging 17 m (ranging from 9 m to 50 m). Of the 46 well records for Unit A, one record representing local conditions within the AA is from Botwood, drilled in 1996. This local well record indicates a yield higher than the regional typical for Unit A, with a reported yield of 90 L/min and a shallower well depth of 12 m.

The sand and gravel deposits associated with Unit B are localized and limited to stream and river channels, and do not represent an important hydrostratigraphic unit in the WPA owing to their limited spatial extent.

The bedrock underlying the WPA is mainly classified as Hydrostratigraphic Unit 3. This unit consists of relatively unmetamorphosed Ordovician-Silurian volcanic rocks, including pillow lavas, flows, breccias, and tuffs, along with associated sediments. While lithology and textural characteristics influence the unit's storage capacity, groundwater movement is expected to be primarily dictated by secondary porosity associated with structural discontinuities (fractures, joints and faults). Unit 3 is assessed as having a low to moderate well yield potential with yields from 723 well records averaging 22 L/min (range: 0.1 L/min to 255 L/min) and well depths averaging 50 m (range: 5 m to 159 m). This unit makes up the majority of the BWPA, SLWPA, and LTWPA, as well as the northern portion of the TLWPA. Of the 723 well records for Unit 3, 63 records inferred to represent local conditions within the WPA are from Leading Ticks and Glovers Harbour (vicinity of LTWPA), and Philips Head and Point of Bay (vicinity of BWPA), drilled between 1967 – 2002. These local well records indicate yields lower than the regional typical for Unit 3, averaging 17 L/min and 47 m depth for the 63 wells.

Hydrostratigraphic Unit 2 and Unit 5 occur less commonly in the assessment area. Unit 2 comprises Ordovician to Silurian age siliciclastic sedimentary rocks (sandstone, siltstone, conglomerate, argillite, and greywacke) that have undergone moderate metamorphism. While these sediments may possess primary intergranular porosity influenced by grain characteristics (roundness, sorting) and cementation, groundwater movement is predominantly governed by secondary porosity associated with structural discontinuities. Unit 5 comprises an Ordovician to Devonian age plutonic suite, consisting of granite, granodiorite, diabase, and diorite intrusions. These intrusive rocks possess negligible primary porosity due to their interlocking crystalline texture, and permeability is solely dependent on the presence of secondary structural discontinuities. Both Unit 2 and Unit 5 are reported as having low to moderate potential. For Unit 2, 1,403 well records indicate well yields averaging 20 L/min (range: 0.1 L/min to 491 L/min), with well depths averaging 51 m (range: 7 m to 219 m). For Unit 5, 688 well records indicate well yields averaging 22 L/min (range: 0.1 L/min to 550 L/min), with well depths averaging 44 m (range: 9 m to 207 m). Unit 2 is mainly present in BWPA; while Unit 5 is a dominant hydrostratigraphic unit in TLWPA and occurs locally in the BWPA. Of the 1,403 well records for Unit 2, 65 records inferred to represent local conditions within the assessment area are from Botwood, Wooddale, Northern Arm and Point Lemington (vicinity of BWPA), drilled between 1966 – 2007. These local well records indicate yields higher than the regional typical for Unit 2, averaging 27 L/min and 51 m depth for the 65 wells. None of the wells used to define Hydrostratigraphic Unit 5 are located in the vicinity of the assessment area.

No known hydraulic conductivity testing has been completed in the hydrostratigraphic units of the assessment area. However, these regional hydrostratigraphic units are defined by a wide variety of rock types, each with its own unique hydraulic properties. Consequently, the rocks in the assessment area are expected to display a broad range of hydraulic conductivity values, potentially differing by multiple orders of magnitude.

Groundwater Levels and Flow Directions

Based on information for existing water wells, which indicates an absence of significant low-permeability layers (aquitards) directly overlying the water-bearing zones, WPA is inferred to

be underlain by an unconfined aquifer system contained within the underlying mixed siliciclastic sediment, volcanic and plutonic bedrock. Groundwater flow in these diverse rock types occurs via primary (e.g., intergranular) and secondary (e.g., fractures, joints, faults) porosity. Flow characteristics are variable, depending on the density and interconnectivity of primary depositional/textural features and secondary structural discontinuities. Semi-confining to confining conditions may be present at depth due to an increase in lithostatic pressure resulting in fracture closure and reduced permeability of some rock types with depth.

Groundwater flow within WPA is assumed to be primarily controlled by water table conditions and variations in topography. Based on a review of topographic maps, this means groundwater generally flows from higher-elevation recharge areas (where hydraulic head is higher) toward lower-elevation discharge areas (where hydraulic head is lower), following the regional topography. All four Wind Project sub areas as well as the connecting road/transmission line to the LTWP occur in high ground areas and are inferred to be regional areas of groundwater recharge in the WPA. Major regional discharge features include South Twin Lake in the TLWPA, New Bay Pond and Peters Pond in the BWPA, as well as coastal areas bordering the WPA north of the LTWP and east and north of the BWP. The shallow groundwater system is expected to be largely controlled by surface runoff and local recharge, and wetlands, ponds, rivers, and lakes within the assessment area serve as discharge points within this shallow system. Information from water well records in the vicinity of the WPA, coupled with the presence of multiple streams and standing water, suggests groundwater levels are generally shallow (within 8 m of the ground surface) and are a subdued reflection of the topography in the area.

6.6.4.2 Local Groundwater Users and Public Water Supplies

There are no public groundwater supply wells in the WPA. A review of the provincial Drilled Water Well Database and a potable well search conducted by NLECCC for this project identified a total of 31 drilled wells and 11 dug wells within a 500 m buffer of the WPA (Drawing 6.6-1A-J, Appendix A). These wells are situated specifically within the communities of Botwood, Peterview, Northern Arm, Phillips Head, and Point Leamington, as well as in outlying areas primarily associated with private developments located outside of municipal boundaries.

All the reported wells in these areas are used as private domestic water supplies, including one well misclassified in the database located in a low-density development area along the northern shoreline of New Bay Pond. In addition, although not recognized as a protected public water supply, a spring, locally referred to as Dwyer's Spring that may serve as a potable water source for local residents, is located in the BWPA along the north shoulder of the New Bay Pond access road (Drawing 6.6-1C, Appendix A). The nearest well is 174 m from the PF and 244 m from the nearest turbine.

The locations of all groundwater source Water Rights/License holders in the provincial database (NLECCC-WRMD, 2025) were mapped to determine if major non-domestic groundwater users were present in the Project area. Based on this analysis no registered active non-domestic groundwater withdrawal approvals were identified within 500 m of the

WPA.

A total of six public surface water supplies border the WPA. The protected public water supply areas (PPWSA) for these are shown on Drawing 6.6-1A-J (Appendix A) and include:

- Northern Arm Lake (WS-S-0291): Public water supply for the Town of Northern Arm.
- Muddy Hole Pond (WS-S-0514): Public water supply for the Town of Northern Arm.
- Dogberry Brook (WS-S-0538): Public water supply for the community of Phillips Head.
- Indian Cove Pond (WS-S-0559): Public water supply for the community of Point of Bay.
- Little Pond (WS-S-0556): Public water supply for the community of Point Leamington.
- Cook's Pond (WS-S-0407): Public water supply for the community of Leading Tickles.

While these six PPWSAs border the WPA, they are excluded from the groundwater resources assessment since they are situated within separate drainage basins that are expected to lack hydraulic connectivity to groundwater resources in the WPA.

6.6.4.3 Groundwater Quality

No known groundwater quality data exists directly for the WPA. Characterization of groundwater quality is therefore based on a regional compilation of public drinking water well quality data for Central NL prepared by the NLECCC (2026b). This dataset is informed by public supply water well data from communities across the region, including Laurenceton (15 km), Stanhope (24 km), and Campbellton (35 km), which represent the closest communities with available well data. Public drinking water wells are sampled every two to three years to provide an overview of groundwater quality across the province. The summary of the Central Region dataset used for this assessment includes data collected up to October 30, 2020.

A summary of groundwater quality data for Central Newfoundland is provided in Table 6.6.2 below.

Table 6.6.2: Summary of Provincial Public Water Well Groundwater Quality Data for Central Newfoundland

Parameter	Samples	Minimum	Maximum	Average	Median	GCDWQ ¹	Units
Alkalinity	175	7	496	48.28	19	N/A	mg/L as CaCO ₃
Color	175	0	340	14.53	0	15 (A)	TCU
Conductivity	175	36	1310	191.79	128	N/A	µS/cm
Hardness	176	0	223	48.53	24	N/A	mg/L as CaCO ₃
pH	175	5.89	8.47	7.03	6.66	7.0–10.5 (A)	N/A
Total Dissolved Solids (TDS)	175	23	852	122.41	83	500 (A)	mg/L
Turbidity	175	0	22	0.72	0.20	1 (C)	NTU
Boron	176	0	0.28	0.01	0.01	5 (C)	mg/L
Bromide	175	0	0.72	0.02	0.00	N/A	mg/L
Calcium	176	0	73	15.46	8	N/A	mg/L
Chloride	175	3	336	26.28	17	250 (A)	mg/L
Fluoride	175	0	0.36	0.05	0.00	1.50 (C)	mg/L

Parameter	Samples	Minimum	Maximum	Average	Median	GCDWQ ¹	Units
Potassium	176	0	3	0.68	1	N/A	mg/L
Sodium	176	0	230	17.97	11	200 (A)	mg/L
Sulphate	175	3	78	9.03	6	500 (A)	mg/L
Ammonia	176	0	0.32	0.02	0.00	N/A	mg/L
Dissolved Oxygen Content (DOC)	176	0	35.40	2.00	0.50	N/A	mg/L
Nitrate + Nitrite	175	0	1.92	0.26	0.17	10 (C)	mg/L
Kjeldahl nitrogen	176	0	0.760	0.083	0.000	N/A	mg/L
Total phosphorus	176	0	0.12	0.020	0.01	N/A	mg/L
Aluminum	176	0	1.25	0.09	0.00	2.9	mg/L
Antimony	168	0	0.0005	0.0001	0	0.0060 (C)	mg/L
Arsenic	177	0	0.0060	0.0010	0.0000	0.01 (C)	mg/L
Barium	176	0	0.03	0.01	0.00	2.0 (C)	mg/L
Cadmium	177	0	0.000	0.0000	0	0.0070 (C)	mg/L
Chromium	176	0	0.003	0.0000	0.0000	0.05 (C)	mg/L
Copper	176	0	5.430	0.042	0.001	2.0 (C)	mg/L
Iron	176	0	2.40	0.16	0.000	0.1 (A)	mg/L
Lead	177	0	0.029	0.001	0	0.0050 (C)	mg/L
Magnesium	176	0	11	2.44	1	N/A	mg/L
Manganese	176	0	0.59	0.034	0.010	0.12 (C)	mg/L
Mercury	176	0	0.00005	0.00001	0	0.0010 (C)	mg/L
Nickel	176	0	0.008	0.0007	0	N/A	mg/L
Selenium	176	0	0.004	0.0002	0	0.05 (C)	mg/L
Uranium	168	0	0.016	0.0009	0	0.02 (C)	mg/L
Zinc	176	0	0.330	0.0064	0	5 (A)	mg/L

⁽¹⁾ Guidelines for Canadian Drinking Water Quality Summary Table (Health Canada, 2025)

N/A = No applicable criteria

mg/L = milligram per litre

µS/cm = microsiemens per centimeter

TCU = True colour units

NTU = Nephelometric Turbidity Unit

CaCO₃ – Calcium carbonate

(A) – Aesthetic

(C) – Contaminant

Based on the regional dataset, which includes analytical results for up to 177 samples depending on the specific parameter, groundwater in Central NL exhibits a range of results, with several parameters exceeding the Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada, 2025). Analytical results for pH range from 5.89 to 8.47, with a median of 6.66, which is below the aesthetic objective range of 7.0–10.5. Aesthetic parameters including color (maximum 340 TCU), turbidity (maximum 22 NTU), and TDS (maximum 852 mg/L) show localized elevations exceeding guidelines. Concentrations of metals also exhibit exceedances. Concentrations of iron and manganese are measured at levels up to 2.40 mg/L and 0.59 mg/L, respectively, exceeding their applicable aesthetic and health-based guidelines. In addition, the regional data indicate that lead (maximum 0.029 mg/L) and copper (maximum 5.43 mg/L) concentrations exceed applicable guidelines in specific locations.

6.6.5 Effects Assessment

An overview of the potential interactions between the Project and groundwater resources by Project phase (construction, operation, and decommissioning) in the WPA are presented in Table 6.6.3. These interactions were identified by integrating the Project description with baseline conditions established through the desktop assessment.

Table 6.6.3: Potential Project – Hydrogeology Interactions – Wind Project and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	-
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	-
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	-

The Project components and activities anticipated to interact with groundwater resources within the WPA include:

- Construction activities such as clearing and grubbing of vegetation and soils, blasting, and earthworks for the development of the road network, WTG pads, and site buildings.
- Construction excavation dewatering for WTG pads and site building foundations.
- Water withdrawal of groundwater for potable supply at the four temporary accommodation camps during the Project construction phase, and the two permanent accommodation camps during the Project operation phase in the WPA.

- Discharge of treated domestic sewage from septic systems at the temporary accommodation camps during the Project construction phase and permanent accommodations camps during the Project operations phase.
- Decommissioning activities involving earthworks and potential dewatering for the removal of infrastructure, including the restoration of site surfaces and foundation areas.
- Potential accidental releases of hazardous substances or dust-suppression agents during construction and maintenance across all Project phases.

These interactions have the potential to result in measurable changes to groundwater quantity and quality.

6.6.5.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries for groundwater resources in the WPA are established by several provincial and federal requirements, as well as the Project-specific EIS Guidelines (NLECCC, 2025). Under the Water Resources Act (2002b), the NLECCC-WRMD holds legislative authority for provincial water management. Relevant regulations under this Act include:

- Environmental Control Water and Sewage Regulations (Newfoundland and Labrador, 2003b): Sets effluent limits for discharges to surface water, including groundwater baseflow.
- Well Drilling Regulations (Newfoundland and Labrador, 2003c): Defines technical standards for the construction and abandonment of water supply wells (NLR 63/03).

Management of accidental releases is governed by the (NLECCC, 2014) Guidance Document for the Management of Impacted Sites through the Atlantic Risk-Based Corrective Action (RBCA) Version 4.0 process (Atlantic RBCA, 2022). This approach utilizes Tier I Environmental Quality Standards (EQS) and Tier II Pathway-Specific Standards (PSS). The Ecological Tier II PSS for groundwater >10 m from surface water is applied to protect freshwater aquatic life, based on the assumption of groundwater discharge to a receiving water body.

Groundwater suitability and baseline assessments for potable use and the protection of human health follow the GCDWQ (Health Canada, 2025). These establish Maximum Acceptable Concentrations (MAC) for health and Aesthetic Objectives (AO) for physical and chemical parameters, serving as the basis for potability.

Technical Boundary

Technical boundaries for the assessment of groundwater resources are defined by specific information and data constraints. A spatial coverage gap exists due to the absence of Project-specific hydrogeological field data (e.g., including borehole logs, in-situ hydraulic conductivity testing, groundwater level monitoring, and groundwater quality sampling) within the WPA. Current characterization relies on regional geological mapping and community and private well records. As such localized water table depth, soil and bedrock permeability and groundwater

quality at specific Project infrastructure sites remain unconfirmed. As a result, the confidence level for localized spatial predictions is moderate.

A temporal gap is also present as available groundwater quality data represents historical sampling events rather than continuous monitoring. This limits the characterization of seasonal fluctuations in groundwater quality. Due to the lack of long-term continuous monitoring data, the confidence level regarding the range of natural variability is low to moderate.

Furthermore, an analytical gap exists because the assessment utilizes topography as a proxy data set to predict groundwater behavior in the absence of groundwater elevation monitoring. It is assumed that an unconfined aquifer system underlies the WPA and that groundwater flow follows surface terrain and that flow aligns with surface drainage basins. This assumption may not account for localized hydraulic conditions or variations in groundwater flow associated with perched or confined aquifers, resulting in a moderate confidence level for flow direction interpretations.

To manage these uncertainties, the assessment employs a conservative characterization strategy. Assumptions are weighted to ensure that potential risks to receptors, particularly local potable well water supplies, are accounted for in the analysis. These technical boundaries will be addressed through site-specific drilling and hydrogeological testing and monitoring during Project pre-construction geotechnical programs.

Spatial Boundary

Spatial boundaries for the assessment of groundwater resources are established to define the geographic extent within which Project-related effects are evaluated (Drawing 6.6-1A-J, Appendix A). These boundaries are determined by the physical footprint of the Project and the hydraulic characteristics of the surrounding landscape.

The LSA is defined by a 500 m buffer extending from the PA. This boundary is established to evaluate the geographic extent where direct and indirect subsurface interactions with groundwater resources such as changes in infiltration, soil and bedrock disturbance, or localized water table and groundwater quality variations are likely to occur. A 500 m radius is utilized as a conservative radius of influence to specifically account for potential blasting effects on groundwater resources, including vibration-induced turbidity and alterations to fracture connectivity within bedrock aquifers, as well as effects due to localized construction-related dewatering. This distance aligns with the *Groundwater Supply Assessment and Reporting Guidelines for Subdivisions Served by Individual Private Wells* (NLECCC-WRMD, 2009), which require a 500 m characterization radius to identify sensitive receptors and potential sources of interference related to residential development.

The RSA encompasses the limits of the drainage catchment areas that overlap with the PA. This boundary is based on the principle that groundwater flow and potential migration pathways are governed by watershed-level drainage patterns. By utilizing catchment limits, the assessment accounts for the hydrogeological context and evaluates potential connectivity with

receptors that fall within the same drainage basins as the Project components.

Temporal Boundary

The temporal boundaries for the groundwater effects assessment include the site preparation and construction (3 years), operation and maintenance (32 - 33 years), and decommissioning and rehabilitation (up to 2 years) phases of the Project.

6.6.5.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to groundwater. The VC-specific definition for magnitude defines the degree of change to groundwater resources relative to baseline conditions. For this assessment, these changes are evaluated specifically in the context of well yield (L/min) for existing water well users, the reduction in groundwater-derived baseflow (as a percent) for surface water features, and the concentration of chemical parameters compared to applicable water quality guidelines as follows:

- Negligible: No measurable change to groundwater resources relative to baseline. There is no detectable reduction in well yields, no change in the percentage of groundwater contributing to baseflow, and no change in the concentration of chemical parameters.
- Low: A measurable change is detectable but remains within the normal variability expected relative to baseline. This includes minor fluctuations in well yield, baseflow percentage, or chemical concentrations that do not impair the long-term integrity of a water supply or ecological receptor or exceed the natural range of baseline water quality.
- Moderate: A measurable change occurs that is considered elevated above, or depressed below, baseline but remains within acceptable limits or regulatory objectives. This includes a distinct reduction in well yield or baseflow percentage that does not impair the overall function of the water supply or ecological receptor, and chemical concentrations that remain within applicable regulatory guidelines, specifically the GCDWQ for wells and CCME Water Quality Guidelines for the Protection of Aquatic Life (FAL) for ecological receptors.
- High: A measurable change occurs that is considered elevated above acceptable limits or regulatory objectives. This includes a reduction in well yield that interferes with domestic or industrial supply, a substantial reduction in baseflow percentage, or chemical concentrations that exceed the GCDWQ or CCME FAL at a receptor location.

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

6.6.5.3 Effects

The Project interactions with groundwater noted above have the potential to result in measurable changes to groundwater quantity and quality. These potential effects are discussed separately in the following sections.

Changes in Groundwater Quantity

Groundwater resources may be affected by Project site preparation, infrastructure construction, and decommissioning activities through both direct and indirect pathways. Direct effects occur through immediate physical interaction with the subsurface, such as excavation dewatering, the extraction of water for potable supply, and the physical alteration of the aquifer during blasting. These activities can cause a measurable change in groundwater quantity at the time and location of the activity.

Indirect effects result from Project-related changes to the land surface that subsequently alter regional hydrogeological processes. Groundwater is recharged from the surface via infiltration through porous rock, soils, and bedrock fractures. As such ground disturbance during site preparation, construction, and decommissioning activities within the WPA have the potential to affect groundwater quantity by altering recharge volumes. These secondary consequences of site development and may eventually affect the yield of well water supplies and the percentage of baseflow supporting ecological receptors.

Effects of Excavation Dewatering on Groundwater Quantity

The primary Project activity expected to result in a direct effect on groundwater quantity within the WPA is possible construction-related excavation dewatering. This is mainly associated with WTG foundations, though dewatering may also be required for site buildings.

Where a shallow water table is encountered during excavation, temporary dewatering will be required to allow for foundation installation and the proper curing of concrete. This process will require physical removal of groundwater to maintain a dry work area, creating a localized lowering of the water table (drawdown) and altering flow pathways immediately surrounding the excavation. If water supply wells or fish-bearing streams are situated within the resulting cone of depression, this could temporarily reduce the available well yield (L/min) or the percentage of baseflow supporting aquatic receptors.

The distance over which water table drawdown could be measurable in response to dewatering for the construction of foundations is known as the Radius of Influence (ROI). Consistent with the methodology used in the approved GH2 EIS (Stantec, 2023), the ROI was estimated using the Sichardt and Kryieleis method (Powers et al., 2007) as follows:

$$ROI = 3000(H - h)\sqrt{K}$$

Where:

ROI = Radius of influence of dewatering from the edge of the excavation (m)

H = Depth of the excavation (m)

h = Depth to water table (m)

K = Hydraulic conductivity of the aquifer (m/s)

In the absence of Project-specific field data, the parameters for the ROI calculation were conservatively estimated based on regional data and literature values. The depth of excavation (H) was set at 5 m based on the upper range of the current design specifications for the WTG

foundation depths. To account for a conservative "worst-case" scenario regarding dewatering requirements, the depth to the water table (h) was assumed to be at 2.0 m, representing the shallowest water level measurement recorded in the regional water well database. The hydraulic conductivity (K) was assumed to be 4×10^{-6} m/s. This value is based on the upper range K estimate for till provided in Fetter (2001) and is considered a conservatively representative estimate for both the soil and the underlying fractured bedrock typically encountered during excavation in the WPA. These values ensure that the resulting ROI provides a conservative spatial boundary for assessing potential interactions with existing water wells in the LSA.

Based on the analytical parameters described, the calculated ROI for WTG foundation dewatering is 18 m from the edge of the excavation. This ROI is also conservatively applied to other building foundations in the WPA, including the collector system structural foundations, the accommodation camps and other ancillary buildings. While the design depth for the collector system foundations is specified at 3 to 4 m, the final design for other buildings is not currently finalized; however, it is assumed these will be shallower than the 5 m depth used for the WTG foundations.

As the LSA extends 500 m from the WPA footprint, this ROI distance remains well within the assessment boundaries. Further, given that all documented water wells in the LSA are situated at distances greater than 18 m from planned infrastructure locations, no measurable reduction in well yield in local existing water wells is anticipated. Additionally, no significant surface water features were identified within the 18 m ROI; therefore, no impacts to ecological receptors are predicted. Consequently, dewatering activities are not expected to affect the availability of groundwater for existing users.

Effects of Extraction of Water for Potable Supply

To support the construction workforce, the Project includes the construction of four proposed accommodation camps, including two located within the BWPA and two within the TLWPA. These facilities will provide housing for approximately 1,000 people per camp during the construction phase, reducing to between 50 to 100 people in two camps during the operations phase. A groundwater supply is proposed to meet the potable water requirements for these camps, with a projected demand of 350 L/day per person.

The proposed use of groundwater at these locations will require localized withdrawals to meet potable needs. The evaluation of these groundwater supply systems, including pumping tests to confirm sustainable well yield and assessments of potential interference with existing users, will be completed as part of the provincial Water Use License and the non-domestic well construction permit application processes. These regulatory requirements involve the technical validation of final well locations and pumping rates to manage potential effects on the local aquifer and nearby receptors prior to operation.

Effects of Blasting on Groundwater Quantity

Blasting may be required during the construction and decommissioning phases of the Project

to facilitate access road construction, WTG pads, site building foundations, and quarry operations. These activities have the potential to impact groundwater quantity by altering bedrock fracture networks, which may result in changes to flow for water wells in the LSA and the volume of baseflow supporting surface water features.

Physical changes to the rock mass during blasting could partially or fully seal fractures that currently provide water to nearby wells or discharge as baseflow to streams and wetlands. Conversely, blasting may open new fracture networks or expand existing ones, potentially increasing or redirecting the volume of water available to these receptors.

Blasting may be necessary for WTG and site building foundations where competent bedrock is encountered at shallow depths, as well as in select locations where the road network needs to achieve design grade. It is anticipated that only a small fraction of the identified wells and surface water features will be located within 500 m of a blasting point. Furthermore, vibration levels decrease with distance from the source, reducing the potential for significant structural or hydraulic changes at greater radii.

Impacts to baseflow from blasting are generally anticipated to be localized. While alterations to the bedrock can shift groundwater flow paths, the overall catchment area contributing to surface water features is expected to remain largely unchanged. Any measurable changes to the percentage of baseflow in nearby streams are expected to be minor and restricted to the immediate vicinity of the blasting zone.

Should blasting be required, a certified contractor holding a valid NLECCC certificate will develop a blast design for approval. This design must maintain vibrational limits relative to infrastructure, buildings, and fish habitat, with a predicted zone of influence defined confirmed prior to work. An Explosives and Blasting Management Plan will be implemented to govern the safe handling of explosives and protect Project personnel, the public, and the environment. As part of this plan, a pre-blast survey of all structures and water wells within the predicted blasting zone of influence will be conducted to establish baseline performance and integrity.

Effects of Site Preparation and Construction

In addition to the direct effects from dewatering, water supply extraction, and blasting, indirect effects may occur due to ground disturbance during construction and decommissioning (such as clearing, grubbing, and grading). Surface alterations can affect groundwater quantity by changing recharge volumes, which may influence well supply and baseflow supporting ecological receptors.

General earthworks can modify infiltration rates as surface permeability is altered across the PA. While these changes could impact the volume of water recharging water-bearing fractures, the planned infrastructure accounts for only 13% of the total surface area of the WPA. Furthermore, runoff from less permeable surfaces, such as roadways, will be directed to constructed ditches or undisturbed areas. This will result in redistribution of water within the WPA and contribute to restoration of aquifer recharge to pre-construction conditions.

Changes in Groundwater Quality

Potential changes to groundwater quality in the WPA are associated with physical disturbances to the subsurface and the introduction of substances during the construction, operation, and decommissioning phases. These interactions have the potential to affect the underlying aquifer and associated receptors, including water supply wells and ecological features. The potential interaction pathways are described below.

Dewatering activities during foundation excavation or infrastructure removal can alter local hydrogeological systems. These changes can lead to negative impacts on groundwater quality, primarily through the mobilization of contaminants and increased sedimentation. The most common quality change associated with these activities is increased turbidity and total suspended solids (TSS).

Blasting required for site grading or foundation work can impact quality through chemical and physical pathways. Physical vibrations can expand bedrock fracture networks and mobilize fine sediments, potentially increasing turbidity and concentrations of chemical parameters. Additionally, nitrogen-based explosive residues could be introduced into the groundwater system if not fully detonated.

General earthworks, including clearing, grubbing, and grading, can indirectly affect groundwater quality by enhancing infiltration through disturbed soils and bedrock with altered permeabilities. In areas with highly permeable, coarse soils or fractured bedrock near the surface, there may be a reduction in natural filtration capacity, making the subsurface more susceptible to rapid contamination

The operation of on-site septic systems at the temporary and permanent accommodation camps will result in the discharge of domestic sewage into the subsurface. This activity has the potential to alter the chemical and bacteriological quality of the underlying aquifer.

The potential for accidental surface releases of hazardous substances, including petroleum hydrocarbons and other contaminants, as well as the application of dust-suppression agents, exists for all Project phases. These substances have the potential to infiltrate the underlying soil and bedrock fracture network, leading to localized degradation of water quality.

6.6.6 Mitigation

6.6.6.1 *Mitigation Measures – Groundwater Quantity*

The following mitigation and environmental protection measures will be implemented during Project site preparation, infrastructure construction, and decommissioning to minimize or eliminate residual effects on groundwater quantity:

- **Dewatering Management:** Should dewatering be required for foundation excavation or infrastructure removal, the extracted groundwater will be directed to vegetated areas or sediment control structures to facilitate natural infiltration. Given that all documented

water wells in the LSA are situated at distances greater than 18 m from planned infrastructure, no measurable reduction in well yield is anticipated.

- Potable Water Supply Extraction: Prior to the operation of the accommodation camps, the proposed groundwater supply systems will undergo technical validation, including pumping tests, to confirm sustainable well yields. These assessments will be completed during the provincial Water Use License and non-domestic well construction permit application processes to manage potential interference with existing users and ensure the local aquifer can support the projected demand of 350 L/day per person.
- Recharge and Surface Water Management: To maintain regional hydrogeological processes, runoff from less permeable Project surfaces, such as access roads and turbine pads, will be directed to constructed ditches or undisturbed areas. This allows for the redistribution of water within the WPA and contributes to the restoration of aquifer recharge to pre-construction conditions. The PF will be limited to the minimum area necessary accounting for only 13% of the total WPA to preserve natural infiltration through porous rock, soils, and bedrock fractures. Draft and implement a Water Management Plan (Appendix Q.12) to support drainage, and ensure water quality conforms to applicable regulations and guidelines.
- Decommissioning and Site Restoration: During the decommissioning phase, Project infrastructure will be removed to a depth determined by final engineering and regulatory requirements, and the areas will be graded and contoured to restore natural drainage where possible. Temporary construction areas will be de-compacted to restore soil permeability, allowing long-term groundwater recharge volumes and baseflow supporting ecological receptors to return to baseline levels.

6.6.6.2 Mitigation Measures – Groundwater Quality

The following mitigation and environmental protection measures will be implemented during Project site preparation, construction, operation, and decommissioning activities to minimize or eliminate residual effects on groundwater quality:

- Dewatering Management: Should dewatering be required for foundation excavation or infrastructure removal, the extracted groundwater will be pumped to a vegetated area or a sediment control structure to allow for natural filtration before re-entering the groundwater system. This ensures water quality at receptor locations does not deviate from baseline conditions for an extended duration.
- Explosives and Blasting Management Plan: Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.
- Septic System Compliance: The accommodation camps septic systems will be designed, sited, and operated in accordance with provincial Environmental Control Water and Sewage Regulations. These systems will be properly decommissioned and the sites restored following the construction phase.
- BMPs: Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous

substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed. Maintain a minimum 30 m vegetated buffers surrounding watercourses, where possible.

- Erosion and Sediment Control: Runoff from disturbed areas and less permeable surfaces, such as roadways, will be directed toward vegetated buffers or constructed ditches to facilitate natural filtration of fines before recharge occurs.

6.6.7 Monitoring and Follow-up

Aligned with the 2025 EIS Guidelines (NLECCC, 2025) and to verify the accuracy of the effects predictions presented above, a groundwater monitoring program will be established. This program will be designed to manage technical uncertainties and will provide data on the integrity of local existing water wells and ecological receptors.

- Hydrogeology data will be collected as part of the planned Project geotechnical programs. These programs will include the installation of monitoring wells at select infrastructure locations to confirm localized depth to the water table, hydraulic conductivity, and baseline water quality.
- Pumping tests and water quality sampling will be conducted for new camp supply wells to verify sustainable yield and meet provincial permitting requirements. Monitoring of groundwater levels and quality during testing will ensure new Project wells do not interfere with existing private well supplies in the LSA.
- Consistent with the requirements of the NLECCC-WRMD, the Project will evaluate the installation and operation of real-time water monitoring stations intended to monitor groundwater levels and select chemical parameters to detect changes in quantity or quality. The specific number, location, and technical specifications of these stations will be determined based on further consultation with the NLECCC.
- For infrastructure requiring blasting, a monitoring program will be implemented for water wells within the predicted zone of influence. This will include pre- and post-blast water quality sampling and structural inspections to monitor vibrational effects and bedrock integrity.
- In the event of a recorded release of hazardous materials, the Hazardous Substances Management and Spill Prevention Plan will trigger subsurface investigation and, if necessary, the installation of wells to monitor for the migration of constituents.

6.6.8 Conclusion

Foundation dewatering is calculated to have a predicted radius of influence of approximately 18 m, placing all 42 identified private wells and Dwyer's Spring beyond the extent of drawdown. Potential influences on groundwater quality from construction activities, such as turbidity or nitrogen-based blasting residues, will be managed through engineered controls and the application of industry best practices to maintain the suitability of local potable water supplies.

Project infrastructure occupies approximately 13% of the total WPA, allowing most precipitation to infiltrate the ground surface and maintain regional recharge capacity, local well yields, and groundwater discharge to wetlands and streams. New Project supply wells will be subject to

hydrogeological testing and provincial permitting requirements to ensure no interference with existing users or the surrounding environment. Based on these factors, residual environmental effects on groundwater resources in the WPA related to this Project are predicted to be low in magnitude, localized, and reversible, with no significant adverse effects anticipated.

After mitigations, predicted residual effects on groundwater are characterized in Table 6.6.4.

Table 6.6.4: Hydrogeology Residual Effects – Wind Project and Transmission

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Groundwater Quantity (Dewatering and Supply)	Sustainable yield testing and provincial permitting of Project supply wells; 18 m calculated ROI for dewatering; monitoring of private wells.	A	L	LSA	MT	I	R	Not significant
Groundwater Quality (Construction and Blasting)	Engineered controls; secondary containment; blast management best practices; pre-blast surveys within zone of influence.	A	L	LSA	ST	I	R	Not significant
Recharge Maintenance (Infrastructure Footprint)	Minimize footprint (13%); utilize vegetated buffers and perimeter ditches to facilitate natural infiltration.	A	L	PA	LT	C	R	Not significant

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term, MT – Medium Term, LT – Long Term

Frequency: SE – Single Event, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

6.7 Surface Water

6.7.1 Overview

The objective of the surface water assessment was to inform the Project's design and collect the information necessary to assess potential impacts to surface water and fish habitat (assessed separately in Section 6.8) resulting from the Project within the WPA. This was accomplished using the following approach:

- Identify and characterize potential water resources and use within the WPA using desktop resources and predictive methods.
- Use the information collected to inform Project design (e.g., avoid/minimize impacts to surface water).
- Completed baseline watercourse crossing assessments at a subset of locations based on stream classifications driven by upstream drainage area and guidance from DFO.
- Use the information collected to inform mitigation and monitoring programs.

6.7.2 Regulatory Context

Under the *Water Resources Act* (Newfoundland and Labrador, 2002c), NLECCC has the authority to control, protect, and manage water resources to ensure the continuing availability of clean water for the environmental, social and economic well-being of the province. Alterations to bodies of water require provincial approval.

The *Water Resources Act* defines a body of water as:

“a surface or subterranean source of fresh or salt water within the jurisdiction of the province, whether that source usually contains liquid or frozen water or not, and includes water above the bed of the sea that is within the jurisdiction of the province, a river, stream, brook, creek, watercourse, lake, pond, spring, lagoon, ravine, gully, canal, wetland and other flowing or standing water and the land occupied by that body of water”.

Using this definition and the parameters listed in the Guidelines for Applying to Alter a Body of Water (Newfoundland and Labrador, 2018c), surface water features were identified and described throughout the WPA to support the assessment of effects to regulated water bodies, which may require provincial approval.

Although the *Water Resources Act* defines a body of water as “surface or subterranean”, this section focuses on surface water features. Potential effects to groundwater as a result of Wind Project and transmission activities are described in Section 6.6. Similarly, potential effects to wetlands as are discussed in Section 6.9.

6.7.3 Desktop Assessment Methods

A desktop study was conducted to identify all potential permanent and intermittent bodies of water that intersect or are located within 5 km of the WPA. Potential surface water features

were identified using the following sources:

- Provincial Land Cover (NLFAL, 2025h)
- Federal CanVec watercourse and waterbody shapefiles (NRCan, 2023)
- Provincial digital elevation model (NRCan, 2024a)
- Newfoundland and Labrador Land Use Atlas (Newfoundland and Labrador, 2025d)
- Newfoundland and Labrador Angler's Guide (DFO, 2025d)
- Water Resources Portal (NLECCC, 2022)

Modelled watercourses were classified and characterized to support the development of field surveys. Protected water supply areas in the vicinity of the Project were also identified. The desktop review methodology is discussed in more detail in the Baseline Aquatic Environment Report (Appendix H.2).

6.7.4 Desktop Assessment Results

6.7.4.1 Watersheds

The WPA intersects 85 local watersheds. Three watersheds intersect the TLWPA, six intersect the SLWPA, 28 intersect the LTWPA, and 48 intersect BWPA (Drawing 6.7-1, Appendix A).

There are no protected water supplies within the WPA; however, there are six PPWSAs areas adjacent to the WPA boundaries (Drawing 6.7-1, Appendix A). Northern Arm Lake and Little Pond are located on the southern and northern boundaries of the BWPA, respectively. Muddy Hole Pond, Dogberry Brook, and Indian Cove Pond are grouped together on the eastern boundary of the BWPA. Cook's Pond is located adjacent to the LTWPA along the northern boundary (NLECCC, 2022). While these six PPWSAs border the WPA, they are excluded from the surface water resources assessment as they are situated within separate drainage basins.

Northern Arm Brook, New Bay River, Northwest Arm Brook, and West Arm Brook are scheduled salmon rivers that fall within the WPA, whereas the Exploits River, and Charles Brook are scheduled salmon rivers that occur outside the WPA but within the 5 km buffer (Drawing 6.7-1, Appendix A; DFO, 2025a).

A detailed description of watersheds, protected water supplies, and CanVec waterbody and watercourse databases is provided in the Baseline Aquatic Environment Report (Appendix H.2).

6.7.4.2 Surface Water Classification

Of the 1,307 modelled watercourse crossings identified within the WPA, 1,259 watercourses classified as N, 41 as S1, and seven as S2 (Drawing 6.7-2A-J, Appendix A). When visible, watercourses classified as N were predominantly 0.5 to 1 m wide with a riparian area dominated by shrubs, which is consistent with a mixed substrate composition (coarse and fines). However, no estimated widths could be produced for 297 (30%) N watercourses as these were not visible on satellite imagery. This may be due to dense tree canopies that

reduce the efficacy of aerial-based classification, or because some modelled watercourses are expected to be ephemeral drainage features. Tabulated watercourse crossing characteristics are provided in Appendix H.2.

Watercourses classified as S1 were predominantly 3.5 m wide with treed riparian areas and coarse substrate. Watercourses classified as S2 ranged from 7 to 23 m wide and are characterized by treed and shrub riparian areas. Substrate classifications for S2 watercourses were predominantly mixed or coarse (Appendix H.2).

The watercourses identified via desktop review are predicted, and field verification has only been completed on a portion (as required by DFO). The measurements and characteristics described above are also estimated and will be field verified at the permitting stage.

6.7.5 Field Assessment Methods

Watercourse crossing assessments were completed within a subset of watercourses within the WPA. This selection of watercourses was driven by guidance and discussion completed with DFO (T. Wight, personal communication, March 25, 2025).

Within the WPA, approximately 3% of watercourses were assessed within the BWPA, 2% in the LTWPA, 3% in the TLWPA, and 6% within SLWPA. Of the 40 S1 watercourses, 25% were field assessed, and of the seven S2 watercourses, approximately 29% were field assessed. The field assessment methods and results are detailed in the Baseline Aquatic Environment Report (Appendix H.2). Survey results as they pertain to fish habitat characteristics are described in Section 6.8.

Surface water quality was collected at ten Water Quality Monitoring (WQM) locations in August 2024, and at 12 locations in April 2025 and November 2025 to provide a reasonable characterization of seasonal surface water quality in the PA. Six of the ten WQM locations sampling in 2024 were located within watersheds that intersect the WPA, and in 2025, seven of the 12 WQM locations were located within watersheds that intersect the WPA (Table 6.7.1 : Drawing 6.7-3, Appendix A). In-situ water quality parameters (temperature, pH, dissolved oxygen, conductivity, and turbidity) measured during watercourse crossing assessments, fish collection surveys, and surface water sampling across the WPA are described in the Baseline Aquatic Environment Report (Appendix H.2).

Table 6.7.1: Surface Water Sample Locations

Sample ID	Local Watershed ID	Location	Sample Location Description	Sample Location (UTM)	
				Easting	Northing
WQM-1	3	Adjacent to BWPA	New Bay Pond	604002	5449491
WQM-2	5	BWPA	Northern Arm Brook	603062	5438217
WQM-7	7	Adjacent to BWPA	Unnamed waterbody east of the BWPA	618232	5451233
WQM-8	3	Adjacent to BWPA	New Bay River	616195	5456380
WQM-9	18	LTWPA	Rocky Pond	612252	5478341

Sample ID	Local Watershed ID	Location	Sample Location Description	Sample Location (UTM)	
				Easting	Northing
WQM-10	30	LTWPA	Unnamed waterbody north of Rocky Pond	611908	5481525
WQM-11	3	BWPA	North shoreline of New Bay Pond	602498	5446722

All water samples were kept cool and were transported to Bureau Veritas Laboratories in St. John's, NL for processing. Surface water samples were analysed for the following parameters:

- General chemistry (including reactive silica)
- Metals (total/dissolved)
- Petroleum hydrocarbons (benzene, toluene, ethylbenzene, and xylenes [BTEX] and total petroleum hydrocarbons [TPH])
- Volatile Organic Compounds (VOCs)
- PAHs
- Total suspended solids (TSS)
- Bacteriological

Surface water sample results have been compared to the CCME Guidelines for the Protection of Freshwater Aquatic Life (CCME, n.d.-a). For parameters that do not have CCME Guidelines, results are compared to Schedule A of the Environmental Control Water and Sewage Regulations (Newfoundland and Labrador, 2003b).

6.7.6 Field Assessment Results

Table 6.7.2 summarizes the results of baseline desktop and field surveys completed within the WPA.

Table 6.7.2: Summary of Results within the WPA

Survey	Summary
Desktop Review	
Surface Water Classification	Across 85 watersheds, 1,307 potential watercourse crossings were identified
Surface Water Characterization	
Watercourse Crossing Assessment	28 Class N watercourses were assessed.
	10 Class S1 watercourses were assessed.
	2 Class S2 watercourses were assessed.
In-Situ Water Quality	
Water Quality	Temperature range: 12.4 to 27.3 °C (summer) 2.6 to 4.2 °C (spring)
	pH range: 4.37 to 7.81 (summer) 6.07 to 6.71 (spring)
	DO range: 1.65 mg/L to 13.54 mg/L (summer) 13.93 mg/L to 14.08 mg/L (spring)
	Conductivity and turbidity range: 7.81 µS/cm to 223.7 µS/cm and 0.15 FNU to 14.03 FNU (summer) 16.7 µS/cm to 28.1 µS/cm (spring)

The results of crossing assessments are discussed further in the Aquatic Baseline Report (Appendix H.2) and Fish and Fish Habitat VC (Section 6.8).

Surface water samples were collected and analyzed to establish a baseline for future surface water quality comparison. Results have been tabulated and are presented in Appendix H.1. Water quality results exceeded CCME Guidelines for the Protection of Freshwater Aquatic Life (FWAL) for aluminum (100 µg/L if pH ≥ 6.5) at all WPA monitoring locations, except for WQM-11. In NL, variation in the amount of aluminum in surface water is largely dictated by geology (Newfoundland and Labrador & ECCC, 2013). Multi-decade datasets produced from the Canada–Newfoundland Water Quality Monitoring Agreement document naturally occurring aluminum in ranges that can exceed CCME water quality guidelines in some areas, depending on local geology and water chemistry characteristics. As such, naturally elevated aluminum concentrations are expected in local surface water features. Across sampling sites, aluminum concentration appears at its lowest in the late summer months, as surface water runoff reduces to its lowest.

A single exceedance for lead (1 µg/L) occurred in April 2024 at the WQM-2 monitoring station (1.3 µg/L). This station, along with station WQM-7 exceeded long-term zinc (7 µg/L) concentrations during the April 2024 sampling event. The exceedances were 8.5 µg/L and 7.4 µg/L, respectively. All other results meet the CCME Guidelines for the Protection of Freshwater Aquatic Life (freshwater) and the Schedule A Environmental Control Water and Sewage Regulations (CCME, n.d.-a; Newfoundland and Labrador, 2003b). Water quality results provided in Appendix H.1 and are further discussed in Section 7.6.

6.7.7 Effects Assessment

Project activities, primarily those that involve earth moving, vegetation removal, road and transmission line construction, or quarry and accommodation development, have the potential to impact surface water within the WPA and transmission area (Table 6.7.3). These potential impacts could include changes to surface water quantity and quality.

Table 6.7.3: Potential Project-Surface Water Interactions – Wind Project and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X

Project Phase	Potential for Interaction
Transportation of Turbine Components	X
Turbine Assembly	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	
Operations and Maintenance	-
Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

6.7.7.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries for surface water include the *Water Resources Act*, CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life, and Newfoundland and Labrador Environmental Control Water and Sewage Regulations (CCME, n.d.-a; Newfoundland and Labrador, 2003b).

Technical Boundary

The assessment of potential effects on surface water resulting from Project development is constrained by the accuracy of the watercourse modelling and by the limitations of aerial imagery in identifying surface water features. Additionally, as per DFO guidance, only a percentage of watercourses at crossing locations have been assessed, which limits the level of detail at which surface water across the WPA and transmission area can be described.

Spatial Boundary

The LSA for surface water in relation to Wind Projects and the transmission infrastructure is the WPA including the transmission area, as indirect effects are predicted to remain within the WPA. The RSA for this components surface water includes all modelled local watersheds that intersect the WPA (Drawing 6.7-4).

Temporal Boundary

The temporal boundaries for the surface water effects assessment include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

6.7.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to surface water. The VC-specific definition for magnitude is as follows:

- Negligible: Less than 1% change in flow from baseline. No measurable change to in water quality parameters relative to baseline (CCME, n.d.-a).
- Low: 1-10% change in flow from baseline. A measurable change in water quality parameters but within natural variation as compared to baseline (CCME, n.d.-a).
- Moderate: 10-25% change in flow from baseline. A measurable change in water quality parameters above baseline but within acceptable limits (CCME, n.d.-a).
- High: >25% change in flow from baseline. A measurable change in water quality parameters that elevates parameters above applicable guidelines (CCME, n.d.-a).

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

6.7.7.3 Effects

Direct effects to surface water such as channel destruction, alteration, or diversion from infrastructure placement are likely to be most prominent during the site preparation and construction phase. Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects. An assessment of potential Project-surface water interactions was completed for all modelled surface water features identified in the WPA (Appendix H.2). The infrastructure within the WPA may interact with up to 1,310 watercourses through road crossing upgrades or installations, quarry development, substation development, or construction of accommodation camps. An additional 122 modelled watercourses may be spanned by the transmission line (Drawing 6.7-5A-J, Appendix A). The loss of fish habitat associated with potential direct effects to surface water features within the WPA is discussed in Section 6.8.

Indirect effects such as changes in water quantity (e.g., alterations to hydrological inputs) and quality (e.g., sedimentation, water chemistry) can be farther reaching. These effects are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes, and the magnitude at which they are felt (DFO, 2022).

Changes in Surface Water Quantity

In the absence of mitigation, the potential effects identified in Table 6.7.3 can alter surface water quantity through changes in runoff, modifications to watershed areas (including evapotranspiration and infiltration characteristics), and watercourse alteration (including channel destruction) and realignment. These potential effects on surface water quantity are expected to occur primarily during activities associated with site preparation and construction. Decommissioning and rehabilitation activities may also impact surface water quantity as land use will be returned to a more naturalized condition. Potential effects to surface water quantity associated with specific WPA components are discussed further in the following sections. Effects of potential changes in water quantity in the context of fish and fish habitat are

discussed further in Section 6.8.

Note that blasting may be required during the construction and decommissioning phases of the Project to facilitate a number of Project components, including access roads, WTG pads, site building foundations, and quarry operations. These activities have the potential to impact groundwater quantity by altering established bedrock fracture networks, which may result in changes in the volume of baseflow supporting surface water features. The effects of blasting on groundwater quantity and baseflow are described in Section 6.0. In summary, any measurable changes to the percentage of baseflow in nearby streams are expected to be minor and restricted to the immediate vicinity of the blasting zone. The potential effects of blasting on fish and fish habitat are described in Section 6.8.

Road and Turbine Pad Construction

Of the 1,307 modelled watercourse crossing locations within the WPA, 1,248 are associated with road crossing locations. There are 17 proposed crossing locations known to have existing crossing infrastructure, which may only require upgrades during road construction. The remaining 1,231 potential road crossings are not associated with existing infrastructure.

Within the WPA, there will be 317 km of new road constructed, and 222 km of road that will require upgrading. Project engineers will make culvert upgrade/installation determinations during the detailed design phase. Each crossing will be designed to avoid any permanent diversion, restriction, or blockage of natural flow, such that the hydraulic function of the watercourse is maintained. Specific details of each crossing will be finalized during the detailed design phase and will be included in a Request for Review (RFR) for DFO and any necessary applications for alteration or notifications to NLECCC. All watercourses will be field assessed as part of the permitting process. Roads will be micro-sited to minimize impacts by working to design the roads perpendicular to watercourse crossing locations and designing roads to cross watercourses along a straight section of stream.

All turbine pads will be micro-sited to avoid direct impacts to surface water features. Construction-related excavation dewatering may be required for WTG foundations and site buildings, which can cause a temporary localized lowering of the water table (drawdown) and alteration of flow pathways immediately surrounding the excavation. The effects of excavation dewatering on groundwater quantity are assessed in Section 6.6. Based on this assessment, no impacts to ecological receptors from excavation dewatering are anticipated.

Quarry and Laydown Areas

Within quarry and quarry laydown areas, activities such as clearing, grubbing, and blasting can lead to a direct loss of watercourses during infrastructure placement. Site access and movement of equipment across watercourses may necessitate the installation of drainage structures such as culverts or bridges.

Of the 1,307 modelled watercourses at crossing locations within the WPA, 18 are either partially or fully within the PF of the 53 proposed quarry development locations, and

62 watercourses are either partially or fully within a 100 m buffer of the quarries. Watercourses within 100 m quarry buffers are likely to experience indirect effects resulting from changes in the associated contributing drainage areas (DFO, 2022) (Drawing 6.7-5A-J, Appendix A).

Specific details of quarry placement and associated activities will be finalized during the detailed design phase and will be included in any necessary applications for alteration or notifications to NLECCC. During the permitting process, as surface water features are confirmed and assessed, quarries and laydown areas will be micro-sited to avoid direct impacts to surface water features to the greatest extent possible. Water balance assessments may be completed to evaluate any potential changes in surface water quantity affecting nearby water features.

Accommodation Camps

Construction of accommodations can affect surface water through activities such as clearing, grubbing, and infrastructure placement. These activities can lead to water quantity changes through the destruction of overprinted surface water features or through grading, watercourse diversions, and water management. Site access and movement of equipment across watercourses may necessitate the installation of drainage structures such as culverts or bridges. Furthermore, potable water needs and wastewater management has the potential to alter surface water quantity through groundwater drawdown or withdrawal/discharge into aquatic receivers if not disposed of in approved septic tanks.

Of the 1,307 modelled watercourses at crossing locations within the WPA, there are three that are either partially or fully within a 30 m buffer of accommodation development locations (Drawing 6.7-5A-J, Appendix A). The 30 m buffer on accommodation camps has been established based on BMPs created by DFO (2022) for fish habitat protection. All modelled surface water features within this buffer will field confirmed and characterized during the detailed design phase.

Accommodation camps will be micro-sited to avoid direct impacts on surface water features, where feasible. Specific details of accommodation placement and associated activities such as water management and wastewater discharge locations will be finalized during the detailed design phase and will be included in any necessary applications for alteration or notifications to NLECCC. The impact of accommodation camp development on local watershed characteristics and drainage patterns is expected to be minimal due to the limited size of camp footprints, and natural drainage patterns will largely be maintained.

The use of a groundwater supply at accommodation camps will be required to meet potable and domestic water needs (Section 6.6). The evaluation of these groundwater supply systems, including pumping tests to confirm sustainable well yield and assessments of potential interference with surface water quantity will be completed during the provincial Water Use License and well construction permit application processes.

Transmission and Collector Lines

Transmission and collector lines are not expected to impact water quantity, as the lines and associated infrastructure will span or otherwise avoid water resources. Based on the current layout, 122 modelled watercourses may be spanned by the transmission line, all of which will be field-confirmed and characterized prior to construction (Drawing 6.7-5A-J, Appendix A). Further, any activity related to the installation of poles or structures to string or pull the collector or transmission lines will be confined to the area above the ordinary high-water mark and will ensure a 30 m vegetative buffer (50 m if near a scheduled salmon river) is preserved along the riparian zone (DFO, 2022).

Potential effects of temporary access road construction to install the transmission and collector line infrastructure are equivalent to those discussed in other Project components and are expected to be mitigated with the implementation of standard BMPs.

Changes in Surface Water Quality

Changes in the quality of surface water can arise from alterations to the surrounding environment and can include an increase in water temperature from decreased shade, an increase in pollutants from machinery and infrastructure, and the mobilization of sediments (MTO, 2009). Given the dynamic nature of channeling water, effects upon water quality can quickly spread throughout different reaches of the respective watershed.

The mobilization of sediment within aquatic environments can cause shifts in ecological integrity, including changes to the plant species composition, the distribution of primary and secondary producers, and the habitat suitability for vulnerable species (Tilman et al., 1997). Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, routine road and vegetation maintenance, daily traffic, and site reclamation. However, the highest potential for these effects is related to the construction and upgrading of access roads, quarry development, and stockpiling of material. The alteration or removal of riparian vegetation can also result in bank instability and channel erosion.

Elevated suspended solids in site runoff is a primary concern associated with quarrying activities. All surface water runoff and drainage occurring on the site will be directed via sloping and grading, or other water management infrastructure (e.g., rock-lined ditches, swales, culverts) to settling pond(s). Settling ponds will be designed with adequate residence time to treat the expected TSS load and attenuate flow during storm events. Individual quarry settling pond sizing will be defined during the detailed design phase.

In addition to the large-scale erosion and sedimentation reduction measures to be outlined in site-specific erosion and sediment controls plans, it is expected that localized control measures will be implemented whenever earth works occur (i.e., silt fences, reducing amount of time disturbed soil is exposed, grading controls, seeding of disturbed soils to enhance soil stabilization, and directing runoff towards vegetated buffers or constructed ditches/settling ponds). These environmental controls will be repaired and replaced as needed and will be implemented throughout all Project phases.

The potential for accidental releases of hazardous substances including petroleum hydrocarbons and other contaminants exists across all Project phases. These substances have the potential to quickly migrate to water resources. In addition, blasting required for site leveling, foundation work, or quarrying can impact water quality through both increases in turbidity and introduction of nitrogen-based explosive residues (if not fully detonated).

Mitigation and monitoring, which are described below, will ensure discharge from accommodations is disposed of properly within approved septic tanks or fall within the Newfoundland Environmental Control Water and Sewage Regulations (Newfoundland and Labrador, 2002c) and that water management structures are functioning as intended.

6.7.8 Mitigation

Avoidance of direct impacts on surface water is the highest priority in the mitigation sequence. Throughout the iterative process of developing the current Project infrastructure layout, avoidance of effects on surface water was attained through several key design considerations. Initial identification and characterization of surface water features within the WPA helped inform an optimized site layout and reduce potential impacts to surface water. During the detailed design and regulatory permitting phases, field verification of surface water features will help further inform micro-siting of infrastructure to avoid and lessen impacts to water resources to the greatest extent possible.

Mitigation measures will be employed to further reduce potential indirect effects to surface water resources. The following mitigation measures will be included in the design of the Project:

6.7.8.1 Changes to Surface Water Quantity

- Complete further micro-siting of infrastructure during the detailed design and permitting phase to with the intent to avoid impacts to surface water features.
- Complete culvert installations and upgrades (where applicable) in accordance with the Environmental Guidelines for Watercourse Crossings (NL WRMD, 2017).
- Identify surface water features and ensure they are clearly marked.
- Redesign/upgrade existing watercourse crossings to facilitate hydraulic function.
- Fit any watercourse crossings with appropriately sized infrastructure, as prescribed by a certified professional.
- Design any necessary alterations in a way that maintains the natural grade of a watercourse.
- Integrate water management systems including diversion and collection ditches, roadside drainage channels, vegetated swales, and stormwater retention ponds.
- Maintain existing drainage patterns to the extent feasible through minimal grading and water management infrastructure.
- Develop a maintenance schedule for regular maintenance and inspection of Project water management infrastructure.
- Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-

specific blast design to maintain vibration limits.

6.7.8.2 Changes in Surface Water Quality

- Treat wastewater discharge prior to release to ensure it meets applicable regulatory requirements, if required.
- Draft and implement a Water Management Plan (Appendix Q.13) to support drainage, and ensure water quality conforms to applicable regulations and guidelines.
- Sample water prior to discharge as per the Groundwater and Surface Water Monitoring Management Plan (Table of contents included in Appendix Q.10) to ensure water quality conforms to applicable regulations and guidelines.
- Use rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life.
- Develop site-specific Hazardous Materials Response and Training Plan (Appendix Q.11) and an Emergency Response Plan (Appendix Q.2) to address potential impacts of spills, hazardous substances, and other emergencies on surface water resources.
- Develop site-specific Erosion and Sediment Control Plan (Appendix Q.9) during the detailed design phase. Properly install, inspect, and repair erosion and sediment controls.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Require that workers are fully trained in spill response.
- Ensure operators remain with equipment during refueling.
- Plan any construction activities that may impact stream banks and substrate to align with low-flow periods, when possible.
- Revegetate along the watercourse edge and above the ordinary high-water mark to facilitate bank stabilization, where applicable.
- Maintain a minimum 30 m vegetated buffers surrounding watercourses, where possible.
- Locate stockpiles a minimum of 30 m from any surface water feature and stabilize to reduce the likelihood of erosion and sedimentation.
- Collect or direct runoff containing suspended materials into settling ponds, diversion ditches, or well vegetated areas.
- Integrate outlet protection features on settling ponds to dissipate flow velocities and decrease erosion at the outflow.

6.7.8.3 General

- Adhere to all Approval conditions outlined in all regulatory approvals.
- Complete site kick-off meetings with relevant staff/contractors to educate and confirm policies related to working near surface water resources, and that all Approval conditions are clearly communicated and adhered to.

6.7.9 Monitoring

All surface water features that are expected to be directly or indirectly impacted will be field verified, and the impacts will be quantified as part of the detailed design and permitting process. As watercourses are verified, Project infrastructure will be micro-sited to avoid impacts to surface water features whenever possible. Any expected alterations to surface water resources will be permitted in accordance with the *Water Resources Act* through NLECCC.

A Groundwater and Surface Water Monitoring Management Plan will be implemented to ensure water quality meets the regulatory requirements and minimize potential impacts to water quality throughout the life of the Project (table of contents included in Appendix Q.10). Should changes in water quantity be expected, the Groundwater and Surface Water Monitoring Management Plan may also include locations for flow monitoring to compare actual conditions with predicted streamflow changes. A site-specific Erosion and Sediment Control Plans will also be developed (Table of contents included in Appendix Q.9). These will be living documents and will evolve with the Project and be updated as needed.

6.7.10 Conclusion

After mitigations, residual effects on surface water are characterized in Table 6.7.4.

Table 6.7.4: Surface Water Residual Effects – Wind Project and Transmission

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Changes to water quantity	Water management	A	L	LSA	LT	I	PR	Not significant
	Surface water monitoring							
Changes to water quality	Erosion and sediment control	A	L	LSA	LT	I	PR	Not significant
	Water management							
	Spill preparedness							
	Surface water monitoring							

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term, MT – Medium Term, LT – Long Term

Frequency: O – Once, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

6.8 Fish & Fish Habitat

6.8.1 Overview

The objective of the fish and fish habitat assessment was to inform the Project's design and collect the information necessary for the assessment of fish species and associated habitat within the WPA. This was accomplished using the following approach:

- Identify potential fish habitat (waterbodies, watercourses) within the WPA using desktop resources.
- Use the information collected to inform the Project design (e.g., avoid/minimize impacts to watercourses and waterbodies).
- Assess the quality of fish habitat within the WPA via field surveys.
- Inventory and assess abundance and diversity of fish within the WPA.
- Use the information collected to inform mitigation and monitoring programs.

6.8.2 Regulatory Context

The *Fisheries Act* (Canada, 1985) is the primary federal legislation governing the conservation and protection of fish and fish habitat in Canada. The *Fisheries Act* prohibits any work, undertaking or activity that results in death of fish (other than fishing) and the Harmful Alteration, Disruption, or Destruction (HADD) of fish habitat, unless such activities are authorized through appropriate regulatory approvals.

The Fisheries Act defines the following:

Fish:

“(a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;”

Fish habitat:

“waters frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas”.

SARA (Canada, 2002b) provides federal protection for fish species listed as “Endangered”, “Threatened”, or “Special Concern”. Species designations are determined through the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (ECCC, 2022c).

Provincially, the ESA (Newfoundland and Labrador, 2001) protects fish species that have been designated as endangered, threatened, or vulnerable. Species designations are based on recommendations from COSEWIC and/or the SSAC.

Under the *Water Resources Act* (Newfoundland and Labrador, 2002c), NLECCC has the authority to control, protect, and manage water resources to ensure the continuing availability

of clean water for the environmental, social and economic well-being of the province. Under the *Water Resources Act*, alterations to bodies of water require provincial approval.

The *Water Resources Act* (Newfoundland and Labrador, 2002c) defines a body of water as:

“a surface or subterranean source of fresh or salt water within the jurisdiction of the province, whether that source usually contains liquid or frozen water or not, and includes water above the bed of the sea that is within the jurisdiction of the province, a river, stream, brook, creek, watercourse, lake, pond, spring, lagoon, ravine, gully, canal, wetland and other flowing or standing water and the land occupied by that body of water”.

Using this definition and the parameters listed in the Guidelines for Applying to Alter a Body of Water (Newfoundland and Labrador, 2018c), watercourses and waterbodies were identified and described throughout the SPA to support the identification and characterization of fish habitat.

In Newfoundland and Labrador, retention of Atlantic salmon is only permitted on scheduled rivers. Scheduled salmon rivers are explicitly named and listed in the Newfoundland and Labrador Fishery Regulations (Newfoundland and Labrador, 2018b). As per the EIS guidelines, all scheduled salmon rivers that are anticipated to be directly or indirectly affected by the Project must be characterized (NLECCC, 2025).

6.8.3 Desktop Assessment Methods

Desktop assessment methodology used to identify surface water features (and potential fish habitat) is discussed in Section 6.7.

6.8.3.1 Fish Community

A desktop review to identify fish species that are potentially present within the WPA was completed using the following resources and databases:

- Aquatic Species at Risk Map (DFO, 2025b)
- Atlantic Canada Conservation Data Centre (ACCDC) Data Report (ACCDC, 2023)
- NL FAL GEOHub Aquaculture Licenses dataset (NLFAL, 2024a)
- Water quality station profile for Peters River (Newfoundland and Labrador, n.d.)
- Scientific reports
- Consultation with local outfitters

The Aquatic Species at Risk Map is a federal database that shows the distribution of SAR and their associated critical habitat within Canadian waters (DFO, 2025b). A SAR is defined as species that are:

- Species listed under SARA as “Endangered”, “Threatened”, or “Special Concern” (Canada, 2002b).

- Species listed under the Newfoundland and Labrador ESA as “Endangered”, “Threatened” or “Vulnerable” (Newfoundland and Labrador, 2001).

The ACCDC is part of a network of NatureServe data centres and heritage programs that maintain records of rare flora and fauna species and habitat areas of ecological interest that exist within the majority of North and South America. ACCDC records were reviewed to identify records of SAR and SOCC. Throughout this EARD, SOCC are defined as follows:

- Species listed by COSEWIC but not SARA as “Endangered”, “Threatened”, or “Special Concern”.
- Species having a subnational (provincial) rank (S-Rank) of “S1”, “S2”, or “S2S3” (ACCDC, 2026a).

6.8.4 Desktop Assessment Results

A review of the NL ESA list determined that the WPA includes habitat for two inland SAR:

- Banded killifish (*Fundulus diaphanous*, ESA Vulnerable)
- American eel (*Anguilla rostrata*, ESA Vulnerable)

A review of data from a biomonitoring site at Peters River near Botwood indicated that the following species may be found within the associated local watershed 4 (Newfoundland and Labrador, n.d.). The WPA does not intersect local watershed 4 (Drawing 6.7-1, Appendix A). However, based on proximity, it is assumed that there is potential for the following species to be present within the WPA:

- Atlantic salmon – Northeast Newfoundland population (*Salmo salar*, both sea run and ouananiche - land locked Atlantic salmon)
- Brook trout (*Salvelinus fontinalis*)
- Arctic char (*Salvelinus alpinus*)
- Threespine stickleback (*Gasterosteus aculeatus*)
- Ninespine stickleback (*Pungitius pungitius*)
- Rainbow smelt (*Osmerus mordax*)
- American eel
- Sea lamprey (*Petromyzon marinus*)

The ACCDC database did not identify any fish species considered to be SOCC or SAR within 5 km of the WPA (ACCDC, 2026a).

Keefe et al. (2019) reported the first records of finescale dace (*Chrosomus neogaeus*) in four ponds within a first order tributary of Exploits River, which is located within approximately 9.3 km south of the BWPA.

The results of the desktop review are described in detail in the Aquatic Baseline Report (Appendix H.2).

6.8.5 Field Assessment Methods

Fish habitat was characterized within the WPA at potential crossing locations following the methods outlined in Sooley et al. (1998). Modelled watercourse crossings were selected for field verification and assessment through selection via proportional random stratified sampling according to watershed area and accessibility. Fish habitat assessments were also completed on all scheduled salmon rivers within the WPA that are proposed to be crossed by road infrastructure.

Within the WPA, 44 watercourses were selected for fish collection. Electrofishing was conducted in 22 sites and trapping was conducted in 25 sites (Drawing 6.8-1A-J, Appendix A). A combination of electrofishing and trapping was used in three watercourses. The goal of the fish collection surveys was to determine species presence and estimate relative abundance within the WPA. Sampling reaches were selected based on representative habitats with potential to support fish along a section of an accessible watercourse, while prioritizing the sampling of scheduled salmon rivers.

Water quality parameters were measured in-situ during watercourse crossing assessments, fish collection surveys, and surface water sampling at water quality monitoring stations (Drawing 6.8-1A-J, Appendix A). Seasonal surface water sampling is discussed further in Section 6.7.

Field assessment methodology is further described in the Aquatic Baseline Report (Appendix H.2).

6.8.6 Field Assessment Results

Table 6.8.1 summarizes the results of trapping and electrofishing field surveys conducted within the WPA. Refer to Section 6.7 for watercourse crossing assessment and water quality results.

Table 6.8.1: Summary of Fish Collection Results within the WPA

Section	Summary
Fish Collection	
Trapping	25 sites were trapped resulting in the capture of the following species: • 18 brook trout • 67 Atlantic salmon • 28 American eel
Electrofishing	22 sites were electrofished resulting in the capture of the following species: • 225 brook trout • 116 Atlantic salmon • 4 American eel • 3 unidentified salmonids
Fish Habitat Characterization	
Watercourse Crossing Assessment	40 watercourses surveyed (see Section 6.7).

Section	Summary
Detailed Fish Habitat Assessment	Not completed within this component – fish habitat characterization completed as part of watercourse crossing assessments (Section 6.7).

Fish habitat characterization surveys were completed at 64 crossing locations. Due to adjustments to the road layout following the completion of watercourse crossing assessments, some watercourses surveyed are no longer crossed. Of the 64 watercourses surveyed, 40 are current watercourse crossing locations within the WPA. Six additional locations were either field identified as wetland habitat, ephemeral drainage, or no watercourse existed. Suitable habitat was present for several life stages of the fish species known to be present within the WPA in most field-verified watercourses. Suitable spawning habitat for brook trout and Atlantic salmon were identified in 23 of the 40 current crossing locations assessed within the WPA. There are four scheduled salmon rivers that intersect with the WPA (Northern Arm River, New Bay River, Northwest Arm Brook, and Western Arm Brook) (Drawing 6.7-1, Appendix A). Habitat descriptions for each watercourse assessed are presented in the Aquatic Baseline Report (Appendix H.2).

Fish collection surveys resulted in the capture of 461 individual fish and three species across 42 locations in the WPA (some sites were selected for both electrofishing and trapping). Brook trout were the most commonly captured species, accounting for approximately 53% of the total catch. Atlantic salmon and American eel comprised approximately 40% and 7% of the total catch, respectively. Three unidentified salmonids escaped prior to identification. Species descriptions are provided in the Aquatic Baseline Report (Appendix H.2).

American eel were captured within the BWPA and SLWPA. Of the three species captured, American eel are the only SAR/SOCC due to their vulnerable listing under the ESA and designation as threatened by COSEWIC (COSEWIC, 2012; Wildlife Division, 2010). Atlantic salmon were captured within the BWPA and SLWPA. The Northeast Newfoundland Atlantic salmon population (whose range includes rivers within the WPA) is considered “Not at Risk” (COSEWIC, 2025). Brook trout were captured in all four individual WPAs (BWPA, LTWPA, TLWPA, and SLWPA) and is also not listed as a SAR.

In-situ water quality results are summarized in Section 6.7 and described in the Aquatic Baseline Report (Appendix H.2). Overall, the measured water quality parameters—temperature, pH, and dissolved oxygen—are generally suitable for the fish species expected in these systems, though some rivers show exceptions. Periods of low pH, reduced dissolved oxygen, and elevated summer temperatures can create suboptimal conditions at certain times of year, particularly for trout and salmon, but these factors are not considered severe enough to fully limit fish habitat. Note that these results represent conditions at a specific moment and do not indicate any spatial or temporal trends in water quality. In-situ water quality is used only to support a general description of habitat quality.

6.8.7 Effects Assessment

Project activities, primarily those that involve earth moving, vegetation removal, road and transmission line construction, or quarry and accommodation development, have the potential to impact fish and fish habitat within the WPA and transmission area (Table 6.8.2). These potential impacts could include changes in fish habitat quality, quantity, and fish health and survival.

Table 6.8.2: Potential Project-Fish and Fish Habitat Interactions – Wind Project & Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (three years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Turbine Components	X
Turbine Assembly	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	
Operations and Maintenance	-
Vegetation Management	X
Decommissioning and Rehabilitation (two years)	
Infrastructure Removal	X
Site Reclamation	X

6.8.7.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries for fish and fish habitat include the framework offered by the *Fisheries Act* (Canada, 1985) and supporting policy statements and management objectives from DFO. DFO interpretation of HADD of fish habitat supports the evaluation of this VC. The fish and fish habitat effects assessment is undertaken in accordance with the specific requirements prescribed for the Aquatic Environment in the Environmental Impact Statement Guidelines for the Botwood and Area EVREC Green Energy Project (NLECCC, 2025).

Technical Boundary

The assessment of potential effects to fish and fish habitat as a result of Project development is limited by the accuracy of the models developed to identify fish habitat across the landscape. Additionally, as per DFO guidance, only a percentage of watercourses at crossing locations have been assessed, which limits the level of detail at which fish habitat across the WPA and transmission area can be described. To manage these uncertainties, the assessment employs a conservative characterization strategy. All modeled watercourses are considered to support fish and fish habitat until proven otherwise through field verification.

Spatial Boundary

The LSA for fish and fish habitat is the WPA, as indirect effects are predicted to remain within the WPA. The RSA for fish and fish habitat includes all modelled local watersheds that intersect the WPA (Drawing 6.7-4, Appendix A).

Temporal Boundary

Temporal boundaries associated with fish and fish habitat include the site preparation and construction (three years), operation and maintenance (33 years), and decommissioning and rehabilitation (two years) phases of the Project.

6.8.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for fish and fish habitat. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable change to fish habitat quantity (m^2) or quality. No loss of fish.
- Low: A change in fish habitat quantity or quality or impacts to fish that are within natural variation.
- Moderate: A change in fish habitat quantity or quality, above the range of natural variation, which partially limits the ability of fish to use the habitat or carry out one or more life processes. Impacts to fish will only be experienced by individuals rather than entire populations and can be managed with routine measures.
- High: A change in fish habitat quantity or quality that limits the ability of fish to use the habitat to carry out one or more life processes. Impacts to fish will be experienced by entire populations and cannot be managed with routine measures.

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

6.8.7.3 Effects

Direct effects to fish and fish habitat (i.e., habitat loss) will most likely occur during the site preparation and construction phase. This potential loss of fish habitat corresponds to the assessment of Project infrastructure-surface water interactions presented in Section 6.7 through which 1,307 potential watercourse interactions were identified. Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise

manage the magnitude of these direct effects.

Indirect effects such as changes in habitat quality through flow alterations or sedimentation can be farther reaching. These effects are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes, and the magnitude at which they are felt (DFO, 2022).

Wetland alterations required for the Project during the construction phase also have the potential to impact fish and fish habitat. Wetlands that are contiguous with a watercourse or offer areas of open water may provide areas of fish feeding, spawning, and/or rearing (DFO, 2023b). The dense macrophytic vegetation that often comes with these wetland environments can offer refuge to fish including shelter from predators, a substrate to which eggs can be adhered, and a source of food (DFO, 2008). Wetland types present within the WPA and potential effects are discussed further in Appendix I.1.

Change in Habitat Quantity

The Project design has been optimized to reduce interactions between Project infrastructure and surface water that may support fish and fish habitat. These avoidance efforts will continue through the detailed design phase. However, where interactions cannot be avoided, some habitat loss may occur. For this VC, habitat loss is defined as any fish habitat feature that is directly overlain by Project infrastructure.

As detailed in Section 6.7 there are 1,307 potential watercourse interactions within the WPA based on intersections of Project infrastructure with modelled watercourses (Drawing 6.7-5A-J; Appendix A). Loss of fish habitat may occur during the construction phase through road crossing upgrades or installations, quarry development, substation development, or construction of accommodation camps. An additional 122 modelled watercourses may be spanned by the transmission line but will be installed to avoid direct impacts to watercourses and fish habitat (see Section 6.7).

To be conservatively inclusive, all potential watercourses identified through modelling are presumed to provide fish habitat, though only a subset have been field-verified. Fish habitat will be confirmed and characterized at every modelled watercourse expected to be impacted in advance of Project permitting.

Road and Turbine Pad Construction

Of the 1,307 modelled watercourses within the WPA, there are 1,248 potential alterations associated with road crossings based on the modelled watercourse layer and verifications performed through aerial imagery. Additional micro-siting during the detailed design phase will minimize the loss of fish habitat from road construction.

Four scheduled salmon rivers are expected to interact with the Project through road construction and upgrades. Northern Arm Brook, New Bay River, Northwest Arm Brook, and West Arm Brook each have one or more planned crossing locations (Drawing 6.7-5A-J,

Appendix A):

- Northern Arm Brook: two crossings (one upgrade, one new installation)
- New Bay River: five crossings (three upgrades, two new installations)
- Northwest Arm Brook: one crossing (upgrade)
- West Arm Brook: one crossing (new installation)

Each crossing will be designed to avoid any permanent diversion, restriction, or blockage of natural flow, such that the hydraulic function of the watercourse is maintained. Specific details of each crossing will be finalized during the detailed design phase and will be included in any necessary applications for alteration or notifications to NLECCC. Based on Strum's experience with culvert design, crossing construction, monitoring, and implementation of BMPs (DFO, 2022), it is anticipated that standard design and construction practices can be applied to avoid a HADD of fish habitat. All watercourses will be assessed as part of the permitting process. Roads will be micro-sited to minimize the number of crossings required and impacts, and all turbine pads will be micro-sited to avoid direct impacts to fish habitat.

Quarry and Laydown Areas

Of the 1,307 modelled watercourses within the WPA, 18 modelled watercourses are either partially or fully mapped within the PF of quarry and laydown development locations. An additional 62 modelled watercourses are either partially or fully located within a 100 m quarry buffer (Drawing 6.7-5A-J, Appendix A).

Quarry and laydown area locations are considered preliminary and will be adjusted to avoid impacts to field verified watercourses to the greatest extent possible. Wherever possible, quarrying will be limited to areas above the design flood high water mark and no closer than 100 m from all watercourses. Vegetation within this buffer zone will remain undisturbed (DFO, 2022). No additional destruction of fish habitat is expected to occur during operations or closure phases.

Following micro-siting of infrastructure, quarry and laydown areas are not expected to result in permanent losses to fish habitat, however, nearby watercourses may experience flow alterations due to associated changes in runoff and watershed areas (discussed further in Change in Habitat Quality). Water balance assessments may be completed to evaluate any potential changes in surface water quantity affecting nearby water features.

Accommodation Camps

Of the 1,307 modelled watercourses within the WPA, there are three modelled watercourses either partially or fully located within a 30 m buffer of accommodation development locations (DFO, 2022) (Drawing 6.7-5A-J, Appendix A). Accommodation locations are considered preliminary and will be adjusted to avoid impacts to fish habitat. Watercourses (and associated fish habitat) will be field verified during the detailed design phase to ensure avoidance by infrastructure.

Following micro-siting of infrastructure, accommodation camps are not expected to result in permanent losses to fish habitat. A 30 m vegetative buffer between camp infrastructure and watercourses will be maintained wherever possible to reduce potential indirect impacts to fish habitat (DFO, 2022). Potential impacts of accommodation camps on habitat quality (through flow alterations, potable water needs, and wastewater discharge) are discussed further under Changes in Habitat Quality.

Change in Habitat Quality

Changes in fish habitat quality can occur through any mechanism that alters or disrupts the habitat's ability to support one or more life processes of fish. Indirect effects to fish and fish habitat will be explored through the following pathways:

- Flow modification (i.e., changes in water quantity) from a combination of surface water management, groundwater drawdown, and changes to contributing drainage areas.
- Water quality changes through erosion and sedimentation, increases in temperature, wastewater discharge, blasting, or an accidental release of a deleterious substance,

Flow Modification

Changes in the amount of water entering a water resource can affect the suitability of that resource to support fish and fish habitat. The Pathways of Effects diagram developed by DFO outlines potential impacts to fish and fish habitat as a flow modification (DFO, 2024). Flow modification can influence fish habitat in several interconnected ways. When water levels or flow patterns are altered, the continuity of aquatic habitat can be disrupted, limiting or completely blocking fish passage between critical areas such as spawning, rearing, and feeding habitats. Reduced discharge can also shrink the extent of wetted area within a channel, decreasing the amount of physically available habitat.

Project infrastructure will be micro-sited to avoid direct impacts to fish and fish habitat where possible (i.e., accommodations, quarries, and turbine pads). Whenever possible, the maintenance of natural drainage patterns will be prioritized through grading and water management infrastructure. Despite avoidance by infrastructure, watercourses may experience flow alterations due to associated changes in runoff and watershed areas. This is particular concern for quarry development due to their potential impacts on the groundwater table, surface runoff/drainage patterns, and infiltration rates. If substantial changes in catchment areas are anticipated, water balance assessments may be completed to evaluate any potential changes in surface water quantity affecting nearby water features as directed by DFO. As all quarrying is planned to occur above the water table, there is no anticipated impact on fish or fish habitat from lowering of the water table associated with quarry development.

The impact of accommodation camp development on local watershed characteristics and drainage patterns is expected to be minimal due to the limited size of camp footprints, and natural drainage patterns will largely be maintained. However, the use of a groundwater supply at accommodation camps will be required to meet potable and domestic water needs (Section 6.6). The evaluation of these groundwater supply systems, including pumping tests to confirm

sustainable well yield and assessments of potential interference with surface water will be completed during the provincial Water Use License and well construction permit application processes. Additionally, any wastewater to be discharged from accommodations either into the surrounding environment will be completed in such a way as to prevent impacts to fish and fish habitat (e.g., directing discharge to well vegetated areas or other containment measures) or into septic tanks to be properly disposed of according to provincial regulations. Wastewater discharge will be quantified and assessed during detailed engineering and permitting.

Note that blasting may be required during the construction and decommissioning phases of the Project to facilitate a number of Project components, including access roads, WTG pads, site building foundations, and quarry operations. Blasting required for access roads, WTG pads, site building foundations, and quarry operations have the potential to impact surface flow through change groundwater quantity (i.e., baseflow) available to infiltrate a watercourse. The effects of blasting on groundwater quantity and baseflow are described in Section 6.6. In summary, any measurable changes to the percentage of baseflow in nearby streams are expected to be minor and restricted to the immediate vicinity of the blasting zone. The potential effects of blasting on water quality and fish health and survival are described below.

Changes in Water Quality

Changes in the quality of surface water can arise from alterations to the surrounding environment and can include an increase in water temperature due to decreased shade, an increase in pollutants from machinery and infrastructure, and the mobilization of sediments, which can impact fish and fish habitat (MTO, 2009).

Temperature

Water temperature affects the metabolic rates and biological activity of aquatic organisms, thus influencing the use of habitat by aquatic biota. There are no CCME guidelines related to temperature and aquatic biota. Temperature preferences of fish vary between species, as well as with size, age and season. For example, salmonids (the predominant species encountered within the WPA) are cold-water fish species, meaning they require cold water to live and reproduce (Kanno & Beazley, 2004).

Throughout the construction phase, watercourse alterations required for the Project have the potential to alter instream temperatures through reduced shading (from removal of riparian vegetation) and impoundment or slowing of water velocities due to poorly designed crossing structures. To mitigate these potential effects, vegetation removal will be restricted to immediate work areas, and all crossings will be designed to maintain the natural hydraulic function of the watercourse.

Erosion and Sedimentation

The mobilization of sediment within aquatic environments can affect habitat suitability for fish (Tilman et al., 1997). Sedimentation can reduce biological productivity, which affects food availability, egg development, and at high concentrations, fish survival (DFO, 2000). Erosion and sedimentation can occur throughout the lifecycle of the Project, including during

construction efforts, routine road and vegetation maintenance, daily traffic, and site reclamation. However, the highest potential for these effects is related to the construction and upgrading of access roads, quarry development, and stockpiling of material. The alteration or removal of riparian vegetation can also result in bank instability and channel erosion.

In addition to the large-scale erosion and sedimentation reduction measures to be outlined in site-specific erosion and sediment controls plans, it is expected that localized control measures will be implemented whenever earth works occur. Specific sediment control measures for certain Project components will be designed as part of future permitting processes. For example, all quarries will include space for an acceptable settling pond system(s) to remove suspended solids from site runoff (DFO, 2022). Appropriate vegetative buffers will also be employed, wherever possible, to mitigate the potential effects of sedimentation on fish habitat (DFO, 2022). Potential effects of blasting on sedimentation of fish habitat will be minimized through the use of site-specific blast designs that incorporate BMPs for fish and fish habitat (DFO, 2022; Wright & Hopky, 1998).

Release of Deleterious Substances

Accidental releases of deleterious substances, including petroleum hydrocarbons and other contaminants, present a risk to fish and fish habitat during all Project phases. If released, these substances can rapidly migrate into nearby watercourses, where they may degrade water quality and impair habitat functions essential for fish survival. Blasting activities required for site leveling, foundation preparation, or quarrying can also affect aquatic conditions by increasing turbidity and introducing nitrogen based explosive residues (when incomplete detonation occurs), both of which can adversely affect fish and their habitat.

These risks will be mitigated through strict spill prevention and containment measures, including proper storage and handling of fuels and hazardous materials, use of secondary containment, and implementation of spill response plans. Blasting impacts will be reduced by adhering to setback distances, minimizing blast charge weights, remove blasting equipment and products from blast area, and timing blasting activities to avoid sensitive fish periods.

Change in Fish Health and Survival

Construction activities which require the use of industrial equipment in watercourses (i.e., road crossing installation and upgrades) can result in the direct loss of fish. Impacts to fish through the use of industrial equipment in or near water can be mitigated through widely accepted best management practices and standards for working in and near water, including but not limited to timing in-water works within appropriate fish timing windows, isolating in-water work areas and performing fish rescues prior to equipment mobilization (DFO, 2019).

Blasting for roads and temporary works during the construction phase may result in sensory disturbance to fish, impacting fish behaviour, spawning grounds, and migration patterns. The detonation of explosives near watercourses can produce post-detonation shock waves which involves a rise to a high peak pressure and then a subsequent fall to below ambient hydrostatic pressure. This pressure deficit can cause impacts in fish (Wright & Hopky, 1998).

Overpressure in excess of 100 kilopascals (kPa) can result in adverse effects to fish including damage to the swim bladder in finfish, and potential rupture and hemorrhage to the kidney, liver, spleen, and sinus venous. It is also possible that fish eggs and larvae can be damaged (Wright & Hopky, 1998). The degree of damage is related to the type of explosive, the size and pattern of the charges, and the distance to the watercourse; depth of water within the watercourse; and species, size, and life stage of the fish. Sublethal effects have also been observed, including changes in fish behaviour as a result of noise produced during blasting (Wright & Hopky, 1998). Explosive charge weights will be restricted based on setbacks to fish habitat to achieve the 100 kPa guideline criteria outlined in Wright and Hopky (1998).

6.8.8 Mitigation

Avoidance of impacts to fish and fish habitat is the highest priority in the mitigation sequence. Throughout the iterative process of developing the current Project infrastructure layout, avoidance of effects to fish and fish habitat was attained through several key design considerations. Initial identification and characterization of potential water resources through modelling within the WPA helped inform an optimized site layout and reduce potential impacts to fish and fish habitat. Further micro-siting of Project infrastructure will be completed during the detailed engineering and permitting phases and supported by field-verification and characterization of all fish habitat expected to be directly or indirectly impacted by Project activities.

Where avoidance of impacts to fish and fish habitat are not possible, mitigation measures must be employed to further reduce impacts to fish and fish habitat. Standards and best practices for working in and near water are well understood and will be followed (DFO, 2019). Best management practices for the protection of freshwater fish habitat in Newfoundland and Labrador will also be incorporated in mitigation measures (DFO, 2022). Mitigation measures that will be included in the design of the Project are detailed below.

Change in Habitat Quantity

- Complete culvert installations and upgrades (where applicable) in accordance with the Environmental Guidelines for Watercourse Crossings (NL WRMD, 2017).
- Complete further micro-siting of infrastructure during the detailed design and permitting phase to with the intent to avoid impacts to surface water features.
- Identify fish habitat features and ensure they are clearly marked.
- Minimize the number of stream crossings required through detailed designs of haul and access roads.
- Using existing roads, trails, and cutlines whenever possible.
- Micro-site crossings away from sensitive fish habitat (i.e., salmonid spawning sites), where possible.
- Consider redesign requirements for existing watercourse crossings to facilitate habitat upgrades, including unblocking culverts and making waterways more conducive to fish passage.
- Prioritize structures that maintain the natural watercourse bottom and hydraulic

conditions (e.g., bridges, bottomless arch culverts), where possible.

- Limit riparian vegetation removal to the immediate work area.
- Restore stream banks and riparian vegetation to their natural state (when possible).
- Educate Project personnel on the sensitivity of fish and fish habitats.

Surface Water Quantity

- Integrate water management systems including diversion and collection ditches, roadside drainage channels, and stormwater retention ponds.
- Complete water balance assessments if/when indirect impacts to flow are anticipated to nearby watercourses from quarry development (to be determined in consultation with DFO).
- Maintain drainage patterns via grading and hydraulic connectivity structures.

Surface Water Quality

- Adhere to the buffers outlined in the Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador for quarries, roads, camps, fuel storage, and grubbing, whenever possible (DFO, 2022).
- Treat wastewater discharge prior to release to ensure it meets applicable regulatory requirements.
- Draft and implement a Surface Water Management Plan to support drainage, and ensure water quality conforms to applicable regulations and guidelines.
- Utilize rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life.
- Develop site-specific erosion and sedimentation control plans during the detailed design phase. Properly install, inspect, and repair erosion and sediment controls.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Require that all equipment, including mobile, are equipped with spill kits and appropriate spill mitigation materials.
- Require that workers are fully trained in spill response.
- Ensure operators remain with equipment during refueling.
- Plan any construction activities that may impact stream banks and substrate to align with low-flow periods, when possible.
- Revegetate along the watercourse edge and above the ordinary high-water mark to facilitate bank stabilization, where applicable.
- Locate stockpiles a minimum of 30 m from any surface water feature and stabilize to reduce the likelihood of erosion and sedimentation.
- Collect or direct runoff containing suspended materials into settling ponds, diversion ditches, or well vegetated areas.
- Integrate outlet protection features on settling ponds to dissipate flow velocities and decrease erosion at the outflow.

Change in Fish Health and Survival

- Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.
- Ensure explosive materials storage meets government regulations including required separation distances as regulated by the Explosives Regulatory Division of Natural Resources Canada (NRCAN).
- Avoid instream work whenever possible. When required, ensure effective worksite isolation and work in the dry.
- Complete fish rescues in habitats to be directly impacted.
- Time in-water work, when possible, as per DFO Timing Windows for Newfoundland and Labrador (DFO, 2019).

General

- Adhere to all Approval conditions outlined in all regulatory approvals, including, but not limited to, provincial watercourse alteration permits.
- Complete site kick-off meetings with relevant staff/contractors to educate and confirm policies related to working in and around fish habitat, and that all Approval conditions for in-stream works are clearly communicated and adhered to.

6.8.9 Monitoring

All watercourses will be field verified as part of the permitting process, and fish habitat in all watercourses that are expected to be directly or indirectly impacted will be assessed and the impacts will be quantified. As the watercourse model is verified, quarries, accommodations, and WTG pads will be micro-sited to avoid direct impacts to fish and fish habitat.

A Groundwater and Surface Water Monitoring Management Plan will be implemented to ensure water quality meets the regulatory requirements and minimize potential impacts to water quality throughout the life of the Project (table of contents included in Appendix Q.10). Should changes in water quantity be expected, the Groundwater and Surface Water Monitoring Management Plan may also include locations for flow monitoring to compare actual conditions with predicted streamflow changes. A site-specific Erosion and Sediment Control Plans will also be developed (Table of contents included in Appendix Q.9). These will be living documents and will evolve with the Project and be updated as needed.

6.8.10 Conclusion

After mitigations, predicted residual effects on fish and fish habitat are characterized in Table 6.8.3.

Table 6.8.3: Fish and Fish Habitat Residual Effects – Wind Project and Transmission

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Change in fish habitat quantity	Avoidance of fish habitat through infrastructure placement	A	M	LSA	LT	O	PR	Not significant
	Appropriately designed and installed road crossings/upgrades							
Change in fish habitat quality	Erosion and sediment control	A	L	LSA	LT	I	PR	Not significant
	Riparian buffers							
	Spill preparedness							
	Water management							
	Surface Water Monitoring							
Change in fish health and survival	Erosion and sediment control	A	L	LSA	MT	O	PR	Not significant
	Surface Water Monitoring							
	Spill preparedness							
	Blast management							

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term, MT – Medium Term, LT – Long Term

Frequency: O – Once, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

6.9 Flora & Vegetation Communities

6.9.1 Overview

A desktop review and field studies were undertaken to understand the diversity and distribution of land cover types, flora species, and wetlands present in the WPA (described in detail in the Baseline Vegetation and Wetlands Report in Appendix I.1). The objective of the assessment was to collect the information required to assess the potential impacts of the Project on vegetation and wetlands. The assessment was completed using the following approach:

- Complete a desktop review to characterize the land cover types, flora species, and wetlands known to occur within and near the broader PA.
- Informed by the desktop review, undertake targeted field surveys to document the floral diversity of the WPA, with a focus on flora SAR and SOCC.
- Use the information from the desktop review and field surveys to update the Project design to minimize interactions with rare flora species, their supporting habitat, and wetlands.

This section provides details about the potential effects of the Wind and Transmission Project Component on vegetation and wetlands. Information about the effects of the Industrial and Solar Project Components is provided in Section 7.8 and 8.8, respectively.

6.9.2 Regulatory Context

The Project has potential to interact with lands, flora species, and their associated habitats that may be protected under federal and/or provincial legislation and regulatory guidelines. Legislation relating to vegetation and wetlands includes:

Federal Legislation

- *Species At Risk Act* (SARA) (Canada, 2002b)

Provincial Legislation

- *Endangered Species Act* (NL ESA) (Newfoundland and Labrador, 2001)
- *Lands Act* (Newfoundland and Labrador, 1991)
- *Water Resources Act* (Newfoundland and Labrador, 2002c)

6.9.2.1 *Species at Risk Act, S.C. 2002 c. 29*

The objective of SARA is to prevent species from becoming lost or extinct, to provide for the recovery of species designated Endangered or Threatened, and to prevent species of Special Concern from becoming further at risk. Individual protection of SAR is granted under Section 32(1) of SARA, which states that “no person shall kill, harm, harass, capture, or take an individual of a wildlife species that is listed as an Extirpated species, an Endangered species or a Threatened species”. It is also prohibited to “damage or destroy the residence of one or more individuals of a wildlife species that is listed as an Endangered species or a Threatened species” under Section 33 of SARA.

Habitat protection for species listed in Schedule 1 of SARA (i.e., species designated as Extirpated, Endangered, or Threatened) is granted through the identification and designation of Critical Habitat. Critical Habitat is defined as habitat that is critical to the survival of a species and for flora SAR, applies to federal lands.

6.9.2.2 Endangered Species Act S.N.L. 2001, c. E-10

Species designated as Threatened, Endangered, or Extirpated receive individual protection from harm under Section 16 of NL ESA which states that a person may not, “disturb, harass, injure, or kill an individual of a species designated as threatened, endangered or extirpated” (Newfoundland and Labrador, 2001). NL ESA also prohibits disturbing or destroying the residence of any of these species.

Habitat protection for designated species may be established through a Critical or Recovery Habitat order under Section 28 of NL ESA. Critical Habitat refers to areas that are critical to the survival of a species, and Recovery Habitat refers to areas that are necessary for the recovery of a species. These areas are identified in species recovery plans developed for Threatened and Endangered species.

The Minister may issue a permit to engage in an activity that affects a designated species, its residence, or Critical Habitat, as described in Section 19 of NL ESA.

6.9.2.3 Lands Act, S.N.L. 1991, c. 36

The *Lands Act* (Newfoundland and Labrador, 1991) designates Crown Reserves and Special Management Areas. This legislation may be used to grant temporary protection to an area of land.

Under Section 7(1) of the *Lands Act* (Newfoundland and Labrador, 1991), Crown lands grants, leases, and licenses do not include the 15 m area around lakes, ponds, rivers, seashore, or foreshore (i.e., the shoreline reserve), unless an exception is issued by the Minister.

6.9.2.4 Water Resources Act, S.N.L. 2002, c. W-4.01

The use and modification of wetlands is regulated under the *Water Resources Act* (Newfoundland and Labrador, 2002c). Under Section 48 of the Act, a permit is required to undertake certain activities in wetlands, which are further described in the Policy for Development in Wetlands (NLECCC, 2001).

The *Water Resources Act* (Newfoundland and Labrador, 2002c) defines “wetlands” as land that has the water table at, near, or above the land surface and includes bogs, fens, marshes, swamps and other shallow open water areas. Wetland development is defined in the Policy for Development in Wetlands (NLECCC, 2001) as, “the carrying out of an activity or operation which includes the construction of ditches, mechanical disturbance of the ground, alteration of normal water level fluctuations, infilling, drainage, dredging, channelization, and removal of vegetation cover and/or organic matter on a wetland for social or economic benefits, or the making of any change in the use or the intensity of use of any wetland which affects its

hydrologic characteristics or functions". Certain developments may be permitted in wetlands with the written permission of the Minister of NLECCC.

In addition to legislative requirements, communications provided by NLECCC during the Environmental Assessment Committee process recommends that undisturbed buffers be placed on the highwater mark of all wetlands.

6.9.3 Desktop Assessment Methodology

6.9.3.1 *Vegetation*

Ecological Land Classification

Two Ecological Land Classifications (ELCs) were developed for the Project to understand the range of land cover and terrestrial habitat types present within and near the PA (including the WPA). A generalized ELC was developed early in the Project planning process to inform initial biophysical field assessments. A more detailed ELC was developed as the Project progressed using LiDAR data to refine the assessment of land cover within the PA and to assist with identification of potential habitat for rare flora. The technical methods used to develop the ELCs are provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

Old-Growth / Late-Successional Forests

Old-growth/late-successional forests hold ecological value through providing ecosystem services (carbon sequestration, regulating surface and groundwater supplies) and supporting a range of flora and fauna species (Luyssaert et al., 2008). The extent of old-growth/late-successional forest within the PA was estimated by identifying stands classified as 81+ years and older from the Forest Resource Inventory (FRI) (NLFAL, 2025h).

6.9.3.2 *Flora Species*

The desktop review for flora species focused on identifying the range of species likely to occur in the PA, with a focus on flora SAR and SOCC. This was completed by reviewing species occurrence data provided by the ACCDC (2023, 2026a) and identifying habitats with elevated potential to host rare flora within approximately 5 km of the PA boundary.

Potential Habitat Mapping

Potential habitat mapping was completed for the following flora SAR to prioritize locations for field assessments:

- Red pine (*Pinus resinosa* - natural population, NL ESA Threatened, S2)
- Blue felt lichen (*Pectenium plumbeum*, SARA Special Concern, NL ESA Vulnerable, S2S3)
- Boreal felt lichen (*Erioderma pedicellatum* - Boreal population, SARA Special Concern, NL ESA Vulnerable, S3)

In addition to species-level mapping, an additional mapping exercise was completed to identify areas within the WPA with landscape characteristics that may be suitable for species of rare

flora more generally. A detailed description of the approach used for mapping is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1). Note that potential habitat for rare lichens was not mapped for SLWPA.

6.9.3.3 Wetlands

Wetlands provide valuable ecosystem services including flood and erosion control, water purification, carbon storage, wildlife habitat, and recreational opportunities. The distribution and type of wetlands present in the WPA was estimated using data from the LiDAR-ELC and Canadian National Wetlands Inventory (CNWI) (ECCC, 2024a) to provide a representative range of potential wetland area. The technical methods and limitations and the data sources reviewed for wetlands are described in the Baseline Vegetation and Wetlands Report (Appendix I.1).

6.9.4 Desktop Assessment Results

6.9.4.1 Vegetation

The WPA is within two of Newfoundland's nine ecoregions (Drawing 3.1-2, Appendix A). The BWPA, SLWPA, and TLWPA are within the Central Newfoundland Ecoregion (North Central Subregion) and the majority of the LTWPA is in the North Shore Forest Ecoregion. Both ecoregions are heavily forested, with an abundance of rivers, streams, ponds, and bogs. Further details about the ecological context of the WPA are provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

Ecological Land Classification

The LiDAR-ELC developed for the Project provides a detailed overview of the land cover types present in the PA (Drawing 6.9-1 A-J, Appendix A). Within the WPA, softwood forest was identified as the dominant land cover type (34% of the WPA) with shrub cover the next most common (22%). The barren land cover class makes up the smallest proportion of the WPA (< 1%). A total of 415 ha of road area was identified, which represents 1% of the total WPA. The complete extent of modelled land cover types in each component PA is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

Old-Growth/Late-Successional Forests

A total of 5,726 ha of potential old-growth/late-successional forest was identified in the WPA (Drawing 6.9-2 A-J, Appendix A). These stands are present in all WPAs, with distinct concentrations in the northern portions of the TLWPA and LTWPA. The extent of old-growth/late-successional forest stands within each component PA is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

6.9.4.2 Flora Species

The ACCDC data reports prepared for the Project (ACCDC, 2023, 2026a) contained occurrence records representing 59 unique species of vascular plants. Of these, the natural population of red pine is a SAR (NL ESA Threatened, S2), and 25 species are SOCC (Appendix I.1). No non-vascular plant or lichen SAR or SOCC were identified in the reports.

Red Pine Potential Habitat Mapping

Potential red pine habitat was identified in the eastern portion of the BWPA (Drawing 6.9-2 A-J, Appendix A). No areas of potential habitat were identified in the remaining WPAs.

Two forest stands in the BWPA (7 ha) were identified in the FRI as containing red pine.

Rare Lichen Potential Habitat Mapping

Concentrated areas of potential blue felt lichen habitat were identified in the LTWPA, the northern third of TLWPA, and throughout the eastern half of the BWPA (Drawing 6.9-2 A-J, Appendix A). Concentrated areas of potential boreal felt lichen habitat were identified in the southern portion of the BWPA and the eastern corner of the TLWPA (Drawing 6.9-2 A-J, Appendix A).

Potential Rare Flora Habitat

Areas of potential habitat for rare flora were identified in all WPAs (Drawing 6.9-2 A-J, Appendix A).

6.9.4.3 Wetlands

Based on the two models used to estimate wetland area (LiDAR-ELC and CNWI), wetlands are estimated to be between 7% and 24% of the total WPA (Drawing 6.9-3, Appendix A). Wetlands are most abundant in the BWPA (8%) and least common in the LTWPA (2%). Bogs were the most common wetland type identified in the WPA. The complete extent of mapped wetland areas in each component PA is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

6.9.5 Field Methodology

6.9.5.1 Vegetation

Vascular and Non-Vascular Plants

Surveys for vascular plants in the WPA began in June 2024 and continued until July 2025. A variety of approaches were used to obtain representative survey coverage of major land cover types, including point-based surveys, transects, and targeted surveys for red pine. Further details about the timing and methods used for vascular and non-vascular plant surveys are provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

Rare Lichens

Targeted lichen surveys were completed in the WPA in April, May, and October 2025. Surveys occurred in all WPAs in areas of suitable habitat for lichen SAR and SOCC. Further information about the approach used for rare lichen surveys is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

6.9.5.2 Wetlands

Information about the presence of wetlands in the WPA was recorded incidentally during

biophysical surveys.

6.9.6 Field Results

6.9.6.1 Vegetation

The WPA is a relatively uniform landscape dominated by black spruce forests and wet ground with shallow soils. There is a history of forestry across the landscape, and regenerating forests are intersected by forest access roads and ATV trails. Despite this, many portions of the WPA are very remote with little access. A total of six forest types were observed during surveys in the broader PA: balsam fir forest, black spruce forest, hardwood forest, and black spruce fen (W. J. Meades & Moores, 1994).

Vascular and Non-Vascular Flora

A total of 128 species of vascular flora were identified during field surveys in the PA (Appendix I.1). Within the WPA, one SAR, red pine, and three SOCC were observed (Table 6.9.1; Drawing 6.9-4 A-J, Appendix A).

Table 6.9.1: Field-Observed Flora SAR and SOCC in the WPA

Scientific Name	Common Name	COSEWIC	SARA	NL ESA	S-Rank	Number of Occurrences (Individuals)
<i>Chimaphila umbellata</i>	Common Wintergreen	--	--	--	S2	3 (200+) - LTWPA
<i>Pinus resinosa</i>	Red Pine	--	--	Threatened	S2	BWPA ⁽¹⁾
<i>Polypodium virginianum</i>	Rock Polypody	--	--	--	S2S3	2 (9) - LTWPA
<i>Pyrola elliptica</i>	Shinleaf	--	--	--	S2S3	1 (5) - BWPA

⁽¹⁾ Occurrences of red pine were not individually recorded due to their relative abundance.

A total of 17 non-native vascular plants, four of which are considered invasive in Canada, were observed during field surveys (Appendix I.1). There were also 31 bryophyte species that were recorded (Appendix I.1), none of which are SAR or SOCC.

Rare Lichens

A total of 131 lichen species were identified during lichen surveys. Of these, one lichen SAR, blue felt lichen, and three lichen SOCC were observed in the WPA (Table 6.9.2; Drawing 6.9-4 A-J, Appendix A).

Table 6.9.2: Lichen SAR and SOCC Observed in the WPA

Scientific Name	Common Name	COSEWIC	SARA	NL ESA	S-Rank	Number of Occurrences (Individuals)
<i>Leptogium acadiense</i>	Acadian Jellyskin Lichen	--	--	--	S2S3	2 (7) - BWPA 12 (88) - LTWPA 5 (9) - TLWPA
<i>Pectenia plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S2S3	22 (66) - LTWPA
<i>Ramalina dilacerata</i>	Punctured Ramalina Lichen	--	--	--	S1S3	1 (4) - LTWPA
<i>Ramalina intermedia</i>	Rock Ramalina Lichen	--	--	--	S2S3	1 (12) - LTWPA

6.9.6.2 Wetlands

Wetlands were a dominant feature on the landscape. As predicted in the wetland models, there were a range of shrub swamps, fens, and bogs throughout the WPA. Representative photographs of wetlands are included in a photograph log (Appendix I.1).

6.9.7 Effects Assessment

Project activities, primarily those that involve earth moving and vegetation removal have the potential to impact vegetation cover, rare flora and their supporting habitat, and wetlands (Table 6.9.3). Potential impacts could include direct or indirect impacts to flora SAR, SOCC, and their supporting habitat, and alterations to wetland area and function.

Table 6.9.3: Potential Project-Vegetation and Wetlands Interactions – Wind and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	-
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Turbine Components	X
Turbine Assembly	-
Removal of Temporary Works and Site Restoration	X

Project Phase	Potential for Interaction
Commissioning	-
Operations and Maintenance (33 years)	
Operations and Maintenance	-
Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

6.9.7.1 Assessment Boundaries

Administrative Boundary

No administrative boundaries are identified for the effects assessment on vegetation and wetlands.

Technical Boundary

The primary technical boundary relating to the assessment vegetation and wetlands is the large overall scale of the WPA and associated access limitations within remote areas. Although efforts were made across two years of field data collection, complete coverage of the WPA was not possible and it is therefore expected that additional flora species, and additional occurrences of reported species are present on the landscape. Additional technical limitations of the assessment relate to the availability and accuracy of the land cover classifications and potential habitat mapping completed for the Project. LiDAR data used for the ELC is limited to the PA (99% coverage), and the accuracy of mapping is influenced by a variety of factors, including the accuracy of layers used as inputs. Finally, although wetland areas were incidentally recorded during field assessments, the assessment of impacts relating to wetlands relies primarily on modelled data.

Spatial Boundary

The WPA consists of four individual wind project areas: the BWPA, LTWPA, TLWPA, and SLWPA. These areas include 34,434 ha of land in Central Newfoundland, extending from the Bay of Exploits at the eastern boundary, to North Twin Lake at the western boundary. The Leading Tickles sub-area extends to the Labrador Sea in the north.

The LSA for vegetation and wetlands is a 5 km buffer on the WPA (Drawing 6.9-5, Appendix A). This area encompasses the maximum extent of direct and indirect impacts to vegetation and wetlands. The RSA is not applicable for vegetation and wetlands.

Temporal Boundary

The temporal boundaries indicate when vegetation and wetlands may be impacted by the Project. Impacts will occur throughout the site preparation and construction, operations, and decommissioning phases, with most impacts to vegetation and wetlands occurring during site preparation and construction.

6.9.7.2 Assessment Criteria

The VC-specific definition for magnitude is as follows:

- Negligible: No loss of sensitive vegetation types or wetlands; no loss of terrestrial flora SAR or SOCC individuals; no alteration to habitat known to support terrestrial flora SAR or SOCC expected.
- Low: Small loss of sensitive vegetation types or wetlands; no terrestrial flora SAR or SOCC individuals lost; small loss of or effects on habitat supporting terrestrial flora SAR or SOCC.
- Moderate: Moderate loss of sensitive vegetation types or wetlands; small loss of or effects on terrestrial flora SAR or SOCC individuals (and associated habitat) that do not have legislated protection status, but their populations remain largely intact.
- High: High loss of sensitive vegetation communities or wetlands; high loss of or effects on the habitat that supports terrestrial flora SAR or SOCC that do have legislated protection status.

6.9.7.3 Effects

Potential environmental effects and associated pathways of the Wind and Transmission Project Component in relation to vegetation and wetlands are grouped into four major categories:

- Loss and Alteration of Vegetation Cover
- Landscape Fragmentation and Edge Effects
- Loss of Rare Flora
- Impacts to Wetland Area and Function

Project related effects can influence vegetation and wetlands directly and indirectly. A direct effect is defined by interactions that have no intermediate process (e.g., loss of an individual plant or lichen, loss of a tree that supports a rare lichen) and indirect effects are interactions that have intermediate processes such as landscape fragmentation and edge effects.

Loss and Alteration of Vegetation Cover

Losses and alterations to vegetated land cover will occur during the site preparation and construction phase of the Project because of activities requiring vegetation clearing and ground disturbance. Removal of vegetation via clearing and grubbing of the soil surface will result in changes to the distribution and extent of land cover types, such that alterations in vegetation community characteristics (i.e., the distribution, abundance, and composition of flora species) are likely to occur.

Losses of vegetated land cover will primarily be associated with Project components requiring grubbing and access to the subsurface, including quarries, buildings (e.g., accommodations), roads, and turbine pads. These areas are likely to experience long-term (or permanent) loss of vegetation. In contrast, components such as transmission and collector line ROWs and roadsides will primarily require vegetation clearing, such that alterations, but not an overall loss of vegetated area can be expected. For example, much of the LSA consists of softwood forests, and clearing for ROWs in these areas will result in a conversion to low vegetation

cover, such as shrubs and herbaceous species.

During the operations phase of the Project, impacts to vegetation will primarily be limited to routine vegetation maintenance along roadsides, ROWs, and other Project Infrastructure. Low-growing vegetation will be allowed to re-grow in areas where it does not pose a safety risk or limit site access. Detailed site rehabilitation plans, including landscaping and re-vegetation, will be determined prior to decommissioning.

Project infrastructure associated with the Wind and Transmission Project Component will be constructed within a 4,433 ha PF (127 ha of which extends beyond the WPA). The PF represents the area where direct disturbance will occur and represents the maximum anticipated extent of vegetation clearing for the Project. The infrastructure and areas of potential disturbance associated with the Wind and Transmission Project Component are presented in Table 6.9.4.

Table 6.9.4: Area Associated with Project Infrastructure – Wind and Transmission

Infrastructure	BWPA (ha)	TLWPA (ha)	LTWPA (ha)	SLWPA (ha)	Component Total (ha)
Roads (Newly Constructed)	578	377	158	203	1,316
Roads (Upgraded)	732	128	86	129	1,075
WTG Pads/Laydown Areas	436	212	77	127	852
Transmission Line	445	71	129	164	809
Substations	12	6	6	6	30
Quarries	133	106	57	30	326
Accommodation Camps	16	9	0	0	25
Area Total	2,352	909	513	659	4,433
Total Infrastructure Footprint as % of Project Area	11%	12%	21%	19%	13%

Land cover modelling and field surveys completed for the Project indicate that the WPA is dominated by softwood forest cover and shrub cover, with abundant bogs and other wet areas. To quantify the impacts of the Project on land cover types within individual WPAs, the amount of each land cover type present within the PF was determined using the LiDAR-ELC and compared to the total amount available within the WPA (Table 6.9.5). The land cover types with the greatest overlap with the PF are softwood forest and shrub cover, which together make up over half of the PF (2,708 ha). The amount of softwood forest and shrub cover expected to be cleared for the Project represents up to 15% and 14% of the amounts available within the WPA, respectively. On a proportional basis, the road cover class is expected to have the highest percentage of impacts (66%), highlighting the prioritization of existing roads by the Project.

Table 6.9.5: Land Cover Types within the PF – Wind and Transmission

Land Cover Type	Estimated Impact Area (ha)					Total Available in the WPA (ha)	% Impacted
	BWPA	LTWPA	SLWPA	TLWPA	Total		
Road	186	20	33	25	264	400	66
Barren	15	4	2	-	21	67	32
Bog	83	5	12	20	120	2,348	5
Hardwood Forest	199	62	100	75	436	2,792	16
Herbaceous/Shrub Barren	104	25	22	29	180	1,417	13
Raised Wet Area	66	12	17	3	98	1,156	9
Shrub	501	123	238	236	1,098	7,439	15
Softwood Forest	911	201	114	384	1,610	11,809	14
Water	9	4	5	9	27	1,730	2
Wet Hardwood Forest	26	6	15	17	64	499	13
Wet Herbaceous/Shrub	33	11	15	4	63	663	9
Wet Mixedwood	9	-	2	1	12	140	9
Wet Shrub	93	14	20	25	152	1,525	10
Wet Softwood Forest	113	20	13	74	220	1,936	11
Total	2,348	507	608	902	4,365	33,921⁽¹⁾	13

⁽¹⁾ LiDAR data are unavailable for small sections of the PF, including areas that extend beyond the WPA (hence total is slightly smaller than actual WPA area).

Old-growth/late-successional forest stands were identified in the desktop review as having ecological value and potential to serve as habitat for several species of flora and fauna. The estimated loss of these stands due to vegetation clearing for the Project was determined by calculating the areas of overlap with the PF relative to the amount identified within individual WPAs. It is expected that up to 710 ha of the 5,726 ha of old-growth/late-successional forest identified in the WPA will be impacted by the Project (12%; Table 6.9.6). On a proportional basis, the relative impact will be greatest in the SLWPA where 24% of stands are in the PF, and lowest in the BWPA (8%). Although a loss of old-growth/late-successional forest stands will occur, this forest type will remain abundant within the WPA following construction (88% of the pre-construction area).

Table 6.9.6: Estimated Impacts to Old-Growth/Late-Successional Forest Stands in the WPA

Project Area	Area in Project Footprint (ha)	Amount Available (ha)	Percentage (%) Impacted
BWPA	220	2,729	8
LTWPA	165	1,003	16
SLWPA	199	822	24
TLWPA	126	1,172	11
WPA	710	5,726	12

Landscape Fragmentation and Edge Effects

Of the Project Infrastructure planned for the Wind and Transmission Project Component, new roads make up the largest portion of the PF (1,316 ha; Table 6.9.4). Approximately 317 km of new roads will be developed, with an additional 222 km of existing roads likely to require upgrades to support the transportation of Project components (41% of the road network). A concern associated with the development of roads and other linear features (such as transmission and collector line ROWs) is a process referred to as landscape fragmentation, in which areas of intact vegetation cover are divided into smaller, more isolated patches. Landscape fragmentation can have a variety of impacts on flora and fauna, including changes in the composition, diversity, and reproductive output of flora species (Brisson et al., 2010; Hulting et al., 2025) (the effects of landscape fragmentation on fauna and avifauna are discussed in Sections 6.10 and 6.11).

A road density analysis was completed to estimate the extent of landscape fragmentation associated with the Project. Transportation data and aerial imagery were first compiled to determine the current road density of the WPA and surrounding 5 km (LSA). The resulting data were combined with the locations of new Project roads to allow for a comparison of pre- and post-construction road density across individual WPAs, the WPA, and the LSA.

The results of road density analysis (Table 6.9.7; Drawing 6.9-6A-B, Appendix A) indicate that the average pre-construction road density of the WPA is higher than the LSA (0.72 km/km² and 0.64 km/km²), indicating that the fragmentation baseline condition of the WPA is greater than the surrounding 5 km. The BWPA has the highest fragmentation baseline condition of the four WPAs, with a pre-construction road density of (0.99 km/km²). Pre-construction road density is lowest in the TLPWA (0.42 km/km²).

Table 6.9.7: Estimated Increase in Road Density within the WPA and LSA – Wind and Transmission

Project Area	Pre-Construction Road Density (km/km ²)	Post-Construction Road Density (km/km ²)	Percent Increase in Road Density (%)
BWPA	0.99	1.41	42.42
LTWPA	0.76	1.25	64.47
SLWPA	0.72	1.47	104.16
TLWPA	0.42	1.25	197.62
WPA	0.72	1.35	86.16
LSA	0.64	0.82	28.13

The largest increases in road density due to the Wind and Transmission Project Component are expected to occur in the more remote TLWPA (198% increase) and SLWPA (104% increase), primarily based on low fragmentation in baseline condition. As a whole, the effects of fragmentation due to the Project are anticipated to be more substantive in the WPA compared to the LSA. While the WPA is expected to experience an 86% increase in road density due to the Project the overall increase of road density within the LSA is estimated at 28% (Drawing 6.9-6 A-B, Appendix A).

One aspect of landscape fragmentation that is highly relevant for flora species is the creation of new edge habitat. Edge habitat is associated with the loss of intact vegetation cover, particularly forests, and occurs at the interface of disturbed and undisturbed areas. A variety of impacts to flora species, known as edge effects, are associated with the creation of edge habitat, and have the potential to alter vegetation community composition and impact the growth of flora individuals. Edge habitat will be created during the site preparation and construction phase of the Project throughout the WPA (although portions of the WPA already experience edge effects associated with existing road, clearcuts, and other open features). The extent of new edge habitat is expected to be highest in the BWPA due to the extent of Project infrastructure in that area, and lowest in the LTWPA and SLWPA.

Vegetation within the edge habitat may experience effects associated with altered environmental conditions, dust deposition, and the introduction and spread of invasive species. The degree to which flora and vegetation communities are impacted by edge effects varies depending on the species and specific site conditions. For example, the creation of edge habitat has been shown to induce changes in environmental conditions such as light availability, moisture levels, and temperature (Braithwaite & Mallik, 2012; Hamberg et al., 2009), while also increasing the vulnerability of forest edges to natural disturbances, such as windthrow (Boudreault et al., 2008).

Lichens and non-vascular plants are especially sensitive to edge effects and changes in air quality due to being unable to regulate and maintain their water content (Boudreault et al., 2008; Nash, 2008). Multiple studies have shown that edge effects relating to drying of plant material can be observed from 15 m to 70 m (Gauslaa et al., 2019). Edge effects from activities such as forest harvesting can have a negative impact on lichens that extends up to 50 m into

the forest (Rheult et al., 2002). Non-vascular plants and lichens located near the PF have the greatest potential to be impacted by edge effects due to the Project.

Dust deposition may impact flora near the PF when fugitive dust is generated by traffic on unpaved roads, quarry operations, crushing material, and blasting. Dust from unpaved roads has been found to change the pH of lichen substrates (i.e., the tree bark they are attached to) and impact individual health and species richness (Degtjarenko, 2016). Vascular plants may be impacted by dust through reductions in photosynthesis and leaf diffusion (Thompson et al., 1984). The effects of dust on flora may depend on the duration of exposure; one study found that lichens along a gravel road were unaffected within two years, but significant changes to the communities were observed after 10 years (Farmer, 1993).

The spread of fugitive dust is influenced by several factors, including the height at which the dust is released, wind conditions, and particle size. Under standard conditions, fugitive dust particles above 30 µm settle out within 100 m of the emission source, whereas finer particles have a slower settling velocity and may travel further (US EPA, 1995). It is expected that impacts to vegetation relating to dust deposition will be greatest during the site preparation and construction phase (short-term duration) in areas near the PF. Site traffic and operations within quarries will be greatly reduced during the operational and maintenance phase of the Project.

Finally, the creation of edge habitat is also associated with the introduction and spread of invasive species. Terrestrial flora, particularly rare native flora, may be at risk due to threats from invasive species (BCMECCS, 2018). Non-native species, often introduced to a landscape accidentally by humans, can become invasive when they cause harm to the environment, economy, or human health through rapid reproduction and out-competing of native species (Rutledge et al., 2024). Industrial projects can lead to the introduction of invasive species in two main ways:

- Revegetation of cleared land with non-native seed mixes.
- Increased access to remote areas with equipment carrying seeds, spores, or other reproductive materials from non-native species.

The soil and vegetation disturbance required for the construction of wind energy projects has also been identified as a pathway for the establishment of non-native species (Urziceanu et al., 2024). For example, road and WTG construction and the subsequent increase in vehicle traffic associated with the operation and maintenance of WTGs can lead to the introduction or spread of non-native species, some of which are invasive. Research indicates that early detection and eradication can play a key role in preventing the spread of invasive species in disturbed areas such as wind farms (Kumar Rai & Singh, 2020; Urziceanu et al., 2024).

Within the broader PA, there were 17 non-native vascular plant species observed, of which four are considered invasive (Appendix I.1). Given that non-native and invasive species are already known to be present, mitigation strategies to minimize the risk of non-native and

invasive species risk are provided.

Loss of Rare Flora

Activities requiring ground disturbance and vegetation clearing during the site preparation and construction phase have the potential to directly impact occurrences of flora SAR and SOCC. Throughout the planning phase of the Project, information from the desktop review and the results of subsequent field surveys was considered in determining the layout of the Project. The PF associated with the Wind and Transmission Project Component currently overlaps with occurrences of flora SAR and SOCC within the BWPA, LTWPA, and TWLPA (Drawing 6.9-4 A-J, Appendix A). Of the WPAs, LTWPA hosts the highest abundance of rare lichens whereas red pine, a vascular plant SAR, was only observed in the BWPA.

Red Pine (NL ESA Threatened, S2S3)

Several occurrences of red pine were observed in two general areas in the southeastern extent of the BWPA associated with transmission and collector line infrastructure, new road construction and upgrades (Drawing 6.9-4 A-J, Appendix A). During field surveys, it was not possible to determine the origin of red pine trees with absolute certainty (the natural red pine population, but not silvicultural plantings, are protected under NL ESA). However, many of the red pine trees observed during field assessments had the appearance of planted trees or of trees that naturalized from planted stands. For example, several of the trees observed were in stands of uniform size and arranged in rows, features that are indicative of silvicultural plantations. Additional trees of various sizes were observed in low numbers in areas near what appeared to be planted stands, which may be indicative of naturalized trees. Data provided to Strum by NL FAL-Forest Ecosystem Management Division indicates that all recorded occurrences fall within or directly adjacent to areas that have undergone silvicultural treatments, including planting and harvesting. This indicates that the trees are currently growing in managed as opposed to “natural” landscapes where naturally occurring stands may be expected to occur. Additional occurrences of red pine were also observed in the IPA, as described in Section 7.8.

To avoid impacts to red pine, engagement with NL FAL will be undertaken to confirm whether the trees observed are part of Newfoundland’s natural red pine population that is protected under NL ESA. If the trees are determined to be of part of the natural population, additional engagement with NL FAL will be undertaken to develop a strategy to avoid direct losses of red pine, as is practicable. As a shade-intolerant pioneer species adapted to disturbance (USDA, n.d.-b, 1990), indirect impacts to red pine habitat due to the Project are expected to be low.

Blue Felt Lichen (SARA Special Concern, NL ESA Vulnerable, S2S3)

A total of eight of the 22 occurrences of blue felt lichen observed during field surveys are in the PF of the LTWPA (12 of the 66 thalli observed in the WPA; Drawing 6.9-4A-J, Appendix A). Of these, three are in areas associated with turbine placement, and five are associated with new road developments. During detailed design and engineering, efforts will be made to microsite Project infrastructure to reduce direct losses of blue felt lichen and maintain vegetated buffers where possible. It is possible that a low number of individuals will be directly impacted by the

Project.

Flora SOCC

In addition to flora SAR, three species of flora SOCC were observed in the PF of the WPA. Two occurrences of common wintergreen are in the PF within the LTWPA (100+ individuals) (Drawing 6.9-4 A-J, Appendix A). Both are in areas associated with turbine placement. One occurrence of shinleaf is in the PF in the BWPA (Drawing 6.9-4 A-J, Appendix A) in an area associated with road upgrades and collector line infrastructure (five individuals). Finally, two occurrences of Acadian jellyskin lichen (18 thalli) are in the PF of the LTWPA (Drawing 6.9-4 A-J, Appendix A) in locations associated with new road development, and one occurrence is in the area planned for a collector line ROW in the TLWPA (one thallus observed) (Drawing 6.9-4 A-J, Appendix A). No impacts to Acadian jellyskin lichen are expected where the species occurs in the BWPA. Although some refinements in the placement of Project infrastructure may be made during the detail design stage to avoid direct impacts to flora SOCC, it is likely that most individuals will be lost due to vegetation clearing for the Project.

Potential Sensitive Flora Habitat

Due to the large overall scale of the WPA it was not possible to obtain complete survey coverage for flora species, particularly in remote areas. Potential habitat mapping for rare flora species was therefore completed to estimate the impacts of the Project on habitat with elevated potential to host rare flora species (referred to as “potential sensitive flora habitat”). This mapping exercise used several of the inputs used in the desktop review to prioritize surveys for rare flora. The selection of mapped inputs was similarly informed by known associations between rare flora and specific landscape features. The following features were included in mapping:

- Mature forest (61+ year age classes determined from FRI Data) located along drainage features.
- Alluvial floodplains, as determined using LiDAR by simulating a 3 m water rise on water features.
- Areas with volcanic substrate identified detailed bedrock geology layers (Geological Survey of Newfoundland and Labrador [NLGS], 2013).

Feature layers were combined to identify areas where multiple features coincide, and the overall area of potential sensitive flora habitat was determined. Although the mapping exercise was not validated using field observations, it is based on established associations between rare flora and landscape features and is expected to serve as a reasonable approximation of areas where suitable habitat is likely to occur.

A total of 2,243 ha of potential sensitive flora habitat was identified in the WPA, 267 ha of which is in the PF (Table 6.9.8; Drawing 6.9-7 A-J, Appendix A). The BWPA has the highest overall amount of impact on potential sensitive flora habitat (1,084 ha) but the lowest overall proportional loss (7% impacted). The overall amount of potential habitat impacted by the Project is relatively low (12%) and a high amount of suitable habitat will remain available in the

WPA following construction (2,243 ha).

Table 6.9.8: Estimated Impacts to Potential Sensitive Flora Habitat in the WPA

Project Area	Area in Project Footprint (ha)	Amount Available (ha)	Percentage (%) Impacted
BWPA	75	1,084	7
LTWPA	43	317	14
SLWPA	97	355	27
TLWPA	52	487	11
WPA	267	2,243	12

Impacts to Wetland Area and Function

Wetlands are a common feature throughout the broader PA and the WPA, as identified by modelling and confirmed through field surveys. Project activities that involve vegetation removal and ground disturbance have potential to impact wetlands through a direct loss of wetland area as well as impacts to wetland function.

Effects to wetlands include both direct loss and changes in wetland functionality and can occur throughout the life of the Project. Effects might be direct (e.g., habitat loss through infilling) or indirect (e.g., changes to functionality due to hydrologic shifts). Effect-specific active management, mitigation, and long-term monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

The impacts of the Wind and Transmission Project Component on Groundwater Hydrogeology, Surface Water Hydrology, and Fish and Fish Habitat (VCs with linkages to wetlands) are described in Sections 6.6 to 6.8.

Loss of Wetland Area

A direct loss of wetland area will occur during the site preparation and construction phase through infilling or excavating for Project Infrastructure. Wetland loss has the potential to fragment wildlife corridors, potentially isolating species and lowering species richness. It can also disrupt vital habitat characteristics that support vulnerable species. Further, the removal or infilling of wetland habitat can impact the hydroperiod of neighbouring wet areas, resulting in farther reaching impacts on habitat quality (Mitsch & Gosselink, 2000).

The wetland areas identified in the LiDAR-ELC were used to estimate the maximum direct loss of wetlands associated with the Project. The PF was overlaid with the total wetland area identified within each WPA and impacts were determined relative to the amount of wetland area identified (Drawing 6.9-8, Appendix A). It is expected wetlands identified using this model incorporated an undetermined amount of “wet areas” that are not true wetlands, such that the areas reported are a conservative estimate of the total impacted area.

Within the WPA, 425 ha of the wetlands identified by the LiDAR-ELC are in the PF, which represents 5% of the total wetland area (Table 6.9.9). Direct impacts to wetlands are expected

to be highest in the BWPA and TLWPA where 146 ha and 143 ha of wetlands were identified in the PF, respectively.

Table 6.9.9: Estimated Impact to Wetlands within the LSA – LiDAR-ELC

Wetland Type	Estimated Impact Area (ha)					Total in WPA (ha)	% Impacted
	BWPA	LTWPA	SLWPA	TLWPA	Total		
Bog	46	3	12	20	81	2,345	3
Raised Wet Area	17	9	17	3	45	1,152	4
Wet Hardwood Forest	7	2	14	17	41	496	8
Wet Herbaceous/Shrub	18	8	15	4	45	660	7
Wet Mixedwood	3	0	2	1	6	139	4
Wet Shrub	33	8	20	25	87	1,519	6
Wet Softwood Forest	23	13	13	73	121	1,929	6
Total	147	43	93	143	426	8,240	5

Change in Wetland Function

Wetlands play a variety of functional roles in boreal landscapes, which differ based on wetland type. Changes to wetland functionality may be caused through direct loss of wetland area, as discussed above, or through other Project activities that release dust, sediment or invasive species into the wetland, thus shifting its ecological, chemical, and hydrological profiles. Changes to wetland function are therefore possible during all Project phases.

The temporal and spatial extent of indirect effects such as hydrological effects, erosion and sedimentation, invasive species, and compaction can be far reaching, but are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes. Indirect impacts are mitigated by maintaining a vegetated buffer between Project activities and unaltered wetlands.

Hydrological Effects

The hydrology of a wetland is one of the most important aspects of its overall structure and function. Project infrastructure within or near a wetland can result in changes in the timing and quantity of flow, potentially impacting species composition, water treatment capabilities, and nutrient export (Mitsch & Gosselink, 2000). Further, disruption to the hydrology of one area may hinder the hydrological connectivity to other areas, thus resulting in impacts being felt in neighbouring wet areas.

During the detailed design phase, the location of WTGs and other infrastructure will be micrositied to avoid unnecessary impacts to wetlands, including locating crossings of large wetlands along edge or narrow portions of the wetland where possible. Wetland crossings will be designed to avoid any permanent diversion, restriction or blockage of natural flow, such that the hydrological function of wetlands is maintained. Specific details of the crossings will be

finalized during the detailed design phase and will be included in the application for wetland development. Measures to mitigate the impacts of the Project on surface water and groundwater resources, which may indirectly impact wetlands, are described in Sections 6.6 and 6.7.

Erosion and Sedimentation

Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, daily traffic, routine road and transmission line ROW maintenance. The accumulation of sediment within wetland environments can cause shifts in ecological integrity, including the plant species composition and subsequent nutrient retention potential, hydrological storage capabilities, and habitat suitability for vulnerable species (Tilman et al., 1997). Additionally, the use of road salt for winter maintenance may result in indirect adverse effects on microbial and vegetative wetland communities, including detrimental salinity levels and increased soil erosion due to salt-damaged vegetation (Jones et al., 2017). A site-specific Erosion and Sedimentation Control Plan will be developed during the detailed design phase. The plan will address the type of control structures, proper installation techniques, grading, maintenance and inspection, and revegetation. During winter, Project roads will be maintained by plowing, sanding, and/or salting main arteries as required for safe driving.

Invasive Species

The colonization of invasive species can result in detrimental impacts on wetland environments, including alterations to evapotranspiration rates, infilling from reduced decomposition rates, and ultimately a reduction in the complexity of the wetland and its subsequent species richness (Zedler & Kercher, 2004). The creation of roadways can act as a vector for invasive species, with the potential for seed dispersal increasing with both vehicular and animal traffic. Further, because many invasive species thrive in disturbed soils, routine maintenance of roadways can provide ideal conditions for their establishment (Trombulak & Frissell, 2000). Due to the existing presence of invasive species in the PA, mitigations will be applied to reduce the further introduction or spread of invasive species.

Compaction

Compaction can hinder both the vegetative and hydrological structure of a wetland, with a loss of pore space restricting root growth and groundwater infiltration (Duiker, 2004). This impacts the absorption of moisture and nutrients, thus impacting the ecological integrity of the wetland and the ecosystem services it provides. Further, compaction can decrease percolation rates, resulting in prolonged periods of saturation, and increasing the potential for flooding (Duiker, 2004). Following established BMPs for construction in wetlands and avoiding unnecessary travel through wetlands will reduce the overall extent of wetland compaction.

Summary of Wetland Impacts

Changes in wetland function associated with the Project were qualitatively assessed by identifying the dominant wetland types present within each WPA. As the wetlands identified by the LiDAR-ELC do not follow an established wetland classification system, such as the Canadian Wetland Classification System (NWWG, 1997), the extent of wetlands identified by

the CNWI (ECCC, 2024a) were reviewed. The total areas of each wetland type within the PF were determined for each WPA to identify the relative impacts to primary wetlands types (Table 6.9.10). Similar amounts of bog, fen, and swamp wetlands are expected to be impacted; however, impacts to bogs are lowest on a proportional basis due to being very abundant on the landscape, and highest for swamps.

Table 6.9.10: Estimated Impact to Wetlands within the LSA – CNWI

Wetland Type	Estimated Impact Area (ha)					Total in WPA	% Impacted
	BWPA	LTWPA	SLWPA	TLWPA	Total		
Bog	20	3	7	6	36	1,371	3
Fen	19	3	14	2	38	609	6
Swamp	23	1	11	5	39	400	10
Marsh	1	0	0	0	2	28	7
Total	63	7	32	13	115	2,408	5

Bogs typically have a high water table and receive most of their water from precipitation, resulting in nutrient-poor, acidic environments (NWWG, 1997). This acidity is further compounded due to the release of organic acids that result from the decomposition of *Sphagnum spp.* Bogs have an important role in carbon storage (due to the accumulation of peat), water storage, and habitat for wildlife species (DUC, n.d.). Bogs are the most common wetland type in the WPA and a proportionally low amount will be impacted by the Project.

Fens typically exhibit more open water than bogs, often with a connection to a watercourse or abutting a lakeshore. They may also receive hydrology from neighbouring uplands. Ultimately, this inundation of water from outside sources facilitates a transfer of nutrients that allow fens to support a wider variety of flora and fauna than bogs (NSNR, 2018). Fens store large amounts of carbon, and are generally more biologically diverse than bogs due to being supplied by various sources of water (DUC, 2013a). The highest impacts to fens will occur in the BWPA and SLWPA, although overall impacts are low on a proportional basis.

The Canadian Wetland Classification System (NWWG, 1997) defines a swamp as a wetland characterized by the dominance of woody vegetation in which the water table is typically at or near the surface or inundates the soil for a significant portion of the growing season. Swamps are often associated with poorly drained or saturated soils, and they provide important habitat for various plant and animal species adapted to wet conditions. Swamps offer nutrient rich soils for a variety of flora species and offer a high diversity of habitat for wildlife species (DUC, 2013c). Based on the Proportion of swamps within the PF relative to the WPA, it is expected that swamps will experience the greatest relative impacts due to the Project.

Marshes often display more persistent surface water areas that tend to shrink as the growing season progresses. The hydrology of marshes can be influenced by various external sources, including precipitation, surface runoff, surface water connections, and groundwater. This diversity of hydrological sources typically fosters a nutrient-rich environment which, when paired with the lack of canopy cover, often facilitates the vigorous growth of herbaceous vegetation (NSNRR, 2018). In many cases, this vigorous growth can lead to the full engulfment

of any open water areas, resulting in meadow-like marshes that may be partially or fully inundated. Marshes are the least common but most biologically diverse type of wetland in boreal environments (DUC, 2013b). A low overall amount of marsh wetland is expected to be impacted by the Project, with most impacts occurring in the BWPA.

Changes in wetland function due to the Project are likely to occur within the WPA; however, wetlands are abundant within the WPA and will remain a common landscape feature after construction. The use of construction BMPs and targeted mitigations will help reduce changes in wetland function due to factors such as erosion and sedimentation, invasive species, and accidental compaction.

6.9.8 Mitigation

To address the abovementioned effects to vegetation and wetlands, the following mitigation measures will be implemented:

Loss and Alteration of Vegetated Land Cover

- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Conduct vegetation management activities (through application of herbicides and manual brush cutting) in accordance with the Pesticide Control Regulations under the NL EPA.

Landscape Fragmentation and Edge Effects

- Use approved dust suppressant to control road dust and minimize airborne emissions, where required.
- Establish and implement speed limits to minimize dust and potential collisions.
- Use quarried, crushed materials for road construction to reduce the introduction of invasive vascular plant species.
- Clean and inspect equipment to prevent the introduction of non-native species.
- Revegetate cleared areas with native species, to the extent possible.

Loss of Rare Flora

- Prioritize the avoidance of flora SAR and maximize avoidance of flora SOCC during the detail design stage, where possible.
- Pre-construction surveys of identified potential sensitive flora habitat within the PF to be conducted to inform detailed design.
- Maintain undisturbed buffers around flora SAR and SOCC to the extent possible to minimize impacts to supporting habitat.
- Consult with NL FAL-Wildlife Division to confirm the origin of red pine trees in the BWPA.
 - If red pine trees in the PF are determined to be naturally occurring individuals protected under NL ESA, avoidance of individuals will be maximized through careful micro-siting of Project Infrastructure, and undisturbed buffers maintained where possible.
- Consult with NL FAL-Wildlife Division if a flora SAR is incidentally observed in the WPA

(e.g., during site preparation, construction).

Loss of Wetlands and Change in Wetland Function

- Avoid unnecessary travel through wetlands, where possible.
- Maintain a minimum 30 m vegetated buffers surrounding watercourses, where possible.
- Where undisturbed buffers cannot be maintained an application for a permit to Alter a Body of Water will be made in accordance with the *Water Resources Act*.
- Design wetland crossings to avoid permanent diversion, restriction or blockage of natural flow, as practical, such that hydrologic function of wetlands will be maintained.
- Direct run-off from construction activities away from wetlands, where possible.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation, where possible (e.g., mulching, seeding, rock cover).

6.9.9 Monitoring

No monitoring programs specific to vegetation and wetlands are recommended.

6.9.10 Conclusion

A desktop review and field studies were undertaken to characterize the range of vegetation and wetlands present within the WPA. This information was incorporated into the Project design, and mitigation measures have been developed to further reduce impacts to the vegetation and wetlands due to the Project. Vegetation and wetlands may be impacted through the following:

- Loss and Alteration of Vegetation Cover
- Landscape Fragmentation and Edge Effects
- Loss of Rare Flora
- Impacts to Wetland area and Function

Modelling and geospatial analyses were used to assess the impacts of the Project on vegetated land cover. The PF of the Wind and Transmission Project Component consists of 4,433 ha of land, and vegetation clearing will have the highest impacts to softwood forest and shrub cover.

The extent of new landscape fragmentation and edge effects associated with the Project was determined to assess indirect effects of the Project on vegetation. The Wind and Transmission Project Component is expected to increase landscape fragmentation and edge habitat within all WPAs. The LTWPA and TLWPA are expected to experience the greatest relative increase in landscape fragmentation due to having a lower baseline fragmentation condition. New edge habitat will be highest in the BWPA due to the concentration of Project infrastructure.

The results of field surveys indicate that two flora SAR, red pine and blue felt lichen are present within the PF of the Wind and Transmission Project Components. Red pine was identified in the BWPA, and further consultation with NL FAL is required to confirm if the occurrences are part of the natural red pine population that is protected under NL ESA. Blue felt lichen was identified in the LTWPA, and adjustments to the infrastructure layout during the detail design phase will be undertaken to reduce impacts to the species where possible. Desktop mapping for the assessment indicates that while some sensitive areas such as old-growth/late-successional forest and potential rare flora habitat will be impacted by the Project, the amount lost will be relatively low compared to the amount available in the WPA.

Impacts to wetlands associated with direct loss of wetland area and changes in function were assessed using modelled data about the extent and type of wetlands in the WPAs. Approximately 425 ha of wetlands are within the PF and may be directly impacted by the Project. Wetlands are abundant across the broader landscape, such that this represents 5% of the amount in the WPA.

Following the application of mitigations, the residual effects of the Project on vegetation and wetlands are not expected to be significant (Table 6.9.11).

Table 6.9.11: Vegetation and Wetlands Residual Effects – Wind and Transmission

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Loss and Alteration of Vegetation Cover	Maximize use of pre-existing roads and disturbed areas	A	M	LSA	LT	SE	PR	Not Significant
	Restore cleared areas where possible							
Landscape Fragmentation and Edge Effects	Minimize dust production and spread	A	M	LSA	LT	I	PR	Not Significant
	Inspect and clean work vehicles to limit spread of non-native and invasive species							
Loss of Rare Flora	Prioritize avoidance of flora SAR and maximize avoidance of flora SOCC during detail design	A	M	LSA	ST	SE	IR	Not Significant
	Maintain undisturbed buffers around flora SAR and SOCC to the extent possible							
	Consult with NL FAL if a flora SAR is incidentally observed (e.g., during site preparation)							

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Impacts to Wetland Area and Function	Avoid unnecessary travel and disturbance in wetlands	A	L	LSA	LT	SE	PR	Not Significant
	Maintain vegetated buffers on wetlands where possible							
	Implement an Erosion and Sediment Control Plan							
	Design wetland crossings to avoid permanent diversion/blockage of flora							
	Design wetland crossings to avoid permanent diversion/blockage of flow							
LEGEND (Refer to Section 5.0 for definitions)								
Nature of Effect: A – Adverse, P – Positive								
Magnitude: N – Negligible, L – Low, M – Moderate, H – High								
Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area								
Duration: ST – Short Term, MT – Medium Term, LT – Long Term								
Frequency: SE – Single Event, I – Intermittent, C – Continuous								
Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

6.10 Terrestrial Fauna

6.10.1 Overview

Fauna was selected as a VC because fauna species and their habitat will be impacted, directly and indirectly, by proposed Project activities within the WPA. The objective of this assessment was to collect the information required to assess the potential impacts of the Project within the WPA, with a focus on rare species. The assessment was completed using the following approach:

- Gain an understanding of the potential terrestrial fauna and fauna habitat types present within and near the WPA using desktop resources.
- Identify fauna SAR and SOCC with elevated potential to occur in the WPA.
- Undertake surveys for different taxa of terrestrial fauna to document the species present within the WPA, particularly SAR and SOCC.
- Use the information collected through field studies to update the Project design to avoid or minimize interactions between Project infrastructure components and terrestrial fauna and their supporting habitat, particularly SAR and SOCC.
- Apply mitigation, construction, and operational management practices to minimize effects to terrestrial fauna.

This fauna assessment specifically includes the assessment of the Wind and Transmission Project Component on moose (*Alces alces*), muskrat (*Ondatra zibethicus obscurus*), American marten (*Martes americana atrata*), and at-risk insects. Baseline conditions and effects assessments for bats and caribou in relation to the Wind and Transmission Project Component are discussed separately in Sections 6.12 and 6.13.

6.10.2 Regulatory Context

Several laws and regulations provide protection for fauna and their habitats in Newfoundland and Labrador. Legislation that may direct resource development and conservation of fauna include:

Federal Legislation

- *Species At Risk Act* (Canada, 2002b)
- *Migratory Birds Convention Act* (Canada, 1994)
 - Designates Migratory Bird Sanctuaries
- *Canada National Marine Conservation Areas Act* (Canada, 2002a)
 - Designates National Marine Conservation Areas
- *Canada Wildlife Act* (Canada, 2000)
 - Designates National Wildlife Areas
- *Canada National Parks Act* (Canada, 2022)

Provincial Legislation

- *Wild Life Act* (Newfoundland and Labrador, 1990f)
 - Designates wildlife reserves.

- *Water Resources Act* (Newfoundland and Labrador, 2002c)
- *Endangered Species Act* (Newfoundland and Labrador, 2001)
- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)
- *Wilderness and Ecological Reserves Act* (Newfoundland and Labrador, 1990g)
- *Lands Act* (Newfoundland and Labrador, 1991)

6.10.3 Desktop Assessment Methods

The following sections summarize the baseline desktop methods and results for fauna within the WPA. Full descriptions of baseline conditions can be found in the Fauna Baseline Report (Appendix J.1). The following resources and databases were consulted for the desktop review:

- ACCDC Data Report (ACCDC, 2026a)
- SARA Critical Habitat layers
- SARA Recovery Strategies
- Big Game Management Areas (NLFAL, 2024b)
- Provincial Protected Areas (NLECCC, 2024f)
- Provincial Land Use Atlas (Newfoundland and Labrador, 2025d)

6.10.3.1 *Fauna Habitat Model Methodology*

Two Ecological Land Classifications (ELCs) developed for the Project were used to understand the range of land cover and terrestrial habitat types present within and near the PA. Several habitat models were also developed to identify potential habitat for select fauna species within the component PAs based on known habitat requirements and available spatial data (including the ELCs). Technical details about the development of the ELCs and habitat models can be found in Section 6.9 and Appendix I.1, respectively.

Moose

Prior to field assessments, a detailed desktop review of known moose observations and potential moose habitat within the WPA was completed by reviewing Moose Management Areas (MMAs) (Newfoundland and Labrador, 2023a). A habitat suitability model was also developed to assess the availability of suitable moose habitat within the WPA (see Appendix J.1 for more details).

Muskrat

Muskrat populations are primarily managed through recreational and traditional hunting practices in Newfoundland. A habitat suitability model was developed to assess the availability of suitable muskrat habitat within the WPA (see Appendix J.1 for further details).

American Marten

Prior to field assessments, American marten den data retrieved from ACCDC (ACCDC, 2026a) were reviewed for known American marten observations. A habitat suitability model was also developed to assess the availability of suitable American marten habitat within the WPA (see Appendix J.1 for more details).

Invertebrates

The ACCDC data report (2026a) was reviewed for SAR invertebrate species prior to completing field surveys.

6.10.4 Desktop Assessment Results

The ACCDC data report (2026a) includes one observation of a terrestrial mammal SAR and no observations of terrestrial mammal SOCC (excluding bats and birds, see Section 6.12 and 6.11) within 5 km of the PA (Table 6.10.1).

Table 6.10.1. ACCDC Terrestrial Fauna SAR within 5 km of the Project Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	NL ESA Status	S-Rank
American Marten (Island of Newfoundland Population)	<i>Martes americana</i>	Special Concern	Special Concern	Vulnerable	S3

6.10.4.1 Moose

The WPA lies within MMA 15 Twin Lakes (Drawing 9.4-11; Appendix A). Habitat modelling for moose indicates that approximately 8,645 ha of suitable habitat is present within the WPA, with the greatest availability in the BWPA (Table 6.10.2; Drawing 6.10-1, Appendix A).

Table 6.10.2: Predicted Moose Habitat within the WPA

Project Area	Available Predicted Moose Habitat (ha)
BWPA	5,413
LTWPA	1,057
TLWPA	1,478
SLWPA	697
Total	8,645

6.10.4.2 Muskrat

Habitat modelling indicates that approximately 3,197 ha of suitable habitat for muskrat is present within the WPA (Drawing 6.10-2, Appendix A). The breakdown of suitable habitat within each WPA is shown in Table 6.10.3, below. Highly suitable habitat accounts for 86 ha (<1% of the WPA) and was only identified within the BWPA.

Table 6.10.3: Predicted Habitat for Muskrat within the WPA

Habitat Ranking	Highly Suitable Habitat (ha)	Moderately Suitable Habitat (High) (ha)	Moderately Suitable Habitat (Low) (ha)	Suitable Habitat (ha)	Total (ha)	Total as percent
BWPA	86	141	597	1,401	2,225	11%
SLWPA	-	-	29	66	95	3%
TLWPA	-	-	166	390	556	7%
LTWPA	-	-	161	162	323	14%
WPA Total	86	141	953	2,019	3,199	9%

6.10.4.3 American Marten

The occurrence of American marten included in the ACCDC data report (ACCDC, 2026a) was reported approximately 3.7 km from the WPA (Appendix J.1). A review of the Recovery Plan for American marten in Newfoundland, indicates that the PA does not overlap with any identified critical habitat areas (Newfoundland and Labrador, 2010).

Habitat modelling indicates that approximately 7,237 ha of high potential and 8,563 ha of low potential habitat for American marten is present within the WPA (Table 6.10.4, below) (Drawing 6.10-3).

Table 6.10.4: Predicted American Marten Habitat within the WPA

Project Area	High Potential American Marten Habitat (ha)	Low Potential American Marten Habitat (ha)	Total Available Habitat (ha)	Total as percent
BWPA	3,863	7,277	11,140	55%
LTWPA	911	212	1,123	47%
TLWPA	2,021	796	2,817	37%
SLWPA	443	279	722	20%
WPA Total	7,237	8,563	8,248	24%

Invertebrates

No insect SAR or SOCC were identified in the ACCDC data report (2026a).

6.10.5 Field Assessment Methodology

Species at Risk & Species of Conservation Concern

Direct observations of terrestrial fauna or signs thereof within the WPA were recorded and photographed, when feasible, during targeted fauna surveys and other non-target biophysical field surveys, with particular emphasis on terrestrial fauna SAR and SOCC. Incidental observations were recorded in addition to dedicated wildlife surveys as they provide broad temporal and spatial coverage of the WPA. Signs included features such as dens, nests, scat, tracks, and evidence of foraging.

6.10.5.1 Wildlife Trail Cameras

Wildlife trail cameras were deployed from December 2022 to January 2023 and January 2024 to February 2025 across the WPA (Drawing 6.10-4; Appendix A). Survey methodologies were developed in consultation with NL FAL - Wildlife Division as per the EIS Guidelines (NLECCC, 2025).

6.10.5.2 Caribou and Moose Cameras

A total of 33 trail cameras were deployed in and around the PA from December 2024 to January 2026 (Drawing 6.10-4; Appendix A). An occupancy analyses was also completed to estimate moose populations within the region and across broad habitat classifications (NRCAN, 2024b) based on data collected by trail cameras. Survey methodologies were developed in

consultation with NL FAL - Wildlife Division (NLECCC, 2025). The details of caribou and moose camera grid location selection can be found in Appendix J.1.

6.10.5.3 American Marten Surveys

American marten surveys were conducted from March to April 2025 in accordance with Herdman et al. (2014). A total of 20 hair snag stations were established for one month (Drawing 6.10-5; Appendix A) in mature forest stands and checked at least three times during their deployment. A total of eight hair samples were collected from six of the 20 trapping stations, and samples were analyzed following the techniques outlined in Kestler et al. (2022). Trail cameras and track sightings were consulted for further confirmation about the presence of American marten near a hair snag station.

6.10.5.4 Invertebrates

Targeted surveys for insects were not completed. Incidental observations of insect SAR or SOCC were documented during non-target biophysical surveys, if observed.

6.10.6 Field Assessment Results

6.10.6.1 Species at Risk & Species of Conservation Concern

A total of 13 species of terrestrial fauna (excluding avifauna and bats) were identified during field assessments either by sighting individuals or signs thereof, including both targeted surveys and incidental observations conducted within the WPA (Table 6.10.5).

Table 6.10.5: Fauna Species Observed within the WPA

Scientific Name	Common Name	COSEWIC Status ⁽¹⁾	SARA Status ⁽¹⁾	NL ESA ⁽²⁾	S-Rank ⁽³⁾
<i>Alces alces</i>	Moose	-	-	-	SNA
<i>Canis latrans</i>	Eastern Coyote	-	-	-	SU
<i>Castor canadensis</i>	American Beaver	-	-	-	S5
<i>Lepus americanus</i>	Snowshoe Hare	-	-	-	SNA
<i>Lutra canadensis</i>	Northern River Otter	-	-	-	S5
<i>Lynx canadensis</i>	Canada Lynx	-	-	-	S3S4
<i>Microtus pennsylvanicus</i>	Meadow Vole	-	-	-	S3S4
<i>Mustela vison</i>	American Mink	-	-	-	SNA
<i>Rangifer tarandus</i>	Caribou	Special Concern	Special Concern	-	S3S4
<i>Rattus norvegicus</i>	Norway Rat	-	-	-	SNA
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	-	-	-	SNA
<i>Vulpes vulpes</i>	Red Fox	-	-	-	S5
<i>Ursus americanus</i>	Black Bear	-	-	-	S4

Source: ⁽¹⁾ECCC (2025b); ⁽²⁾Newfoundland and Labrador (2002); ⁽³⁾ACCDC (2026b)

6.10.6.2 Wildlife Trail Camera

A total of 552 individuals consisting of eight species were recorded on wildlife trail cameras.

These animals included: snowshoe hare (*Lepus americanus*), red squirrel (*Tamiasciurus hudsonicus*), moose, eastern coyote (*Canis latrans* var), Canada lynx (*Lynx canadensis*), red fox (*Vulpes vulpes*), black bear (*Ursus americanus*), and caribou (*Rangifer tarandus*).

Moose was the most common species observed (n=438 photos). Moose observations occurred at over half (n=28) of all trail camera locations within and around the WPA, indicative of the overall abundance of moose in MMA 15. A total of three observations of caribou were recorded within the WPA. The complete results of the wildlife trail camera analysis are available in the Fauna Baseline Report (Appendix J.1)

6.10.6.3 Caribou and Moose Camera

Across all caribou and moose cameras, there was a total of 10,343 camera trapping days. Seven wildlife species were observed: woodland caribou, moose, Canada lynx, snowshoe hare, coyote, red fox, and red squirrel. See Section 6.13 for a full description of field results.

6.10.6.4 American Marten Surveys

No American marten signs were recorded during any surveys. All hair snag samples were determined to be “not marten” or “possible marten” based on their length, colour, colour pattern, waviness, and thickness. No American marten were recorded by trail cameras at any of the hair snag locations within the WPA, and information from the hair analysis is consistent with lack of signs of American marten recorded by trail cameras and observations of tracks at the trap sites.

6.10.6.5 Invertebrates

No SAR or SOCC invertebrate species were observed during field surveys.

6.10.7 Effects Assessment

6.10.7.1 Project-Terrestrial Fauna Interactions

Project activities, primarily those that involve earth moving, road construction, quarry and accommodation development, or vegetation removal, have the potential to impact terrestrial fauna and fauna habitat (Table 6.10.6). These potential impacts could include the loss of habitat and habitat fragmentation, injury or mortality, and sensory disturbance.

Table 6.10.6: Potential Project-Fauna Interactions – Wind and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	
Geotechnical Investigations	X
Implementation of Erosion and Sediment Control measures	X
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X

Project Phase	Potential for Interaction
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Turbine Components	x
Turbine Assembly	x
Removal of Temporary Works and Site Restoration	x
Commissioning	x
Operations and Maintenance (33 years)	
Operations and Maintenance	x
Vegetation Management	x
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	x
Site Reclamation	x

6.10.7.2 Assessment Boundaries

Administrative Boundary

No administrative boundaries are identified for the effects assessment on terrestrial fauna.

Technical Boundary

Prediction of habitat availability within the WPA was limited by the availability and accuracy of GIS models developed to support this effects assessment. Several models were designed to understand the potential impacts of the Project on the landscape and to fauna. This includes an ELC that was developed using aerial imagery, airborne LiDAR data and land cover data for only the area within the PA. The ELC model was used as the basis of all habitat models developed for the effects assessment. As comparable data outside the PA were not available, these models cannot predict the potential habitat outside of the WPA. This reduces the ability contextualize potential impacts to habitat within the WPA to the surrounding region.

Additionally, technical boundaries include constraints associated with the availability of provincial data including the accuracy of the NLFAL - Land Cover Database (NLFAL, 2025h), thus impacting predictions of potential habitat for fauna.

Finally, the large size and remoteness of the WPA restricted access and limited the scope of biophysical surveys for fauna.

Spatial Boundary

The spatial boundary for determining residual effects to terrestrial fauna is the LSA, which includes a 5 km buffer around the WPA (excluding ocean). The LSA was defined considering the maximum expected extent of direct and indirect impacts to terrestrial fauna. The WPA is used to describe specific interactions and impacts to specific habitats and species; the WPA is further narrowed to individual wind project areas (BWPA, LTWPA, TLWPA and SLWPA; Drawing 6.10-6, Appendix A). The RSA is not applicable to this effects assessment.

Temporal Boundary

Temporal boundaries associated with terrestrial fauna include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

6.10.7.3 Assessment Criteria

Assessment criteria provided in Section 5 apply for terrestrial fauna. The fauna definition for magnitude is as follows:

- Negligible: No loss of fauna habitat or impact to fauna through sensory disturbance or injury/mortality.
- Low: Small loss of habitat supporting fauna and low impacts to fauna through sensory disturbance or injury/mortality.
- Moderate: Moderate loss of fauna habitat and/or moderate impacts to fauna through sensory disturbance or injury/mortality, but these impacts will only be experienced by individuals rather than entire populations.
- High: High loss of fauna habitat or high impact to fauna through sensory disturbance or injury/mortality that would impact fauna on a population scale.

6.10.7.4 Effects

Potential environmental effects and associated pathways of the Wind and Transmission Project Component in relation to fauna are grouped into three major categories:

- Habitat Loss and Fragmentation
- Injury or Mortality
- Sensory Disturbance

Project related effects can influence fauna directly and indirectly. A direct effect is defined by interactions that have no intermediates (e.g., mortality by vehicle collision) or direct loss of habitat and indirect effects are interactions that have intermediate steps such as edge effects, sensory disturbance, or changes in fauna behaviour associated with road development.

Mammals - General

Habitat Alteration and Fragmentation

The Project will result in direct and indirect impacts to habitat used by fauna within the WPA. Most effects to fauna habitat are expected to occur during the site preparation and construction phase of the Project through vegetation clearing and grubbing, excavating, and the development of new roads, and transmission lines. Clearing for infrastructure placement will occur within the Project Footprint and will reduce and alter the overall availability of terrestrial fauna habitat. The infrastructure and areas of disturbance presented in Table 6.9.4, indicate that Wind and Transmission infrastructure will be constructed within 4,433 ha, which accounts for 13% of the WPA and 3% of the LSA.

The WPA consists of a variety of habitat types, including softwood, mixedwood, and hardwood forests, barrens and shrub-dominant areas, as well as bogs and other wetland types. Historical disturbance is evident within the WPA, primarily consisting of disturbed areas associated with logging, wind-throw, and insect disturbance. Softwood forest and shrub cover are the dominant land cover types in the WPA and will also experience the greatest overall impacts due to vegetation clearing. Vegetation is described further within the Baseline Vegetation and Wetlands Report (Appendix I.1).

Vegetation clearing for the Project will cause a direct loss of habitat for various fauna species, which may cause fauna that currently use habitat within the WPA to leave the area during construction. Habitat loss could potentially result in mortality if individuals are unable to relocate to alternative suitable habitats. However, the WPA is located in a landscape with a range of land cover types, and land cover present within the WPA is not unique or rare in the local, regional, or provincial context. It is therefore expected that most fauna species will be able to move to alternative areas of suitable habitat within the WPA and surrounding LSA when habitat is lost in the Project Footprint. Studies completed by Buckmaster et al. (1999) indicate that wildlife populations may be expected to disperse from the area during periods of construction, and return once it is complete. Considering the land cover characteristics of adjacent areas and the conclusions of Buckmaster et al. (1999), it is expected that displacement of wildlife will be temporary.

Habitat loss or alteration may also result in behavioural changes for fauna stemming from the following indirect Project impacts: reduced refugia, loss of adequate sources of food, and reduced space for mating. However, it is not anticipated that these pathways will result in changes in overall fauna populations.

In addition to habitat loss, fragmentation of terrestrial fauna habitat (the division of habitat into smaller, more isolated areas) also has potential to indirectly impact individuals. Some species will find new opportunities in fragmented habitats (i.e., foraging), while others are likely to avoid areas with new construction in favour of undisturbed, intact habitats. In particular, Project roads have potential to fragment habitat and alter the movement patterns of fauna species (roads may serve as a barrier for certain species and act as a conduit to the movement of others). Further, road density has been identified as a key indicator of ecological integrity and a potential predictor of habitat suitability for large mammals, such as moose and caribou, as roads are closely correlated with human development (Beazley et al., 2004).

To estimate the extent of fragmentation associated with the Project, a road density analysis was completed to compare the pre- and post-construction road density of the WPA and LSA (Drawing 6.9-6 A-B, Appendix A). The analysis includes the LSA to allow for an evaluation of how wildlife movement corridors may be affected by the Project. It is important to note that the road density analysis does not account for fragmentation caused by wind turbine pads, laydown areas, or transmission lines within the WPA. The results of these road density calculations are presented in Table 6.10.7.

Table 6.10.7: Estimated Increase in Road Density within the WPA and LSA

Project Area	Pre-Construction Road Density (km/km ²)	Post-Construction Road Density (km/km ²)	Percent Increase in Road Density	Pre-Construction Road Density in the LSA (km/km ²)	Post-Construction Road Density in the LSA (km/km ²)	Percent Increase in Road density
BWPA	0.99	1.41	42%	0.63	0.81	29%
LTWPA	0.76	1.25	63%			
SLWPA	0.72	1.47	104%			
TLWPA	0.42	1.25	198%			
WPA	0.72	1.35	86%			

Road density within the WPA and LSA is expected to increase following the construction of the Project, to a mean density of 1.35 km/km² in the WPA and 0.81 km/km² in the LSA. Some areas will see greater increases than others, depending on existing conditions and the inclusion of pre-existing roads for the Project.

The greatest increase in road density is expected within the TLWPA, which will change from 0.42 km/km² to 1.25 km/km², a 198% increase. The TLWPA has the highest proportion of intact and unfragmented forest, especially through its central area, which has the current potential to support east–west movement of fauna. The Project Footprint will result in a change to this potential wildlife corridor and is expected to possibly create a barrier to movement for certain species. Road density within the LSA is predicted to increase by 29%, from 0.63 km/km² pre-construction to 0.81 km/km² post-construction. Road density within the LSA outside of the WPA will remain unchanged. It is important to note that changes in road density vary within and between individual WPAs, so the spatial distribution of the increase in road density is not even across the WPA. This means that those species which may be sensitive to changes in road density will still have areas less affected within and surrounding the WPA.

The changes in road density described above may have a variety of effects on terrestrial fauna species. Road development can place increasing direct and indirect pressure on wildlife by causing mortality, disrupting movement patterns, and reducing and fragmenting available habitat (Jalkotzy et al., 1997). Road density thresholds for medium and large mammals is identified at 0.6 km/km², below which naturally functioning landscapes are maintained for sustainable populations (Beazley et al., 2004). Some species are more sensitive to road densities than others (i.e., caribou) due to differences in their ecology and behavioural characteristics (Beazley et al., 2004). Current road densities in most of the WPA exceed the upper limits known to impact wildlife, indicating that species in these areas may already be experiencing ecological pressures linked to road-related disturbance. Only TLWPA is below the 0.6 km/km² threshold pre-construction, but even this area demonstrates evidence of existing anthropogenic disturbance within the WPA.

An aspect of landscape fragmentation that is relevant for fauna species is the creation of new

edge habitat. Edge habitat is associated with the loss of intact vegetation cover, particularly forests, and occurs at the interface of disturbed and undisturbed areas. Effects associated with the creation of edge habitat may indirectly impact fauna through changes in breeding habitat and predator-prey dynamics (Dijak & Thompson, 2000). For example, edges may alter physical habitat conditions such as light, temperature (e.g., higher wind exposure), and wind, which in turn influences vegetation structure and food availability, potentially impacting fauna (Dijak & Thompson, 2000). The creation of edge habitat associated with the Wind and Transmission Component will occur due to land clearing for the placement of Project infrastructure, including roads, collector and transmission lines, turbine pads, and quarries. Edge effects as they relate to avifauna species are discussed in Section 6.11.

The creation of new edge effects is expected to be highest in the BWPA due to the extent of Project infrastructure in that area, and lowest in the LTWPA and SLWPA. It is expected that any fauna using habitat that will be disturbed by Project activities will move to similar habitats within and adjacent to the WPA and LSA.

During the detailed design process, consideration will be made to minimize adverse impacts to sensitive habitats, such as mature forests, wetlands and watercourses to maintain important ecological corridors for fauna. Approximately 540 km of roads will be required for the Project, and the existing network of access roads is being leveraged to the greatest extent feasible to limit the amount of new disturbance required for road development. This approach not only minimizes the extent of newly impacted areas, but also consolidates linear disturbances, potentially lessening the overall impact on wildlife movement patterns. Existing road densities range from 0.42 to 0.99 within the WPA, suggesting that the landscape is already subject to anthropogenic disturbance. As such, the additional increase in road density from the Project is expected to have a reduced impact compared to locating the Project in a previously undisturbed landscape. Although movement of species may change, available habitats are present within the LSA. The overall magnitude of impact to wildlife from habitat loss and fragmentation is predicted to be moderate. Impacts are expected to be permanent in nature as Project roads will remain when the WTGs are decommissioned.

Injury/Mortality

Direct injury or mortality of fauna species could result from Project activities, particularly due to an increase in vehicle traffic. The construction and decommissioning phases of the Project will experience the highest levels of vehicle traffic and associated risks of wildlife-vehicle collisions. During operation, trucks and other equipment will be accessing and working at the site but at a much lower frequency, lessening the potential for interactions with wildlife. Maintaining cleared right of ways, with speed limits, is expected to increase visibility of wildlife approaching roadways and reduce chances of mortality.

Species that are attracted to roadways and other cleared areas for travel, nesting, or foraging will have an elevated potential for injury or mortality. Although the presence of humans, vehicles, and equipment will be highest during construction, some fauna may be particularly avoidant of the Project Footprint during this phase as noise from machinery and equipment will

be highest. Opportunistic scavengers that have been observed in the WPA such as eastern coyote and black bear, may be drawn to elevated activities.

Accidents such as fuel spills have the potential to cause indirect mortality to fauna due to exposure of contaminants. Best management practice (BMPs) for the handling and use of materials will be followed to reduce the likelihood of spills and impacts to the environment (including fauna habitat). Overall, direct mortality to fauna from Project activities is possible but unlikely to occur and only infrequently.

Sensory Disturbance

The reproduction and survival strategies of terrestrial mammals may be directly or indirectly impacted by sensory disturbances caused by Project activities. Many species have sensitive windows for breeding and birthing, and any small disruption to these activities may reduce reproductive success in the population. Sensory disruptions may result from sound/vibration or excess light. Lovich and Ennen (2013) stress the importance of turbine siting relative to the needs of wildlife to minimize effects. The iterative Project design process will continue to prioritize avoidance and minimization of interactions with important wildlife habitat such as wetlands and mature forest.

Project-related noise may impact habitat use, patterns of activity, stress levels, immune response, reproductive success, risk of predation, communication with conspecifics and antipredator behaviours, and hearing damage (Lovich & Ennen, 2013). Noise levels and associated impacts to fauna are expected to be highest during the construction phase of the Project. The temporary development of quarries for the provision of material for roads and infrastructure foundations, as well as activities such as land clearing and infrastructure construction will generate noise that may result in temporary, localized wildlife avoidance of the WPA during the construction phase.

A literature review conducted by Shannon et al. (2016) found that an increase in stress and decrease in reproductive success in terrestrial mammals has the potential to occur at noise levels ranging from 52 to 68 dBA. According to Suter (2002), bulldozers, graders, and excavators generate noise of the following ranges: 91-107 dBA, 88-91 dBA, and 70-108 dBA, respectively. The decibel limits of construction equipment required for the Project are not expected to be greater than 115 dBA. Blasting noise may exceed this range but this activity will be sporadic in nature, only occurring during the construction phase, and may not be required. Blasting plan mitigation measures will be developed to lessen impacts during blasting if it is required. The levels of noise during the construction phase are likely to exceed the levels cited by Shannon et al. (2016) for indirect impacts to wildlife, however, these activities are temporary and will not persist beyond Project construction.

Light is another source of sensory disturbance that can impact fauna by potentially causing disorientation, or attraction and avoidance behaviour (Longcore & Rich, 2004). In turn, these behavioural changes can affect the success of foraging, reproduction, and communication of wildlife (Longcore & Rich, 2004).

In summary, sensory disturbance (noise and light) to fauna is expected to occur, and may result in changes in fauna behaviour and movement. Species of fauna respond differently to sensory disturbance, and an overall negative effect to wildlife is expected for species that are sensitive to disturbance. Sensory disturbances are expected to be localized and only occur within the WPA and not extend into the LSA. Due to the proportion of the habitats proposed to be impacted by the Project and habitat availability in the surrounding LSA, suitable habitat for many species is present. Species that are sensitive to sensory disturbances may be able to relocate to suitable habitat within the LSA during the construction phase when associated impacts will be greatest.

Species Specific Effects

Moose, muskrat, American marten and at-risk insects were selected for further assessment related to Project impacts. Assessment of the following species was completed within the WPA, as data were too coarse and unavailable beyond this boundary to support modelling efforts.

Moose

Moose were introduced to Newfoundland over 100 years ago and have rapidly grown in population size due to the lack of predators and abundant food sources (Parks Canada, 2025). Since their introduction, moose populations have fluctuated due to over-browsing and over-hunting, which lead the Government of Newfoundland and Labrador to introduce a quota system for species management (NLFAL, 2022). Moose are an important cultural species on the island for subsistence hunting by Newfoundlanders and economic value from non-resident hunting (NLFAL, 2022). Moose are generally associated with mixed wood and boreal forests and may be found in younger, recently disturbed forests (e.g., forest harvesting, fire, insect outbreaks (NLFAL, 2025a).

A moose habitat model was developed to identify potential suitable habitat within the WPA, assess how moose may move through the landscape and identify where important corridors of ecological connectivity exist (model parameters are provided in Appendix J.1). The model identified habitat a moose may use throughout the year for various life stages including foraging, overwintering, and calving.

Table 6.10.8: Direct Impacts to Predicted Moose Habitat within the WPA

Project Area	Available Predicted Moose Habitat (ha)	Loss of Predicted Habitat from Project Footprint (ha)	Percentage of Loss
BWPA	5,413	515	10%
LTWPA	1,057	128	12%
TLWPA	1,478	164	11%
SLWPA	697	122	17%
WPA Total	8,645	928	11%

The Project Footprint will result in the loss of 928 ha of predicted habitat for moose within the

WPA. This accounts for 11% of the suitable habitat within the WPA (Table 6.10.8).

Changes to habitat availability and quality as a result of the Project's activities is likely to affect moose behaviours by reducing areas for thermoregulation, overwintering, mating, and protection for calves (NSNR, 2021). As moose rely on large, connected habitats to meet their seasonal and life-stage requirements, habitat loss and fragmentation can compel individuals to expand their home ranges in search of suitable habitat. However, displacement tends to be localized, as moose often shift to adjacent undisturbed areas rather than fully relocating (Street et al., 2015).

Habitat fragmentation may indirectly benefit moose populations as they are often attracted to edge habitats and early successional forests, which offer foraging opportunities. It is likely that moose occurrences will remain consistent with existing conditions as a result. Foraging quality and availability have a greater influence on ungulate movement than the construction of wind-power facilities (Walter et al., 2006). Although the study by Walter et al. (2006) was on a smaller scale, it indicates that wind power development did not deter elk from grazing. As long as food sources remain present and accessible, ungulates may remain in the area.

Project related road development can lead to increased risk of vehicle mortality to moose and increase in hunting activity because of improved road access. Moose are attracted to roads for barrier free movement and research shows that increases in road density are directly linked to increased moose hunting opportunities (Beazley et al., 2004). Risks of vehicle mortality and illegal hunting of moose will be reduced through the appropriate mitigation measures.

Sensory disturbance from Project activities has the potential to impact moose at various life stages. Construction activities during the fall could potentially affect the rutting behaviour of moose. Most ungulates prefer riparian areas, typically with high shrub vegetation cover to give birth. As the turbines will be sited away from riparian areas to the extent practicable, the noise associated with the construction and assembly of turbines is not likely to affect the selection of calving areas.

Newfoundland moose are an introduced species to the island, with no natural predators, populations have fluctuated (NLFAL, 2025d). The overabundance of moose foraging can lead to over browsing and result in the depletion of local plant communities, particularly balsam fir and birch species (McLaren et al., 2006). The effects of over-browsing by moose are primarily linked to broader population management issues, rather than being a direct result of the Project. These impacts are addressed through regulated hunting within designated Moose Management Areas.

Musk rats

Musk rats are a semi-aquatic rodent that use wetlands, rivers, and riparian habitats. Muskrat are native to the island of Newfoundland and represent a unique genetic population, that differ from those found off of the island (Rigby & Threlfall, 1982). Muskrat populations have been suppressed by the introduction of mink; however, in recent years, muskrat populations have

been making a recovery (NLFAL, n.d.). Muskrat are an important furbearer species and trapping is permitted island-wide (NLFAL, 2025b).

Musk rats are sensitive to increases in road density, primarily due to their requirements on aquatic habitats for movement (B.C. Conservation Data Centre, 1994). High road density can lead to habitat fragmentation, reduced connectivity, and increased mortality rates for muskrats. Impacts to wet areas, including watercourses and wetlands at road crossings, proposed by the Project have the potential to impact muskrat habitat within the WPA. Impacts to overhanging stream bank vegetation decreases shade/cover for muskrats, increases vulnerability to predators and decreases foraging opportunities. Changes in channel morphology and flow regimes may also disrupt muskrat movement. With the exception of road crossings, infrastructure will be placed away from riparian areas, which will minimize impacts to muskrats.

A muskrat habitat suitability model was developed for the Project, using parameters outlined in the Provincial muskrat survey protocol (NL FAL, 2019; details available in Appendix J.1). The muskrat habitat model identified a total of 5332 ha (15% of the WPA) of predicted habitat that may support muskrat (Drawing 6.10-2, Appendix A).

Of the 5,332 ha of suitable predicted habitat, 155 ha are expected to be impacted by the Project Footprint, either through partial or complete alteration, upgrades to existing watercourse crossings, construction of new crossings, quarry construction, or accommodation construction (Table 6.10.9).

Table 6.10.9: Direct and Indirect Impacts to Predicted Muskrat Habitat within the WPA

Habitat Ranking	Loss of Predicted Habitat (ha): BWPA	Loss of Predicted Habitat (ha): SLWPA	Loss of Predicted Habitat (ha): TLWPA	Loss of Predicted Habitat (ha): LTWPA	Combined Loss of Predicted Habitat (ha): WPA	Percentage Loss
Highly Suitable Habitat	< 1	-	-	-	< 1	< 1%
Moderately Suitable Habitat (High)	2	-	-	-	2	1%
Moderately suitable Habitat (Low)	21	3	9	15	48	5%
Suitable Habitat	54	7	17	16	94	5%
Total	78	10	26	31	145	4.5%

The Project Footprint will alter 145 ha of muskrat predicted habitat within the WPA (4.5% of loss). Not all alterations will be permanent, and avoidance of sensitive areas will prioritize. If alterations are required, EVREC commits to maintaining 30 m vegetated buffers on wetlands and watercourses, when possible. Loss of habitat for muskrats are expected to be low. Overall effects of habitat loss or fragmentation on muskrats will be reduced through mitigation measures.

American Marten

American marten are particularly sensitive to habitat fragmentation, primarily due to their reliance on interior forest conditions for critical life functions. These forests provide essential cover for movement, subnivean (under-snow) access for hunting, denning opportunities, thermoregulation, and habitat for prey species (COSEWIC, 2022).

Road development and vegetation clearing for wind turbines will introduce additional breaks in forest cover, potentially creating barriers to movement for American marten within the WPA. The Project is anticipated to result in a mean road density of 1.35 km/km², representing an 86% increase of road density within the WPA. Although a species-specific road density threshold for American marten has not been identified in research, Beazley et al. (2004) identified 0.6 km/km² as a threshold above which medium and large mammals often experience negative impacts. Road density, however, will not be homogenous throughout the WPA, there is a variability in densities for each WPA. Furthermore, current road density within the LSA is 0.63 km/km², already above the wildlife amount recognized in literature. It may be that the general area is not ideal American marten habitat, as supported by the lack of evidence observed for the animal in field surveys.

A habitat suitability model identified 8,248 ha of suitable American marten habitat within the WPA (Drawing 6.10-3, Appendix A). Areas with greater habitat connectivity are considered more favourable for American marten. Hargis et al. (2001) found that American marten avoid open areas wider than 100 m, highlighting the species' preference for continuous forest cover. Consequently, the model applied a 100 m gap threshold between patches to delineate areas with greater connectivity, and more likely to be used by the species.

The results of the model show that ideal habitat with less than 100 m of connectivity for American marten exists in patches located in the northern portions of the TLWPA and LTWPA of the WPA. However, overall habitat connectivity is fairly limited in the WPA overall, with most habitat being composed of small, isolated patches (Drawing 6.10-3, Appendix A). The Project Footprint will account for the loss of 699 ha of predicted habitat with WPA (Table 6.10.10). Road and turbine development will result in greater fragmentation of American marten habitat, particularly within the BWPA. As a result, American marten may need to use lower quality habitat within the WPA, where gaps of 100 m between patches are present.

Table 6.10.10: Direct Impacts to Predicted American Marten Habitat within the WPA

Wind Project Areas	Total Available Predicted Habitat (ha)	Loss of Predicted Habitat (ha)	Percentage of Loss
BWPA	11,140	321	3%
LTWPA	1,123	115	10%
TLWPA	2,817	198	7%
SLWPA	722	65	9%
WPA Total	8,248	699	8%

Edge effects on roads and cleared areas will further reduce the amount of habitat availability

and connectivity for American marten. Forest edges (usually adjacent to clearings or disturbances) are exposed to higher winds, with sunnier and dryer conditions and are often subject to both natural and anthropogenic disturbances. These conditions result in different vegetative structure and composition than interior forests. American marten have been shown to avoid forests within 100 m of an edge (Hargis et al., 2001). Edge effects from the Project Footprint will reduce the amount of interior habitat available for American marten. However, the WPA has an existing mix of disturbance regimes with edge habitat due to historical forestry activity, which likely reduced favourable habitat for American marten, this is further proven by absence of American marten observations during biophysical surveys.

Recent studies indicate that Newfoundland population of American marten are more adaptable to human-modified landscapes than previously believed. COSEWIC (2022) reports that American marten have been observed using younger regenerating stands (< 6 m tall) and precommercial thinned forests. This behavioural shift is likely driven by habitat availability and adaptation from historical forestry within Newfoundland (COSEWIC, 2022). As such, American marten appear capable of using a broader range of vegetation types, particularly where structural complexity and prey availability are maintained.

American marten populations in Newfoundland are primarily concentrated in the western and eastern regions of the island, with notably lower densities in central Newfoundland (ECCC, 2013a). This distribution pattern is attributed to a combination of historical and ecological factors as well as human intervention. Higher populations of American marten in eastern and western regions of the province are associated with the establishment of large contiguous areas of protected forest such as Terra Nova National Park and Bay du Nord Wilderness reserve. Intensive logging and land use changes in central Newfoundland have likely reduced habitat availability and connectivity for American marten in this region (COSEWIC, 2022). Due to these legacy impacts, the landscape within the WPA already offers limited suitable habitat for American marten, and existing moderate road densities contribute further to fragmentation. These conditions are evident by poor habitat connectivity in existing conditions (Drawing 6.10-3, Appendix A).

While the Project will result in habitat loss and alteration in the WPA, the effects are expected to be moderate but not significant, given the existing reduced habitat suitability and no American marten were observed during biophysical surveys.

Potential American marten mortality from vehicle collisions is also a concern. Although the risk of road mortality generally increases with population density (COSEWIC, 2022), the low abundance of American marten in the WPA suggests that this risk remains low in the context of the Project. However, the development may lead to increased access to previously remote areas, raising the potential for illegal trapping or other forms of human-induced mortality (COSEWIC, 2022).

Invertebrates

Four invertebrate species recorded in Newfoundland are SAR; these species and their ranks

are shown in Table 6.10.11 below. Flying insects, including bees (and other hymenopterans) and beetles (coleopterans), are susceptible to mortality from collisions with wind turbines. There are several hypotheses as to whether, or why, these insects are attracted to wind turbines (Jansson et al., 2020). Questions remain in the literature concerning how this potential attraction affects mortality rates; whether insect fatalities at wind turbines are contributing to population declines; and how these fatalities are impacting ecological functions (Voigt, 2021).

Table 6.10.11: Insect SAR Known to Occur in Newfoundland

Common Name	Scientific Name	COSEWIC	SARA	NL ESA
Hymenoptera				
Gypsy Cuckoo Bumble Bee	<i>Bombus bohemicus</i>	Endangered	Endangered	Endangered
Suckleys Cuckoo Bumble Bee	<i>Bombus suckleyi</i>	Threatened	--	Threatened
Yellow-banded Bumble Bee	<i>Bombus terricola</i>	Special Concern	Special Concern	Vulnerable
Coleoptera				
Transverse Lady Beetle	<i>Coccinella transversoguttata</i>	Special Concern	Special Concern	Vulnerable

Habitat loss will result in the decrease of localized biodiversity and microhabitats that many insects rely on. No significant effects are expected for the four SAR listed above based on current insect population and ecology research and considering that none of these species were observed during field surveys or by the ACCDC report (ACCDC, 2026a).

6.10.8 Mitigation

To address the abovementioned effects to terrestrial fauna, the following mitigation measures will be implemented:

Habitat Alteration and Fragmentation

- Wherever possible, install open span, natural bottom culverts or oversize pipe culverts to support safe wildlife passage and preserve ecological connectivity to prevent obstacles for muskrat movement.
- Wherever possible, avoid gating culverts and minimize culvert length.
- Maintain a minimum 30 m vegetated buffers surrounding watercourses, where possible.
- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Revegetate cleared areas with native species, to the extent best possible.

Injury or Mortality

- Inform all Project-related staff working on the site of dangers to wildlife and create awareness around wildlife hotspots on the site.
- Establish and implement speed limits to minimize dust and potential collisions.
- Install signage where specific wildlife concerns have been identified.
- Install motion activated lights on-site infrastructure, where feasible, to reduce insect

attraction.

- If SAR species are observed in the area during blasting, blasting shall be paused, until animal has left the area.
- Provide wildlife awareness training to all site personnel to reduce interactions between personnel and wildlife.
- Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.
- Maintain good housekeeping practices during construction to avoid indirectly feeding fauna and potentially attracting nuisance wildlife.
- Store hazardous and non-hazardous waste in designated areas, in appropriate containers to reduce potential for spills and to avoid attracting wildlife.

Sensory Disturbance

- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Use noise controls (e.g., mufflers) on machinery and equipment to limit disturbance.
- Limit unnecessary lighting as much as possible, especially at night.
- Complete visual surveys for wildlife (moose and caribou) prior to blasting.

6.10.9 Monitoring

Monitoring and management plans will be developed to assess the accuracy of the predicted environmental effects and effectiveness of the mitigation measures. The management and monitoring plans are subject to modifications after consultation with NL Wildlife. The following Plans will be developed as part of the Project's commitment to monitoring and mitigation of adverse effects to Fauna:

- Wildlife Response Plan – The primary goal is to provide strategies in reducing human-wildlife interactions, promote safety of both wildlife and site personnel and best management practices for vegetation management including invasive species management. This plan will also address reporting and response protocols for terrestrial fauna mortalities. This plan will occur during the duration of the construction, operation and reclamation phase of the Project. The Wildlife Response Plan is included in the Emergency Response Plan (Appendix Q.2)
- Waste Management Plan will be developed to reduce attraction of animals (Appendix Q.12).

6.10.10 Conclusion

After mitigations, predicted residual effects on fauna and fauna habitat are characterized in Table 6.10.12.

Table 6.10.12: Fauna Residual Effects – Wind and Transmission

VC Interactions	Mitigation	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Habitat Alteration and Fragmentation	Limit habitat disturbance and minimize Project footprint during detailed design where possible. Implement spill prevention and ERP Plans. Ensure safe handling of waste to prevent attracting wildlife. Revegetation or allow for natural revegetation of cleared areas wherever possible.	A	M	LSA	LT	SE	PR	Not significant
Injury or Mortality	Implement speed limits to reduce potential collisions with fauna. Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited. Provide wildlife awareness training to site personnel. Implement WRP and associated monitoring plans	A	L	LSA	MT	I	R	Not significant

VC Interactions	Mitigation	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Sensory Disturbance	Visual surveys for wildlife will be completed prior to blasting. Use noise controls on machinery. Minimize lighting Implement WRP and associated monitoring plans	A	L	LSA	MT	I	R	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

6.11 Avifauna

6.11.1 Overview

This section covers effects on the avifauna VC based on the wind project and transmission components of the Project. Impacts such as habitat loss/fragmentation, mortality risk, and sensory disturbance will be assessed.

6.11.2 Regulatory Context

The Project has potential to interact with avifauna species that are protected under federal and provincial legislation. Legislation that may direct resource development and conservation of avifauna species and their habitats include:

Federal Legislation

- *Species at Risk Act* (Canada, 2002b)
- *Migratory Bird Convention Act* (Canada, 1994)
- *Canada Wildlife Act* (Canada, 2000)
- *Canadian Environmental Protection Act* (Canada, 1999)

Provincial Legislation

- *Endangered Species Act* (Newfoundland and Labrador, 2001)
- *Wild Life Act* (Newfoundland and Labrador, 1990f)
- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)

The CEPA provides protection of the federal environment through pollution prevention, toxic substance control, waste management, and emissions management. Similarly, the *Environment Protection Act* supports and promotes the protection, enhancement, and use of the provincial environment while maintaining ecosystem integrity and sustainable development, along with pollution prevention and reduction.

The MBCA protects all migratory birds while they are present in Canadian jurisdiction, including on land, in the air, and on the water. The Migratory Birds Regulations, 2022, protect the nests of species listed under Schedule 1 of MBCA for a set period, depending on the species. Nests of species listed under Schedule 1 can be registered under the Abandoned Nest Registry to begin a waiting period, after which the nest can legally be removed. Under the provincial *Wildlife Act*, it is illegal to destroy or disturb bird nests or eggs unless authorized by the MBCA. ESA and SARA prohibit harm to listed SAR along with their habitually occupied spaces and core/critical habitat, as defined by each of these Acts.

The Project is also driven by policies, guidelines, and standards that provide guidance on the development of the Project and the survey design for all industries (e.g., wind, quarry). These guidance documents and policies include:

- Environment and Climate Change Canada's Canadian Wildlife Service (Atlantic Region) – Wind Energy & Birds Environmental Assessment Guidance Update (ECCC-

- CWS, 2022).
- Wind Turbines and Birds - Updated Guidance for Environmental Assessment and Monitoring, Canadian Wildlife Service – Atlantic Region (2018).
- Wind Turbines and Birds - A Guidance Document for Environmental Assessment (ECCC-CWS, 2007b).
- Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007a).
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009).
- Various provincial and Environment and Climate Change Canada (ECCC) special management practices and species at risk management plans.

6.11.3 Desktop Assessment Methodology

Desktop information was summarized to provide insight into protected avifauna habitats, species usage of the area, and to identify avian SAR and SOCC potentially occurring at or within the PA using the following sources:

- Atlantic Canada Conservation Data Centre (ACCDC)
- SARA Recovery strategies
- CWS Waterbird Colony Database (Atlantic Region)
- Newfoundland Breeding Bird Atlas (Birds Canada, 2025)
- Waterfowl Breeding Population and Habitat Survey
- eBird, iNaturalist, or other public data sources

6.11.4 Desktop Assessment Results

Avian SAR identified during desktop review include evening grosbeak (*Coccothraustes vespertinus*), Newfoundland grey-cheeked thrush (*Catharus minimus minimus*), olive-sided flycatcher (*Contopus Cooperi*), red crossbill (*Loxia curvirostra perchna*), and rusty blackbird (*Euphagus carolinus*).

Key findings from the desktop review within the avian baseline report (Appendix M.1) include:

- ACCDC: identified 10 avian SOCC and three avian SAR: Newfoundland grey-cheeked thrush, olive-sided flycatcher, and rusty blackbird.
- Newfoundland Breeding Bird Atlas: a total of 80 species were reported, including four avian SAR:
 - Within the grid squares encompassing the LTWPA, 51 species were reported, none of which were SAR.
 - Within the grid squares encompassing the BWPA, 73 species were reported, including two SAR: red crossbill and rusty blackbird.
 - Within the grid squares encompassing the TLWPA, 62 species were reported, including two SAR: evening grosbeak and olive-sided flycatcher.
- eBird: evening grosbeak, olive-sided flycatcher, and rusty blackbird were identified within or near the WPA.

- CWS Waterbird Colony Database (Atlantic Region): 14 waterbird colonies were identified within 5 km of the PA, 10 of which are concentrated around the northern coastal extent of the LTWPA. The closest colony is located on Red Island, approximately 1.4 km north of the LTWPA.
- There were no Important Bird Areas or Migratory Bird Sanctuaries identified within 100 km of the Project. The closest IBA, Wadham Island and adjacent Marine Area (NF013), is located approximately 105 km northeast of the LTWPA.

The avian baseline report (Appendix M.1) can be referred to for detailed desktop results, with more information and details on the findings listed above.

6.11.5 Field Assessment Methodology

The following surveys were conducted within or near the WPA during the 2024 and winter 2025 seasons, which aligned with CWS and EIS guidelines (NLECCC, 2025):

- Winter resident surveys (March) – targeted for red crossbill (*Loxia curvirostra perona*)
- Spring and fall migration surveys (April, May, and August to September)
- Nocturnal owl surveys (May)
- Waterfowl Surveys (May to October)
- Breeding bird surveys (June and July)
- Shorebird surveys (June to August)
- Coastal waterbird surveys (September and October)
- Avian radar monitoring and acoustic monitoring (April to November)

The survey locations are shown on Drawing 6.11-1 and acoustics and radar monitoring locations are on Drawing 6.11-2 A-C (Appendix A). The avian field and acoustic/radar baseline reports (Appendices M.1 and M.2) can be referred to for detailed methodology and mapped drawings of survey locations for each survey type.

6.11.6 Field Assessment Results

In total, 2,127 individuals were observed during field surveys within the WPA, representing 90 species, as well as nine unconfirmed species (identified to family or group as duck sp., sandpiper sp., etc.).

Avian SAR observed within the WPA during field programs, all of which were observed during the breeding bird season, included evening grosbeak (COSEWIC Special Concern, ACCDC S3S4) olive-sided flycatcher (COSEWIC Special Concern, ACCDC S3B,SUM), red crossbill (COSEWIC Threatened, ACCDC S1S2), and rusty blackbird (COSEWIC Special Concern, ACCDC S2S3B,SUM), as well as several avian SOCC. The avian baseline report (Appendix M.1) can be referred to for more details of the SOCC observed.

Avian SAR observed per WPA during avian surveys are as follows:

- BWPA: evening grosbeak, olive-sided flycatcher, red crossbill, and rusty blackbird.

- TLWPA: olive-sided flycatcher.
- LTWPA: olive-sided flycatcher and red crossbill.
- SLWPA: no avian SAR observed.

Additional SAR observations occurred during acoustic analysis which detected Newfoundland grey-cheeked thrush (COSEWIC Threatened), in the BWPA and Canada warbler (*Cardellina canadensis*, COSEWIC Special Concern, ACCDC SNA) in the LTWPA.

Survey locations and results are summarized by survey type in Table 6.11.1 below. The avian baseline report (Appendix M.1) and radar/acoustic baselines (Appendix M.2) can be referred to for full detailed field results.

Table 6.11.1: Summary of Wind and Transmission Component Results

Section	Summary
Desktop Review	
ACCDC Results	Three SAR species were identified to potentially occur in the WPA: rusty blackbird, olive-sided flycatcher, and Newfoundland grey-cheeked thrush.
eBird Results	Three SAR species were identified to potentially occur in the WPA: evening grosbeak, olive-sided flycatcher, and rusty blackbird.
Field Surveys	
Waterfowl Surveys	10 sites were surveyed identifying 79 birds representing 27 different species. Two SAR were observed: olive-sided flycatcher and rusty blackbird.
Nocturnal Owl Surveys	12 nocturnal owl surveys were conducted identifying 12 owls representing three different species. No SAR or SOCC were observed.
Spring Migration Surveys	Seven sites were surveyed identifying 29 birds representing 14 different species. No SAR and one SOCC was observed.
Fall Migration Surveys	Seven sites were surveyed identifying 88 birds representing 27 different species. No SAR or SOCC were observed.
Breeding Bird Surveys	101 point counts were surveyed identifying 1,577 birds representing 66 different species. Four SAR and three SOCC were observed.
Shorebird Surveys	Two sites were surveyed identifying a total of 245 birds representing 15 different species. No SAR and three SOCC were observed.
Coastal Waterbird Surveys	Two sites were surveyed for coastal waterbirds identifying 20 birds representing six different species. No SAR or SOCC were observed.
Winter Resident Surveys	Four transects, encompassing 50 point counts, were surveyed identifying 77 birds representing 12 different species. No SAR or SOCC were observed.

Olive-sided flycatcher was the most abundant SAR overall, with 22 individuals observed during the breeding season. While red crossbill is a known resident species on the island of Newfoundland, it was observed only during the breeding season and not during winter resident

surveys. The highest concentration of winter resident birds occurred in the BWPA, which also has the highest amount of human activity due to the number of cabin owners and residents within the area.

Although study results from all surveys indicated a higher number of individuals in the BWPA, the BWPA had similar species diversity as the TLWPA. The higher numbers observed in the BWPA are a probable result of the size of this PA, which is significantly larger than the LTWPA, the TLWPA, and the SLWPA, and a result of increased survey effort in the BWPA. As recreational trails improved accessibility within the BWPA, a more fulsome survey effort was possible compared to the other three WPAs. In addition to having the highest overall avian abundance, the BWPA also had the highest abundance of SAR, with four species (rusty blackbird, olive-sided flycatcher, red crossbill, and evening grosbeak) identified, including a breeding pair of rusty blackbirds.

The LTWPA is the most coastal by proximity, therefore higher survey efforts for seabirds and shorebirds were implemented in this area. The LTWPA is the smallest and has the highest abundance of old growth forest relative to its size (i.e., 1002.79 ha, as calculated in the Vegetation and Wetlands baseline reporting). For this reason, winter resident survey efforts were increased in the LTWPA to increase the likelihood of identifying red crossbill, a resident SAR, however none were identified in the winter season.

6.11.6.1 Avian Acoustics Summary

Avian acoustic detections per WPA are as follows:

- BWPA: 41 species for 2024 and 32 species for 2025, 6 SOCC detected and one SAR detected: Newfoundland grey-cheeked thrush.
- TLWPA: 13 species for 2024 and 15 species for 2025, no SAR or SOCC detected.
- LTWPA: one SAR detected: Canada warbler.

6.11.6.2 Avian Radar Summary

Notable migration times were determined from reviewing a combination of radar and acoustic data from the monitoring periods. These notable time periods aimed to be broad to capture general trends, however peak dates are mentioned to highlight potential timing for monitoring efforts. Peak times per season are as follows:

- Spring
 - Early-to-late April (April 5 to 26), with April 15 and 18 being the highest peaks
 - Late May (May 20 to May 25)
- Fall
 - Early August-to-late Late August (August 1 to August 27)
 - Mid-to-late September (September 12 to September 30)
 - Early October (October 2 to October 6)

6.11.7 Effects Assessment

Project activities, primarily those that involve earth moving or vegetation removal, or interactions with avifauna in the airspace have the potential to impact avifauna (Table 6.11.2). These activities could result in habitat removal, habitat alteration through edge effects, reductions in food availability, and direct avifauna-infrastructure interactions. Other Project related activities, including during construction and operation, may increase risk of mortality and injury, as well as impact avifauna behaviours, such as sensory disturbances resulting from increased traffic, light, and noise.

Table 6.11.2: Potential Project-Avifauna Interactions – Wind and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

6.11.7.1 Assessment Boundaries

Administrative Boundary

This VC has no identified administrative boundaries.

Technical Boundary

The primary technical boundary relating to the assessment of avifauna is the overall scale of the WPA and associated access limitations within remote areas. Although efforts were made across two years of field data collection to obtain survey coverage of the WPAs, complete coverage was not possible and it is therefore likely that additional avifauna species, and potentially additional occurrences of known avifauna species, including SAR, were missed.

Additional technical limitations of the assessment relate to the accuracy of the potential habitat mapping and land cover classifications completed for the Project. The accuracy of these mapping products is influenced by a variety of factors, including the accuracy of layers used as inputs.

Prediction of habitat availability within the WPA was limited by the accuracy of GIS models developed to support this effects assessment. Several models were designed to understand the potential impacts of the Project on the landscape and to avifauna. This includes an Ecological Land Classification (ELC) model that was developed using aerial imagery, airborne LiDAR data, and land cover data for the WPA. The ELC model was used as the basis of all other additional habitat models developed for the effects assessment, and as a result cannot predict the potential habitat outside of the WPA within the LSA. This reduces the ability of this assessment to compare available habitat within the WPA to the surrounding LSA.

In addition, technical boundaries include constraints associated with the available provincial data including the accuracy of the NLFAL - Land cover layer, thus impacting predictions of potential habitat for avifauna.

Spatial Boundary

For the purposes of this assessment, the WPA and the airspace that is directly surrounding infrastructure (i.e., the rotor swept area of turbines), will be assessed for avifauna. An LSA was also selected based on the maximum expected indirect impacts, which extends a 5 km buffer on the WPA (excluding ocean) (Drawing 6.11-3A). No RSA was established for this VC.

Temporal Boundary

Temporal boundaries include the time periods of each Project phase: Site Preparation and Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Rehabilitation (2 years).

6.11.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply for avifauna. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable loss of avifauna habitat and no impacts to birds (i.e., no sensory disturbance to birds or loss/injury of individuals) are expected.
- Low: Low loss of sensitive avifauna habitat (i.e., avian SAR habitat, wetlands, and interior forest) and/or direct impacts to birds are expected to be low.
- Moderate: Moderate loss of sensitive avifauna habitat and/or moderate impacts to birds on an individual level rather than population level.
- High: High loss of sensitive avifauna habitat and/or high impact to birds (i.e., loss of individuals at a scale which may cause population level impacts).

6.11.7.3 Effects

Potential environmental effects and associated pathways of the Wind and Transmission Project

Component in relation to avifauna are grouped into three major categories:

- Direct Loss of Suitable Habitats
- Alteration of Suitable Habitats Through Landscape Fragmentation and Edge Effects
- Loss of Rare avifauna

Project related effects can influence avifauna directly and indirectly. A direct effect is defined by interactions that have no intermediate process (e.g., loss of an individual bird, loss of suitable habitat that supports an avian SAR) and indirect effects are interactions that have intermediate processes such as landscape fragmentation and edge effects.

Avian SAR Potential Habitat Modelling – Methodology

Potential avian SAR habitat modelling was completed to calculate the impact to potential habitat for the five avian SAR that were identified through desktop review and observed during field assessments and/or acoustic monitoring. The avian SAR included for the potential habitat modelling included evening grosbeak, Newfoundland grey-cheeked thrush, olive-sided flycatcher, red crossbill, and rusty blackbird. Canada warbler was not included in the avian SAR potential habitat modelling since the potential presence within the LSA was not flagged during desktop review and, despite Canada warbler being observed during acoustic monitoring, only two individuals were detected during acoustic monitoring in the LTWPA during the fall migration season.

The potential habitat modelling is based on habitat descriptions within federal and provincial government recovery strategies and management plans (referenced below). It is also important to note that potential habitat modelling may result in an overestimation based on limits and constraints regarding GIS data and aerial imagery.

Evening grosbeak: The FRI dataset was used where the species matched trembling aspen for nesting habitat. Softwood forest classification from the ELC was included as well to capture spruce-fir woodland. The ECCC management plan was used as a habitat reference for evening grosbeak (ECCC, 2022a).

Newfoundland grey-cheeked thrush: To account for boreal forest, inland or coastal, in shrubby areas, the ELC Shrub class was used which captures some shrubby understory or thickets and regenerating clear-cuts with shrub regrowth. This class is also limited to 3 m height. Softwood Forest classification from the ELC was included as well. The COSEWIC assessment and status report was used as a habitat reference for grey-cheeked thrush (Environment and Climate Change Canada, 2024).

Olive-sided flycatcher: Mainly associated with wet areas, wetlands, and vegetation supported by such ecosystems. All ELC classes that represent a high-water table, supporting a high abundance of aerial insects, respective vegetation was included (e.g., Bog and Raised Wet Area). To account for open to semi-open areas within forested regions, the Barren and Herbaceous/Shrub Barren ELC classes were included. This captured recent clearcut areas as

well. The ECCC recovery strategy was used as a habitat reference for olive-sided flycatcher (COSEWIC, 2016).

Red crossbill: A mature softwood forest layer was created to include all softwood species such as spruce, fir, and pine that produce cone crops. The Softwood ELC class was clipped to a “mature” layer created from the FRI data by filtering based on an Age Code of 4 -7 (e.g., ages 60 - 121 +). The ECCC recovery strategy (ECCC, 2009) and action plan (Canada, 2011) were both used as a habitat reference for red crossbill.

Rusty blackbird: Softwood Forest data was isolated from the ELC. To acquire fir and all spruce near water bodies or wetlands, hydrological modelling was used to predict wet areas. This was crossed with the softwood forest. This captures wet areas containing softwood and would also include potential softwood dominated treed swamps. The ECCC management plan was used as a habitat reference for rusty blackbird (ECCC, 2015b).

To further understand how different habitat criteria are influencing overall habitat for the SAR species in the WPA, the occurrence of specific habitat criteria and connectivity relationships between all relevant habitat criteria was examined (e.g., forest cover and ELC).

The analysis is based on point density calculations, which involve generating a series of regularly spaced points across the WPA in each input layer. At each point, the density of suitable habitat in the surrounding area of 50 m is calculated. This allowed for the identification of patterns of habitat availability and how areas with more criteria being met are clustered, which in turn helps infer the strength of connectivity between habitat patches. Different criteria and their density are assumed to limit habitat suitability (Schroeder, 1983).

To ensure consistency and to reduce variability introduced by irregularities in the ELC data such as classification artifacts or inconsistencies, a fixed sampling interval of 10 m was used. This helps smooth out spatial noise and avoid over-interpreting fine-scale inconsistencies in the ELC dataset.

In short, the fixed interval approach provides a cleaner, more consistent representation of habitat connectivity by avoiding distortions caused by small-scale noise or overly detailed classifications in the source data.

The range of densities produced are reclassified to a scale of 0 – 100 based on equal intervals for a habitat suitability index. A reclassified map showing only a few classes may be more honest about its actual informative content (Hirzel et al., 2006). Following literature review (Muhammed et al., 2022), habitat is considered excellent if the classification is above 0.8 for most land cover types used in the analysis. Thresholds of 0.6 to 0.8 were adopted to show connectivity and “fair” habitat and greater than 0.8 for “suitable” habitat.

Potential avian SAR habitat modelling results will be referred to throughout the effects assessment.

Habitat Loss

The LSA supports various life stages for migratory birds due to the wide range of habitats present, as confirmed through desktop review and baseline field observations. The WPA consists of a variety of habitat types, including barrens, bogs, shrubland, softwood forest, mixedwood forest, and hardwood forest, watercourses, as well as other wetland types. The majority of the WPA consists of softwood forest, barren, wetland (e.g., bog), and shrubland based on the habitat and land cover modelling completed in the vegetation and wetlands baseline reporting. Refer to Appendix I.1 for habitat/land cover areas in hectares.

Through desktop review and field observations, it is apparent that the WPA supports various life stages for migratory birds due to the wide range of habitats present. Coastal habitats associated with the WPA are limited to the northern portion of the LTWPA (Drawing 6.11-1, Appendix A). Locations that provide a variety of habitat types, including edge habitat, appeared to offer the highest avian abundance and avian species diversity.

The coastline of Newfoundland is known as a fly-way during migration, and it is evident that birds use the various habitats found along the coastline as well as inland for various needs (i.e., foraging, migratory stop-overs).

The TLWPA has a higher portion of undisturbed forest and the LTWPA has the highest concentration of old growth forest relative to its size (i.e., 1,002.79 ha). Refer to the Vegetation and Wetlands baseline reporting (Appendix I.1) for further details.

There is historical disturbance within the WPA from human exploration (e.g., natural resources) and forestry activity, which includes cleared areas in various stages of regeneration. Although disturbed and cleared areas can be considered degraded habitat for interior species, species that use edge habitat and disturbed and regenerating landscapes can benefit.

The WPA is 34,434 ha in total and the total PF equates to 4,433 ha, broken down by WPA in Table 6.11.3.

Table 6.11.3: Wind Project Area and Project Footprint by WPA

Wind Project Area	Size (ha)	Project Footprint (ha)	Project Area % Impact
BWPA	20,802	2,352	11%
TLWPA	7,686	909	12%
SLWPA	3,555	659	19%
LTWPA	2,391	513	21%
Total	34,434	4,433	13%

Within the WPA, the proposed PF includes 534 turbines, approximately 51% of which are in the BWPA (Drawing 6.11-3A). To accommodate up to 534 turbines, transmission lines, and substations, the total road network within the WPA will be 540 km, 318 km of which are new roads and 222 km of which are roads that will be upgraded to the appropriate width required for

construction and hauling wind turbine parts for assembly (Drawing 6.11-3B, Appendix A). The total PF for transmission lines will be 823 ha, 809 ha being in the WPA (more than 50% being in the BWPA) and 14 ha being in the IPA. Wherever practical, lines will be doubled to minimize environmental disturbance.

The highest impacted area based on the PF within the WPA will be to shrub habitat (i.e., 1,135 ha, or 26% of the PF) and softwood forest habitat (i.e., 1,637 ha, or 37% of the PF), which represent a variety of habitat for birds. Refer to Appendix I.1 for habitat/land cover areas in hectares.

Clear-cutting, grubbing, and industrial development can result in habitat loss for forest and wetland-dependent avian species as well as disrupt individuals and their migratory and breeding behaviours. The Project is expected to impact 425 ha of the wetlands identified by the LiDAR-ELC, which accounts for 5% of total wetland cover in the LSA (Table 6.9.9). Direct impacts to wetlands are expected to be highest in the BWPA and TLWPA where 146 ha and 143 ha (i.e., 34% each for total wetlands impacted) of wetlands were identified in the PF, respectively. It is expected that 95% of wetlands within the LSA will remain undisturbed and continue providing suitable habitat for wetland-dependent SAR.

Impacts to Avian SAR Modelled Habitat

Potential avian SAR habitat present within the WPA and impacted by the PF is shown in Table 6.11.4. Based on the calculations, the percent of impacted potential habitat per species from highest to lowest is as follows: Newfoundland grey-cheeked thrush (Drawing 6.11-4 A-D, Appendix A), red crossbill (Drawing 6.11-5 A-D, Appendix A), evening grosbeak (Drawing 6.11-6 A-D, Appendix A), rusty blackbird (6.11-7 A-D, Appendix A), and olive-sided flycatcher (6.11-8 A-D, Appendix A). Drawings specified above can be referred to for the potential modelled habitat for each of these species.

Note that these calculations were completed before the final Project layout was chosen and based on a previous Project Footprint (i.e., 4,173 ha for WPA, compared to the current Project Footprint of 4,433 ha). Areas of the Project Footprint that are outside of the revised PA and avian SAR habitat within the LSA could not be calculated in these results due to insufficient data beyond the ELC.

Table 6.11.4: Avian SAR Potential Habitat – WPA and Project Footprint

Avian SAR	Overall WPA (ha)			Footprint WPA (ha)			% Total Habitat Impacted
	Suitable Habitat	Fair Habitat	Total	Suitable Habitat	Fair Habitat	Total	
Grey-cheeked Thrush	2,433	11,152	13,585	351	1,439	1,789	13%
Red Crossbill	431	1,163	1,594	41	134	175	11%
Evening Grosbeak	128	330	458	14	31	45	10%
Olive-sided Flycatcher	203	1,093	1,295	10	37	47	4%
Rusty Blackbird	80	398	477	6	39	44	9%

*WPA = 34,434 ha, Project Footprint = 4,173 ha.

Overall impact to wetland-dependent avian SAR (i.e., olive-sided flycatcher and rusty blackbird) is expected to be low within the WPA.

The LTWPA has more suitable habitat for red crossbill (Drawing 6.11-5B), likely due to the area having less disturbance and having the presence of mature softwood forest. Based on the calculations above, 89% of potential modelled habitat for red crossbill will remain undisturbed within the WPA.

In Newfoundland, grey-cheeked thrush are known to inhabit mature softwood forests with dense understory/shrub cover, coastal softwood thickets, and older cleared areas with regenerating softwood trees. They are also known to be less common in the interior of the province. Based on Drawing 6.11-4B, the LTWPA visually has more potential habitat for the grey-cheeked thrush compared to the other WPAs, potentially due to the amount of disturbed and regenerative habitat present in other WPAs. Based on the calculations above, 87% of potential modelled habitat for grey-cheeked thrush will remain undisturbed within the WPA.

Although a decrease in suitable habitat for these SAR is anticipated from the PF, avian SAR potential habitat modelling results indicate that there is likely sufficient suitable habitat surrounding the PF to maintain habitat functionality and use within the larger PA and LSA (i.e., 87% - 96% of the modelled potential habitat for each species above will be left undisturbed in the WPA). If alternative suitable habitats are unoccupied, the affected species may choose those alternate habitat areas in lieu of the cleared area. However, this may increase competition for territory, nesting areas, and foraging for the affected species in the LSA (Chen & Wang, 2024). In addition to increased competition, habitat loss could alter migration patterns via reduction of stopover areas and negatively affect food availability and abundance (Chen & Wang, 2024).

Habitat Alteration

The continuity of intact habitats will be affected through construction of 318 km of new roads and 222 km of upgraded roads, and further through construction of wind turbine and transmission line infrastructure. Habitat alterations such as fragmentation and edge effect are used to describe this disruption in continuity and are assessed herein through evaluation of changes in road density and associated edge effects.

Habitat fragmentation and increased edge areas may lead to increased predation on birds; a study by Manolis, et al. (2002) found that distance to the nearest clear-cut was a high predictor of nest predation in multiple ground laying birds. However, some bird species benefit from forest edge habitat and have shown to return in subsequent years after an area is cleared due to the availability of foraging opportunities and other niche habitats (Tittler et al., 2001). Additionally, some species (e.g., blackbirds) can also tolerate forestry activities if their coniferous tree-dominant habitat with varying heights near waterbodies is maintained (C. Stacier, avian biologist and professor at Dalhousie University, personal communication 2018). Other forest species that benefit from increased edge habitat in fragmented landscapes or

transitional habitats include understory gleaners (González-Salazar et al., 2014), cavity nesters (e.g., woodpeckers), and long-distance migrators (Terraube et al., 2016).

Habitat alteration has also been shown to increase the number of habitat generalist species while also decreasing the number of habitat specialists. Habitat generalists have a higher likelihood of surviving in smaller habitat patches in a mosaic landscape (e.g., a road network associated with a wind project) due to their ability to use various habitat patch types (Andrén, 1994). Bird species with different characteristics, such as habitat specialization, reproductive rates, and trophic guilds, may respond differently to edge effects. Interior-forest birds that prefer larger tracts of undisturbed forest or habitat specialists can be impacted by habitat fragmentation due to the lack of habitat connectivity (Andrén, 1994).

Undisturbed avian habitats present within the WPA are not unique and are extensively present within the surrounding LSA. It is expected that any birds using habitat that will be disturbed by Project activities will move to similar habitats within and adjacent to the PF and WPA area. This supports the conclusion that loss of habitat will not be significant, although habitat types will differ from baseline conditions even with planned site reclamation plans for the transmission line, road network, and turbine laydown areas associated with the WPA.

Habitat Fragmentation

A road density analysis was completed to estimate the extent of landscape fragmentation associated with the Project (see Section 6.9 for methods). Transportation data and aerial imagery were first compiled to determine the current road density of the WPA and surrounding 5 km (LSA). The resulting data were combined with the locations of new Project roads to allow for a comparison of pre- and post-construction road density across individual WPAs, the WPA, and the LSA.

Overall, the total percent increase in road density is approximately 86% within the WPA, the largest percentage being within the SLWPA and TLWPA, and approximately 29% within the LSA. The results of the road density analysis suggest the landscape is already subject to anthropogenic disturbance. The BWPA has the highest fragmentation baseline condition of the four WPAs, with a pre-construction road density of 0.99 km/km². Pre-construction road density is lowest in the TLPWA (0.42 km/km²). As such, the additional increase in road density from the Project is expected to have a reduced impact given the landscape is already subject to anthropogenic disturbance.

Despite existing road density being present within the WPA and LSA, an increase in road density will increase habitat fragmentation and subsequent edge effect for birds. As described in the previous section, certain species can respond positively (e.g., olive-sided flycatcher) or negatively (e.g., red crossbill) to these changes. Across the broad landscape, certain areas will experience greater degrees of change than others, but overall road density within the LSA remains low, and those negatively affected have suitable habitat nearby.

Edge Effect

Edge effect refers to the changes in environmental conditions and biodiversity that occur along the boundary between two different habitats (e.g., clearcut and forested habitat). These changes, as described above in the habitat fragmentation section, can affect bird abundance, species composition, and nesting success (e.g., nest predation and parasitism). For example, edges may alter physical conditions like light, temperature (e.g., higher wind and sun exposure), and wind, which in turn influences vegetation structure and food availability, potentially impacting bird communities (Andrén, 1994).

Evening grosbeak, Newfoundland grey-cheeked thrush, and red crossbill are known to be more sensitive to edge effect due to breeding preferences in intact forest, (ECCC, 2022a).

To model edge effect, a 100 m buffer was applied to the PF (Drawing 6.11-9 A-D, Appendix A) and this boundary was used to observe edge effect within the WPA. The 100 m buffer was chosen as a minimum zone of influence based on literature on the impacts of forestry on bird communities in adjacent forest (Brazner et al., 2024), recognizing that edge effect is quite variable from one species to the next, even in terms of nature of adverse effect (i.e., positive vs. negative). Note that a constraint to this calculation is the potential for the inclusion of small areas of open habitats (e.g., lakes, open wetlands, clear-cuts).

It is expected that birds that use interior forest may be disturbed by Project activities and move to similar habitats within and adjacent to the Project Footprint and LSA. Overall, undisturbed avian habitats within the WPA are not unique and are extensively present within the surrounding landscape of the LSA. Although there will be habitat loss as a result of the Project, habitat functionality across the LSA is expected to remain intact.

Avifauna-Project Interactions – Injury and Mortality Risk

Birds have the potential to interact with Project infrastructure through behavioural changes or strikes, which could lead to injury or death. There will be up to 534 WTGs, maximum height of 231 m depending on the chosen model, and 467 km of collector line (i.e., 15.2 to 22.9 m tall) and 57 km of 230 kV transmission line (i.e., 23-40 m tall).

Birds moving through the WPA during migration seasons may encounter turbines and transmission lines as a new structural barrier, potentially leading to alterations in their natural flight paths, which could result in additional energy expenditure to avoid these obstacles. This is particularly relevant for species traveling at altitudes within the infrastructure height range, as they may need to navigate around or above the structures to avoid collisions.

The radar and acoustic monitoring program provided quantifiable insights into the volume, movement patterns, and flight heights of birds moving within the WPA, enabling a more precise understanding of collision risk relative to the Project's infrastructure.

The modified airspace could lead to temporary disorientation for birds unfamiliar with the infrastructure, especially during low visibility conditions such as fog or heavy rain, which are common in the region and particularly along the coastline. Additionally, radar survey efforts

have shown peaks in migration during fall and spring, with high-altitude movements in certain periods, indicating that while most birds seem to fly well above infrastructure height, there are episodic migration events where more birds could be affected. Thus, although overall disruption to migratory routes is likely minimal, specific conditions or migration events may increase the likelihood of navigational adjustments as birds travel through this altered environment.

Interaction Risk - WTGs

Bird strikes are a primary concern when considering the interactions of avifauna with the Project, as turbine blades spin at high speeds through the airspace frequented by a variety of species at all different altitudes within the rotor swept area. Bird strikes include instances when birds are struck by the rotating turbine blades, or birds collide with the turbine tower or nacelle structures, which can cause injury or mortality to birds. Collisions with transmission lines are also a concern for avian injury and mortality risk. Factors including species abundance, frequency of passage, species-specific flight behaviour, avoidance behaviours, differential use of areas within the WPA, weather, and topography may all influence collision risk (De Lucas et al., 2008). Estimated bird mortality as a result of wind turbine collisions varies across Canada, with Zimmerling et al. (2013) estimating mortalities at 8.2 per turbine per year. Bird Studies Canada (2016) conducted a study to review mortality across Atlantic Canada and Ontario, showing mortality estimates in Atlantic Canada to be lower, at approximately 1.17 birds per turbine per year. Strum has conducted avian mortality monitoring across a variety of wind projects in Nova Scotia and New Brunswick, with an overall rate of approximately one observable mortality per turbine per year.

More than 99% of biological target detections were observed higher than 250 m, which is above turbine height and transmission line height, for radar monitoring in the BWPA and TLWPA. However, only 44% of biological target detections were detected above turbine height within the LTWFPA. Based on the height at which detections occurred, the overall risk of avian collisions with Project infrastructure within the BWPA and TLWPA is considered low while the risk of collisions with the infrastructure within the LTWFPA is considered moderate.

Temperature, lunar cycle and periods of low wind speed showed the strongest correlation in influencing migratory timing and movement. Peak migration periods appear to be between April to May and August to mid-October based on the radar and acoustic data. There were also peaks in biological detections in June and July, likely post-breeding dispersal movements before fall migration. The radar and acoustic baseline reports (Appendix M.2) can be referred to for further information regarding literature, methodology, field data, trends, and observations.

Less than 1% of observed targets were detected within the interaction corridor (i.e., rotor swept zone: between 44 m and 231 m) during the entirety of the 2024 monitoring period of the BWPA and TLWPA. 56% of observed targets were detected within the interaction corridor during the entirety of the 2025 monitoring period of the LTWFPA. The MBII model projection indicates that the interactions would be low and would have occurred on only a few nights during the 2024 monitoring period, indicating that the level of avian mortality caused by the Project would be low for most of the Project's operation, and mortality events would be limited to a few events.

during the migration periods. During the 2025 monitoring period of the LTWFPA MBII projections indicate that the interactions would be low to moderate with most interactions occurring during the early months of fall.

Based on the detection heights during radar monitoring, collisions with turbines are anticipated to be low in magnitude. Furthermore, the Project will include mitigation measures such as lighting restrictions, mortality monitoring (i.e., carcass searches), and adaptive measurement plans which will help decrease risk to birds.

Additional monitoring may be conducted to meet CWS guidelines (ECCC-CWS, 2022) and EIS guidelines (NLECCC, 2025) following consultation with these agencies, which may initiate further mitigations and adaptive management measures depending on monitoring results and collision risk modelling.

Interaction Risk – Transmission and Collector Lines

Collisions with transmission lines are also a concern for avian injury and mortality risk. Based on studies, shield wires on transmission lines are most associated with bird collisions as they are the highest wires and are smaller in thickness which makes them more difficult to see (APLIC, 2012). Potential collision increases when birds increase altitude to avoid more visible infrastructure (i.e., phase conductors), which can place them at the same elevation of shield wires (APLIC, 2012). Various studies of high collision rate transmission lines show that collision risk can reduce by 50% to 80% when these lines are fitted with bird flight diverters, although this can vary based on location and environmental factors (Barrientos et al., 2011). Vibration dampers installed between line markers are also known to be effective on reducing bird collisions (APLIC, 2012).

Overall, studies on bird interactions with transmission lines have shown varying results. Rioux et al (2013) noted that estimating bird mortality from collisions with power lines is challenging due to a lack of studies and factors like carcass scavenging, which can limit survey results. The study estimates that in Canada, mortality rates due to transmission line collisions range from 1 million to 229.5 million birds per year, although rates may vary considerably depending on factors like habitat type and line type. The study notes that waterfowl, grebes, shorebirds, and cranes appear to be particularly vulnerable to collision. As most transmission lines associated with the Project are inland and not near the coastline, this reduces concern of avian collisions. Other studies have shown that individual bird losses from collisions are not biologically significant and are unlikely to impact species of birds that have large populations (APLIC, 2012).

Upon completion of construction and throughout the lifespan of the Project, the navigation hazard lights on the transmission towers, designed to flash only a few times per minute at night, are expected to have minimal sensory disturbance effects on birds due to their low intensity and infrequent flashes. At night, and especially during nights of cloudy skies and low ceiling, artificial lighting can attract birds during migration. Lights that are known to increase disorientation include consistent white or red lights. Strobe lights or intermittent/flashing lights

have been shown to decrease avian mortality as it interrupts the zone of influence that lighting on birds can have (Longcore et al., 2008). While continuous lighting can attract or disorient birds, especially nocturnal migrants, the brief and low-frequency nature of these lights reduces the risk of such disruptions.

Based on the radar monitoring results (more than 99% of detections were above 250 m), avian collisions with transmission lines are not anticipated to be of concern and therefore low in magnitude.

Other Interactions

An increase in road traffic during construction and wind turbine maintenance will increase the chances of mortality to avifauna species that use roadways, especially grouse species and similar species, as they are known to use roadways for travel and nesting (Madden & Perkins, 2017; Whitaker et al., 2010). Construction and increased road traffic particularly pose a risk to nests and unfledged nestlings. Outside of the construction phase, the Project will only require technicians to access the site to perform regular maintenance/equipment checks and occasional larger-scale repairs. Considering the pre-existing traffic load in the LSA (i.e., forestry and off-roading vehicles) and the minimal traffic that will be associated with Project operation, along with road traffic mitigations (e.g., speed limits), road traffic is expected to have a negligible or low effect on avifauna in the WPA. To mitigate the risk of vehicle-avifauna collisions, speed limits will be established within the WPA for construction vehicles and traffic signs will be installed to alert road users of speed limits.

Sensory Disturbance

Construction and operational activities for the Project, including lighting, noise, and increased traffic, have the potential to disturb bird species within the WPA and LSA. Sensory disturbance may occur during all Project phases. Temporary sensory disturbance is expected during construction, and limited disturbance is expected through operations (i.e., consistent and sporadic noise and lighting generated by traffic and WTG/transmission line operations).

Noise

Birds may be impacted by noise associated with increased vehicle traffic along access roads and construction sites. The movement of vehicles could lead to short-term displacement of birds, particularly ground-nesting or low-flying species within proximity to access routes. Traffic disturbance can be particularly stressful for species with established territories within the area, potentially prompting them to abandon nests or avoid otherwise suitable habitat. Overall, while these construction-related disturbances are temporary, they may cause localized changes in bird distribution and behaviour during the active phases of the Project.

Noise from heavy machinery and equipment can disrupt normal behaviours such as foraging, breeding, and resting, especially for sensitive species documented during breeding bird surveys. The sounds associated with construction, while temporary, may lead some birds to avoid areas near active construction zones, possibly altering their habitat use patterns during critical breeding or migration periods (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon,

Crooks, et al., 2016).

A literature review conducted by Shannon et al. (2016) found that birds have the potential to exhibit changes in song characteristics, reproduction, abundance, stress levels, and species richness at levels greater than 45 dBA. Sensory disturbance from noise levels associated with construction activities during the avian breeding season could result in abandonment of nests. If adjacent suitable habitat is not available, birds that have been displaced are not likely to nest until habitat becomes available which may result in a higher non-breeding population. According to avian SAR predicted habitat modelling results, adjacent breeding habitat will remain available in the WPA and LSA for all SAR in cases where modelled habitat will be impacted by the Project (Drawings 6.11-4 - 6.11-8).

Noise and vibrations are provincially regulated under the *Occupational Health and Safety Act* to protect the health and safety of site workers and the general public, which will help mitigate negative impacts to birds. Birds can exhibit greater susceptibility to noise impacts as many species rely on vocal communication (Blickley & Patricelli, 2010). Potential impacts can also differ between acute and chronic noise sources. Chronic exposure may degrade auditory cues, feedback, and vocal development over time, which are important for predator/prey detection, communication, breeding, and orientation (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon, Crooks, et al., 2016). A direct physiological impact causing a temporary decrease in auditory sensitivity can occur at acute noise levels above 93 dBA, while permanent damage to avian auditory systems is not recorded until 125 to 140 dBA (Blickley & Patricelli, 2010). In one study, chicks exposed to 111 dBA for 48 hours were found to completely recover from hearing damage within 10 days (Saunders & Tilney, 1982). Ryals et al. (1999) found that birds lose hearing from hair cell loss and that these hairs can recover via regeneration allowing birds to regain hearing.

Certain bird species may not be impacted by sensory disturbances. A study of the impact of logging truck traffic on birds reported no observed effects on nesting at noise levels of 53 dBA (Grubb et al., 1998). It was also found that noise-tolerant species had increased nesting success and decreased nest predation through higher awareness and less flushing (Francis et al., 2009). The median sound level produced by construction equipment at 15 m from point source is comparable to sound produced from an ATV or pick-up truck (96 dBA), which is already a common source of sound within the WPA, as are logging trucks and harvesting equipment. Therefore, impacts to auditory sensitivity may occur from acute noise on a short term and intermittent frequency during the construction phase, but levels will be consistent with existing sound levels in parts of the WPA. The decibel limits of construction equipment required for the Project are not expected to be greater than 115 dBA, indicating permanent damage to avian auditory systems is not likely to occur. Blasting noise from quarry use may exceed this range but this activity will be sporadic in nature, only occurring during the construction phase of the Project. A blasting plan and mitigation measures will be developed to lessen impacts during blasting if it is required.

Based on these conclusions and planned mitigation measures, the effects of noise on birds are

anticipated to be low in magnitude. Mitigation measures for noise include maintaining all equipment and machinery on site so that a level of good working condition is kept, reducing noise and vibration emissions. Where practical, install vehicles and machinery with noise muffling equipment to limit disturbance to birds.

Light

Lighting used during construction and operations, particularly if activities extend into early morning or late evening hours, could also impact birds within the vicinity. Given the frequency of foggy conditions regarding the portions of the WPA that encroach on the coastline, light intensity may be amplified, further enhancing the potential for disturbance. Light sensory disturbance that can impact birds includes behavioural effects such as disorientation, avoidance, or attraction (Longcore & Rich, 2004). Research has demonstrated that birds attracted to or congregating around lights often become disorientated and lose their sense of direction, ultimately disrupting migration (Adams et al., 2021).

Light attraction is a particular concern during nights with low visibility (e.g., low cloud cover or fog) and high winds. Light sources for this Project will be inland as well as coastal due to boat traffic and infrastructure. Some portions of the WPA are along the coast. Lighting used during construction, particularly if activities extend into early morning or late evening hours, could also impact birds within the vicinity. Artificial lighting may disorient nocturnally active birds, increasing the likelihood of attracting them closer to construction areas. For species sensitive to light, especially migratory and nocturnal species, this could temporarily alter natural behaviours or increase the risk of collisions with equipment or structures (Longcore & Rich, 2004).

Disoriented migratory birds are prone to circling light sources, which increases the potential for death by exhaustion or predation when forced to land in high-risk areas (Poot et al., 2008). In turn, these behavioural changes can affect the success of foraging, reproduction, and communication and can disrupt habitat connectivity through anthropogenic development (Bliss-Ketchum et al., 2016; Longcore & Rich, 2004). It has been known that exterior structures such as buildings and other floodlit structures can attract birds during the night and lead to mortality events. In addition, migratory birds during fall and spring are especially attracted to lighting on tall structures. Modifications and timing of use for lighting can be managed to limit impacts on birds (Bliss-Ketchum et al., 2016; Longcore & Rich, 2004).

For nocturnally active species that may be more sensitive to artificial lighting, the risk of attraction or disorientation remains low due to limited light exposure. In the event of foggy or low-visibility conditions (i.e., heavy rain), the short, infrequent flashes will also reduce the overall light presence, limiting the potential for enhanced attraction effects.

Lighting will be restricted during construction and minimal within the WPA during operations, including the turbines being un-lit at night (apart from a navigation hazard light mounted on the turbine's nacelle). As such, lighting is not expected to impact bird migration. Upon completion of construction and throughout the lifespan of the Project, the lighting on-site will be minimized

and mitigation measures applied to limit the effects of lighting on birds through the development of a lighting plan.

Based on these conclusions and mitigation measures, the effects of lighting on birds are expected to be low in magnitude with potential differences based on time of year (e.g., migration).

6.11.8 Mitigation

Mitigation and monitoring measures will be considered to minimize the effects on avifauna, including adhering to the *MBCA*, *SARA*, and the *Newfoundland Wildlife Act*.

Adaptive management of potential effects will be addressed through the development and implementation of an Avifauna Management Plan, which will include mitigation and monitoring for avian species. The primary mitigation for avifauna is avoidance in the siting of infrastructure, including:

- Avoidance of impacts to the terrestrial environment (e.g., limiting infrastructure impact).
- Prioritize Project infrastructure within areas of existing disturbances, such as current roads and historically cleared areas, where practicable.
- Avoid topographic funnels, such as within lake or river valleys, for turbine placement, where possible, to reduce the likelihood of interactions with concentrated bird movements.

Various plans will be created, which also fall under avifauna mitigation and monitoring measures: Wildlife Response Plan, Waste Management Plan, and Hazardous Materials Response and Training Plan.

Mitigations to reduce effects on avifauna include:

Habitat Loss and Fragmentation

- Adhere to ECCC guidelines on clearing windows for nesting migratory birds, where possible. Due to seasonal variability regarding conditions, if vegetation and tree clearing activities during the nesting/breeding season cannot be avoided, nests will be marked and avoided by appropriate buffers if found.
 - Regulatory bodies will be contacted to receive advice on construction buffers for any nesting or confirmed breeding activity that must be avoided during the nesting season.
 - When vegetation and tree clearing activities take place during the non-nesting season, crew must be aware of nests protected year-round under the 2022 update to the Migratory Bird Regulations (under the *MBCA*).
- Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities within stockpiles or exposed areas during construction or operations, until chicks can fly, and the nesting areas are no longer being used. Exposed stockpiles will be limited, covered, or vegetated as much as possible during

construction and operation phases.

- Limiting and managing exposed sedimentation banks to reduce the attraction of burrow-nesters such as bank swallows (e.g., maintain at least a 70 degree-slope), as per ECCC best management practices and recommendations.
- Develop a site reclamation plan in accordance with engineering standards and in consultation with NLECCC and NLFAL.

Sensory Disturbance

- Establish and implement speed limits to minimize dust and potential collisions.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Use noise controls (e.g., mufflers) on machinery and equipment to limit disturbance.
- Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Incorporate a lighting plan for construction-related activities into the EPP.
- Limit unnecessary lighting as much as possible, especially at night.
- Follow Transport Canada requirements for navigational hazard markings and lighting on transmission lines.

Mortality and Injury Risk

- Monitor for bird injuries and fatalities frequently within the WPA. ECCC-CWS will be notified in the event of mortality or injury. Under the MBR, a scientific permit is required to possess or handle any stranded, injured, or dead migratory bird. Any birds found injured that may require transport to on-land facilities must also be reported. Records will be kept of such incidents.

6.11.9 Monitoring

A site-specific post-construction Avifauna Management Plan has been developed and will evolve as a living document across the life of the Project in consultation with government regulators and all other relevant parties. The management plan will inform monitoring activities that will take place to ensure continued protection of avifauna within the WPA. The Avifauna Management Plan includes mitigation measures, monitoring, and adaptive management frameworks for minimizing impacts to avifauna (Appendix Q.1).

Additional acoustic and radar monitoring will occur, if required.

Post-construction mortality monitoring and carcass searches (e.g., including monitoring for predator removal of carcasses) will be conducted to assess mortality levels caused by turbine, for a minimum of one year, developed in consultation with government regulatory bodies. Post-

construction mortality monitoring will require an MBR permit. Under the MBR, a scientific permit is required to possess and handle any dead migratory birds during mortality monitoring and is recommended for the collection of a migratory bird (dead or alive), feathers, or part of a migratory bird.

During avian mortality monitoring, if results note continuous incidents and/or a concerning number of avian injuries or deaths, additional mitigation measures may need to be implemented in the future as part of adaptive management. The client is committed to adaptive management with consultation from CWS and NL FAL.

6.11.10 Conclusion

While effects to avifauna species differ, the potential effects considered to be of greatest concern include habitat loss and fragmentation, potential sensory disruption, and potential avifauna-infrastructure interactions. Based on this assessment and through the implementation of proposed mitigation and monitoring activities, effects to avifauna are expected to be of low to moderate magnitude, as loss of habitat may occur, the habitat loss is partially reversible and overall impact to bird populations and behaviours is expected to be low.

Taking the above characterizations into consideration for the Project, the residual effects are considered not significant (Table 6.11.5).

Table 6.11.5: Avifauna Residual Effects – Wind and Transmission

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Habitat Loss and Fragmentation/ Edge Effect	Limit habitat disturbance and minimize Project Footprint during detailed design where possible Restoration and reclamation plans	A May be some positive effect for species that forage and nest in disturbed habitats (e.g., raptors and aerial insectivores)	M VC interaction causes direct loss of habitat and creates fragmentation and an edge effect for birds	WPA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	SE Occurs once during construction	PR Partially Reversible due to the extent of fragmentation	Not Significant
Mortality and Injury Risk	Mitigation and monitoring measures surrounding infrastructure operation (e.g., bird deterrents and mortality monitoring), Project traffic, and nesting season	A	L VC interaction has potential to cause mortality and injury due to collisions with Project infrastructure and interactions with workers and traffic	WPA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	I May vary based on seasonal differences (e.g., breeding vs migration), as well as Project phase	R	Not Significant

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Sensory Disturbance	Mitigation and monitoring measures for noise and light	A Adverse	L VC interaction has potential to cause sensory disturbance to birds, which may impact behaviour and distribution, as well as increased risk for collisions with Project infrastructure	LSA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	C	R	Not Significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

6.12 Bats

6.12.1 Overview

A desktop review and field studies (described in detail in Appendix K.1) were undertaken to gather information on bat species and associated habitat present in the WPA. Objectives were as follows:

- Assess observations, species diversity, and habitat utilization of bats within the WPA during the active bat period (spring to fall).
- Use the information collected to inform and refine the Project design (i.e., avoid impacts to bat SAR and their habitats).
- Use the information collected to inform mitigation and management practices.

This section provides details about the effects of the wind component of the Project on bats. For information on the effects of the industrial and solar components on bats, see Sections 7.9 and 8.9.

6.12.2 Regulatory Context

Five species of bats have been documented in Newfoundland, of which two are resident species that reside in the province year-round and three are migratory species that overwinter in the southern United States. Resident species include the little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*). Migratory species include the eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*). The eastern red bat and silver-haired bat have rarely been detected within the province.

All five bat species which occur in Newfoundland are listed as provincially “Endangered” and protected under the NL ESA (Newfoundland and Labrador, 2001). Additionally, the little brown myotis and northern myotis were declared “Endangered” under Schedule 1 of the SARA (Canada, 2002b) on November 26, 2014. These designations were driven by the emergence of white-nose syndrome (a disease caused by the fungus (*Geomyces destructans*), which was first detected in Canada in 2010 and spread to Newfoundland by 2017 (NLFFA, 2023). All three migratory bat species were listed by the COSEWIC in May 2023 as “Endangered” (COSEWIC, 2023).

6.12.3 Desktop Assessment Methodology

A desktop assessment was completed to review potential impacts of the Project on bats and bat habitat. This involved modelling suitable habitat for bats, reviewing ACCDC data and critical habitat records.

6.12.3.1 *Suitable Habitat Modelling*

Suitable habitat modelling was used to identify potential locations of bat foraging and roosting habitat within the WPA. Land with characteristics associated with bat habitat were identified using provincial land cover data (NL FAL, 2025) and ELC (Appendix I.1). Forested areas may

provide potential roosting habitat (over-day or maternity). Forest containing trembling aspen (*Populus tremuloides*) was highlighted to emphasize areas with a greater potential to represent ideal roosting habitat (CWHC, 2024). While trembling aspen stands were highlighted in the model, other forested stands are also considered suitable for roosting, as bats are known to roost in black spruce in Newfoundland where trembling aspen is less prevalent (Park & Broders, 2012). Suitable foraging habitat includes wetlands and a 50 m buffer on waterbodies, watercourses, and existing roadways (edge habitat).

6.12.3.2 Other Sources of Information

The ACCDC data report (ACCDC, 2026a) was reviewed for records of bats within 5 km of the Project center. Additionally, the Recovery Strategy for Little Brown Myotis, Northern Myotis, and Tri-colored Bat (ECCC, 2015c) was reviewed to assess presence of critical habitat within the PA. Other sources of information to identify bat habitat along with historical records and observations of bat presence are scarce within the regional area of the Project.

6.12.4 Desktop Assessment Results

6.12.4.1 Suitable Habitat Modelling

Suitable habitat modelling identified suitable bat habitat throughout the WPA (Drawing 6.12-1A-D, Appendix A). In total, 13,057.7 ha of suitable roosting habitat, 552.1 ha of high potential roosting habitat (roosting habitat which contains trembling aspen), and 5,296.7 ha of suitable foraging habitat is present within the WPA (Table 6.12.1). The BWPA contains the most area of both habitat types.

When considered as a percentage of the area of each section of the WPA, the TLWPA contains the highest proportion of foraging habitat and roosting habitat, including roosting habitat containing trembling aspen. Note that, as LiDAR data was not available across the entire WPA, suitable foraging and roosting habitat were not able to be predicted (or were not predicted with the same parameters) in some areas (Drawing 6.12-1A-D, Appendix A).

Table 6.12.1: Suitable Bat Habitat Present Within the Wind Project Area

Component	Component Project Area (ha)	Suitable Foraging Habitat (ha)	Suitable Roosting Habitat (ha)		Total Suitable Habitat by %
			Does Not Contain Trembling Aspen	Contains Trembling Aspen	
BWPA	20,802	3,431.0	7,669.4	371.3	55%
TLWPA	7,686	785.2	3,336.2	109.4	55%
SLWPA	3,555	565.1	824.3	46.4	40%
LTWPA	2,391	515.4	1,227.8	25.0	74%
WPA Total	34,434	5,296.7	13,057.7	552.1	55%

Other Sources of Information

The ACCDC Data Report (ACCDC, 2026a) completed for this Project did not indicate any records of bats within 5 km buffer on the Project Area. In addition, the Recovery Strategy for Little Brown Myotis, Northern Myotis, and Tri-colored Bat does not identify the presence of

critical habitat for *Myotis* species within the PA (ECCC, 2015c).

6.12.5 Field Assessment Methods

Passive acoustic monitoring was conducted from April 13 to December 11, 2024 using 39 acoustic detectors across the PA (Drawing 6.12-2A-D, Appendix A). There were 35 detectors deployed in a variety of habitats throughout the WPA, with placements determined based on ELC and NABat data. Detectors were programmed to record from 30 minutes before sunset to 30 minutes after sunrise to capture peak bat activity.

Acoustic data collected during passive monitoring was analyzed using Kaleidoscope Pro software following guidance outlined in the Canadian Wildlife Cooperative's Guide for Bat Monitoring in Atlantic Canada (McBurney & Segers, 2021). The automatic call identification provided by Kaleidoscope Pro was reviewed by a trained biologist, with calls being classified into one of the following categories:

- MYOLUC Little brown myotis
- MYOSEP Northern myotis
- 40KMyo *Myotis* species (little brown myotis or northern myotis)
- LowF Unknown low-frequency bat (hoary bat or silver-haired bat)

For additional information regarding passive acoustic monitoring methodology, refer to Appendix K.1.

6.12.6 Field Assessment Results

Within the WPA, 1,668 bat passes were recorded throughout the monitoring period. Bat passes were detected between April and October 2024 and peaked in July and September 2024. Bat recordings were determined to be almost entirely *Myotis* species, with one exception of one low frequency vocalization which was detected in the TLWPA. Of the 35 detectors deployed in the WPA, eight recorded less than 10 bat passes and four recorded more than 100 bat passes.

The highest bat activity within the WPA was recorded in the BWPA (586 bat passes); however, the highest average number of bat passes relative to the number of detectors deployed occurred in the LTWPA (140 bat passes) (Drawing 6.12-3, Appendix A). This indicates that the LTWPA had the highest level of bat activity relative to its size. The pattern of bat passes throughout the night within different parts of the WPA indicates that northern myotis may be more prevalent within the BWPA and the LTWPA, whereas there may be a more even proportion of northern myotis and little brown myotis present within the TLWPA and SLWPA. It is important to note that bat detections confirm presence of bats of various species. The number of detections cannot reliably be correlated with an estimate of abundance.

For additional information regarding the results of passive acoustic monitoring, refer to Appendix K.1.

6.12.7 Effects Assessment

An effects assessment was undertaken to describe the potential impacts of the Project on bats and bat habitat, considering results of the desktop assessment and field studies. Table 6.12.2 outlines potential interactions during site preparation and construction, operations and maintenance, and decommissioning and rehabilitation phases of the Project.

Table 6.12.2: Potential Project-Bats Interactions – Wind and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	-
Implementation of Erosion and Sediment Control measures	-
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Turbine Components	-
Turbine Assembly	X
Removal of Temporary Works & Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

6.12.7.1 Assessment Boundaries

Administrative Boundary

There are no administrative boundaries identified for this VC.

Technical Boundary

Suitable habitat modelling developed to support this effects assessment was limited by the availability of LiDAR data and the accuracy of the provincial datasets within the WPA. Data collection for bats and bat habitat was limited by the overall size and remoteness of the WPA, which constrained the scope of acoustic surveys to areas that were accessible. In addition, data loss associated with equipment malfunctions (acoustic monitors and/or SD cards) given the remoteness of the WPA, resulted in an incomplete dataset, which may have affected the understanding of bat activity patterns within the WPA.

Spatial Boundary

The spatial boundary for determining residual effects to bats is the LSA, which includes a 5 km buffer around the WPA (Drawing 6.12-4, Appendix A). The LSA boundary was defined considering the typical distance in which bat species identified during acoustic monitoring may travel between roosts and foraging areas (Balzer et al., 2023; COSEWIC, 2013).

Temporal Boundary

Temporal boundaries associated with bats and bat habitat include site preparation and construction (3 years), operations and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project (Table 6.12.2).

6.12.7.2 Assessment Criteria

The VC-specific definition for magnitude is as follows:

- Negligible: No loss of bat habitat or impact to bats through sensory disturbance of injury/mortality
- Low: Small loss of habitat supporting bats and low impacts to bats through sensory disturbance or injury/mortality
- Moderate: Moderate loss of important bat habitat and/or moderate impacts to bats through sensory disturbance or injury/mortality, but these impacts will only be experienced by individuals rather than entire populations
- High: High loss of important bat habitat or high impact to bats through sensory disturbance or injury/mortality that would impact fauna on a population scale

6.12.7.3 Effects

Potential environmental effects and associated pathways in relation to bats and bat habitat are grouped into three major categories:

- Habitat fragmentation and/or removal
- Mortality and/or injury
- Sensory disturbance (i.e., lighting, noise, human activity, etc.)

Project related effects can influence bats either directly or indirectly. A direct effect is defined by interactions that have no intermediates (e.g., mortality by WTG blade collision) or direct loss of habitat. Indirect effects are interactions that have intermediate steps such as habitat fragmentation, edge effects, sensory disturbance, or changes in bat behaviour.

Habitat Fragmentation and/or Removal

Vegetation clearing required for Project construction can result in the removal of bat habitat and/or disruption of corridors between important habitat features, such as foraging and roosting habitats (Reusch et al., 2022; Segers & Broders, 2014). Removal or disruption of bat habitat could impede movement, foraging, flight activity, and habitat use (ECCC, 2015c). Harvesting and the creation of cleared areas may also reduce landscape-level habitat quality and increase predation risk as bats travel across open areas (Slough et al., 2023).

Construction of the Project will result in fragmentation and removal of habitat suitable for bats. Habitat fragmentation and removal may be associated with newly constructed roads, upgrades to existing roads, and clearing for construction of quarries, substations, accommodation camps, WTG pads, and transmission/collector lines within the WPA. The total area of direct disturbance within the WPA will be 4,433 ha (Table 6.12.3).

Table 6.12.3: Areas of Direct Disturbance Within the WPA

Infrastructure	BWPA (ha)	TLWPA (ha)	LTWPA (ha)	SLWPA (ha)	WPA Total (ha)
Roads (Newly Constructed)	578	377	158	203	1,316
Roads (Upgraded)	732	128	86	129	1,075
WTG Pads/Laydown Areas	436	212	77	127	852
Transmission Line	445	71	129	164	809
Substations	12	6	6	6	30
Quarries	133	106	57	30	326
Accommodation Camps	16	9	0	0	25
Total	2,352	909	513	659	4,433
Total as %	11%	12%	21%	19%	13%

Suitable habitat modelling was completed to understand important features for bats and their distribution through the WPA (Section 6.12.4). Table 6.12.1 shows that suitable roosting habitat is present in 13,609.8 ha, representing 39% of the WPA. As this habitat constitutes a large proportion of the WPA, it is considered non-limiting to bat populations.

Suitable foraging habitat is present throughout 5,296.7 ha, or 15% of the WPA. Modelled suitable foraging habitat is defined based on edge habitat near watercourses, waterbodies, and wetlands. This habitat type is distributed throughout the WPA, and is not expected to be negatively affected by the Project. Construction of roads may create beneficial edge habitat for *Myotis* species. Within the WPA, 317 km of new roads will be constructed. Assuming that bats forage in the same buffer used to define road edge habitat during suitable habitat modelling (50 m), construction of new roads in the WPA would create approximately 3,170 ha of additional foraging habitat. This is more than half of the amount of modeled suitable foraging habitat that is modelled to currently exist in the WPA.

As habitat modelling was only completed within the WPA due to limited availability of LiDAR data, it was not possible to estimate the availability of potential bat habitat as accurately in the LSA as it was predicted within the WPA. However, land area within the WPA is visually similar to the LSA based on aerial imagery in terms of lakes, wetlands, and forested areas. Given this, it can be assumed that potential bat habitat is also present in the LSA, though the extent of habitat occurrence is unknown. According to ECCC (2015c), no critical habitat (i.e., confirmed hibernacula) is located inside the WPA or LSA.

Road density modelling was conducted both within the WPA and within the LSA. The model was developed using transportation data and aerial imagery to determine road density within

the LSA. This data was combined with a layer showing proposed new roads within the WPA based on the wind project footprint to determine post-construction road density. This allows for a comparison of road density within the WPA before and after construction of the Project as well as a comparison of road density between the WPA and the LSA.

Road density modelling indicates that road density will increase in all sections of the WPA with the construction of the Project (Table 6.12.4; Drawing 6.9-6 A-B, Appendix A). The BWPA will experience the smallest increase, while the TLWPA will undergo the largest increase; however, it is important to note that the larger percent increase is relative to the low baseline road density. The LSA has a lower road density than the pre-construction road density of the WPA, indicating that the WPA has a higher habitat fragmentation baseline condition than the LSA.

Table 6.12.4: Road Density Within and Surrounding the Wind Project Area

Project Area	Pre-Construction Road Density (km/km ²)	Post-Construction Road Density (km/km ²)	Percent Increase in Road Density (%)
BWPA	0.99	1.41	42.42
LTWPA	0.76	1.25	64.47
SLWPA	0.72	1.47	104.16
TLWPA	0.42	1.25	197.62
WPA	0.72	1.35	86.16
LSA	0.64	0.82	28.13

One study by Segers & Broders (2014) found that different species of bats respond differently to landscape alteration for wind development. Many bat species prefer edge habitat over both open clearcuts and intact interior forest for foraging (Hein et al., 2008). Suitable habitat for the little brown myotis has been found to increase after wind turbine installation, which is likely associated with the increase in open areas and forested edges which are preferred foraging habitats for this species (Segers & Broders, 2014). Harvesting can also create foraging habitat suitable for hoary bats and eastern red bats (COSEWIC, 2023). A study conducted in Ontario found that all recorded bat species preferred to forage within 40 m of hard forest edges adjacent to open fields (Jantzen & Fenton, 2013).

Passive acoustic monitoring detected 1,668 bat passes within the WPA during the monitoring period, all but one of which were attributed to *Myotis* species. Little brown myotis has been shown to benefit from edge habitat created during harvesting and road construction, preferring to forage in cut blocks and road ROWs over intact forest (Slough et al., 2023). Both *Myotis* species are known to forage in forest edge habitat and along woods roads (COSEWIC, 2013); however, some literature indicates that northern myotis may experience a loss of foraging habitat after harvesting and road construction due to a preference to forage in forested areas (Segers & Broders, 2014). Additionally, pregnant and lactating female bats have also been shown to be sensitive to habitat degradation as their foraging ranges are more constricted due to decreased energy and caring for young (Henry et al., 2002; Segers & Broders, 2014).

As *Myotis* species may prefer to forage in edge habitat (COSEWIC, 2013; Segers & Broders, 2014; Slough et al., 2023), the construction of new roads is likely to create foraging habitat for this species; however, may also result in a loss of roosting habitat. Construction of the Project will cause road density to increase throughout the WPA, however, road density will remain relatively low in surrounding areas (Table 6.12.4; Drawing 6.9-6 A-B, Appendix A). This indicates that foraging habitat is likely to increase within the WPA. Habitat fragmentation within the LSA will remain lower relative to the WPA.

In addition to habitat fragmentation through road construction, mortalities may increase due to traffic as well. A study by Fensome & Mathews (2016) found that 79% of bats crossed a two-lane rural road through forested habitat when vehicles were absent, but this decreased to 59% when vehicles were present. In areas that lacked a tree line, crossings decreased to 14% without traffic and 3.5% with traffic (Fensome & Mathews, 2016). Road density is expected to increase throughout the WPA (Table 6.12.4; Drawing 6.9-6 A-B, Appendix A); however, traffic is not expected to be heavy within the WPA at night (when bats are active) during operations and many roads will travel through forested areas. These factors are anticipated to reduce the barrier effect of roads within the WPA.

Quarry development and forestry activity near hibernacula can cause or contribute to blockages of hibernacula, degradation of hibernation habitat, and/or changes in patterns of airflow that affect the microclimate of underground caves (ECCC, 2015c). According to ECCC (2015c), no critical habitat (i.e., confirmed hibernacula) is located inside the WPA or LSA, and no hibernacula were identified during field surveys conducted within the WPA. However, unknown hibernacula within or near the WPA is possible in areas where specific field surveys were not completed. Site personnel will be provided information on protected bat habitats during site orientation, specifically maternity roosts and hibernacula, so that if observed, a plan to avoid can be reviewed with NLFFA.

Siting considerations to reduce the loss or fragmentation of bat habitat within the WPA were implemented as part of the Project's design. A 30 m buffer was included around mapped wetlands and watercourses, including an additional 105 m WTG blade setback, to prevent infringement on this buffer by spinning blades. A buffer of 330 m was also included around publicly maintained roads and transmission lines which may provide edge habitat suitable to support foraging activity. These measures reduced overlap of existing bat habitat and WTG blades to minimize Project related impacts on available bat habitat. Although movement of species may change as a result of habitat fragmentation and removal, suitable foraging and roosting habitats remain present within the WPA and LSA. The overall magnitude of impact to bats associated with habitat fragmentation and removal is predicted to be moderate in magnitude and permanent in nature. While WTGs will be removed during the decommissioning phase, direct impacts and fragmentation impacts will remain as road and turbine pads will not be removed.

Injury/Mortality

Wind development related bat injuries/mortalities are increasingly becoming a concern, as some researchers have highlighted that turbines may have a greater impact on bats than they do on birds (Barclay et al., 2007). Bats have a slower lifecycle than birds, resulting in impacts to population dynamics when mortalities occur (Wellig et al., 2018). This is especially prominent where populations are already small, either naturally or due to the impacts of white-nose syndrome (ECCC, 2018).

Bat injuries/mortalities can result either from direct collision with WTG blades or from barotrauma, which is caused by the sudden decrease in air pressure following rotating blades (ECCC, 2015c). Bats tend to collide with spinning WTG blades, and do not typically collide with stationary blades or towers (Arnett et al., 2008). Bats may collide with blades due to their inability to detect or avoid blades moving at high speeds, which can be up to 300 km/h at the tip of the blade (Wellig et al., 2018).

Research suggests that bats are attracted to WTGs because wind turbines attract insects due to their light colour, and they are often built in high places that coincide with insect hilltopping behaviours (Guest et al., 2022). Swarms of insects that occur alongside WTGs provide an excellent foraging opportunity for bats, especially migratory species that rely on stopover sites to feed during their migrations (Arnett et al., 2008; Guest et al., 2022). WTGs may also attract bats because they can be perceived as potential mating sites or roost trees, or due to their movement and sound (Arnett et al., 2008; Guest et al., 2022; Wellig et al., 2018). One study found that bats actively forage near WTGs during operation (Horn et al., 2008). During the study, researchers observed bats approaching non-rotating and rotating blades, repeatedly investigating WTG elements, following or becoming trapped by blade-tip vortices, and colliding with blades (Horn et al., 2008). Some research suggests that bats may exhibit attraction to or avoidance of WTGs depending on inter-individual and interspecific variation (Reusch et al., 2022).

The results of passive acoustic monitoring showed that resident bat species are dominant within the WPA, with just one of 1,668 recordings being attributed to a migratory species (most likely a hoary bat). *Myotis* species have relatively low fatality rates compared to other species due to their lower flight elevations and shorter migration distances (ECCC, 2015c). However, various studies have found that some resident bats may undertake regional migrations, travelling more than 500 km between summer roosting areas and hibernacula (COSEWIC, 2013; ECCC, 2015c; Norquay et al., 2013). A study by Norquay et al. (2013) found that little brown myotis travelled a median distance of 463 km between summer roosts and hibernacula. This is higher than what has been stated in previous research (Cope & Humphrey, 1977), likely due to hibernacula displaying different spatial distributions in the two study areas [western/central Canada and southeastern USA, respectively (Norquay et al., 2013)].

Norquay et al. (2013) also speculated that more individuals may migrate regionally in eastern Canada, but they may not travel such long distances due to a tendency to roost in smaller groups compared to western populations. However, as one hibernacula in Nova Scotia was

found to have nearly five times as many bats as any other known hibernacula in 2012 [17,000 compared to less than 3,500 (COSEWIC, 2013)], this hypothesis may not be accurate. Although this may indicate that resident bat species may be at risk of mortality associated with WTG operation during periods of regional migration, a tendency to migrate longer distances also implies that the presence of bats in an area during summer does not necessarily indicate the presence of nearby hibernation habitat.

Excluding regional migration, resident bat species generally do not travel great distances. The average foraging areas of resident bat species in Atlantic Canada were found to be between 6 and 200 ha, and bats were found to move less than 2 km between roosting sites (COSEWIC, 2013). As *Myotis* species tend to fly below turbine height during summer (COSEWIC, 2013; ECCC, 2015c), the risk of mortality is lower during this time. In the Recovery Strategy for Little Brown Myotis, Northern Myotis, and Tri-colored Bat, collisions and barotrauma from WTGs were listed as a high level of concern in areas impacted by white-nose syndrome (like Newfoundland), with localized seasonal impacts in the spring, summer, and fall (ECCC, 2015c).

Within the WPA, detection rates were similar across the BWPA, SLWPA, and TLWPA with each area recording an average of between 32.6 and 49 bat passes per detector. The rate of detection was higher within the LTWPA, with an average of 139.5 bat passes per detector; however, this section of the WPA also contains the fewest proposed turbines (48). Conversely, the BWPA contains the most proposed turbines (273) and recorded the lowest average number of bat passes per detector (32.6). This indicates that areas with the highest concentration of proposed turbines are not expected to be the areas with the highest concentration of bat activity within the WPA based on available data to date. Broadly, areas with higher bat activity in the WPA will be less exposed to mortality risk caused by turbine operations.

Other aspects of the Project which may cause injury or mortality to bats include vegetation removal and blasting during construction, as well as movement of vehicles within the WPA. Potential exists for bats to be harmed during vegetation clearing if they are roosting in vegetation as it is being cleared. However, injury and/or mortality is also possible if a hibernaculum is heavily disturbed while occupied. Construction activities, such as blasting or the use of heavy machinery, could potentially cause a hibernaculum to collapse (ECCC, 2015c).

The construction and use of road networks also pose a risk to bats through increasing vehicular traffic. Low-flying species (such as *Myotis* species) account for the majority of recorded vehicle-related mortality events, with juveniles being particularly vulnerable due to their reduced maneuverability and preference to forage in low-clutter habitats (Fensome & Mathews, 2016; Lesiński, 2007). Mortality is also likely to be higher in areas where roads intersect preferred habitats and corridors, such as watercourses or forest edges (Fensome & Mathews, 2016; Lesiński, 2007; Medinas et al., 2013). It should be noted that traffic volumes on most roads within the WPA during operations are expected to be low during nighttime

hours, and therefore, Project vehicles do not pose a high risk to bats.

To avoid bat mortality associated with wind turbines, wind turbines should be strategically sited away from bat habitats such as mature forests, wetlands, and waterbodies (Reusch et al., 2022; Roeleke et al., 2016) wherever possible. The wind project footprint has been designed to avoid potential bat habitat to the extent possible, including implementation of previously discussed buffers on wetlands, watercourses, and certain edge habitat (Table 6.12.3).

Long distance migrating bats, including the eastern red bat, hoary bat, and silver-haired bat, comprise most of the reported mortalities from WTGs due to their higher flight elevations and long migration distances (Arnett et al., 2008; ECCC, 2015c; Parisé & Walker, 2017). In the COSEWIC Assessment and Status Report on the Hoary bat, Eastern Red Bat, and Silver-haired bat (2023), wind energy development was determined to have a high to very high impact, with these three species comprising approximately 75% to 80% of bat fatalities associated with WTGs. A review of mortality studies at wind farms between 1996 and 2006 found that mortality consistently peaked between mid-summer and autumn, during fall migration (Arnett et al., 2008).

Based on bat detections recorded throughout the WPA, 99% of detections were non-migratory species. Studies have shown that on average, greater than 80% of bat mortalities currently recorded at wind energy developments in North America, involve migratory species (Arnett et al., 2008). Bat mortalities, primarily migratory species, occur through direct collision with blades or indirectly from rapid decompression (barotrauma) near turbines (Baerwald et al., 2008). In Alberta, during fall migration (July 15 to September 30), bat mortalities consist mainly of migratory species such as hoary and silver-haired bats (Government of Alberta, 2013). Foraging activities by resident species typically occurs between 1 and 10 m elevation, seldom above 25 m (W. Erickson et al., 2002), well below the rotor swept arc of most WTGs. Furthermore, throughout bat ranges, migratory species face higher risk of collisions with WTGs based on seasonal movements and flight height associated with migration behaviour (Arnett et al., 2008; COSEWIC, 2013).

Sensory Disturbance

Noise and light will be generated during all phases of the Project. During site preparation and construction along with decommissioning and rehabilitation, noise will be generated by heavy equipment and blasting, especially associated with the development of quarries located in the TLWPA and BWPA. During operation and maintenance, noise will be generated by turbine operation. Light generated during site preparation and construction along with decommissioning and rehabilitation will be temporary. Light will also be generated by WTGs, buildings, and substations throughout operations.

Bat echolocation calls are in the ultrasonic range beyond the upper frequency limits of construction noise (CDT, 2016), meaning there is likely no echolocation masking effect from construction noise. Construction noise (e.g., heavy equipment, blasting, and pile-driving) could, however, affect bats roosting nearby, potentially causing roost abandonment (Haarsma & de

Hullu, 2012). Bats are well adapted morphologically, physiologically, and behaviourally to avoid acoustic trauma (CDT, 2016). As they are often exposed to the exceptionally loud sounds of their own echolocation signals (approximately 110 dB), they have evolved protective mechanisms to prevent sensory overload and damage to the auditory system (CDT, 2016). These mechanisms include behavioural avoidance, changing the shape and orientation of the pinnae, closing the cartilaginous fold in the outer ear canal, the tympanic reflex, and resonance absorption (Wever & Vernon, 1961). While these mechanisms are very effective in achieving protection from constant noise exposure (i.e., in the case of wind turbines), it is speculated that these mechanisms also can prevent over-exposure from sudden, unexpected anthropogenic noise shocks (e.g., blasting). This is supported by a recent study which found that blasting related to mining activities had no significant impact on bat activity at a nearby hibernaculum (Summers et al., 2023).

Sensory disturbance associated with lighting during the site preparation and construction, operation, and decommissioning and rehabilitation phases of the Project may impact bat behavior. During site preparation and construction along with decommissioning and rehabilitation, lighting will be a temporary source of sensory disturbance. A study by Seewagen et al. (2023) found that, while white floodlights had no significant impact on migratory species including the eastern red bat and hoary bat, little brown bats were impacted within at least a 75 m radius and showed localized avoidance of lighted areas. During operation, turbine lighting will be restricted to the minimums required by Transport Canada for safety.

The impacts of necessary noise and light associated with the Project on bat behaviour and movements are anticipated to be moderate based on morphological adaptations and behavioural patterns of bats. Indirect effects of sensory disturbance will be limited to the WPA, as only bats roosting or foraging within or near the Project infrastructure will be exposed to sensory disturbance created by the Project.

6.12.8 Mitigation

EVREC has prepared a strategy paper outlining the proposed strategy for smart curtailment measures for protection of bats (Appendix K.2). This document outlines the commitment to usage of data driven smart curtailment to cut back turbine operations based on bat activity data and pre-determined thresholds to trigger mitigation as needed. Effects to bats are minimized through a mitigation sequence of:

- Avoidance of high risk habitats and migratory corridors
- Minimizing impacts through setbacks and micro-siting
- Monitoring bat activity
- Adaptive mitigation through the use of deterrents and targeted data driven curtailment when needed.

Highlights of the mitigation measures outlined in the strategy paper are provided herein and described in further detail in Appendix K.2.

To address the above-mentioned effects to bat and bat habitat, the following mitigation measures may be implemented:

- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Maintain a minimum 30 m vegetated buffers surrounding watercourses, where possible.
- Retain snags and suitable roosting trees to the extent possible.
- Develop and implement a Wildlife Response Plan which outlines requirements to educate site personnel of important bat habitats (maternity roosts, hibernacula, and migratory stopovers), so that if observed, avoidance or additional mitigations can be implemented in consultation with regulators.
- Draft and implement a Water Management Plan (Appendix Q.13) to support drainage, and ensure water quality conforms to applicable regulations and guidelines.
- Limit unnecessary lighting as much as possible, especially at night.
- Develop and implement an Avifauna Management Plan to reduce any observed bat mortalities during monitoring, including use of deterrents and targeted data-driven curtailment if and when needed.
- Use noise controls (e.g., mufflers) on machinery and equipment to limit disturbance.
- Maintain avoidance of potential bat habitat (i.e., mature forests, riparian areas, and wetlands) to the greatest extent possible.
- Revegetate cleared areas with native species, to the extent possible.

6.12.9 Monitoring

A detailed Post-Construction Bat Monitoring Plan will be developed and submitted to NL FAL for review. Monitoring activities may include:

- Post-construction bat mortality monitoring (i.e., carcass searches as described in the Avifauna Management Plan; Appendix Q.1).
- Monthly data review during peak times of the active bat season with rapid-response memos when triggers are met.
- Adaptive management/contingency plan if post-construction monitoring identifies bat mortality in exceedance of pre-determined thresholds developed in consultation with NL FAL and CWS.

EVREC will conduct post-construction monitoring program (and extend if thresholds are approached) comprising:

- Carcass searches at a representative sample of turbines (stratified by habitat/risk, including any exceeding thresholds), with protocol-driven searcher efficiency and carcass persistence trials to enable corrected fatality estimates.
- Feedback loop: update the curtailment rule sets/thresholds based on measured outcomes; document any turbine long-term operating changes.

6.12.10 Conclusion

Field studies were undertaken and a review of multiple desktop sources was conducted to determine the nature of bat presence and habitat utilization within the WPA. This information was then used to inform Project design and mitigation measures to protect bats and bat habitat. Bats may be impacted by the Project through habitat fragmentation and/or removal, injury/mortality, and/or sensory disturbance (Table 6.12.3).

During analysis of data collected during passive acoustic monitoring, it was determined that bats in the WPA are predominately *Myotis* species. Resident *Myotis* species experience fewer negative impacts caused by wind developments than migratory species due to their lower flight paths and preference to forage in edge habitat (Arnett et al., 2008; COSEWIC, 2013; ECCC, 2015c; Parisé & Walker, 2017; Segers & Broders, 2014; Slough et al., 2023). Analysis of passive acoustic monitoring data also revealed that proposed WTG locations generally do not coincide with the areas associated with the highest bat activity in the WPA. Additionally, habitat modelling indicated that suitable foraging and maternity roosting habitat is abundant throughout the WPA and likely throughout the LSA as well. Thus, bats will not be significantly impacted by habitat fragmentation/removal or injury/mortality.

In terms of sensory disturbance, although noise related to Project construction and operations may exceed recommended thresholds at times, noise can be restricted temporally and will be spatially limited. In combination with the natural adaptations of bats to withstand loud sounds, this indicates that bats will not be significantly impacted by sensory disturbance.

EVREC adopts turbine-level thresholds and a mitigation ladder: minimize lighting and avoid creating “bat sinks”; deploy smart curtailment—predictive rules keyed to temperature, wind and precipitation, and/or acoustic-activated curtail/release commands; and, if exceedances persist within a string, apply sectoral curtailment during demonstrated risk windows.

Overall, the effects of the Project on bats will not be significant (Table 6.12.5).

Table 6.12.5: Bats Residual Effects – Wind Project and Transmission

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Habitat Loss and Fragmentation	Avoid potential bat habitat where possible. Minimize area to be cleared where possible.	A	M VC interaction may cause direct loss of habitat available within the WPA	WPA	LT Effects are expected throughout construction, operations, and decommissioning	SE Habitat loss will only occur when vegetation is removed during construction	PR Effects can be partially reversed during decommissioning	Not significant
Injury and Mortality	Target clearing activities outside the active bat window (where possible). Implement acoustically triggered curtailment.	A	M VC interaction may cause direct mortality which will be reduced through mitigations.	WPA	LT Effects are expected throughout construction and operations	I Effects will terminate when turbines are not in operation and during periods of bat roosting and hibernation	IR Effects cannot be reversed	Not significant

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Sensory Disturbance	Install motion activated lights when possible. Use noise controls on machinery. Limit construction activities to daylight hours.	A	M VC interaction may cause low level sensory disturbance with mitigations	WPA	LT Effects are expected throughout construction, operations, and decommissioning	I Effects will terminate during periods of bat roosting and hibernation during operations	R Effects will reverse upon decommissioning of the Project	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

6.13 Caribou

6.13.1 Overview

The objective of the caribou assessment is to collect the information required to assess the potential impacts of the Project on woodland caribou and associated habitat within the WPA. This was accomplished using the following approach:

- Complete a desktop review to determine the potential for caribou to occur in the WPA. Conduct modelling to understand the extent of overlap between the WPA and caribou home ranges, the habitat suitability of the WPA, and the seasonal range use by caribou (particularly for sensitive life history stages).
- Use the information collected through desktop and field studies to assess the potential effects of the Project on caribou and identify mitigations to minimize effects to caribou.

This section provides details about the potential effects of the Wind and Transmission Project Component on caribou (SARA Special Concern). The ecological, cultural, and economic importance of caribou in Newfoundland indicates that a detailed assessment of the effects of the Wind and Transmission Project Component, separate from other fauna species, is warranted. The potential effects of the Industrial and Solar Project Components on caribou are considered alongside other species of terrestrial fauna in Sections 7.9 and 8.9, respectively.

6.13.2 Regulatory Context

Several laws and regulations provide protection for caribou and their habitats in Newfoundland and Labrador. Legislation that may direct resource development and conservation of caribou include:

Federal Legislation

- *Species At Risk Act* (Canada, 2002b)

Provincial Legislation

- *Wild Life Act* (Newfoundland and Labrador, 1990f)
- *Lands Act* (Newfoundland and Labrador, 1991)

Species at Risk Act, S.C. 2002 c. 29

Habitat protection for species listed in Schedule 1 of SARA (i.e., species designated as Extirpated, Endangered, or Threatened) is granted through the identification and designation of Critical Habitat. Critical Habitat is defined as habitat that is critical to the survival of a species and applies to federal lands. Newfoundland population of woodland caribou (*Rangifer tarandus caribou*) has been designated as Special Concern under COSEWIC and SARA (2020) and as such, does not have designated Critical Habitat.

Wildlife Act, R.S.N.L. 1990, c. 8

The *Wildlife Act* (Newfoundland and Labrador, 1990) and its associated legislation regulates the management of game species in Newfoundland and Labrador. This is done through the establishment of harvest areas, season dates, licenses, and harvest limits. Caribou on the Island of Newfoundland are a designated big game species and licenses are issued annually for harvest of some herds in designated regions of the province labelled as Caribou Management Areas.

Lands Act, S.N.L. 1991, c. 36

The *Lands Act* (Newfoundland and Labrador, 1991) designates Crown Reserves and Special Management Areas. This legislation may be used to grant temporary protection to an area of land. Caribou core areas in particular are identified as sensitive wildlife areas on the crown lands atlas) and development proposed for these areas is referred to the NL FAL - Wildlife Division for review. Unfortunately, habitat is not documented on the crown lands atlas for all herds and resident populations.

6.13.3 Desktop Assessment Methods

Prior to field assessments, a detailed desktop review of caribou populations within the WPA was completed using the following databases and resources:

- ACCDC Data Report (ACCDC, 2026a)
- SARA Critical Habitat layers
- SARA Recovery Strategies
- Big Game Management Areas (NLFAL, 2024b)
- Provincial Protected Areas (NLECCC, 2024f)
- NFLD Land Use Atlas (Newfoundland and Labrador, 2025d)
- NL FAL - Wildlife Division telemetry data from collared Hodges Hill caribou
- Publicly available databases, reports and publications

Preliminary desktop results identified that the WPA coincides with a portion of the range of the Hodges Hill caribou herd, and additional work was therefore completed using caribou collar data to understand the degree of overlap with the home range of the herd and the suitability of the WPA to serve as habitat.

6.13.3.1 *Home Range Estimation*

A caribou home range is a spatially defined area occupied by an animal in its normal activities, such as foraging, mating, and calving (Burt, 1943). The home range of the Hodges Hill caribou herd was estimated using location data from collared caribou in the herd provided by NL FAL - Wildlife Division. Collar data consisted of satellite locations of 14 individuals recorded between December 2006 and December 2011. The spatial boundaries of the overall home range were determined from collar location data using a 95% kernel density estimator (Gitzen et al., 2006), a common technique for estimating the range of size of wildlife.

6.13.3.2 Caribou Habitat Suitability Modelling

A habitat suitability model was developed based on the selectivity indices noted for caribou in Central Newfoundland in Hebert & Weladij, (2013) and Hebert, (2012, p. 20) with the goal of assessing the availability of key caribou habitats within the WPA (see Appendix L.1 for further details). Two habitat classes were modelled: overwintering, foraging, rutting habitat, as well as calving and rearing habitat.

6.13.3.3 Caribou Calving Core Space Use and Resource Selection

The collar data described above were used to assess the influence of landscape features on caribou seasonal range use through a Resource Selection Function (RSF) analysis (see Appendix L.1 for further details). The objective of this analysis was to identify areas with land cover attributes more likely to be selected by caribou during the calving season (broadly defined as April 1 to August 31).

6.13.4 Desktop Assessment Results

The insular Newfoundland population of woodland caribou, despite being the same subspecies as the eastern mainland boreal population, is treated as a distinct and isolated population (COSEWIC, 2002). Woodland caribou on the island of Newfoundland are an assemblage of 14 subpopulations (COSEWIC, 2014). These subpopulations use a mixture of boreal and taiga coniferous forest with some shrubland, peatland, and barrens (COSEWIC, 2002). Substantial declines in the Newfoundland population of woodland caribou have occurred over the past three decades due to a combination of density dependent effects (e.g., poor range conditions being unable to sustain elevated population sizes) and increased hunting pressures during the initial period of population decline (COSEWIC, 2014). Calf recruitment is believed to be a driving factor of current population sizes, with reduced calf survival tied to predation by eastern coyotes, black bear, and Canada lynx (J. Weir et al., 2014).

The WPA overlaps the occupied home range of the Hodges Hill herd which travels a portion of Central Newfoundland approximately between Exploits River and Notre Dame Bay (Drawing 6.13-1, Appendix A). Recent surveys of the herd in 2008 and 2017 estimated the population at 436 and 259 respectively (Randell, 2019). The WPA does not intersect with any caribou management areas and there are no licenses issued annually for harvest of Hodges Hill caribou.

6.13.4.1 Home Range Estimation

The kernel analysis of NL FAL - Wildlife Division collar data yielded a home range estimate of 211,666 ha for the Hodges Hill herd (Drawing 6.13-1, Appendix A). The home range extends beyond the WPA and is bounded by the coastline in the north, the Botwood Highway (Route 350) in the east, the Exploits River in the south, and the Trans-Canada Highway in the southwest. On the western edge of the range at Long Lake, the home range shifts east and runs between North and South Twin Lake. The WPA overlaps with 19,399 ha (9%) of the identified home range.

6.13.4.2 Caribou Habitat Suitability Modelling

Using the output of the habitat suitability model, the extent of suitable caribou habitat was determined for the WPA and its components (Table 6.13.1; Drawing 6.13-2, Appendix A).

Table 6.13.1: Predicted Caribou Habitat in the Wind Project Area

Project Area Component	Potential Caribou Habitat (ha)	Area of WPA Component (ha)	Percentage %
BWPA	10,310	20,802	50%
LTWPA	1,578	2,391	66%
SLWPA	1,672	3,555	47%
TLWPA	3,221	7,686	42%
Total WPA	16,781	34,434	49%

Per the habitat suitability model, approximately 16,781 ha (49%) of suitable caribou habitat was identified in the WPA (49%; Drawing 6.13-2, Appendix A). Each of the sub-components, with the exception of LTWPA, have comparable ratios of potential caribou habitat with individual PA values ranging from 42% to 50%. The LTWPA shows the highest overall relative percentage with 66% of the LTWPA being suitable caribou habitat.

6.13.4.3 Caribou Calving Core Space Use and Resource Selection

The calving habitat assessment generated a map demonstrating the relative quality of calving habitat. While these values do not represent a probability of selection by caribou, they do provide a way to compare relative quality of habitat between areas. Estimates of relative habitat quality were produced for the components of the WPA (Table 6.13.2; Drawing 6.13-3, Appendix A).

Table 6.13.2: Calving Habitat Quality Ratio with Range of -2.5 to 3.4

Project Area Component	Mean Value of Relative Calving Habitat Quality	Standard Deviation of Relative Calving Habitat Quality
BWPA	0.04	0.87
LTWPA	0.29	0.76
SLWPA	0.24	1.13
TLWPA	0.54	0.70

Compared to the other components, the TLWPA was observed to have the highest relative quality habitat for selection during the calving period, while the BWPA was observed to have the lowest. Drawing 6.13-3 (Appendix A) shows that habitat within the PA is heterogenous and that relative habitat quality varies within the sub-component areas. In this context, SLWPA had a higher standard deviation than the other areas suggesting a higher degree of variability in habitat quality within this area.

The RSF model indicates that caribou habitat quality improved with increased distance from roads and improved when closer to water. Caribou selected locations with more coniferous and open habitats but avoided locations with more mixed wood forest cover. Selection for open

habitats appears very strong but it is worth noting that open habitats constitute ~7% of the collared study area and the median proportion open at any given point was 1.2%, so even strong selection for this sparse land cover is unlikely to drive selection overall (Appendix L.1).

6.13.5 Field Assessment Methods

From December 2024 through January 2026, 33 trail cameras were deployed (Drawing 6.13-2 Appendix A) to estimate caribou density and abundance within and near the WPA. The cameras were deployed in 'grids' composed of three cameras with a total of 11 grids. Camera grids were positioned in a triangle formation approximately 250 m apart. Deployments followed a stratified random design, where grid locations were randomly chosen via a priority selection criteria using the Camtrapmonitoring R package (Robitaille, 2024) (see Appendix L.1 for further details).

6.13.6 Field Assessment Results

In total, data were collected from 30 unique camera traps representing 10,343 camera trapping days. The cameras recorded 293 photographs of caribou, with 168 photographs of caribou cows, 116 photographs of bulls, and nine photographs of calves.

The mean density estimate for caribou from the camera trap grid was 0.43 caribou/km², which translates to an abundance estimate of approximately 237 caribou in the 550 km² area encompassed by the camera trapping grid (Table 6.13.3; Drawing 6.13-2, Appendix A).

Table 6.13.3: Mean and 95% Confidence Interval Estimates for Caribou Density Estimates from Camera Trapping Data

Species	Mean Density Estimate	Lower Confidence Interval	Upper Confidence Interval	Mean Abundance Estimate
Caribou	0.43 caribou/km ²	0.24 caribou/km ²	0.62 caribou/km ²	237

6.13.7 Effects Assessment

6.13.7.1 *Project-Caribou Interactions*

The works, undertakings, and activities associated with the construction, operation, and decommissioning of the Project may impact caribou and their habitat through multiple direct and indirect pathways.

Project activities, primarily those that involve earth moving, road construction, quarry and accommodation development, or vegetation removal, have the potential to impact caribou and caribou habitat (Table 6.13.4). These potential impacts could include the loss of habitat and habitat fragmentation, sensory disturbance and injury or mortality.

Table 6.13.4: Potential Project-Caribou Interactions – Wind and Transmission

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	X
Geotechnical Investigations	X
Implementation of Erosion and Sediment Control measures	X
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

6.13.7.2 Assessment Boundaries

The scope of the environmental effects assessment is defined by administrative, technical, spatial and temporal boundaries. Spatial boundaries were defined based on the expected maximum extent of direct and indirect impacts to terrestrial fauna. Temporal boundaries are based on the anticipated duration and timing of Project activities. These assessment boundaries are described below.

Administrative Boundary

No administrative boundaries are identified for the effects assessment on terrestrial fauna.

Technical Boundary

Prediction of potential caribou habitat availability within the WPA was limited by the availability and accuracy of GIS models developed to support this effects assessment. Several models were designed to understand the potential impacts of the Project on the landscape and to caribou.

For both home range estimation and calving RSF, the analysis was generated from historic collar data. The accuracy of locations provided in collar data, in this case ARGOS satellite collars, can be variable. Due to that variability, data was screened for low class accuracy, resulting in 23.5% of the locations being removed, and the error radius applied to 40% of the points (see Appendix L.1 for further details). This variability can affect the uncertainty and

precision of the resulting home ranges and selection parameters. Additionally, collar data were captured between 2006-2011 and across 14 animals. As no more recent collar data are available the analysis cannot account for changes in behavior, range, or population in the intervening years.

The ELC used in the habitat suitability index model was developed using aerial imagery, airborne LiDAR data and land cover data for only the area within the PA. The LiDAR data was a key component in the model, and the basis for the effects assessment related to overall potential habitat. As comparable data outside the PA were not available, this model cannot predict the potential habitat outside of the WPA. This reduces the ability to contextualize potential impacts to habitat within the WPA to the surrounding LSA. Technical boundaries include constraints associated with the availability of provincial data including the accuracy of the NLFAL - Land Cover Database (NLFAL, 2025h), particularly as it relates to land classes of non-merchantable timber such as wetlands and barrens thus impacting predictions of potential habitat for Caribou.

For the calving RSF analysis, the use of Canadian Forest Service Land Cover Database (CFS; Hermosilla et al., 2022), and OpenStreetMap data (Padgham et al., 2017) can produce similar constraints to the provincial FRI related to accuracy. Water and coniferous classes have been demonstrated to classify with a high degree of accuracy, while classification confusion is present in similar classes, with accuracy of rock/rubble and treed-wetlands as low as 40% (Hermosilla et al., 2022).

Spatial Boundary

The spatial boundary for determining residual effects to caribou is the LSA, which includes a 5 km buffer around the WPA (excluding ocean). The LSA was defined considering the maximum expected extent of direct and indirect impacts caribou (Drawing 6.10-6, Appendix A). An RSA is not applicable to this effects assessment.

Temporal Boundary

Temporal boundaries associated with caribou include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

6.13.7.3 Assessment Criteria

Assessment criteria provided in Section 5.0 apply to caribou. The caribou definition for magnitude is as follows:

- **Negligible:** No loss of caribou habitat or impact to caribou through sensory disturbance or injury/mortality.
- **Low:** Small loss of habitat supporting caribou and low impacts to caribou through sensory disturbance or injury/mortality.
- **Moderate:** Moderate loss of caribou habitat and/or moderate impacts to caribou through sensory disturbance or injury/mortality, but these impacts will only be

- experienced by individuals rather than entire populations.
- High: High loss of caribou habitat or high impact to caribou through sensory disturbance or injury/mortality that would impact fauna on a population scale.

6.13.7.4 Effects

The Project is expected to interact with caribou through several pathways. The potential effects were grouped into three major categories: habitat loss/alteration, sensory disturbance, and injury or mortality.

Project related effects can influence caribou either directly or indirectly. A direct effect is defined by interactions that have no intermediates (e.g., mortality by vehicle collision) or direct loss of habitat. Indirect effects are interactions that have intermediate steps such sensory disturbance, or changes in caribou behaviour associated with road development.

Habitat Loss/Alteration

Caribou habitat selection and range use can be affected through the direct loss or alteration of habitat. Across Canada, anthropogenic disturbance has been identified as the leading cause of caribou population decline (COSEWIC, 2014). In Newfoundland & Labrador, approximately 92% of the habitat within woodland caribou population ranges remains undisturbed (Solarik, 2020). While anthropogenic disturbances, such as forestry, mining, seismic lines, and roads, have been documented to influence home range and habitat selection, for Newfoundland woodland caribou and their habitat, energy production, logging and wood harvesting, and linear features (roads/utility lines) have been documented to have a low or slight threat designation (COSEWIC, 2014).

Changes to habitat composition within the WPA may result in degradation of overall habitat quality for caribou, potentially leading to localized avoidance of areas within existing home ranges (Williams et al., 2021). Physical alteration to habitat may result in direct habitat loss or exclusion through infrastructure such as fencing. Indirectly, some alterations to habitat may affect habitat selection behaviour resulting in decreased selection of that habitat or increased avoidance (Rettie & Messier, 2000). Given that habitat selection may vary during sensitive periods such as calving, habitat alterations may result in more substantive changes to selection depending on time of year and may be further influenced by factors such as interannual fidelity (Rettie & Messier, 2000).

The primary activity anticipated to result in habitat alteration for caribou within the Project is clearing activities associated with the site construction phase. Seasonal habitat selection by caribou and influence of forestry clearing activity is well documented in the literature (Hebert, 2012; Hins et al., 2009; Rettie & Messier, 2000; Solarik, 2020). During winter and calving, Newfoundland caribou have shown selection for coniferous forests, and bogs relative to cleared areas (Hebert & Weladij, 2013). For post-calving season, selectivity indices did not differ between cutovers or coniferous forests, indicating that these caribou used cutovers and coniferous forests in similar proportions relative to their availability during that season (Hebert & Weladij, 2013). Hins et al (2009) noted seasonal differences in avoidance of cutovers in

Quebec, observing that 6–20-year-old clearcuts were avoided during the calving period, summer, and rutting, but were selected for during early spring. Faillie et al. (2010) noted that while seasonally caribou in Quebec avoided clearcuts, clear cuts were less impactful on interannual site fidelity.

Based on the home range analysis, the Hodges Hill herd occupies a home range that extends beyond the boundaries of both the WPA and the LSA. Overall, the WPA overlaps with 9.2% of the home range of the Hodges Hill caribou herd, with a PF overlap of 1.2%. These values are substantively below the maximum disturbance threshold of 35% for woodland caribou outlined in the Boreal Caribou recovery strategy (ECCC, 2020a). The largest of the WPAs, the BWPA, only represents a 5.3% overlap with a footprint overlap of 0.6% (Table 6.13.5) (Drawing 6.13-1, Appendix A).

Table 6.13.5: Comparison of WPA and PF Overlap with the Hodges Hill Herd Home Range

Project Area Component	Project Area overlap (ha)	% of Hodges Hill home range	Area of Project Footprint overlap (ha)	% of Hodges Hill home range
BWPA	11,239	5.3%	1,247	0.6%
LTWPA	921	0.4%	272	0.1%
SLWPA	3,555	1.7%	649	0.3%
TLWPA	3,684	1.7%	433	0.2%
Total WPA	19,399	9.2%	2,601	1.2%

An estimated 1,763 ha of potential caribou habitat is expected to be disturbed within the PF, (Drawing 6.13-2; Appendix A). Refer to Table 6.13.6 below for details on levels of potential habitat within the PF relative to the WPA.

Table 6.13.6: Predicted Caribou Habitat Loss in the WPA

Project Area Component	Potential Habitat (ha)	Potential Habitat within Project Footprint (ha)	% of Potential Habitat alteration within WPA Component
BWPA	10,310	869	8%
LTWPA	1,578	257	16%
SLWPA	1,672	318	19%
TLWPA	3,221	319	10%
Total WPA	16,781	1,763	11%

The largest level of disturbance with the WPA is expected to occur in the BWPA at 869 total hectares, which will account for 8% of all suitable caribou habitat in that component. The SLWPA is estimated to result in a potential loss of 19%, the largest percent loss of any sub-component. In total, the Project will impact approximately 11% of the habitat predicted to be available to caribou populations within the boundaries of the WPA.

Selection of calving habitat, defined as areas supporting pre-calving, calving, and post-calving, was positively influenced by coniferous forests and open habitat. While open barrens are shown to have a low occurrence and higher than average overall impact related to PF within the WPA (32%), other open habitat types such as herbaceous shrub/barren and shrub are only estimated to see a 13% and 15% impact respectively (Section 6.9).

A comparison of the RSF results was completed looking at mean values within each WPA component, versus the mean values within the footprint (Table 6.13.7; Drawing 6.13-2, Appendix A).

Table 6.13.7: Comparison of Calving Habitat Quality within the WPA and PF

Project Area Component	Mean Value of Relative Calving Habitat Quality	
	Project Area	Project Footprint
BWPA	0.04	-0.14
LTWPA	0.29	0.12
SLWPA	0.24	0.32
TLWPA	0.54	0.44

The average value of calving habitat within the PF was lower for all components than those observed in the WPA, with exception in the SLWPA. While the analysis does not specifically identify calving habitat, it does indicate that relative to the individual WPAs, the PF is currently designed to overlap with lower quality habitat.

Given the plasticity of caribou seasonal habitat selection and factors such as interannual site fidelity (Hebert & Weladij, 2013; Rettie & Messier, 2000), the direct impacts related to habitat alteration are anticipated to be seasonal and short-term. Some avoidance of habitat within the WPA is, however, expected. Additionally, caribou may show reduced avoidance as cleared areas are remediated or regenerate following construction related clearing activities.

Habitat Fragmentation

Aside from direct habitat alteration, impacts from linear features can include avoidance or other changes in behavioural patterns in proximity to the linear features. Degrees of avoidance of linear features by caribou will vary by type (e.g., road, transmission line, etc.), season, and site (Solarik, 2020).

Throughout the WPA, projected road density is expected to reach 1.35 km/km², ranging from 0.125 km/km² in the LTWPA to 1.47 km/km² in the SLWPA. Road densities within the LSA are expected to reach a mean density of 0.81 km/km². Projected mean road densities for the Project can be found below in Table 6.13.8.

Table 6.13.8: Estimated Increase in Road Density within the WPA and LSA

Project Area	Pre-Construction Road Density (km/km ²)	Post-Construction Road Density (km/km ²)	Percent Increase in Road Density	Pre-Construction Road Density in the LSA (km/km ²)	Post-Construction Road Density in the LSA (km/km ²)	Percent Increase in Road density
BWPA	0.99	1.41	42%	0.63	0.81	29%
LTWPA	0.76	1.25	63%			
SLWPA	0.72	1.47	104%			
TLWPA	0.42	1.25	198%			
WPA	0.72	1.35	86%			

The area with the highest increase in road density will be the TLWPA, with a projected increase of 198%. The area with the least amount of increased road density is the BWPA, with an estimated increase of 42%. Comparative to the WPA, the LSA will see a mean road density of 0.81 km/km² post-construction. Within calving season, while the RSF analysis identified a negative selection for distance to roads, the model coefficients show a much stronger influence in the presence of open and coniferous forest of calving habitat selection.

Dickie et al. (2023) details a large body of research involving the effects of linear features - primarily roads - on woodland caribou. As noted by the authors, no instances of explicitly identified thresholds for the impact of linear features on the behavior or demography of caribou, their competitors, or predators could be found. Dickie et al. (2023) recognized a wide consensus that linear features do in fact have direct and indirect effects on caribou population dynamics and migratory behaviors but could not support it with peer-reviewed evidence; despite a wide consensus, no peer-reviewed quantitative thresholds for the impacts of anthropogenic disturbance such as road density have been developed.

Using the thresholds noted in some grey literature, Dickie et al. (2023) transformed the current total disturbed target from COSEWIC (2014) as well as Mann & Wright (2018) to road density targets. Dickie et al. (2023) note that the potential thresholds produced depend on various factors but point to an upper threshold limit for road density of 1 km/1 km².

While predicted road densities exceed the density threshold noted in Dickie et al. (2023) there is little empirical evidence that specifically and mechanistically link linear features to caribou demography, nor does evidence exist for a threshold in behavioural or demographic features that could be used to support a management target for land-use alterations (Dickie et al. 2023).

While the presence of linear features is likely to have an impact on the movement and habitat use of caribou within the vicinity of energy-related infrastructure and activities, work in recent decades in Nordic countries suggest that caribou populations can become habituated over time, dependent on levels of human activity and seasonal behavioural patterns (Anttonen et al., 2011; Colman et al., 2014; Helldin et al., 2012; Helle & Särkelä, 1993).

Sensory Disturbance

Caribou occupancy and habitat selection within the WPA may be affected through factors such as sound that may result in sensory disturbance. Several studies of reindeer and caribou herds have documented the ability of individuals to attenuate to noise related sensory disturbance (Bergerud, 1969; Chubbs et al., 1993; Eftestøl et al., 2016). However, acute, high decibel sound from construction activities, such as blasting and heavy machinery may result in increased movements, physiological response (Ewacha et al., 2017; Harrington & Veitch, 1991; Lawler et al., 2005) and potential for indirect habitat loss through habitat avoidance (Reimers & Colman, 2009).

Section 6.4 identified noise levels from construction activities ranging from 78 dB to 136 dB. Acute construction events, such as blasting, are estimated to produce the loudest decibels, ranging from 115 to 136 dB. While these levels are elevated above background, they remain within a range comparable to those documented by other caribou and reindeer populations globally as noted above.

Sounds generated through increased vehicle traffic along access roads and construction sites will likely act as an indirect disturbance factor to caribou. The increased movement of vehicles could lead to short-term displacement of caribou, especially during the construction phase (Boulanger et al., 2024; Wilson et al., 2016) though levels of caribou presence could return to baseline levels in the operations phase when traffic levels are lower (Eftestøl et al., 2016; Tsegaye et al., 2017).

Boulanger et al. (2024) found that an active mine haul road, during periods of high activity, had the potential to alter movement patterns as much as 20 km from the road itself. Additionally, Wilson et al. (2016) examined the impacts of an active zinc-lead mine haul road on adjacent caribou, finding that the interaction of to the semi-permeable barrier varied between individuals and that impacts, such as delayed crossing during migration, varied between years. As further noted in Johnson & Todd (1977) caribou utilized a highway crossing point near Kootenay Pass, British Columbia even at peak traffic flow – sometimes captured on camera with several cars and persons at the shoulders of the highway photographing the caribou (Johnson & Todd, 1977).

These studies feature regular heavy vehicle traffic, in comparison, the roads built to support the WPA will not be used regularly after the Site Preparation and Construction phase. During the Operation and Maintenance phase, primary and secondary roads occupying the WPA will be used infrequently for the maintenance of infrastructure.

Observing the effects of forest harvesting on the caribou in central Newfoundland during summer, Chubbs et al. (1993) measured changes in the movements, sex and age structure, and habitat selection of 69 collared caribou relative to cutting and related disturbances. Between the summers of 1987-1990, radio locations of eight adult male and 27 adult female caribou were traced to establish mean distances of the individuals from recent and concurrent

cutting. Of the 35 individuals, only two females decreased their mean distance to clearcuts during harvest periods. Ten females moved an average of 10.2 km farther away during the summer of cutting. Three males increased their distance an average 3.7 km during the cutting period, and an additional 2.2 km after; males moved at average a total of 5.9 km from clearing-adjacent habitat when cutting occurred (Chubbs et al., 1993).

Chubbs et al. (1993) also note 14 of the animals – four males and ten females – did not exhibit a significant change in distance from the cuts during harvesting periods. They noted the possibility of habituation of those individuals due to the common cutting operations that had been occurring throughout the study are in the previous decade (Chubbs et al., 1993). Bergerud (1969) also notes within his treatment of caribou populations of Newfoundland that some caribou could habituate rapidly to repetitive stimuli, such as harvesting operations.

Caribou and reindeer behavior in response to loud, acute sounds such as low-flying jets and explosions have been documented in several studies (Harrington & Veitch, 1991; Lawler et al., 2005; Reimers & Colman, 2009). In some cases, caribou and reindeer demonstrate an increase in energetic state, through a startle response, increased movement, or increase in heart rate. Not all responses observed across the studies are uniform, with some individuals showing no observed response. When startle responses were observed, such as changes in heart rate or behavior, the reaction was observed to be short lived and altered movement did not persist over extended periods.

Noise from heavy machinery, equipment and blasting can disrupt normal behaviors such as foraging, breeding, rearing, and resting. These disturbances are most likely to have an impact on caribou presence within the WPA during the construction phase.

Specific to the operations of wind farms, caribou have shown varied degrees of sensory disturbance (Colman et al., 2014; Eftestøl et al., 2016; Tsegaye et al., 2017).

Eftestøl et al. (2016) found that, examining GPS telemetry data from 5 – 22 female reindeer per season in relation to a new 420 kV power line, negative effects on reindeer area use from the power line were not significant. The study area (370 km²) expanded from north of Øfjellet, Norway, to the Swedish border. Examining avoidance patterns across three seasons, the authors analyzed reindeer resource selection – comparing use of resources to distance from central infrastructure and marked trails (Eftestøl et al., 2016). Reduction in resource use was strongest closest to the central infrastructure during the construction phase, reaching 30, 20, and 30% reduced use during the calving, summer, and autumn seasons, respectively. After construction, the central infrastructure had no effect in any of the three seasons (Eftestøl et al., 2016).

Corroborating the findings of Eftestøl et al. (2016), Tsegaye et al. (2017) found similar findings after conducting a longitudinal study of habitat use at the Fakken Wind Farm, built in 2010-2012. The only period during which significant changes in *Rangifer* sp. space use occurred was during the calving period while construction occurred. Significant changes to space usage

were not observed during the operational phases (Tsegaye et al., 2017), suggesting an eventual habituation of *Rangifer* populations to the consistent noise that may be produced by large-scale wind projects. Eftestøl et al. (2016) and Tsegaye et al. (2017) note a significantly lower density of reindeer during the construction period as compared to two years after.

The examples above highlight the ability of caribou to acclimatize to regular, low noise levels – that, while resulting in some avoidance behaviour at the outset within a portion of the population, will eventually decline as the Project transitions from the Site Preparation and Construction phase to the Operation and Maintenance phase.

Injury/Mortality

While roads may pose a semi-permeable barrier to caribou movements through the WPA due to sensory disturbance and habitat alteration; roads may increase the risk of injury or mortality through vehicular collisions (Vanlaar et al., 2019). Helldin et al. (2012) suggest that traffic associated with maintenance during the operation phases of wind projects will likely be quite low as compared to the construction phase; the traffic volumes posing risk for direct collision with terrestrial mammals will be reduced to near-zero in the operations phase as compared to the construction and decommissioning phases. Main arteries of use may see a reduced number of collisions as a result of avoidance behaviours (Anttonen et al., 2011), wherein reindeer populations avoided areas with major roads, but not areas with minor forest roads. The authors attribute this behaviour to lower traffic volumes likely associated with the road types (Anttonen et al., 2011).

6.13.8 Mitigation

To address effects on caribou habitat and use, the following mitigation measures will be implemented:

General Mitigations

- All site personnel shall receive environmental awareness training, including a review of any protection and mitigation plans developed specifically for caribou.
- Project personnel will be required to report any sightings or interactions with caribou including time and location.
- Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.

Habitat Alteration and Selection

- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- The extent of land clearing and grubbing will be restricted such that naturally vegetated areas between the site and surrounding properties and thoroughfares are maintained.
- Disturbance to ground-level vegetation, e.g., herbs, shrubs, and lichens, will be minimized, where possible and as practical.
- Site remediation activities shall be executed to promote natural vegetation by recovering and distributing overburden and organic material and decompacting soils

where possible.

- Revegetate cleared areas with native species, to the best extent possible.

Sensory Disturbance

- Complete visual survey for caribou in the area before blasting; blasting shall be paused until animal has left the blasting area.
- Use noise controls (e.g., mufflers) on machinery and equipment to limit disturbance.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.

Injury/Mortality

- Minimize use of road salt to minimize attraction of ungulates to roadsides during the winter.
- Establish and implement speed limits to minimize dust and potential collisions.
- Monitor for caribou injuries and fatalities frequently within the facility area during construction and operation within the PA. NLFAL Wildlife Division will be notified within 24 hours in the event of the mortality or injury of an individual caribou.
- Personnel will be made aware of caribou potential in the WPA and on roads especially for Project traffic/transportation. Specifically, signage will be posted to indicate caribou presence where previously identified and at any future observation locations.
- Project personnel will always yield right of way to wildlife.
- Multi-passenger vehicles will be prioritized to reduce collision risk.
- Fencing will be installed to exclude wildlife from higher risk areas such as substations.

6.13.9 Monitoring

Monitoring and management plans will be developed to assess the accuracy of the predicted environmental effects and effectiveness of the mitigation measures. The management and monitoring plans are subject to modifications after consultation with NL FAL Wildlife Division. The following plans will be developed as part of the Project's commitment to monitoring and mitigation of adverse effects to fauna and caribou:

- Wildlife Response Plan – The primary goal is to provide strategies in reducing human-wildlife interactions, promote safety of both wildlife and site personnel and best management practices for vegetation management including invasive species management. This plan will also address reporting and response protocols for terrestrial fauna mortalities. This plan will occur during the duration of the construction, operation and reclamation phase of the Project. The Wildlife Response Plan is included in the Emergency Response Plan (Appendix Q.2)

6.13.10 Conclusion

After mitigations, predicted residual effects on caribou and caribou habitat are characterized in Table 6.13.9.

Table 6.13.9: Caribou Residual Effects – Wind Project and Transmission

VC Interactions	Mitigation	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Habitat Alteration Selection	Limit habitat disturbance and minimize Project footprint during detailed design where possible. Maintenance of vegetative throughfares between the site and surrounding area Revegetation or allow for natural revegetation of cleared areas wherever possible.	A	M	LSA	LT	SE	PR	Not significant
Sensory Disturbance	Complete visual surveys for wildlife prior to blasting. Use noise controls on machinery. Wildlife shall not be harassed by project personnel. Implement WRP and associated monitoring plans	A	L	LSA	MT	I	R	Not significant
Injury/Mortality	Implement speed limits to reduce potential collisions with fauna Hunting of wildlife by onsite Project personnel will be prohibited. Provide wildlife awareness training to site personnel. Implement WRP and associated monitoring plans	A	L	LSA	MT	I	R	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA - Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term, P – Permanent Frequency: SE – Single Event, I - Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

7.0 INDUSTRIAL FACILITY EFFECTS ASSESSMENT

7.1 Project Description

7.1.1 Geographic Location

7.1.1.1 *Siting Locations*

The Industrial Project will be constructed on 1,157 ha of land and is comprised of the Industrial Facility (located west of the town of Botwood), water use infrastructure, heavy haul road, and ammonia pipeline (adjacent vapour return line) (Drawing 7.1-1, Appendix A). Access to the Industrial Facility will be via a proposed heavy haul road located off the Botwood Highway, and proceeding to the jetty infrastructure at the Port of Botwood, along the railway alignment (Drawing 7.1-2, Appendix A).

A PF was established within the IPA which included the area of direct physical disturbance. The PF includes sufficient area for a transportation corridor, electrical connections, laydown areas, process facility areas (hydrogen, ammonia), accommodations, quarries, water use infrastructure, and ammonia transportation. EVREC has applied for additional Crown land parcels to support the Project.

7.1.2 Physical Components

This section describes the principal physical components of the Industrial Facility and its associated ancillary infrastructure. The Industrial Facility forms one component of the broader Project. Within the broader Project context, the Industrial Facility serves as the main processing and export hub. Infrastructure includes the hydrogen production systems, ammonia production systems, water supply and treatment systems, electrical and utility infrastructure, energy storage, ammonia storage and export systems, and the associated support buildings, roads, warehousing, worker accommodations, quarry area, fuel storage, and other ancillary infrastructure required for construction, operation, maintenance, and eventual decommissioning of the facility.

The Industrial Facility is one component of the broader EVREC Project, which also includes the wind Project, solar PV development, and associated off-site infrastructure. Within that broader Project context, the Industrial Facility is the main processing and export hub and is physically connected to the wider Project through the incoming renewable power system, the water supply system, the access road, the heavy haul road and ammonia pipeline, and the marine export facilities at the Port of Botwood. The subsections that follow describe the main physical components of the Industrial Facility, beginning with an overview of the facility as a whole, followed by the individual support, process, storage, export, water, and waste-management systems.

For the purposes of this EIS, the assessed scope includes the Industrial Facility and all its associated infrastructure, a portion of the heavy haul road to Water Street and the ammonia pipeline and vapour return line from the Industrial Facility to the Port of Botwood, and extends

to all onshore and jetty-based infrastructure up to the ship-shore interface, where ships will be loaded with ammonia for export to market. This includes the ammonia storage tanks, booster and loading pumps, vapour return and cooldown systems, jetty structures, loading arms, emergency flare systems, and all associated utility, control, and safety systems required for safe operation.

The Port of Botwood jetty physical upgrades (including a portion of the heavy haul road) and shipping are captured under separate cover for the purposes of permitting.

7.1.2.1 Overview of the Industrial Facility

The Industrial Facility is the core processing component of the EVREC Project and will convert renewable electrical energy into green ammonia for storage and export to international markets. The current Industrial Facility draft states that the Project is expected to produce a nominal output of approximately 1.04 million tonnes per annum (mtpa) of green ammonia. This output is expected to require approximately 12,000 to 13,000 GWh of energy per year and an average raw water withdrawal of approximately 3.0 million m³ of raw water withdrawal per year. The broader Botwood Project includes development of an onshore Wind Project (of 3,500 MW) and a 150 MW Solar Project along with associated off-site infrastructure. The Industrial Facility is designed to receive renewable power from these generation sources as the basis for hydrogen production and subsequent ammonia synthesis.

At a process level, the Industrial Facility will receive renewable electricity and raw water, treat the water to deionized quality, and produce hydrogen via electrolysis. Nitrogen will be produced through an air separation process, and hydrogen and nitrogen will be combined in a Haber-Bosch synthesis loop to produce ammonia. export.

The Industrial Facility includes the following key systems and infrastructure (Drawing 7.1-1, Appendix A):

- Raw water storage, treatment, and deionization systems
- Electrolysis units for hydrogen production
- Hydrogen purification, compression, and molecular storage systems
- Electrical energy storage systems to support critical loads
- Air separation units for nitrogen production
- Haber-Bosch ammonia synthesis units, including refrigeration and steam systems
- Bulk ammonia storage and transfer systems
- Utilities, warehousing, administration buildings, and support infrastructure
- Grid connection for critical loads and system stability

Under normal operating conditions, the electrolysis and ammonia synthesis processes will not produce direct carbon emissions, as no fossil fuels are combusted during operation.

The Industrial Facility comprises several integrated component groups, including:

- Pre-construction and permanent support infrastructure

- Hydrogen production systems (electrolysis, purification, compression, and storage)
- Ammonia production systems (air separation, synthesis trains, refrigeration, storage, and control systems)
- Fuel and hazardous materials storage
- Electrical energy storage systems
- Water supply, treatment, stormwater, wastewater, and effluent management systems
- Solid waste management infrastructure
- Approximately 30 diesel backup generators to provide emergency power for safe standby and controlled shutdown during loss of renewable and battery supply

These systems are designed to operate as a highly integrated facility rather than as standalone process units. The overall concept is based on flexible power utilization, with wind energy as the primary source, supplemented by solar generation and grid support for critical loads and operational stability.

From an execution perspective, the Industrial Facility will be constructed and commissioned in phases, with common infrastructure sized for full capacity and process systems brought online sequentially. The facility therefore represents the central integration point where renewable energy generation, water supply, process systems, storage, utilities, and marine export infrastructure converge into a single operating complex.

To support this description, a preliminary three-dimensional rendering of the Industrial Facility is presented in Figure 7.1.1. This figure illustrates the overall site layout and the relationship between key systems, including renewable power input, water treatment, hydrogen production, ammonia synthesis, storage, and export.

Figure 7.1.1 provides a high-level representation of the Industrial Facility and support the more detailed descriptions of individual components presented in the following subsections.



Figure 7.1.1: Preliminary Image of the Proposed Industrial Facility

The marine export facilities will be located at the Port of Botwood and will utilize existing port infrastructure upgraded for ammonia service. These facilities will include a jetty platform, berthing and trestle structures, marine loading equipment, and a marine offloading facility (MOF) within the water lot. Supporting systems will include transfer piping, venting and isolation systems, emergency response infrastructure, backup power systems, control and administration facilities, and security systems. The port is a deep-water facility capable of accommodating large vessels, with the current design basis anticipating export via ammonia carriers in the range of approximately 50,000 to 80,000 deadweight tonnage (DWT).

Liquid ammonia will be pumped from the storage area to the Port of Botwood via a dedicated underground pipeline. The marine loading arrangement will comprise ammonia storage tanks at the central processing facility (CPF), ammonia booster and loading pumps, a cooldown line, vapour return facilities, loading arms, fiscal metering, nitrogen purge facilities, and flare.

The access road and heavy haul road will connect the Industrial Facility to the Botwood Highway and the Port of Botwood facilitating the transport of equipment and materials.

7.1.2.2 Pre-Construction Support Infrastructure

Development of the Industrial Facility will require a combination of temporary and permanent pre-construction support infrastructure to enable construction, commissioning, operation, maintenance, and eventual decommissioning of the facility. This support infrastructure includes quarries and borrow pits, concrete production batch plants, worker accommodations, access and heavy haul roads, grid connection infrastructure, warehousing and fuel stations, and temporary laydown areas. Collectively, these components provide the materials, logistics, workforce support, transportation routes, utility connections, storage capacity, and staging areas necessary to safely and efficiently develop and operate the Industrial Facility (Drawing 7.1-1, Appendix A).

A distinction is made between temporary and permanent support infrastructure. Temporary infrastructure such as construction camps, batch plants, and certain laydown areas will be established to support construction activities and will be decommissioned and removed following completion of the construction phase. Permanent infrastructure such as access roads, selected warehousing and fuel-storage facilities, and portions of the electrical and utility systems will remain in place and continue to support operations and maintenance throughout the life of the Project.

In functional terms, the pre-construction support infrastructure provides the physical platform required to enable the development of the Industrial Facility. Quarries and borrow areas will supply aggregate materials for roads, foundations, and other civil works. Concrete batch plants will produce materials required for structural and foundation works. Worker accommodations will support the construction workforce. The access road and heavy haul road will connect the Industrial Facility to Botwood Highway and the Port of Botwood facilitating the transport of

equipment and materials. Grid connection infrastructure will support plant energization, commissioning activities and ongoing critical load requirements. Warehousing and fuel storage facilities will provide logistics, storage and refueling capacity while temporary laydown areas will serve as staging zones for equipment, modules, and materials arriving at the site.

As part of the permanent facility, the Industrial Facility will also include warehousing, administration buildings, and associated utility infrastructure, including a grid connection to support critical loads.

The following subsections describe each of these support-infrastructure components in more detail.

Quarries and Borrow Pits

The Project will require aggregate materials, including crushed rock, gravel, and sand, to support construction of the Industrial Facility and associated infrastructure. These materials will be used for access and heavy haul road construction, site grading, engineered fills, laydown areas, concrete production, drainage works, and other civil components required during site preparation and construction. Proposed quarry and borrow pit areas within the Project Area will be evaluated during detailed design and permitting, and where feasible, excavated material recovered from road cuts and other construction activities will be reused to reduce the overall demand for new quarry development and to minimize the Project's disturbance footprint. One quarry is presently contemplated in the vicinity of the Industrial Facility, northeast of the facility footprint, with final location, boundaries, footprint, and extraction limits to be confirmed through detailed engineering (Drawing 7.7-1, Appendix A).

Proposed quarry and borrow areas within the Project Area will be identified and refined during detailed design and permitting. Where feasible, excavated materials generated from road cuts and other construction activities will be reused to reduce the demand for new aggregate extraction and minimize the overall disturbance footprint.

Quarry and borrow pit development will occur only within approved lease or permit areas and will be implemented in stages, limiting disturbance at any given time to what is required for active construction. Typical activities will include vegetation clearing and grubbing, overburden stripping, drilling, controlled blasting by qualified personnel, excavation, crushing, screening, stockpiling, and transportation of aggregate to areas of use. Where appropriate, mobile crushing and screening equipment may be deployed within active quarry areas to improve operational efficiency and reduce material handling requirements.

Quarry development will be carried out in accordance with applicable occupational health and safety requirements. Quarry faces, benches, and working areas will be designed and maintained to ensure safe operation. Access to active quarry areas will be controlled through appropriate measures such as fencing, signage, gates, and other barriers to protect workers and the public.

The siting and operation of the quarry has been carried out with consideration for nearby waterbodies, watercourses, wetlands, and other environmentally sensitive features. Surface drainage and runoff will be managed through a combination of site grading and engineered erosion and sediment control measures designed to prevent sediment-laden water from leaving the active quarry area. Such measures may include drainage ditches, sediment settling areas, silt fencing, rock check dams, berms, and other site-specific controls as required. Where water is needed for crushing, washing, or dust suppression, water sourcing and use will be subject to applicable approvals, and water will be recirculated where practical to reduce withdrawals and minimize discharge volumes. Any water discharged from quarry or borrow areas will be managed in accordance with applicable regulatory requirements. Where temporary support facilities or sanitary services are required at quarry locations, any domestic waste and sewage will be collected, contained, and removed by qualified service providers in accordance with applicable requirements.

Progressive reclamation will be implemented throughout quarry operations. Areas that are no longer required for active extraction, stockpiling, or processing will be regraded to achieve stable slopes, stabilized as necessary, and revegetated where appropriate using salvaged soils or other suitable growth media, where available. At the completion of quarry activities, all remaining disturbed areas will be reclaimed in accordance with the applicable closure or rehabilitation plan and relevant provincial regulatory requirements. Final closure measures will be determined based on the approved end land use, the extent of disturbance, and whether any quarry areas are retained for other approved Project related purposes.

Concrete Production Batch Plants

Concrete will be required for construction of the Industrial Facility and its associated infrastructure to support a wide range of structural and civil works. Anticipated uses include foundations and slabs for process buildings and utility buildings, equipment pads, pipe rack foundations, retaining structures, culverts, drainage structures, transformer and electrical equipment pads, storage tank foundations, road-related works, and other supporting infrastructure associated with the Industrial Facility, water systems, heavy haul road interface, and export-related land-based facilities. To support these works efficiently and to reduce the need for long-distance hauling of ready-mix concrete, the Project will establish one or more temporary mobile concrete production batch plants within the PA.

The primary batch plant is expected to be located near the Industrial Facility footprint, where the highest concentration of concrete works will occur. The current preferred location is within or adjacent to the quarry footprint northeast of the Industrial Facility (Drawing 7.1-1, Appendix A), with the final siting, footprint, and to be confirmed during detailed engineering. Where required to support construction sequencing or reduce haul distances to other industrial plant-related work areas, additional temporary satellite batch plants may be established at other suitable locations within the broader construction footprint. Final siting will consider proximately to demand areas, availability of level terrain, separation from sensitive environmental features, drainage and erosion control requirements, and access to the Project's internal road network.

Concrete will be produced on site using locally sourced aggregate, including aggregate obtained from approved Project quarry or borrow areas where feasible, together with cement and admixtures delivered from off-site suppliers. Cement is expected to be delivered via the Port of Botwood and stored temporarily dry storage facilities before being transported to the batch plant locations. This approach is intended to improve construction efficiency, reduce reliance on off-site supply, and support quality control across the range of concrete mixes.

Each temporary batch plant will consist of a modular arrangement of cement storage silos, aggregate stockpile areas, admixture storage, batching and mixing equipment, truck loading systems, a weigh-batching system, and associated washout and containment features. Facilities will be established on engineered granular pads constructed from compacted fill, with sufficient working area for truck circulation, material storage, and safe operation of the batching equipment. Depending on construction sequencing and availability of permanent power, batch plants may initially operate on temporary on-site generation, with transition to grid-supplied construction power used where available.

Concrete washout and plant service areas will be designed to prevent uncontrolled releases of alkaline water, cementitious residues, and suspended solids. Each batch plant will incorporate contained wash-down or washout areas, including sumps, lined containment, or equivalent containment measures, to capture and manage washout systems and residual materials from plant operation and truck cleaning. Surface drainage around the batch plant footprint will be directed and managed so that runoff can be controlled within the working area and integrated with the Project's broader erosion and sediment control approach.

The batch plants are intended to be temporary construction support facilities only. They will operate only for the duration required to complete major concrete works associated with the Industrial Facility and its ancillary infrastructure. Upon completion of these activities, all batch plant equipment, temporary services, stockpiles, and associated infrastructure will be removed, and disturbed areas will be stabilized and reclaimed in accordance with the Project's rehabilitation closure plans.

Worker Accommodations

The Project will require worker accommodation infrastructure to support the construction of the Industrial Facility and associated ancillary infrastructure. The accommodations are intended to provide safe, functional, and serviced living space for the temporary construction workforce, while reducing commuting distances, support labour mobilization and improving worker health, safety and wellbeing. Accommodation planning has been developed with consideration with consideration of workforce welfare and the potential social effects associated with housing a large temporary workforce in proximity to existing communities.

During early works and initial mobilization, accommodation may be provided through existing regional options such as local hotels, cabin rentals, and outfitter camps, where available. As construction activity increases, the Project anticipates development of a centralized temporary

accommodation facility near the southeast corner of the Industrial Facility. This temporary accommodation facility is expected to accommodate approximately 2,500 workers during the peak construction phase, with final camp capacity, footprint, and layout to be confirmed during detailed engineering and workforce planning.

The temporary accommodation facility will consist of modular or prefabricated camp units, supported by common-use buildings and operational infrastructure. Typical components will include sleeping quarters, dining and canteen facilities, laundry, recreation and wellness space, first-aid or medical support areas, offices or camp administration functions, parking and internal circulation areas, and utility/service areas needed to support camp operation.

Utility and support systems for the camp will include water supply, potable water treatment, wastewater collection and treatment, emergency power, solid waste handling, telecommunications, site lighting, and fire protection and emergency-response systems appropriate to the scale of the facility.

The accommodation facility will operate a dedicated water and wastewater systems to meet camp demand. Potable water requirements for the centralized camp are estimated at approximately 350 L/person/day, with final demand assumptions, storage volumes, treatment capacities, and discharge or disposal arrangements will be confirmed during detailed design. The siting and design of the accommodation area will be coordinated with the Project's broader water, wastewater, solid waste, electrical, and access road infrastructure so that camp services can be provided safely and reliably for the duration of construction period. This accommodation facility will remain at a reduced capacity during operations.

Transportation links between the accommodation area and active work areas will be managed through the Projects internal road network and a workforce transportation system expected to rely on shared vehicles and bus services. This approach is intended to reduce traffic volumes, improve safety and enhance efficiency of daily workforce movements.

Access Road and Heavy Haul Road

The Industrial Facility will be served by two principal road components: a site access road connecting the Industrial Facility to Botwood Highway, and a dedicated heavy haul road connecting the Port of Botwood to the Industrial Facility for delivery of oversized and heavy Project cargo. Together, these roads will provide the primary land-based transportation linkages required to support construction, commissioning, operations, emergency response, maintenance access, and the movement of major equipment and materials associated with the Industrial Facility and related project infrastructure. The road system has been designed to separate routine industrial traffic from heavy-haul movements where practicable, thereby improving safety, and reducing reliance on public roads oversized loads.

The site access road will serve as the primary route for workforce traffic, light and medium deliveries, emergency access, and general operational traffic. It will connect the Industrial Facility to the Botwood Highway, approximately 1 km away, and will function as an all-season

industrial road for the life of the Project. The road is expected to have a cleared and constructed width of approximately 15 to 20 m, accommodating two-way traffic, passing movements, drainage features, and the maneuvering requirements of industrial and emergency vehicles. Final design parameters, including alignment, grades, turning radii, and structural capacity, will be confirmed during detailed engineering based on geotechnical conditions, drainage requirements, and anticipated traffic loads.

The heavy haul road will be a dedicated, heavy-duty granular corridor approximately 15 m in width, designed to accommodate repeated transport of oversized and heavy equipment at low operating speeds. This road will originate at the Industrial Facility, extend southeast, cross Botwood Highway, and follow the existing railway alignment toward Valley Road, Water Street, and the Port of Botwood (Drawing 7.1-2, Appendix A). Portions of the route will involve upgrading and reinforcing previously disturbed corridors, including the former railbed, to minimize new disturbance.

Within the scope of this assessment, the heavy haul road includes the land-based corridor linking the Industrial Facility to the port interface, excluding sections under the jurisdiction of the Port of Botwood (Drawing 7.1-2, Appendix A). The route generally maintains proximity to the coastline, with an average distance of approximately 18.3 m from the road shoulder to the high-water mark, although this varies along the alignment. Given this proximity, the design will incorporate appropriate drainage, erosion control, and, where necessary, shoreline protection measures to limit sediment transport and protect adjacent marine environment

The intersection of the heavy haul road with Botwood Highway represents a key design interface. A Traffic Impact Study (Appendix P.1) indicates that adequate sightlines can be maintained and that any required upgrades to accommodate Project axle loads will be incorporated into the Project design. The crossing of Botwood Highway, with detailed traffic management measures including construction phase controls, escort procedures, approved haul windows, and pavement monitoring requirements will be part of the construction planning process.

Grid Connection (Construction Power)

The Project will require a grid connection to provide construction power to the Industrial Facility during early works, site preparation, and the main construction period. Within the context of the pre-construction support infrastructure, the grid connection is intended to supply reliable electrical construction power, reducing the reliance on temporary diesel generation and improving the overall efficiency of site development. This power will support temporary offices and construction facilities, laydown and warehousing areas, lighting, pumps, construction tools and equipment, temporary utility systems, and electrical requirements associated with the staged buildout of the Industrial Facility.

The Project is evaluating a dedicated interconnection using the existing Botwood-area electrical system, which is supplied through the Stony Brook–Bishop Falls–Botwood 138 kV transmission system. Available information indicates that additional capacity may be

achievable through upgrades to existing transformation equipment and/or installation of new transformation infrastructure associated with the selected point of interconnection. Final interconnection arrangements, available capacity, and utility requirements will be confirmed through ongoing discussions with Newfoundland Power and Newfoundland and Labrador Hydro, and through subsequent interconnection studies and detailed engineering and associated permitting. The utilities will lead permitting efforts for this interconnection and thus, detailed analysis relating to this proposed grid connection is not completed in this EIS.

The grid connection is expected to include several principal components. These may include;

- A point of interconnection at or near the Botwood Substation, or another utility-designated location;
- Transformation and switching infrastructure;
- An interconnection line or feeder extending from the point of interconnection to the Industrial Facility; and,
- A terminal substation or switchyard area at the Industrial Facility to receive and distribute construction power to the site.

Depending on the final design, the interconnection may include new overhead line segments with associated structures, conductors, grounding systems, protection and control systems, communications infrastructure, and auxiliary electrical components.

At the Industrial Facility, the interconnection will tie into temporary and permanent electrical systems required to support construction activities. This is expected to include a terminal substation and associated electrical equipment such as transformers, breakers, disconnect switches, control systems, grounding systems, buswork, and auxiliary services. The final location, footprint, voltage levels, equipment ratings, and detailed design configuration will be established during detailed engineering.

Detailed construction sequencing, energization timing, temporary power distribution, and operational electrical arrangements will be addressed in subsequent Project phase sections.

Warehousing and Fuel Stations

The Project will develop temporary and permanent warehousing and logistics infrastructure to support the storage, inspection, staging, and handling of materials, equipment, consumables, and spare parts required during construction of the Industrial Facility and associated ancillary infrastructure. The primary warehousing and logistics hub will be located at the Industrial Facility, enabling integration of receiving, inventory control, and materials management with the broader construction and site logistics systems. This centralized arrangement is intended to improve the coordination of deliveries, reduce unnecessary material handling, and provide controlled storage conditions for equipment and supplies that must be protected from damage, weather exposure, or loss.

Warehousing facilities at the Industrial Facility are expected to include modular or pre-

engineered steel-clad buildings, containerized storage units, and associated outdoor laydown or marshalling areas for oversized components, crates, packaged systems, and bulk construction materials. These facilities will generally be installed on engineered pads or slab foundations and will provide space for receiving, inspection, temporary storage, assembly support, and dispatch of materials to active work areas. Final warehouse footprint, number of structures, and storage capacity will be confirmed during detailed engineering once the Project equipment lists, procurement strategy, and inventory requirements.

The warehousing system will support several core functions, including receipt and inspection of incoming project materials; secure storage of critical spares, consumables, tools, safety equipment, and emergency-response supplies; and short-term staging of materials before installation or distribution to other Project areas. Storage systems will include racking and shelving systems, designated storage zones for different material classes, and indoor or otherwise protected storage for components that are sensitive to moisture, temperature, contamination, or physical damage. Materials requiring segregation such as lubricants, batteries, compressed gas cylinders, or certain chemicals, will be stored separately in accordance with applicable handling requirements and the Project's materials-management procedures.

The primary warehouse area will also accommodate administrative and support functions associated with site logistics and materials control. This may include receiving and dispatch offices, inventory management systems, communications and security infrastructure, designated emergency equipment storage, and internal circulation space for forklifts and other material-handling equipment. Site access controls will be implemented, including fencing, controlled entry points, lighting, and other monitoring or security measures appropriate to the value and sensitivity of stored materials.

Limited fueling capability may be provided in association with warehouse or logistics areas during construction, to support light vehicles and small mobile equipment. Bulk fuel storage, tank capacities, secondary containment, fuel delivery, refueling procedures, spill prevention, and fuel distribution to construction and operational areas are addressed under Section 7.1.2.6 Fuel and Hazardous Materials Storage.

Temporary Laydown Areas

The Project will establish temporary laydown and staging areas to support pre-construction activities, site preparation, and construction of the Industrial Facility and associated ancillary infrastructure. These areas are intended to function as controlled storage, marshalling, and transfer zones for equipment, materials, consumables, fabricated assemblies, and oversized project cargo arriving by marine delivery to Botwood and by road. Their primary purpose is to provide sufficient temporary space for receiving, organizing, inspecting, and staging materials prior to installation while reducing congestion at active works areas and improving overall construction efficiency. These areas are particularly important to support efficient vessel turnaround at Port of Botwood and to offset limited long-term storage capacity at the port.

Three principal laydown and staging areas are currently planned within the Project logistics footprint. These include: (1) a primary laydown area of approximately 14 ha located toward the rear of the Industrial Facility in the direction of the Wind Project; (2) an intermediate staging area of approximately 3 ha located within the Industrial Facility footprint; and (3) a second primary laydown area of approximately 19 ha located on the Botwood side of the Industrial Facility. Temporary laydown areas will be located within the Industrial Facility or quarry footprints. Final configuration, boundaries, grading limits, and access connections will be confirmed during detailed engineering.

The two larger laydown areas will primarily support the receipt, transfer, temporary storage, and marshalling of large or bulky materials and components. These may include major project cargo, wind energy components where relevant to the integrated logistics strategy, structural steel, large skids, transformers, electrical equipment, cable drums, poles or structural members, and other oversized freight that cannot be delivered directly to the point of installation at the time of arrival. The smaller laydown area within the Industrial Facility footprint will be used primarily for staging Industrial Facility components and installation materials such as structural steel, pipe racks, piping, valves, instrumentation and electrical materials, packaged equipment, and similar items needed for concentrated plant-construction activities. Where practical, modular units intended for direct installation may be transported from delivery vehicles directly to their final installed locations to minimize intermediate handling and reduce storage duration.

As part of the pre-construction support infrastructure, these laydown areas are intended to be temporary. Upon completion of construction activities, equipment and materials will be removed, and disturbed areas will be stabilized and reclaimed in accordance with the Project's rehabilitation approach and applicable regulatory requirements. Any laydown areas proposed for continued use during operations and maintenance will be described separately in the relevant Project phase sections.

7.1.2.3 Hydrogen Plant

The hydrogen plant will form the upstream production component of the Industrial Facility and will convert renewable electricity and treated water into gaseous hydrogen for use as feedstock in the ammonia production process. The hydrogen plant will be located within the Industrial Facility and adjacent to the ammonia plant so that hydrogen can be transferred efficiently to downstream purification, compression, storage, and ammonia synthesis systems (Drawing 7.1-1, Appendix A). Under the current design basis, the hydrogen plant will use proton exchange membrane (PEM) electrolysis technology, selected to provide a flexible production system capable of responding to variable renewable power input from the energy park while maintaining the hydrogen supply required by the integrated facility.

The hydrogen plant is expected to include the electrolyzer systems and associated balance of plant infrastructure including package electrical equipment, water treatment systems associated with the electrolyzer packages, hydrogen purification, hydrogen compression, hydrogen venting infrastructure, oxygen venting infrastructure, and associated control, cooling,

piping, and utility systems. In functional terms, the plant will receive electrical power from the site electrical system and treated water from the Project's water infrastructure, split water into hydrogen and oxygen, purify the hydrogen stream to the specification required for ammonia synthesis, and deliver hydrogen either directly to the ammonia plant or to intermediate molecular storage to support the operational flexibility.

The hydrogen plant will comprise of electrolyzer systems, with rating ranging from 80-120 MW DC, resulting in a total installed electrolyzer capacity of approximately 2,160 MW DC. The electrolyzer system will occupy an area of about 6.5 ha excluding separation distances, access corridors, and balance-of-plant systems (Drawing 7.1-1, Appendix A). Final layout, spacing and configuration will be confirmed during FEED and detailed engineering to account for safety separation, access requirements, piping corridors, electrical routing, and equipment maintainability.

Hydrogen produced by the electrolyzers will serve as the sole hydrogen feedstock for ammonia production. The raw hydrogen stream leaving the electrolyzers will contain residual water and trace oxygen and will therefore be processed through downstream purification systems prior to transfer to the ammonia synthesis loop or storage. Oxygen generated during the electrolysis process will be vented at a controlled and safe location.

Electrolyzer System

The electrolyzer system will be based on a combination of both alkaline and proton exchange membrane technologies and consist of multiple modular electrolyzer packages integrated within a dedicated hydrogen production area within the Industrial Facility. The electrolysis selection will be selected based on it's operating flexibility that is compatible with a renewable-energy-based facility, including the ability to ramp production, reduce output during low-power periods, and respond to variable wind and solar generation.

Each electrolyzer package will include the core electrolysis units together with associated balance of plant systems required to support hydrogen production. Each electrolyzer package will include package-level electrical equipment, water treatment components, and cooling systems. These systems will include Each package is expected to incorporate dedicated reverse osmosis (RO) and deionization (DI) systems to ensure that feedwater meets the required purity specifications for electrolysis. Power will be delivered from the Industrial Facility electrical system to the electrolyzer packages through the site substation and electrical distribution infrastructure, while feedwater will be supplied from the Project's raw water and water treatment systems.

The electrolysis process will split demineralized water into hydrogen and oxygen. Average demineralized water consumption is expected to be approximately 9 to 10 m³ of demineralized water per metric tonne of hydrogen produced depending on operating conditions and system efficiency. Feedwater quality is a critical requirement for PEM electrolysis, and the current treatment philosophy includes a combination of centralized Project-level treatment and additional polishing treatment within the electrolyzer packages. The final configuration of water

treatment systems will be confirmed during subsequent stages of engineering.

The hydrogen stream leaving the electrolyzer packages will require further conditioning prior to use as a feedstock for ammonia synthesis. A dedicated hydrogen purification package will therefore be installed downstream of the electrolyzers to remove residual oxygen and moisture to ensure the hydrogen meets the purity requirements for the ammonia plant. The current design basis includes a combined deoxygenation and dehydration system to achieve the necessary product quality. Hydrogen supplied to the ammonia synthesis process is expected to meet a minimum purity of 99.9999 vol% with a maximum allowable oxygen content of less than 5 ppm, to protect catalyst performance and ensure reliable operation of downstream systems.

The electrolyzer system will also include associated piping, control systems, venting systems and safety systems. Dedicated hydrogen and oxygen vent systems will be provided to discharge gases at safe locations, controlled locations in accordance with applicable safety standards. Oxygen generated as a by-product of electrolysis is expected to be continuously vented under normal operation unless a viable beneficial use is identified. Hydrogen venting would be limited to specific operating scenarios such as startup, shutdown, maintenance, or upset conditions.

These vent systems will form part of the broader hydrogen plant safety and utility infrastructure and will be designed to ensure safe handling of process gases, maintain system integrity, and minimize operational risks. Figure 7.1.2 provides an example of a simplified cell arrangement for an electrolyzer stack.

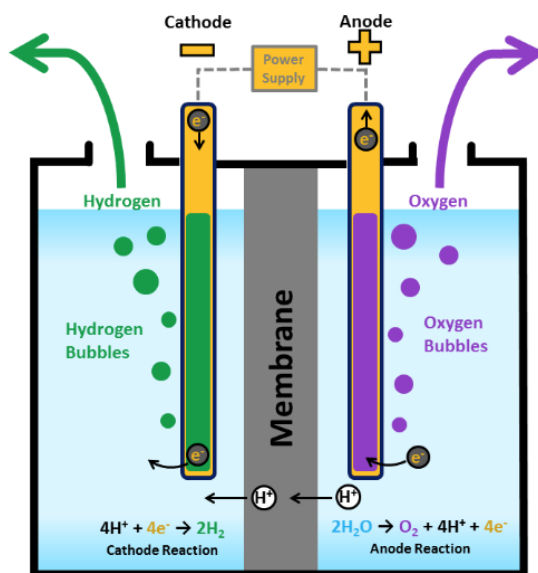


Figure 7.1.2- Simplified Cell Arrangement for an Electrolyzer Stack

Hydrogen Molecular Storage

Hydrogen molecular storage will be provided as an intermediate buffer between hydrogen

production and ammonia synthesis. The purpose of the storage system is to maintain a stable operating profile for the ammonia plant and reduce the likelihood of process disruptions during periods of variable renewable power generation. When renewable power availability is high and hydrogen production exceeds the instantaneous demand of the ammonia plant, excess hydrogen will be compressed and directed to storage. During periods of lower renewable generation, electrolyzer turndown, standby, or shutdown, stored hydrogen will be withdrawn and supplied to the ammonia plant to support continuous and stable operation.

The Project has selected above-ground storage technology in order to minimize execution and quality and geotechnical risks associated with underground alternatives (Drawing 7.1-1, Appendix A). The current design basis utilizes a storage capacity of approximately 270 tonnes of compressed hydrogen. Final storage configuration, number of vessels, manifold arrangement, and detailed pressure basis will be confirmed during FEED and detailed design.

Hydrogen compression will be required upstream of the storage system to raise the hydrogen pressure from electrolyzer discharge conditions to the pressure required for storage. The hydrogen compressors will be sized for the maximum export rate to the storage system, with final compressor sizing and pressure basis to be established during detailed engineering once the final storage arrangement and operating philosophy are confirmed. Compression equipment, storage vessels, associated manifolds, isolation valves, instrumentation, venting systems, and safety systems will together comprise the hydrogen molecular storage area.

Given the nature of compressed hydrogen service, the storage area will be designed with appropriate safeguarding and separation measures. The storage design will incorporate necessary fire stops, blast walls, separation distances, and containment or loss-prevention systems as part of the Project's overall safety approach. The final layout of the storage system within the Industrial Facility will be determined during detailed engineering, taking into account safety setbacks, access for inspection and emergency response, pipe routing, integration with the electrolyzer and ammonia plant areas, and the overall site plot plan.

7.1.2.4 Ammonia Plant

The ammonia plant will form the downstream conversion component of the Industrial Facility and will produce anhydrous liquid green ammonia using hydrogen from the hydrogen plant and nitrogen from dedicated air separation units. Ammonia will be produced using the Haber-Bosch process, in which hydrogen and nitrogen react at elevated temperature and pressure in the presence of an iron-based catalyst to form ammonia. The ammonia plant will be located adjacent to the hydrogen plant within the Industrial Facility. This collocation supports optimized process integration, reduce transfer distances and improved overall operational efficiency of the facility. (Drawing 7.1-1, Appendix A).

The Project plans to install two independent ammonia synthesis trains to achieve a total nameplate production capacity of approximately 5,000 metric tonnes per day, based on two 2,500 metric tonne per day trains. The two-train configuration is intended to provide operational flexibility, phased development capability, and a practical arrangement for integration with the

Project's hydrogen production and storage systems.

The Ammonia Plant will include the following principal physical components:

- hydrogen and nitrogen feed systems;
- air separation units to produce nitrogen;
- ammonia synthesis loop equipment;
- ammonia refrigeration and steam-generation systems;
- ammonia storage and distribution infrastructure;
- associated product conditioning equipment if required;
- flaring and vent systems;
- control and monitoring systems;
- electrical and utility interfaces; and
- supporting safety and environmental protection systems.

These components will be integrated within a single process area and connected to the Industrial Facility's broader water, electrical, drainage, fire protection, wastewater, and emergency-response infrastructure.

In functional terms, the ammonia plant will receive purified hydrogen from the hydrogen plant and nitrogen from the air separation units, compress and heat these feed gases, convert them to ammonia within the synthesis loop. The produced ammonia will be cooled and condensed, then routed as a liquid to refrigerated storage tanks for subsequent transfer via the ammonia pipeline and marine loading system for export. Heat recovered from the synthesis process will be utilized to generate steam and support internal energy integration within the ammonia plant.

The ammonia plant will also include dedicated air separation units (ASU) to produce nitrogen for the synthesis process and other plant users. In addition to serving as a primary feedstock, nitrogen will also be required for auxiliary functions such as electrolyzer purging during shutdown or maintenance, compressor seal gas, utility stations, and other operational demands. A portion of the nitrogen produced by the air separation system will therefore be directed to storage or distribution systems to support those uses and to facilitate safe plant operation and shutdown.

Hydrogen and Nitrogen Feed Systems

The hydrogen and nitrogen feed systems provide the gaseous reactants required for ammonia production and form the interface between the hydrogen plant, the ASU, hydrogen storage system, and the ammonia synthesis loop. Hydrogen will be supplied from the hydrogen plant to the ammonia plant will be supplied from the hydrogen plant, where water is split by electrolysis and the resulting hydrogen stream is purified prior to use. Nitrogen for the ammonia plant will be supplied from the air separation units, which separate atmospheric air into nitrogen and oxygen. Together, these two feed systems will supply the ammonia plant with the reactants required for the Haber-Bosch process.

All hydrogen produced by electrolysis is intended to be used as feedstock to the ammonia plant, with excess hydrogen routed to hydrogen compression and storage when production exceeds immediate ammonia synthesis demand. During periods of reduced renewable power availability or reduced electrolyzer output, stored hydrogen may then be returned to the ammonia plant to support continued ammonia production and maintain a more stable operating profile. Hydrogen production output is therefore prioritized to the ammonia plant, with storage functions as a buffer between hydrogen generation and ammonia synthesis demand.

Before entering the ammonia plant, the hydrogen stream will be purified to meet the required feed specification for the ammonia synthesis catalyst. A combined deoxygenation and dehydration package will be provided downstream of the electrolyzers to remove oxygen and water from the hydrogen stream and prevent catalyst poisoning in the ammonia synthesis loop. Under the current design basis, the hydrogen feed to the ammonia plant is expected to have a typical supply temperature of approximately 30°C, a typical supply pressure of approximately 30 barg, a minimum hydrogen purity of 99.9999 vol%, and a maximum allowable oxygen content of less than 5 ppm. The feed specification also requires that catalyst poisons such as halogens, arsenic, sulphur compounds, oil, and other contaminants are required to be absent from the feed gas.

Nitrogen supplied to the ammonia plant will be produced by the air separation units and delivered to the ammonia synthesis process at the required pressure and purity. Under the current design bases, the nitrogen feed is expected to have a typical supply temperature of approximately 30°C, a typical supply pressure of approximately 30 barg, a minimum nitrogen purity of 99.9945 vol%, a maximum allowable oxygen content of less than 5 parts per million by volume (ppmv), and a maximum allowable argon content of less than 50 ppmv. As with the hydrogen feed, catalyst poisons in the nitrogen stream need to be eliminated. In addition to supplying the ammonia synthesis process, a portion of the nitrogen produced by the air separation units may also be routed to a nitrogen receiver or related storage arrangement for other site users such as electrolyzer purging, compressor seal gas, and utility services.

Within the ammonia production process, the purified hydrogen and nitrogen streams will be combined in the required proportion to achieve the specified $H_2:N_2$ molar ratio at the converter inlet. The make-up gas incoming hydrogen and nitrogen feed streams is mixed with the overhead product from the multiphase separator, which comprised unreacted hydrogen and nitrogen recovered from the synthesis loop. The combined stream is compressed by the synthesis gas compressor to loop pressure, then mixed with circulation gas returning from the loop and compressed in the circulator to the required loop inlet pressure. The resulting gas stream is then heated in the hot gas-gas exchanger before entering the ammonia converter.

Accordingly, the hydrogen and nitrogen feed systems comprise the purified hydrogen supply from the hydrogen plant and hydrogen storage system, the nitrogen supply from the air separation units, associated feed piping and distribution systems, feed gas control and monitoring equipment, and the interfaces required to mix, compress, and deliver the feed gases into the ammonia synthesis loop. Together, these systems form a distinct physical

component of the ammonia plant and provide the direct connection between upstream hydrogen and nitrogen production and downstream ammonia synthesis.

Air Separation Units

The ASUs will provide the nitrogen feedstock required for the ammonia synthesis process and will also supply nitrogen to other users within the Industrial Facility. In addition to ammonia synthesis, nitrogen will be required for electrolyzer purging following shutdown or maintenance, or as a compressor seal gas and services for utility stations within the Industrial Facility. A portion of the nitrogen produced by the ASUs will therefore be routed to a nitrogen receiver or related storage/holding arrangement to serve these users and to support safe plant shutdown and restart conditions. The nitrogen produced by the ASUs will be required to meet the quality specifications of the ammonia synthesis process.

The primary function of the ASUs is to separate atmospheric air into its principal components, primarily nitrogen and oxygen, using cryogenic air separation. Atmospheric air will be drawn into the main air compressor (MAC) through an inlet filtration system, after which it will be compressed and cooled in the pre-cooling unit. The compressed air will then pass to the front-end air purification unit, where it will be cooled and the water vapour and carbon dioxide will be removed to protect downstream cryogenic equipment and ensure stable operation of the distillation system.

This purified compressed air will then be routed to the cold box where it will be, purified and cooled to near its dew point in the main heat exchanger through heat exchange with returning product and waste streams. The remaining portion of the purified air will be boosted to a higher pressure by a turbine-driven booster, cooled in the booster aftercooler, and then further cooled in the main heat exchanger to cryogenic temperature. This stream will then be worked in the turbine, providing the refrigeration required to operate the cold box while also driving the directly connected booster. A small portion of the purified air will also be cooled in the liquid oxygen purge vaporizer and then combined with the main cooled air stream before entering the distillation system.

The combined air stream will be fed to the high-pressure (HP) column, where initial separation of the air will occur. Within the HP column, oxygen-rich liquid will accumulate toward the bottom of the column and nitrogen-rich vapour will rise to the top. Gaseous nitrogen from the top of the HP column will enter the main vaporizer, where it will be condensed by vaporizing oxygen-rich liquid from the low-pressure (LP) column sump. The resulting liquid nitrogen will return to the top of the HP column as reflux. A portion of the nitrogen gas from the top of the HP column will be withdrawn, warmed through the turbine desuperheater and main heat exchanger, and leave the cold box as medium-pressure gaseous nitrogen (MP GAN). Rich liquid from the bottom of the HP column will be flashed in the rich liquid separator, and the resulting liquid and vapour streams will be routed to the LP column.

Further separation will occur in the LP column. Oxygen-rich streams and an air stream will be introduced to the LP column at appropriate points, where rectification will continue in a manner

similar to that in the HP column. Oxygen-rich liquid will accumulate in the lower portion of the LP column, and the reboil duty for the column will be provided by the main vaporizer through vaporization of oxygen-rich liquid. The oxygen-rich liquid bottom fraction will be subcooled and flashed into the LP column condenser, where it will provide cooling to produce reflux for the LP column. Gaseous nitrogen from the top of the LP column will be condensed in the LP column condenser to form reflux, while the remaining nitrogen gas will be withdrawn, warmed in the sub cooler and main heat exchanger, and leave the cold box as low-pressure gaseous nitrogen (LP GAN). Waste gas leaving the LP column condenser will also be warmed before leaving the cold box, with a portion returned to the air purification section as regeneration gas and the balance vented to atmosphere.

The low and medium pressure nitrogen product streams are compressed in the gaseous nitrogen (GAN) compressor and combined to form high pressure nitrogen product which is delivered to the battery limits as the high-pressure gaseous nitrogen product across the Industrial Facility. The majority of this nitrogen will be supplied to the ammonia synthesis plant, with additional distribution to auxiliary users as required. Oxygen generated as part of the air separation process may be considered for future beneficial use or storage if a market or internal use is identified; otherwise, it will be managed and vented safely in accordance with the final facility design.

As cryogenic distillation systems, the ASUs are expected to operate as relatively steady continuous process units integrated with the ammonia plant and broader site utility systems. The ASUs comprise of the main air compressor and inlet filtration system, pre-cooling and air purification units, cold box, booster and turbine system, HP and LP columns, main vaporizer, sub cooler, LP column condenser, GAN compressor, nitrogen receiver and associated product distribution piping, controls, utilities, and vent systems. Cooling for the ASUs will be integrated with the Industrial Facility utility systems, with air coolers being preferred where practical.

Ammonia Synthesis Loop

The ammonia synthesis loop is the core production system of the ammonia plant and is the process by which hydrogen and nitrogen are converted into ammonia. Hydrogen from the hydrogen plant and nitrogen from the air separation units will be combined in the required molar ratio, compressed, heated, and introduced into the ammonia converter, where the reaction will take place over a suitable catalyst. Because the ammonia synthesis reaction is slow under ambient conditions, elevated temperature and pressure are required to achieve practical conversion rates.

Under the current design basis, each ammonia synthesis train will include the major equipment typically associated with a modern Haber-Bosch process, including an inlet compression system, ammonia converter, chiller system, steam generation system, turbo-expansion or power-generation equipment, and ammonia refrigeration system. The synthesis loop will also include associated recycle gas systems, separators, heat exchangers, piping, instrumentation, and control systems required to support stable plant operation.

In simplified terms, make-up hydrogen and nitrogen will be mixed with recycled gas from the loop and compressed to the required synthesis pressure. The resulting synthesis gas will then be heated through heat exchange with hot process gas before being introduced to the ammonia converter. Within the converter, the gas will pass through catalyst beds where a portion of the hydrogen and nitrogen is converted to ammonia. The hot product gas will then pass through a series of heat recovery and cooling steps, including superheaters, waste heat boilers, feed/effluent heat exchangers, air coolers, chillers, and high-pressure separators, to condense ammonia and separate it from the remaining unreacted gas. Unreacted gas will be returned to the synthesis loop through recycling compression equipment.

The current industrial plant design also identifies a start-up heating system for the ammonia converter. At start-up, an external heater will be used to bring the converter to the temperature at which the ammonia synthesis reaction can be initiated. Once the reaction is established, the process becomes self-sustaining and no further continuous external heat input is expected to be required for reaction maintenance.

Associated with the synthesis loop will be the air separation units that provide nitrogen feedstock to the process. The air separation system will cryogenically separate atmospheric air into nitrogen and oxygen streams. The pre-FEED basis indicates that the air separation units are required not only for ammonia synthesis feedstock, but also for nitrogen supply to other plant users. Because air separation is a cryogenic process, the design basis assumes the units will be operated as stable process systems with turndown capability rather than frequent rapid cycling.

A simplified block flow diagram of the ammonia synthesis process is illustrated below in Figure 7.1.3.

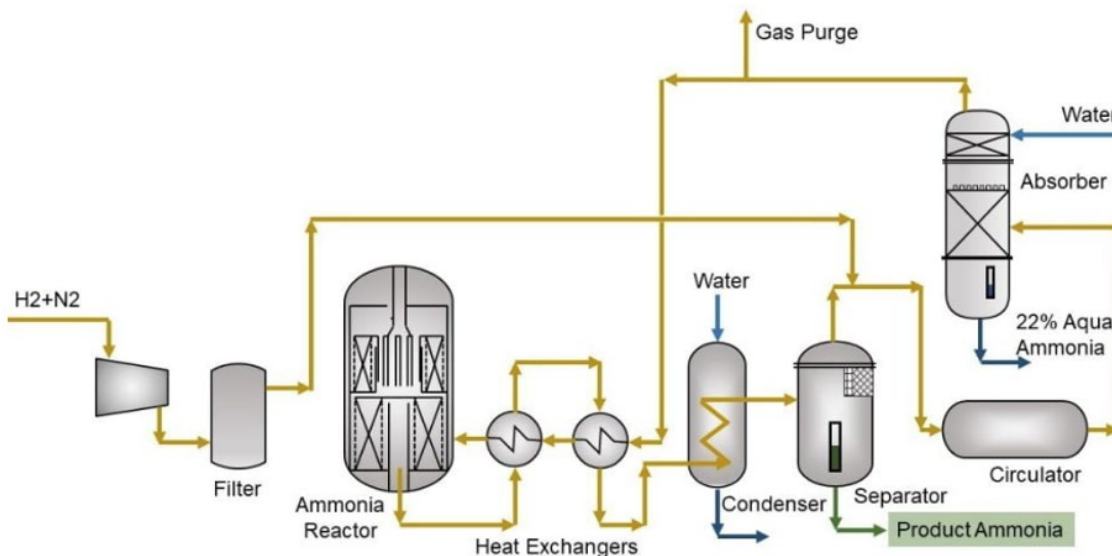


Figure 7.1.3 – Simplified Ammonia Synthesis Flow Diagram

Ammonia Refrigeration and Steam Generation Systems

The ammonia refrigeration and steam network forms an integral part of the ammonia plant and supports both product conditioning and energy recovery within the ammonia synthesis process. Under the current design basis, the ammonia synthesis train includes a chiller system, steam generation, turbo-expansion/power generation, and ammonia refrigeration as key components of the overall plant configuration. Within the Industrial Facility, these systems will be physically integrated with the ammonia synthesis loop, ammonia storage and distribution systems, plant utilities, and electrical infrastructure so that produced ammonia can be cooled to storage conditions while reaction heat is recovered and converted into useful steam and power for the plant.

The refrigeration system is intended to provide chilled liquid ammonia for two principal purposes: condensation of the ammonia produced in the synthesis loop and condensation and recovery of ammonia contained in off-gas streams. The refrigeration system is designed to produce 99.8% cold ammonia at approximately -33°C , after which the chilled liquid ammonia is pumped to the on-site ammonia storage tanks (Drawing 7.1-1, Appendix A). This refrigeration function is therefore a key interface between the ammonia synthesis process and the downstream product storage and export systems.

The steam network is intended to recover heat from the synthesis loop and convert that heat into superheated medium-pressure steam for use within the ammonia plant. The steam generation is incorporated directly within the ammonia synthesis train and the resulting

superheated medium-pressure steam will be used to generate electricity for ammonia plant energy consumption by means of a steam turbine generator. Accordingly, the steam system forms part of the plant's internal energy integration and efficiency strategy rather than being a separate standalone utility.

Refrigeration Circuit

The purpose of the refrigeration circuit is to cool, condense, and recover ammonia from the ammonia synthesis process and associated off-gas streams, and to deliver refrigerated liquid ammonia to storage. Liquid ammonia from the Multiphase ammonia (NH₃) Separator, together with ammonia water solution from the ammonia wash unit, will be directed to the cold section of the ammonia receiver. Liquid ammonia from the ammonia water condenser will also be routed to the ammonia receiver and stored in the hot section of that vessel. The warm ammonia contained in the ammonia receiver will then be sent to an ammonia chiller, where ammonia will evaporate to cool the produced ammonia and synthesis gas. Ammonia vapour from this chiller will enter a separator and will then be routed to the third stage of the ammonia compressor.

Liquid ammonia from the cold section of the ammonia receiver will be directed to a second ammonia chiller, where it will evaporate to further cool the produced ammonia. Ammonia vapour from this second chiller will enter a dedicated separator and will then be routed to the second stage of the ammonia compressor. A small portion of liquid ammonia that is not vaporized in the second chiller will be sent to an inert gas chiller to condense ammonia contained in the inert gas released from the ammonia receiver. Ammonia vapours from the inert gas chiller will be returned to the atmospheric ammonia separator. The remaining liquid ammonia from the second chiller will be flashed to atmospheric pressure in the atmospheric ammonia separator to provide cold ammonia, which will then be sent to storage through the cold ammonia pumps.

Vapours from the atmospheric ammonia separator will be compressed in the first stage of the ammonia compressor, together with ammonia vapours from the chillers in the subsequent compressor stages. The overhead product from the ammonia receiver will be sent to the inert gas chiller, where ammonia gas will be condensed and recovered, while non-condensable gas will be routed to the ammonia absorption column for residual ammonia recovery by washing with demineralized water. Cold ammonia will then be mixed with the aqua ammonia from the bottom of the ammonia absorption column to obtain the required product purity before being sent to storage. Together, the ammonia receiver, ammonia chillers, separators, atmospheric ammonia separator, ammonia compressor, inert gas chiller, ammonia absorption column, and cold ammonia pumps comprise the principal physical components of the refrigeration circuit.

Steam Circuit

The steam circuit is designed to recover heat from the ammonia synthesis loop and convert that heat into superheated medium-pressure steam for use within the ammonia plant. Demineralized water will be sent to a deaerator, where dissolved gases will be removed through the addition of low-pressure steam. Boiler feed water from the deaerator will then be pumped through boiler feed water pumps and preheated in a heat exchanger using hot gases

from the synthesis loop. The preheated water will then be further vaporized in a waste heat boiler, also using hot gases from the synthesis loop, to produce medium-pressure steam. The medium-pressure steam will then be superheated using gases exiting the ammonia converter.

The blowdown from the waste heat boiler will be let down in a blowdown tank and then routed to the stormwater/effluent pond. Low-pressure steam released during this blowdown process will be returned to the deaerator. The generated superheated medium-pressure steam will be fed to the MPS header and then directed to a steam turbine generator for production of electricity for ammonia plant energy consumption. The steam circuit therefore includes, at a minimum, the deaerator, boiler feed water pumps, boiler feed water preheater, waste heat boiler, steam superheater, blowdown tank, MPS header, and steam turbine generator, together with associated piping, controls, condensate and blowdown handling systems, and utility interfaces.

The refrigeration and steam systems will be supported by the broader Industrial Facility utility infrastructure, including cooling, electrical, control, drain, and vent systems. The pre-FEED basis indicates that compressor interstage cooling, air separation unit cooling, ammonia synthesis unit cooling, and electrical equipment cooling will preferably be provided by air coolers where possible. As such, the ammonia refrigeration and steam network should be understood as part of a larger integrated utility and heat-recovery arrangement within the Industrial Facility, rather than as an isolated process package.

Product Storage and Distribution

The ammonia storage system provides the interface between ammonia production and export and is designed to safely store product prior to shipment while maintaining operational flexibility. Green ammonia produced at the Industrial Facility will be stored in dedicated on-site tanks located in proximity to the ammonia production trains. These tanks will provide bulk storage capacity required to receive product from the ammonia synthesis and refrigeration systems and support continuous production, routine maintenance, inventory management and marine export scheduling.

Under the current design basis, ammonia will be stored as a refrigerated liquid at approximately -33°C in above-ground, atmospheric pressure storage tanks. The tanks are presently anticipated to be manufactured of carbon steel, double walled, and insulated on the outside walls, with the appropriate level of containment to meet applicable codes and regulations. Refrigeration of the stored product is required to maintain ammonia at the necessary storage temperature and to avoid flashing. A minimum of two ($65,000\text{ m}^3$) tanks are planned, accommodating up to approximately 89,000 tonnes of ammonia.

The storage system is designed to provide sufficient operational margin to accommodate routine maintenance and variability in export scheduling. The current design basis adopts an approximate $n+0.5$ storage Philo spy allowing partial operational redundancy and inventory management flexibility. While the Port of Botwood is an ice-free harbour and year-round shipping is anticipated, the storage capacity is intended to provide approximately seven days of

peak production to accommodate vessel scheduling constraints and potential weather-related delays.

Due to ambient heat ingress, boil-off gas (BoG) will be generated within the storage tanks and during loading operations. Accordingly, the ammonia storage system will include a BoG system designed to cool and re-liquefy ammonia vapours as they form and to return the condensed liquid to storage. This system is intended to prevent dangerous pressure build-up within the storage tanks while minimizing product losses.

Each tank will be equipped with the safety systems required for ammonia storage, including vapour management systems, and monitoring and instrumentation to ensure safe operation. The design will comply with applicable regulatory requirements and industry standards for the storage of refrigerated ammonia. Final confirmation of tank type, whether single- or full-containment configuration is adopted, and the detailed berm and containment arrangement will be completed during FEED.

Distribution of ammonia from storage will occur through dedicated transfer infrastructure connecting the ammonia storage tanks to the export system. Liquid ammonia will be pumped from the storage area to the Port of Botwood via a dedicated underground pipeline. Cooling of the ammonia will be maintained at the Industrial Facility in the vicinity of the storage tanks, with the export system functioning primarily as a transfer system between storage and the marine loading facilities.

Accordingly, the storage and distribution system therefore comprises the ammonia storage tanks, associated refrigeration and boil-off gas handling equipment, transfer pumps, piping, valves, instrumentation, containment features, and connection to the export pipeline.

Product Conditioning Equipment

No separate standalone final ammonia purification unit is presently anticipated beyond the product conditioning inherently achieved within the ammonia synthesis, condensation, refrigeration, and recovery systems. Additional purification of the final ammonia product other than control of water and trace contaminants is not expected to be required, as the specified high purity of the hydrogen and nitrogen feedstocks is intended to prevent impurities from being introduced into the ammonia product.

Under the current pre-FEED design basis, the facility will export anhydrous ammonia. Based on established industrial practice and the effectiveness of upstream gas purification systems, the produced ammonia is expected to achieve high purity. The current design basis assumes an export specification of refrigerated ammonia at approximately -33°C and atmospheric pressure, with a minimum purity in the range of 99.5 to 99.8 weight percent (wt%), a maximum water content of approximately 2,000 ppm weight/weight (w/w), and a maximum oil content of approximately 10 ppm (w/w). Accordingly, the principal objective of product conditioning is to ensure that ammonia routed to storage and export consistently meets these specifications, with particular emphasis on controlling water and oil carryover.

Product conditioning is achieved through the integrated process arrangement rather than through a dedicated downstream polishing unit. Ammonia produced in the synthesis loop is progressively cooled and condensed through the heat recovery and refrigeration systems, separated from unreacted gases, and routed through the ammonia receiver and associated refrigeration equipment before transfer to storage. Ammonia present in off-gas streams is also recovered through the inert gas chiller and ammonia absorption units, with the recovered ammonia returned to the product stream. Collectively, these systems provide effective ammonia recovery, condensation, and water-content control prior to storage.

To maintain final product quality, the equipment selection, particularly compressors and pumps, will prioritize oil-free design to prevent contamination of the ammonia product. This requirement will be incorporated into the detailed design basis for the ammonia production, refrigeration, transfer, and storage systems.

Should the FEED phase determine that additional product conditioning, polishing, drying, or impurity-removal equipment is required to meet final off taker specifications, storage requirements, or export quality guarantees, those requirements will be incorporated into the final FEED documentation and plant design.

Flaring and Vent Systems

The flare systems associated with the ammonia plant and on-site ammonia storage are intended to provide a controlled means of collecting, combusting, and safely discharging gas released from the facility during non-routine conditions. These conditions include process upsets, emergency relief events, blowdowns, plant start-up, commissioning, shutdown, and maintenance activities. The flare systems are not intended to operate during normal steady state operation and are used primarily for emergency and maintenance-related scenarios.

Under the current design basis, the Industrial Facility will include three flare systems : (i) a high-pressure ammonia plant flare system, (ii) a low-pressure ammonia storage flare system, and (iii) a jetty flare system located at the marine terminal. The ammonia plant and storage flare systems will be located within the Industrial Facility and are expected to share a common flare structure, while the jetty flare system will form part of the downstream export and loading infrastructure.

The high-pressure ammonia plant flare system will receive reliefs and blowdown streams from the ammonia production process including process unit trains, balance-of-plant ammonia vents, and the hydrogen compression and storage systems. This low-pressure ammonia storage flare system will receive relief flows from ammonia production units, ammonia vents within the balance-of-plant facility. Together, these systems provide the primary flaring capability for the ammonia production and on-site storage areas.

In addition to the flare systems, the facility will include dedicated atmospheric vent systems. Hydrogen vent systems from the hydrogen storage system and the raw hydrogen header will

be discharged directly to atmosphere through a dedicated vent/flare. The vent will be used to provide stability primarily during start-up, shutdown, maintenance, or upset conditions. Oxygen is expected to be continuously vented during normal operation from the electrolyzers and the ASU unless a beneficial use is identified, while hydrogen venting will occur mainly during start-up, shutdown, maintenance, or upset conditions. Suitable provisions will be incorporated to address noise attenuation and ignition risk for atmospheric venting systems.

Each flare system will function as collection and disposal system for gas and entrained liquids from reliefs and blowdowns events. The systems are expected to include flare headers and sub-headers, flare gas metering and monitoring instrumentation, and flare stacks equipped with pilots and ignition systems. Flare gas recovery systems may also be incorporated to reduce routine flaring where practicable.

Flare system design will be based on the governing relief scenario, including potential simultaneous relief events, as determined during detailed engineering. Relief valve tailpipes will be sized based on maximum rated capacity, while flare headers and sub-headers will be sized for the applicable design relief loads. In accordance with established industry practices the main flare header will be sized for a maximum velocity of 0.5 Mach, and relief valve tail pipes and sub-headers will be sized for a maximum of 0.7 Mach. Flare headers will be sloped toward the knockout drums to prevent the liquid accumulation and to reduce the risk of liquid carryover to the flare stack.

To prevent air ingress and maintain safe system operation, flare headers will be continuously purged using nitrogen and hydrogen gas, and seal drum will provide a hydraulic barrier at the base of the flare stack. The flare header piping system will also be designed to address potential acoustic induced vibration and flow induced vibration. Ultrasonic metering systems to quantify flared gas volumes for operational monitoring and environmental reporting.

The flare packages are expected to consist of vertical stacks with water seal drums at the base, along with pilots, ignition facilities, and any vendor-recommended mechanical or gas seal systems. Emissions performance will be designed to meet applicable regulatory requirements are to be controlled so as not to exceed 20% opacity for more than five minutes in any consecutive two-hour period, and that the requirement for smoke suppression systems, such as air or steam injection, will be evaluated during detailed design. Flare stack height will be established in accordance with local regulatory requirements and API 521 design guidance, taking into account stack location, radiation criteria, flame shape, and exit velocity. Final flare system sizing, stack design, and flare structure details will be carried forward into FEED and detailed engineering.

Control and Monitoring Systems

The ammonia plant will be equipped with continuous control and monitoring systems to support the safe, stable, and efficient operation of the ammonia production process and its associated utility systems. These systems will continuously monitor process conditions, equipment performance, power supply, and other critical parameters to maintain plant performance and

enable timely identification of deviations or abnormal operating conditions. Within the Industrial Facility, the ammonia plant control systems will form part of an integrated control architecture spanning the hydrogen plant, ammonia plant, storage systems, electrical infrastructure, and utility systems.

The control and monitoring systems for the ammonia plant will comprise field instrumentation distributed throughout the plant together with centralized control facilities housed in the control buildings and associated electrical buildings. Instrumentation will be provided to measure and monitor the key process and equipment parameters required for ammonia production, including pressure, temperature, flow, liquid level, gas composition, equipment operating status, utility availability, and alarm conditions. These systems will be applied across all major plant areas, including the ammonia synthesis loop, air separation units, refrigeration and steam systems, ammonia storage and transfer systems, vent and flare systems, and associated utilities and safety systems.

The primary function of these systems is to maintain process control and ensure stable operation; however, they will also provide continuous visibility of plant performance, support both automated and operator-initiated responses to changing process conditions, and enable early detection of equipment malfunctions, utility interruptions, abnormal process trends, and potential safety events. The design philosophy assumes that the ammonia plant will operate as part of an integrated facility, with control systems coordinated across the broader site rather than functioning as an isolated process.

In physical terms, the control and monitoring systems will include process instrumentation, local transmitters and detectors, control valves and actuated devices, local panels where required, signal and communications cabling, low-voltage and information-technology systems associated with plant control, and centralized operator interfaces within the control building. The plant design includes the installation of instrumentation, Information Technology (IT) systems, and low-voltage electrical systems as part of plant construction, which is consistent with the provision of a dedicated plant monitoring and control network for the Industrial Facility.

The control and monitoring systems will interface with plant protection and emergency systems. Signals from fire and gas detection systems, leak detection systems, venting and purging systems, flare systems, and other safeguarding systems will be monitored and incorporated into the broader plant alarm and response framework so that hazardous conditions can be identified rapidly and appropriate actions initiated. In this regard, the control and monitoring systems form an important link between routine process control and the wider safety systems of the Industrial Facility.

At the Industrial Facility level, control and communication interfaces will be defined during FEED for the Industrial Facility, the wind power facilities, the solar power facilities, and any grid connection. The ammonia plant control systems will be designed to interface with the broader EVREC power and communications architecture, including incoming electrical supply systems, renewable generation sources, and the wider Industrial Facility utility systems. Final details of

the control architecture, communication protocols, equipment redundancy, and exact system interfaces will be confirmed during FEED and detailed engineering.

Electrical and Utility Interfaces

The ammonia plant will be integrated with the broader Industrial Facility through a series of electrical and utility interfaces that are required to support ammonia production, storage, control, safety, and associated balance-of-plant functions. The ammonia synthesis facility is not a standalone process island, but rather a component of an integrated power-to-ammonia facility connected to the site electrical system, substation infrastructure, utility networks, storage systems, and common plant services. Key utility interfaces include electrical power, plant and instrument air, nitrogen, firewater, vent and flare systems, drainage systems, cooling systems, and water supply.

Electrical power to the ammonia plant will be supplied through the Industrial Facility electrical distribution system, which receives power from the broader site power infrastructure. Power will be sourced from a combination of wind generation, solar generation, grid connection, and battery energy storage systems, with the main substation serving as the central interface for power transformation and distribution. The ammonia plant electrical system will include normal power, emergency power, and uninterruptible power supply (UPS) systems, recognizing that critical equipment such as the ammonia synthesis loop and air separation units require a stable and reliable power supply to maintain safe operation.

Within the Industrial Facility, the ammonia plant electrical interface will include connections to the substations, transformers, switchgear, motor control centers and low voltage distribution equipment. Electrical and control buildings will house key electrical equipment, instrumentation, and control systems. These components will provide the electrical connection between the broader site power system and the process equipment, compressors, refrigeration systems, pumps, controls, and safety systems associated with the ammonia plant.

Plant and instrument air systems will provide compressed air for pneumatic controls, actuated valves, instrumentation, maintenance activities, and general plant services. System sizing will be based on vendor data and design requirements, with appropriate margins applied during detailed design.

Nitrogen is both a feedstock and a utility interface for the ammonia plant. In addition to the dedicated nitrogen feed supplied to the synthesis process from the ASUs, the broader site nitrogen system will interface with the ammonia plant and other Industrial Facility users. Nitrogen is also required for electrolyzer purging following shutdown or maintenance, compressor seal gas, utility stations, and other smaller utility demands, and that a portion of the nitrogen produced by the ASU will be routed to a nitrogen receiver or storage arrangement for those users. The ammonia plant will therefore be connected to both the process nitrogen feed system and the wider nitrogen utility distribution network.

Firewater will be provided to the ammonia plant through the site firewater system. The design

includes fire water as one of the core facility utilities and indicates that a standalone firewater system is to be provided, typically comprising a firewater tank (raw water tank), firewater pumps, and jockey pumps sized to meet the governing design demand scenario and applicable local or National Fire Protection Association (NFPA) requirements. The ammonia plant, ammonia storage area, and associated hazardous process areas will interface with this system through the facility firewater distribution network in order to support vessel cooling, fixed fire protection, and emergency response.

The ammonia plant will also interface with the site vent, flare, drainage, and environmental systems. The design includes hydrogen and oxygen vent systems, flare systems, drains, and cooling medium as part of the site utility systems. Local vents will be provided for hydrogen and oxygen and will be discharged at safe locations, while flare systems will manage non-routine reliefs and blowdowns. Drainage systems will connect the ammonia plant to the broader hazardous and non-hazardous drainage and treatment systems, supporting environmental protection and safe plant operation.

Cooling systems form a key part of the utility interface. The overall facility design prioritizes air cooling for major process duties where practicable, including compressor interstage cooling, air separation unit cooling, ammonia synthesis loop cooling, and electrical equipment cooling. Chilled water systems will be used for specific services such as hydrogen purification. The ammonia plant refrigeration and steam systems are therefore integrated with the broader site cooling philosophy rather than relying on a standalone cooling water network.

The ammonia plant will also interface with the site raw water and treated water systems. Raw water supply, treatment facilities, and treated water storage will support steam generation and other process requirements within the ammonia synthesis trains. Treated water storage capacity will be designed to provide operational continuity, including a nominal storage duration of approximately 24 hours. This interface is particularly significant as steam system make-up represents a major water demand within the facility.

Finally, the ammonia plant will be integrated into the broader site control and communication architecture. Interfaces will be established with renewable power generation systems, grid connection, hydrogen production and storage systems, water supply infrastructure, and export systems. These interfaces will include both physical connections (piping, cabling, and equipment) and digital communication systems required for coordinated operation of the Industrial Facility.

The electrical and utility interfaces between the Industrial Facility and the Wind Project, Solar Project, grid provider, hydrogen storage facility, Peters Pond water supply, and port terminal. The ammonia plant is therefore not only connected physically through piping, cabling, utilities, and substations, but also through the wider site control and communication architecture. These interfaces will be defined further during FEED and detailed engineering, but for the purposes of the project description they form part of the overall electrical and utility interface framework supporting the ammonia plant within the Industrial Facility.

Safety and Environmental Protection Systems

The ammonia plant will be designed as a major industrial process facility handling hazardous materials under elevated pressure and temperature conditions, as well as refrigerated liquid ammonia in bulk storage. Ammonia is a designated hazardous substance and, accordingly, the Industrial Facility will incorporate dedicated safety and environmental protection systems to support the safe production, handling, storage, and transfer of hydrogen, nitrogen, and ammonia. Rigorous safety measures will be required for the storage, handling, and transfer of ammonia, and the plant will incorporate robust systems intended to support leak prevention, early detection, emergency response, and environmental protection throughout the Industrial Facility.

The overall Project safety philosophy is to provide an inherently safe design and a pathway to As Low As Reasonably Possible (ALARP) through the implementation of robust preventative and mitigation measures. Within the ammonia plant, this safety philosophy will be reflected in the design of process areas, storage areas, utility systems, and supporting infrastructure to minimize the likelihood of loss of containment and to reduce the consequences of any accidental release. This includes physical separation of hazardous systems where required, appropriate safeguarding of vulnerable equipment and structures, and integration of process safety systems with the broader facility control, shutdown, and emergency-response arrangements.

Fire and gas detection systems will form a key part of the safety framework for the ammonia plant. The design includes fire and gas detection systems, including hydrogen and ammonia detection, as a required design consideration to provide early warning of flammable or toxic atmospheres or fire conditions and to enable timely remedial action. These detection systems will be integrated with alarm, shutdown, isolation, and emergency-response systems so that hazardous situations can be identified rapidly and escalation can be minimized. Passive fire protection and active fire protection measures will also be incorporated where required, including fireproofing and blast protection of vulnerable structural supports, pipe racks, and equipment, together with fixed and portable firefighting systems designed to prevent or limit fire escalation until the source of hazard has been isolated or consumed.

Firewater infrastructure will be provided as part of the Industrial Facility and will support fire detection and protection for the ammonia plant and associated storage areas. The design includes a standalone firewater system, typically comprising a firewater tank sized to meet the governing design demand scenario, firewater pumps with suitable sparing, and jockey pumps, with the system sized to meet local and NFPA requirements. The purpose of this system is to provide cooling to vessels, prevent escalation of fires between isolatable process sections, and support emergency response to potential incidents within the facility, including the ammonia storage area.

Spill containment and release management measures will also be incorporated into the Industrial Facility. The design includes measures to mitigate and prevent spills will include

treatment systems, tank bunds, and other spill-prevention measures, together with provision of spill clean-up systems, spill kits, and associated personnel training. Within the ammonia production and storage areas, these measures are intended to protect ground and water resources by containing accidental releases and directing contaminated liquids to appropriate collection, treatment, or disposal systems. The final storage tank type, containment arrangement, and berm requirements will be confirmed during FEED, but the ammonia storage system will be designed to meet applicable codes and regulations.

The ammonia plant will be integrated with the facility drainage, sewage, and effluent treatment systems to support environmental protection and responsible water management. These systems are designed to collect, segregate, treat, and manage runoff, process effluent, and wastewater generated during plant operation.

The facility drainage system will include separate networks for non-hazardous and hazardous areas, as well as a closed drains system. Non-hazardous open drains will collect runoff from areas not exposed to process contaminants, while hazardous open drains will collect runoff from process and storage areas where contamination may occur. The closed drains system will collect process liquids, equipment drains, and other potentially contaminated streams for controlled handling and treatment.

An effluent treatment system will be provided to treat collected wastewater prior to reuse or discharge. Treated effluent, along with chlorinated cooling water blowdown from the ammonia plant boilers and associated systems, will be routed to a stormwater and effluent management pond. From this location, water may be reused within the facility where appropriate or discharged in a controlled manner in accordance with applicable regulatory requirements.

Sanitary wastewater generated from occupied buildings will be collected and treated separately within a dedicated on-site sanitary treatment system prior to discharge or disposal.

Collectively, these systems form part of the environmental protection framework for the Industrial Facility, ensuring that contaminated runoff, process effluent, sanitary wastewater, and boiler blowdown streams are appropriately managed to minimize environmental impact and comply with applicable regulatory standards.

Environmental protection measures associated with the ammonia plant and broader Industrial Facility will extend to waste management and air emissions control. All waste generated by the facility will be managed in accordance with applicable national and local regulatory requirements. A Waste Management Plan (Appendix Q.12) will be developed during FEED to address the identification, handling, storage, transport, and disposal of all waste streams generated during construction and operation.

The design basis also identifies the preliminary air emissions inventory at which during FEED, the project will quantify emissions under both normal operating conditions and non-routine scenarios, including start-up, shutdown, maintenance, and upset events. This inventory will

inform environmental assessment, permitting, and the development of appropriate emissions control and monitoring strategies.

The outcomes of these studies will be used to refine key design elements, including plant layout, equipment spacing, safety distances, fire protection systems, flare system configuration and location, ammonia storage arrangements, and other risk-sensitive aspects of the facility. Together, these studies form a critical part of the Project's risk management framework and support the achievement of a design that aligns with the Project's safety philosophy and applicable regulatory requirements.

7.1.2.5 Air Emissions and Atmospheric Discharges

The Industrial Facility is intended to be powered primarily by renewable electricity, and neither the electrolysis units nor the Haber-Bosch ammonia synthesis units are expected to produce routine fossil-fuel combustion emissions during normal operation. Accordingly, the principal direct atmospheric discharges presently identified for the Project are associated with flare pilots, semi-continuous purge gas release, non-routine flaring during commissioning and upset conditions, and intermittent diesel-fired backup or support equipment.

Under normal operation, the only continuous combustion sources currently expected are the propane pilots on the process flare, ammonia storage flare, and jetty flare, together with a semi-continuous flash-gas purge used to remove inert gases from the ammonia synthesis process. Under commissioning, additional temporary emissions are expected from flare-assisted system purging, process stabilization, and the intermittent operation of diesel-fired emergency and light-duty generators. Under abnormal low- or no-wind conditions, the emissions profile includes flare pilots, the flash-gas purge routed via the ammonia storage flare, and the operation of emergency diesel generators and electrolyzer diesel generators to maintain safe plant operation. Under upset or emergency relief conditions, emissions may also arise from relief streams routed to the process flare, together with diesel-fired emergency and support equipment required to maintain safe operation.

The principal flare discharge points currently assessed for the Project are located at the Industrial Facility and the Port of Botwood. The flares (Process Flare and Ammonia Storage Flare at an assumed base elevation of 30.6 m; Jetty Flare at an assumed base elevation of 2 m) are located Drawing 7.1-1, Appendix A. For the flare pilots, the current dispersion study assumes a 50 m stack height, 1.0 m stack inside diameter, 27 m/s exit velocity, 0.09 m³/s exit flow, and 1,000°C exit temperature. For the flash-gas purge routed via the ammonia storage flare, the assumed parameters are 50 m stack height, 700°C exit temperature, 0.03 m³/s exit flow, and 27 m/s exit velocity. For the commissioning syngas flare and emergency relief streams routed via the process flare, the study assumes a 50 m stack height, 1,200°C exit temperature, 0.0293 m³/s exit flow, and 37 m/s exit velocity.

For the three continuously lit pilot flares and the flash-gas purge, the effective release height is approximately 50.39 m. For the off-spec ammonia from tankers at the jetty, the effective release height is approximately 59.18 m, and for the emergency blowdown (syn-gas) routed to

the process flare, the effective release height is approximately 89.07 m. These effective heights were derived using a 50 m assumed flare height and a 55% radiative loss factor. The heights will be refined and confirmed during FEED and that building downwash and final Good Engineering Practice stack-height confirmation will need to be revisited once final building heights and the fixed plant layout are confirmed.

Diesel-fired backup and support equipment also form part of the current atmospheric emissions basis for non-routine cases. The current modelling basis includes 30 emergency diesel generators rated at 2 MW each, a bank of 18 electrolyzer diesel generators rated at 1 MW each, and a diesel firewater pump. The emergency generator bank (Drawing 7.1-1, Appendix A) is located within the main plant area, while the electrolyzer generator bank is distributed across the electrolyzer area. For each 2 MW emergency generator, the current model assumes a 5 m stack height, 250°C exhaust temperature, 0.4572 m stack diameter, 2.46 m³/s exit flow, and 15 m/s exit velocity, with typical per-unit emission rates of 0.37 g/s NO_x, 0.06 g/s PM₁₀, 1.94 g/s CO, and 0.10 g/s SO₂. For each 1 MW electrolyzer diesel generator, the current model assumes a 5 m stack height, 250°C exhaust temperature, 0.3 m stack diameter, 1.06 m³/s exit flow, and 15 m/s exit velocity, with typical per-unit emission rates of 0.19 g/s NO_x, 0.03 g/s PM₁₀, 0.97 g/s CO, and 0.05 g/s SO₂. These diesel units are treated as intermittent, short-duration sources rather than continuous operational emissions sources.

The current air dispersion assessment considers NO_x (conservatively modelled as 100% converted to NO₂), PM₁₀, PM_{2.5}, CO, and SO₂. This conservative approach was adopted because the current emissions inventory is based on pre-FEED level information and AP-42 emission factors, which report nitrogen oxides as total NO_x rather than directly as NO₂. Background ambient concentrations were not considered in the current assessment because no site-specific monitoring data were available; however, background concentrations in the Botwood area are expected to be relatively low owing to the limited industrial activity in the surrounding region.

For particulate matter, the current assessment specifically evaluates PM₁₀ and PM_{2.5}, but does not derive TSP because vendor-specific particle size distribution data are not yet available and AP-42 does not provide TSP factors for the identified flare sources. Likewise, the latest air dispersion does not presently quantify constituent-specific emissions or stack concentrations for metals, general or odorous gases, VOCs, carbon dioxide, oxygen, hydrogen sulphide, or polyaromatic hydrocarbons before and after treatment. O₃ and H₂S were not modelled because they are not expected source releases, and that ammonia is not intended to be vented under the current design basis. These items will need to be finalized in the detailed FEED-stage emissions inventory and with vendor data once the final process design, relief philosophy, and equipment selections are confirmed.

In terms of source-specific process discharges, the current assessment indicates that the electrolyzers, air separation units, and the ammonia synthesis process do not create routine direct combustion-stack emissions during normal operation. The design basis is to use air cooling across the facility where practical, including air cooling for compressor interstage

cooling, air separation unit cooling, ammonia synthesis unit cooling, and electrical equipment cooling, while the hydrogen purification package will use chilled water and the electrolyzer packages include dedicated cooling within each package. No separate routine air emission source has been identified for the electrolyzer cooling system or ASU cooling system beyond indirect emissions associated with non-routine backup power generation when diesel equipment is operating.

The current modelling basis for diesel-fuel use is low-sulphur diesel, with the report noting that this is conservative and that use of ultra-low-sulphur diesel would materially reduce predicted SO₂ concentrations. The report further notes that the diesel generators specified for the abnormal and non-routine cases are Tier 4 low-NO_x units, and that the dominant contributor to the highest short-term NO₂ concentrations is not the diesel equipment itself, but rather the hydrogen-rich syngas purge or relief stream routed to the process flare, where high flame temperatures drive thermal NO_x formation.

With respect to monitoring equipment, the current plant design and draft flare description indicate that an ultrasonic metering system will be installed for measurement of flared gas. The broader plant control and monitoring systems will also continuously monitor critical process, power, and operational parameters. Detailed requirements for stack or source-specific air emissions monitoring, continuous emissions monitoring, flare-performance monitoring, and any permit-required reporting will need to be finalized during FEED and permitting, once the final emissions inventory, control philosophy, and equipment package data are available.

Flaring procedures and estimated frequency at the current stage may be summarized as follows. The three flare pilots are assumed to operate continuously. The flash-gas purge routed via the ammonia storage flare is semi-continuous and is used to remove inert gases from the ammonia synthesis process. Larger flare releases are not intended to occur as part of normal routine plant operation and are instead associated with commissioning, maintenance, abnormal depressurization, and upset or emergency relief events. The current studies treat these events as non-routine and short-duration, and do not yet assign a fixed annual numerical flaring frequency. The design basis assumes that the Project intends the main flares to be used only for emergency scenarios and maintenance, and that investigation of a normally unlit flare arrangement is recommended during FEED to reduce routine emissions.

No final flaring or venting radius has yet been defined. Instead, the design basis assumes that flare location and buffer zone will be evaluated during FEED through the Project safety studies, including fire and explosion risk assessment and quantitative risk assessment. Accordingly, flare and vent safety distances should be confirmed later through the technical safety work rather than stated as fixed final values at the present project stage.

7.1.2.6 Fuel and Hazardous Materials Storage

Fuel and hazardous materials storage infrastructure will be developed at the Industrial Facility to support construction, commissioning, emergency preparedness, and ongoing operation of the Project. These materials will include fuel products required for backup and support

equipment, as well as other regulated or controlled materials needed for plant utilities, maintenance, and safe operation of the Industrial Facility. The purpose of this infrastructure is to provide controlled storage, segregation, transfer, and handling of these materials in a manner that supports operational reliability while protecting workers, the public, and the environment.

A central fuel storage facility will be established at the Industrial Facility as the primary location for receipt and storage of bulk fuel products (Drawing 7.1-1, Appendix A). The central fuel facility is expected to store diesel and gasoline and may also include other fuel products depending on final equipment requirements and the confirmed backup-power philosophy. Fuel stored at the Industrial Facility will be used primarily to support emergency diesel generators and other backup or support equipment associated with critical loads, safe standby, and controlled shutdown of plant systems during abnormal operating conditions or interruptions to renewable power supply.

The final storage volume, number and type of tanks, and detailed dispensing configuration will be confirmed during FEED and detailed engineering once the Project's final fuel consumption estimates, emergency power requirements, delivery frequency, and regulatory approvals are established. Fuel storage is expected to be provided in bulk storage tanks located within a controlled fuel storage area at the Industrial Facility. Depending on the final design basis, these tanks may be double-walled and/or installed within bermed secondary containment areas sized in accordance with applicable codes, standards, and provincial requirements. Fuel unloading, transfer, and dispensing areas will be integrated with controlled site-access arrangements, vehicle circulation, and spill prevention measures appropriate to the type and quantity of material being stored.

Fuel will be delivered to the Industrial Facility by licensed external suppliers using standard highway tankers or equivalent approved fuel delivery vehicles. Deliveries will occur as required to maintain adequate inventory and will be undertaken in designated unloading areas using standard safety procedures such as grounding and bonding, controlled access during unloading, and transfer supervision. The storage and transfer systems will be designed so that routine fuel receipt and internal distribution can occur without unnecessary conflict with the broader plant traffic, warehousing, and laydown functions of the Industrial Facility.

In addition to the central fuel storage area, smaller secondary fuel storage or fueling points may be established where required within the broader Project footprint to support construction activities or localized high-use areas. Fuel may be distributed from the central storage location to secondary fueling areas near quarries, batch plants, and other active work areas, using a dedicated Project fuel truck or equivalent refueling vehicle. These secondary areas are expected to be smaller, temporary or semi-temporary in nature, and intended primarily for distribution to mobile equipment, temporary generators, and other support equipment. Where secondary fuel storage or fueling areas are provided, they will be designed and operated using the same general containment, spill prevention, and control principles applied at the central storage facility.

Hazardous materials storage at the Industrial Facility will also include designated arrangements for non-fuel hazardous substances and regulated products required for plant operation and maintenance (Drawing 7.1-1, Appendix A). Depending on final design, this may include lubricants, oils, greases, solvents, treatment chemicals, compressed gas cylinders, batteries, and other controlled materials used in process support systems, utilities, maintenance shops, laboratories, or emergency-response functions. These materials will be stored in dedicated areas appropriate to their hazard class and compatibility, with segregation of incompatible substances and suitable provision for ventilation, spill control, fire protection, and access restriction where required. The storage philosophy for hazardous materials will form part of the broader hazardous materials handling protocol and environmental protection framework for the facility.

The Project design basis requires incorporation of spill prevention and containment measures for fuel and hazardous materials storage areas. Measures to mitigate and prevent spills will include treatment systems, tank bunds, and other spill-prevention measures, as well as the development of a spill management plan, provision of spill clean-up systems, spill kits, and personnel training. Accordingly, fuel and hazardous materials storage areas at the Industrial Facility will be designed with suitable secondary containment, controlled drainage, and other features intended to prevent contamination of soil, groundwater, surface water, and stormwater systems in the event of leaks, overfills, or transfer incidents. Spill response equipment will be provided at appropriate locations, and fueling and transfer areas will be integrated with the Project's emergency response and environmental management systems.

Storage and fueling areas will also be designed to protect nearby drainage features and water resources. Controlled fueling surfaces, graded pads or hard standing, drainage controls, and runoff containment measures will be incorporated where appropriate to prevent contaminated runoff from leaving active storage or fueling areas. Oily wastes, contaminated absorbents, used containers, and related hazardous waste materials generated from fuel storage or hazardous materials handling will be collected, stored appropriately, and removed from site by licensed service providers in accordance with applicable requirements. These storage and handling systems will interface with the broader drainage, sewage, effluent treatment, and waste management systems provided for the Industrial Facility.

Access to fuel and hazardous materials storage areas will be controlled through the Project's broader site security measures. The Industrial Facility is expected to include secure perimeter fencing, controlled access points, and monitored entry arrangements, and the fuel and hazardous materials storage areas will be located and managed within that secured environment. Storage locations, transfer points, and hazardous materials handling areas will therefore be subject to the Project's site access control, inspection, and emergency-response procedures.

The fuel and hazardous materials storage component of the Industrial Facility will comprise the central bulk fuel storage area, any associated dispensing or transfer systems, secondary or

satellite fueling arrangements where required, dedicated hazardous materials storage areas, containment and spill response infrastructure, and the related access, drainage, and safety features needed to support reliable and compliant operation of the Project.

7.1.2.7 Battery Energy Storage System

The Project will include an electrical energy storage system in the form of a BESS located within the Industrial Facility (Drawing 7.1-1, Appendix A). The BESS is planned as a 106 MW / 1,100 MWh system and forms part of the integrated electrical infrastructure of the Industrial Facility.

The majority of electrical power for the Project will be supplied from the Wind and Solar Projects rather than from direct grid import. The role of the BESS within the Industrial Facility is therefore to store excess renewable electricity when production is high and release that energy during periods of reduced renewable output or higher demand from critical plant systems. In this way, the BESS is intended to smooth short-term and medium-duration variations in available power, reduce the risk of trips caused by intermittent generation, and support a stable and continuous supply of electricity to equipment and systems that are sensitive to power fluctuations. The battery system is intended to maintain plant stability, maximize production continuity, and provide power for critical and emergency loads rather than routine electrolyzer operation.

The BESS will be configured to supply life safety systems and critical operating loads only, such as the air separation plant and ammonia plant as these systems are more sensitive to intermittent power fluctuations. The stored electrical energy is only to be used for critical operations and is not intended to power the electrolyzers during normal operation. The BESS should therefore be described as a supporting plant-stability and resilience system within the Industrial Facility, rather than as a primary process-energy source.

The BESS is expected to consist of a modular array of battery enclosures or containerized battery units together with associated balance-of-plant infrastructure. This is expected to include battery racks or modules, integrated battery management systems, heating and cooling systems, fire detection and mitigation systems, power conversion systems, medium-voltage power stations or equivalent inverter-transformer skids, switchgear, protection systems, auxiliary electrical equipment, communications systems, and control interfaces with the broader Industrial Facility electrical network. The overall installation will also require foundations or engineered pads, internal electrical cabling, grounding, access roads, fencing, lighting, monitoring systems, and connection to the site substation and plant control systems.

The BESS is expected to be centrally located within or adjacent to the Industrial Facility process area (Drawing 7.1-1, Appendix A) so that it can interface efficiently with the site substation, the plant control architecture, and the critical-load distribution network. Final siting, footprint, configuration, and setbacks will be confirmed during FEED based on the selected battery chemistry, supplier layout requirements, fire and safety studies, geotechnical conditions, and the final site electrical one-line arrangement.

The BESS will be integrated with the Industrial Facility substation and electrical distribution system, with the substation as the principal interface that receives and distributes renewable and backup power to the major facility systems, and it specifically includes an energy storage connection within the broader electrical arrangement. The electrical energy storage installation will therefore form part of the overall power management strategy for the Industrial Facility, interfacing with the wind and solar supply, the grid connection for critical loads, the site substation, plant controls, and emergency power arrangements.

As a physical component of the Industrial Facility, the BESS will also incorporate dedicated safety systems. The system will be designed with multiple automatic and manual power-down mechanisms, that electrical and fire systems will isolate energy sources during fault conditions, and that each battery enclosure will include fire-protection and emergency stop features. The BESS will include means for manual electrical isolation so that portions or all of the system can be de-energized when required. These functions are consistent with the modular containerized battery arrangements.

7.1.2.8 Ammonia Transport and Ship Loading

Liquid ammonia produced at the Industrial Facility will be exported through a dedicated ammonia transport and marine loading system linking the on-site ammonia storage area to the Port of Botwood. Ammonia will be stored at the CPF in refrigerated tanks and then transferred to the marine terminal for loading to specialized ammonia carriers. The export system comprises the onshore ammonia storage, the transfer systems, the ship loading system, and the jetty / MOF, which together form the physical interface between ammonia production and export shipping.

The marine export facilities will be located at the Port of Botwood and will utilize existing port infrastructure upgraded for ammonia service. These facilities will include a jetty platform, berthing and trestle structures, marine loading equipment, and a MOF within the water lot. Supporting systems will include transfer piping, venting and isolation systems, emergency response infrastructure, backup power systems, control and administration facilities, and security systems. The port is a deep-water facility capable of accommodating large vessels, with the current design basis anticipating export via ammonia carriers in the range of approximately 50,000 to 80,000 DWT.

Ammonia transport between the CPF and the jetty will be undertaken through dedicated pipeline system. Cooling of the ammonia will be maintained at the CPF in the vicinity of the storage tanks, with the export system functioning primarily as a transfer system between storage and the marine loading facilities.

The marine loading arrangement will comprise ammonia storage tanks at the CPF, ammonia booster and loading pumps, a cooldown line, vapour return facilities, loading arms, fiscal metering, nitrogen purge facilities, and flare. The BoG-related equipment associated with safe transfer and vapour management will be on the ship side. The preferred loading philosophy is

based on an alternative system design in which the vessel and jetty are connected directly back to the CPF through a vapour return line collocated in the ammonia pipeline right of way, with the jetty flare retained for upset or abnormal conditions. This configuration is being considered because the ammonia carriers are expected to have sufficient onboard BoG capacity to manage vapour return during loading, thereby reducing the need for routine use of a dedicated jetty BoG package.

At the CPF, the export system is expected to include ammonia storage tanks, ammonia booster and loading pumps, and the CPF flare. These systems allow refrigerated ammonia to be pumped from storage to the jetty while also controlling tank pressure and reliquefying ammonia vapour generated in storage or during loading. At the jetty, the export system will include the ship loading arms, fiscal metering for custody transfer, the cooldown system, nitrogen purge bottles, jetty flare, associated isolation valves and controls, and a no-normal-flow jetty arrangement with direct vapour return to the CPF BoG system. The vapour return line of approximately 1.9 km, collocated with the pipeline, would be required between the ship / jetty interface and the CPF, with preliminary hydraulic work indicating a minimum line size in the order of 20–24 inches nominal bore in the absence of booster compression. Final routing, sizing, and detailed line configuration will be confirmed during FEED.

The ammonia loading system is designed to accommodate two principal vessel arrival conditions: (i) vessels arriving under normal operating conditions with an ammonia heel, and (ii) vessels returning from dry dock with cargo tanks containing air.

For vessels arriving with an ammonia heel, the loading sequence will include pre-cooling of the loading lines, verification of the ship-shore Emergency Shutdown (ESD) system, and gradual initiation of ammonia transfer. Vapour generated during loading will be managed using the vessel's onboard BoG handling and reliquefaction systems. Upon completion of loading, residual ammonia within the transfer system will be returned to the CPF to minimize product loss and prevent unnecessary emissions.

For vessels returning from dry dock with air-filled cargo tanks, the loading philosophy will include nitrogen purging of the cargo tanks, followed by the introduction of ammonia as a coolant to initiate temperature reduction. Final gassing-up and cooling-down of the cargo tanks will be performed by the vessel at sea before returning for normal loading operations.

These loading scenarios demonstrate that the ammonia transport and marine loading system is designed not only as a transfer system, but as an integrated interface between the Industrial Facility, the jetty infrastructure, and the vessel's onboard ammonia handling systems. This integrated approach supports safe, controlled, and efficient loading operations under varying vessel conditions while minimizing emissions and maintaining system integrity.

The ammonia loading system is designed based on a closed-loop vapour management philosophy and a no-normal-flaring approach. Under normal operating conditions, no routine flaring is intended at either the CPF or the jetty. Vapours generated during storage and loading

operations will be captured, returned, and managed through the facility BoG handling systems, thereby minimizing emissions and product loss.

The Project's environmental assessment scope extends to all onshore and jetty-based infrastructure up to the ship-shore interface. This includes the ammonia storage tanks, booster and loading pumps, vapour return and cooldown systems, jetty structures, loading arms, emergency flare systems, and all associated utility, control, and safety systems required for safe operation.

Vapour or trace gas releases originating from the vessel's onboard systems, including the vessel's BoG management system, remain under the responsibility of the vessel operator. Accordingly, the ship-shore interface defines the boundary between EVREC-managed infrastructure and vessel-managed systems.

This closed-loop vapour management approach, combined with clearly defined operational and environmental responsibility boundaries, supports the Project's objective of minimizing routine emissions while ensuring safe and coordinated operation between the facility and visiting vessels.

A range of specific safeguards are incorporated into the ammonia transport and marine loading system to support safe and reliable operation. These include a double-containment design philosophy for transfer systems, sectional isolation valves to enable rapid segregation of the system, and a ship-shore ESD linkage to allow coordinated shutdown of loading operations in response to abnormal conditions. Ammonia gas detection systems will be installed along the transfer corridor to enable early identification of leaks, while insulated liquid ammonia piping will be used to minimize heat ingress and reduce vapour generation during transfer operations.

Additional safeguards include UPS systems for critical loading equipment, routing of pressure relief streams to vapour return systems and flare systems, and provision of emergency flaring capability for upset or relief scenarios. These measures are designed to maintain system integrity, control vapour management, and prevent uncontrolled releases.

A range of emergency and abnormal operating scenarios will be assessed and refined during the FEED phase. These scenarios include, but are not limited to, power failure at the plant or vessel during loading, loss of instrument air, jetty fire events, and BoG system trips. Under such conditions, the design will rely on a combination of ESD system activation, plant and vessel BoG management systems, CPF and jetty flare systems, and process overpressure protection systems to maintain safe operating conditions and prevent loss of containment.

Flaring at the Port Facility

The Port of Botwood ammonia export facilities will include a dedicated jetty flare system associated with the marine loading area. The purpose of the jetty flare is to provide a controlled means of safely disposing of excess ammonia, nitrogen, or other gases and to maintain pressure control during abnormal or upset conditions at the jetty and ship-loading interface.

The ammonia loading system design includes a port loading system that is being designed around a closed-loop vapour management philosophy, with the objective of achieving zero routine releases within EVREC's onshore and jetty-based EIS boundary up to the ship-shore interface. The vapour handling during normal loading is intended to occur through vapour return and BoG management systems rather than through routine flaring, and the jetty flare is retained only as a safety system for upset, abnormal, or emergency relief scenarios. These scenarios include power failure affecting the jetty and/or plant while ammonia is being loaded; instrument air failure affecting plant and jetty systems; fire at the jetty with depressurization of jetty-area pipelines; and potentially certain cases involving BoG system trip or blocked-in sections that could trigger thermal relief or pressure safety devices. In most of these scenarios, emergency shutdown logic, sectional isolation, ship BoG capability, plant BoG capability, plant overpressure protection systems, and the jetty flare are intended to work together to prevent loss of containment and maintain the system within safe operating limits. Final relief loads, settle-out pressures, pressure safety valve (PSV) sizing, and flare sizing still need to be confirmed through dynamic modelling in FEED.

The jetty BoG system is no normal flow safeguard, with a direct vapour return line from the ship/jetty to the Central Processing Facility. Under this arrangement, the jetty flare is still retained for upset or abnormal situations that may require gas flaring, including pressure relief events.

At the present stage of design, the only continuous combustion emission source at the port facility during normal operation is the propane pilot on the jetty flare. The jetty flare pilot has been assigned a stack height of 50 m above grade, an internal stack diameter of 1.0 m, an exit flow of 0.09 m³/s, an exit velocity of 27 m/s, and an exit temperature of 1,000°C. The same condition has been used across the normal commissioning, and abnormal operating cases for the pilot flame. Through air dispersion modelling, an effective flare release height of approximately 50.39 m for the jetty flare pilot, based on the assumed 50 m flare height and thermal buoyancy of the pilot flame, was calculated.

In addition to the continuous pilot flame, the design also includes a non-routine off-spec ammonia from tanker at the jetty relief scenario. For that emergency-type release, a higher effective flare release height of approximately 59.18 m has been calculated, reflecting the greater heat release associated with that event. The final effective flare height with respect to building downwash and final good engineering practice stack-height confirmation has not yet been finalized, because confirmed building heights and final layout information are not yet available. A detailed downwash assessment and updated modelling are therefore still required during FEED once final building and structure information is available.

With respect to the characterization of air emissions from the port flare, the current design basis includes the following pollutants: oxides of nitrogen (NO_x, conservatively assessed as NO₂), PM₁₀, PM_{2.5}, carbon monoxide (CO), and sulphur oxides expressed as SO₂. For the jetty flare pilot, the modelled emission rates are 0.0087 g/s NO_x, 0.0075 g/s PM_{2.5}, and 0.0476 g/s CO, with no PM₁₀ or SO₂ emission rate assigned for the pilot in the normal-operation inventory. Source-specific emissions or concentrations for total suspended particulate, metals, VOCs,

carbon dioxide, oxygen, hydrogen sulphide, odorous gases, or polyaromatic hydrocarbons for the jetty flare have not yet been quantified. At the present pre-FEED stage, detailed vendor data and source-specific composition data are not yet available, and TSP has not been derived because suitable flare-source factors and a reliable particle-size distribution are not yet available. Accordingly, these parameters will be confirmed in the updated emissions inventory during FEED rather than being treated as finalized at this stage.

The only specifically identified routine fuel at the port flare is propane pilot gas. The heat-release basis assigns the pilot gas a lower heating value of 19,937 British Thermal Units per pound (BTU/lb) for the jetty flare pilot. The sulphur content for the propane pilot fuel has not yet been defined, and no boiler or heating plant is associated with the port flare system; accordingly, there is no soot-blowing schedule applicable to this flare subsection. Likewise, there is no dedicated stack-treatment system identified for the jetty flare, because the design intent is to avoid routine releases through vapour recovery and to use the flare only as an emergency or upset safeguard rather than as a treated routine vent.

Monitoring and environmental reporting equipment associated with the flare system have been identified at a high level. The flare systems will include flare gas metering and monitoring instrumentation for environmental reporting, and an ultrasonic metering system will be provided for measuring the amount of flared gas. In addition, the loading system includes a broader instrumentation and safeguard framework including emergency shutdown logic, ammonia gas detection, sectional isolation, and utility/safety interfaces. The exact final arrangement of source monitoring, flare-flow monitoring, and any permit-required reporting instrumentation for the jetty flare will be confirmed during FEED and permitting.

A final flaring or venting radius for ammonia or hydrogen at the port has not yet been defined. Flare location and buffer zone are to be evaluated during FEED through the Project's safety and risk work, including quantitative risk assessment and fire and explosion risk assessment. It would therefore be more accurate to state that the flare and vent safety distances for the port facility are to be finalized during FEED, rather than presenting a fixed value at this stage.

Shipping Routes

The Project will export anhydrous liquid ammonia from the Port of Botwood to overseas customers using specialized ammonia carriers. The Project is intended to produce approximately 1.0 to 1.05 mtpa of green ammonia for shipment predominantly to the European Union, and the Port of Botwood will serve as the marine export point for this product. The marine shipping component of the Project should therefore be understood as the final link in the overall ammonia export chain, connecting the Industrial Facility and port loading system to destination import terminals selected through future commercial offtake arrangements.

The Port of Botwood is an existing deep-water marine facility with year-round access. The port is considered an ice-free harbour, and shipping is expected to occur 12 months per year, subject to normal operational and weather constraints. The port can accommodate vessels up to approximately 385 m in length, and the Project is expected to export ammonia using

specialty carriers generally in the range of approximately 50,000 to 80,000 DWT which is consistent with established ammonia-shipping practice. More broadly, ammonia carriers commonly range from about 15,000 to 85,000 DWT, with typical carrier classes around 30,000 DWT, 52,000 DWT, and 80,000 DWT.

At the current stage of project development, the exact destination ports and voyage routes for exported ammonia have not yet been finalized. Final shipping routes will depend on the location of contracted off takers, commercial shipping arrangements, vessel selection, regulatory requirements, navigational constraints, and operational considerations at both the Port of Botwood and the receiving terminal. Based on the current design basis, however, export shipments are expected to depart from Botwood and connect into established North Atlantic marine shipping routes serving overseas ammonia import markets, with European destinations presently forming the primary commercial focus of the Project.

Marine loading operations at the Port of Botwood are being designed around specialized ammonia carriers and ship-shore transfer arrangements appropriate to refrigerated liquid ammonia service. The loading system is intended to transfer anhydrous liquid ammonia from onshore storage to marine carriers through a dedicated jetty and ship loading system, and the system has been developed around recognized vessel arrival conditions and ammonia-carrier operating practices. The loading-system design also assumes that the vessel operator remains responsible for vessel-specific systems and onboard cargo management, while EVREC's onshore and jetty facilities extend to the ship-shore interface.

The duration of vessel loading will depend on the selected carrier size, loading rate, and final ship-loading configuration. Based on the current design basis, loading pumps are expected to be sized to enable full vessel loading within approximately 24 hours. Actual loading durations are anticipated to range between approximately 12 and 24 hours per vessel, depending on operating conditions and the selected loading arrangement.

Vessel frequency will be determined by the facility's annual production rate, the capacity of the selected ammonia carriers, and operational factors such as offtake scheduling and berth availability at the Port of Botwood.

Marine transport associated with delivery of project components will also be accommodated at the Port of Botwood where required. Materials delivered by sea will be received at the port at one of their wharfs or jetty(s) and transported overland to the Industrial Facility via the dedicated heavy haul road and associated internal access road network. As such, inland transport of construction materials and equipment forms part of the Project's construction logistics and road infrastructure systems, rather than the marine export system described herein.

7.1.2.9 Water

Water is critical for the Industrial Facility, supporting hydrogen production, ammonia synthesis, cooling systems, fire protection, potable use, and overall site operations. The Project will

implement an integrated water management system that includes supply, storage, treatment, distribution, drainage, and effluent handling, designed to ensure reliable operations while protecting surface water, groundwater, and the surrounding environment.

The Project anticipates a total raw water demand of approximately 8.5 ML/day (annual average) and a peak monthly withdraw of 12.64 ML/day, driven primarily by electrolyzer feedwater and ammonia plant boiler make-up requirements. The intake and pumphouse will be designed to meet the peak daily volume which will be approximately 12.64 ML/day, excluding reliability requirements.

Water used to produce hydrogen and ammonia will be sourced from Peters Pond and conveyed to the Industrial Facility through a dedicated water supply system including a new pumphouse and conveyance system. Upon arrival, raw water will be directed to on-site storage and treatment facilities before distribution to plant systems. Overall water demand is driven primarily by electrolyzer feedwater requirements and make-up water for the ammonia synthesis steam system, making water a key utility interface for the Facility.

The Industrial Facility will include integrated treatment systems for raw to produce filtered water, demineralized water, potable water, firewater storage and distribution, stormwater management, wastewater collection (including oily and ammonia-contaminated streams), and effluent treatment. Raw water will be treated using ultrafiltration, reverse osmosis, and electro-deionization to meet the quality requirements of the electrolyzers and ammonia plant steam systems, while potable water will be treated separately to meet drinking water standards. Dedicated storage will be provided for raw, filtered, and treated water, with firewater systems incorporated into the overall facility water balance.

The Industrial Facility water management system is designed to segregate clean water, process-affected water, and contaminated runoff to ensure appropriate handling and treatment. The system includes perimeter diversion and ditching to route clean runoff away from operations, along with an evaporation pond and a stormwater/effluent pond, hazardous and non-hazardous drainage networks, and treatment systems for oily, ammonia-contaminated, and sanitary wastewater.

Treated effluent and selected non-contact flows will be directed to the stormwater/effluent pond for reuse or controlled discharge, with all discharges meeting applicable Newfoundland and Labrador regulations and relevant CCME guidelines. Overall, the water system functions as an integrated utility and environmental management framework, spanning water withdrawal, treatment, distribution, use, collection, and final discharge.

Water Sources

The primary source of water for the Industrial Facility will be Peters Pond, which will supply the raw water required for hydrogen production, ammonia production, utility systems, potable water treatment, and general plant water demand. Water from Peters Pond will support both electrolyzer feedwater preparation and make-up water requirements for the ammonia synthesis

steam system.

Peters Pond is located approximately 6 km from the Industrial Facility (Drawing 7.1-1, Appendix A). Water used to produce hydrogen and ammonia will be sourced from Peters Pond and conveyed to the Industrial Facility through a dedicated water supply system including a new pumphouse and conveyance system. The final conveyance route and distance to be confirmed during detailed engineering, but the design intention is to have the water supply line run adjacent to the access road that will be built to reach the pumphouse.

Water will be withdrawn from Peters Pond through a dedicated intake and pumphouse system located near the shoreline. The final intake location and pumphouse configuration will be determined through detailed engineering to minimize impacts and optimize performance.

The pumphouse is expected to occupy an area of approximately 1,000 m² and will include multiple high-power pumps with standby redundancy and variable speed drives to match facility demand. Electrical power will be supplied through a dedicated connection to the Industrial Facility electrical system. The Peters Pond intake will include screening and debris removal systems to protect pumps and downstream treatment processes, with rotary screens used to remove debris prior to pumping.

Raw water will then be conveyed to the Industrial Facility via a dedicated HDPE pipeline forming the primary raw water supply connection between Peters Pond and the site, which will be adjacent to the pumphouse access road.

Water Storage

Raw water delivered from Peters Pond will be received, filtered and stored at the Industrial Facility in a dedicated filtered water storage tanks. These tanks represent the first stage of the Industrial Facility water system and provides buffering capacity between the off-site raw water supply infrastructure and the on-site treatment and distribution network.

The storage tanks will be sized to accommodate approximately 24 hours of the facility's peak raw water demand as well as emergency fire water requirements, providing operational flexibility and continuity between raw water withdrawal from Peters Pond and on-site water use. In practical terms, the storage system will help equalize fluctuations between water withdrawal, pumping, and treatment demand; provide short-term reserve capacity during interruptions to pond withdrawal or pump operation; and support stable operation of downstream raw water pre-treatment, potable water treatment, and demineralized water production systems.

This buffering function is particularly important, as the principal water users at the Industrial Facility namely the electrolyzer feedwater systems and the ammonia synthesis plant steam system depend on a reliable and continuous upstream water supply.

Water Usage and Distribution

Water use at the Industrial Facility is divided into three principal categories: filtered water,

demineralized water, and potable water. These water streams are produced and distributed according to the requirements of the various process, utility, safety, and domestic systems within the facility. In general terms, filtered water is used as an intermediate utility stream and for selected site services, demineralized water is used where high-purity water is required for process purposes, and potable water is used for domestic and sanitary needs and other limited non-process uses.

Filtered Water

Filtered water is water from which suspended solids have been removed but still contains dissolved minerals. Within the Industrial Facility, the main consumers of filtered water are for the production of demineralized water and the various closed-loop cooling systems used throughout the facility.

Filtered water will be used as makeup for closed loop cooling systems associated with the electrolysis process, the ammonia production process, gas compression, condensation systems, and a range of auxiliary equipment such as generators, electrical equipment, pumps, seals, and vacuum systems. Although these cooling systems are designed to recirculate water continuously, minor losses will occur over time through evaporation, small leaks, and routine maintenance activities, filtered makeup water will therefore be supplied to maintain the required operating volume and pressure within these systems.

Filtered water will also form part of the fire protection system at the Industrial Facility. Water required for fire suppression will utilize the common process plant infrastructure within the Industrial Facility footprint. Firewater storage and pumping capacities will be based on applicable NFPA requirements. The design firewater demand may also be incorporated into the overall raw water storage inventory during FEED.

Demineralized Water

Demineralized water is high-purity water from which dissolved minerals and other impurities have been removed. This water stream is required for the electrolyzer systems and for the ammonia plant boiler and steam systems and is therefore one of the most critical process water streams within the Industrial Facility. The principal water demands at the facility are associated with electrolyzer feedwater and boiler makeup water the ammonia synthesis train, both of which require water that is filtered, purified, and fully demineralized.

For hydrogen production, demineralized water will be supplied to the electrolyzers as process feedwater. The average demineralized water consumption of the electrolyzer system is approximately 9 to 10 m³ of demineralized water per metric tonne of hydrogen produced. Under the current design basis, each 120 MW electrolyzer package is expected to include dedicated reverse osmosis (RO), deionization (DI), or equivalent demineralization systems, along with associated storage, to supply the required demineralized water for hydrogen production. Demineralized water supplied to the electrolyzers is consumed directly in the electrolysis process and converted into hydrogen and oxygen.

For ammonia production, demineralized water will be used primarily as make-up water to the ammonia plant steam system and associated boiler feed water systems. Treated water storage will be provided to support steam generation within the ammonia synthesis facility including an atmospheric tank sized for 24 hours of treated water supply. Dedicated demineralized water treatment units located near the ammonia plant will supply the required high purity water to the ammonia process systems. Demineralized water for the ammonia plant therefore constitutes a distinct but closely integrated process water stream, distributed from the treatment system to the steam generation and boiler feedwater systems within the ammonia facility.

Potable Water

Potable water is water suitable for human consumption and for other domestic or sanitary uses within the Industrial Facility. Potable water is expected to comprise only a small proportion of the total facility water demand, and the Project will include a potable water generation and distribution system at the Industrial Facility. This system is intended to provide treated water for drinking, cooking, washrooms, offices, and other common facilities, as well as for limited use in the process facilities for washing, flushing, and similar intermittent service needs.

Raw water will supply the potable water treatment system(s), from which potable water will be distributed for drinking and greywater uses in common facilities as well as intermittent service or utility applications within the process facilities (i.e., safety showers). All potable water produced for the Industrial Facility will be treated to meet the Health Canada Guidelines for Canadian Drinking Water Quality (2022).

This potable water stream is therefore distinct from the filtered and demineralized process-water systems and will be distributed through a separate potable water network serving the human-occupied and service areas of the Facility.

Water Distribution

Water distribution within the Industrial Facility will occur through dedicated piping networks and along with associated pumps, valves, tanks, and controls that direct each water stream to its required end use. Raw water from Peters Pond will be pre-treated and converted to filtered water. The filtered water will then be distributed to the demineralized water production system, the potable water treatment system, the closed-loop cooling systems, and the firewater system.

Demineralized water will then be routed to the electrolyzer packages and the ammonia plant steam and boiler systems, while potable water will be routed to offices, washrooms, common facilities, and other designated service points.

Overall, the water distribution within the Industrial Facility will be dominated by process consumption associated with hydrogen production, with smaller portions allocated to ammonia-plant water treatment, potable water use, and internal reject or discharge streams.

A summary of water distribution is provided in Figure 7.1.4.

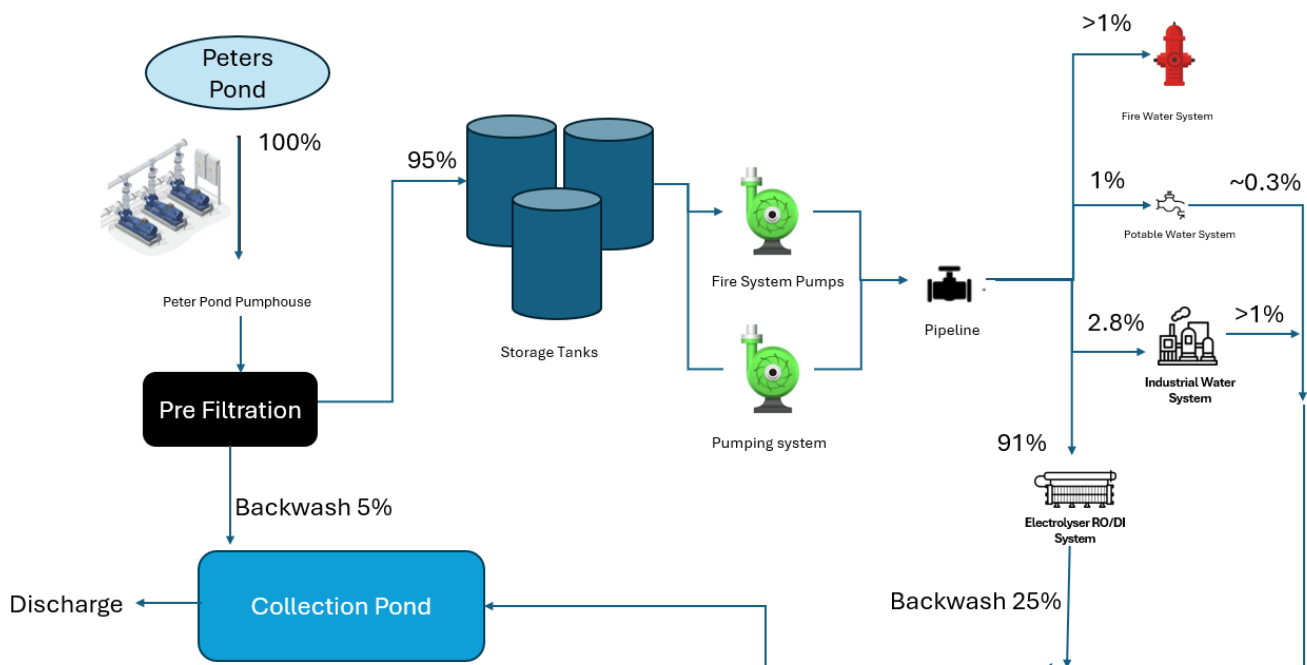


Figure 7.1.4 Summary of Water Distribution

Water treatment at the Industrial Facility will convert raw water supplied from Peters Pond into the various water qualities required for process, utility, fire protection, and domestic uses. In general, the water treatment system will include raw water pre-treatment, production of filtered water, production of demineralized water for process use, and potable water treatment for human consumption and domestic applications. These systems will operate as an integrated water management framework extending from the raw water storage system to the various end users within the Industrial Facility.

The first stage of treatment will consist of a raw water pre-treatment package designed to remove suspended solids and produce filtered water. This stage will primarily target the removal of suspended materials, with ultrafiltration (UF) serving as the principal treatment step. The UF system will remove fine colloidal and other insoluble particles from the raw water using semipermeable membrane technology and will supply treated water for both process-water and potable-water systems.

Filtered water produced by the pre-treatment system will then be routed to downstream treatment processes based on final use requirements. For high-purity process applications, filtered water will undergo further treatment to produce demineralized water. The electrolyzer systems and ammonia plant boiler systems require water that is filtered, purified, and fully demineralized, which will be achieved through a treatment train incorporating UF, RO, and electro-deionization (EDI). Raw water from Peters Pond will therefore be processed through these technologies to meet the required electrolysis feedwater and ammonia plant steam-

system water quality specifications.

Within this treatment train, RO will be used to remove dissolved salts, bacteria, metals, and other unwanted contaminants by forcing water through a semipermeable membrane under pressure. RO permeate may serve as the feed source for downstream polishing, and RO will also provide backwash water for the UF system. EDI will then be used as the polishing stage, removing ionized or ionizable substances from the RO product water through the use of ion exchange membranes, electrically active media, and direct current. Together, these systems will produce the high-purity water required for hydrogen production and ammonia-plant steam generation.

Demineralized water treatment for the Industrial Facility is expected to be provided through a combination of centralized treatment and package-level treatment. Each individual hydrogen plant package is expected to include dedicated RO/DI units. A dedicated treatment package will also be provided to support steam generation within the ammonia synthesis plants, and opportunities may be explored during FEED to centralize more of the demineralized-water production rather than relying entirely on package-level treatment.

The overall water treatment system will therefore be designed to meet two primary high-purity process requirements: feedwater for electrolysis and treated water for ammonia plant steam and boiler systems. Raw water quality from Peters Pond has been benchmarked against electrolyzer influent specifications, confirming that the required water quality can be achieved using the proposed UF–RO–EDI treatment train without the need for additional upstream treatment beyond the current design basis. Key parameters to be controlled include alkalinity, hardness, silica, chlorides, sulphate, total dissolved solids, and other constituents critical to protecting electrolyzer performance and reliability.

In addition to process water treatment, the Industrial Facility will include a potable water treatment system. Raw water will supply the potable water treatment system, from which potable water will be distributed for drinking and domestic (greywater) uses in common facilities such as offices and washrooms, as well as for intermittent washing and flushing applications within process areas. Potable water will be produced on site and subject to routine sampling and monitoring to ensure compliance with applicable standards. All potable water is intended to meet the Health Canada Guidelines for Canadian Drinking Water Quality (2022).

Stormwater and Rainwater Diversion

Stormwater, rainwater, and surface water diversion at the Industrial Facility will be managed through an integrated drainage system designed to keep clean, non-contact runoff separate from process-affected or potentially contaminated water. The objective of this system is to intercept and divert upgradient runoff around the facility, safely convey clean stormwater away from plant infrastructure, limit the volume of non-contact water entering contact-water systems, and protect the site and downstream receiving environment from erosion, flooding, and sediment transport. The stormwater management system will consist of a combination of natural drainage features and engineered ditches, catchment areas, culverts, and an outfall

integrated with the broader site water management system.

Diverted surface water from around the Industrial Facility will be rerouted around the site in a perimeter ditch. This perimeter ditch will collect runoff from the south (upgradient) side of the facility and will drain generally west and then north by gravity, discharging to the north (downstream) watercourse Wc15-104 (Drawing 7.6-4, Appendix A). The majority of non-contact stormwater and rainwater falling within the Industrial Facility footprint will be directed to a ditching system located within the perimeter of the plant, with drainage routed to an evaporation pond. The expectation is that the majority of water within this pond will evaporate, however, the pond will be routed to the stormwater/effluent pond to manage overflow. The stormwater/effluent pond will be tested prior to discharge (Drawing 7.6-4, Appendix A) to meet regulatory requirements.

Two mapped watercourses within the footprint of the Industrial Facility, identified as Wc15-104 and Wc15-159 (Drawing 7.6-4, Appendix A), will be removed to accommodate development of the facility. Provincial and federal permits will be obtained, as required, to authorize the alteration of these watercourses and to support the final drainage configuration. The water associated with these two watercourses will be captured in the outside perimeter ditch (west and then north around the Facility).

Stormwater will be diverted away from Project infrastructure via natural and graded ditches, with graded ditches conveying runoff into catchment areas that drain to the on-site evaporation pond. Offsite roads, pipe racks, parking lots, building areas, and undeveloped areas will be treated as clean water areas. In those areas, surface drainage will generally be directed by grading to catch basins and then conveyed through ditches or underground piping first to the evaporation pond and then to the permitted stormwater/effluent pond outfall system. Areas intended to receive uncontaminated surface water will be graded to slope away from locations served by dedicated contact-water sewers, chemical sewers, and chemical storage areas, thereby minimizing the potential for mixing clean runoff with potentially contaminated water.

The clean stormwater drainage system and evaporation pond will be designed based on peak runoff generated from a minimum 10-year, 24-hour storm event, while the on-site stormwater/effluent pond will be designed to accommodate larger storm events in accordance with applicable design criteria. The Project will maintain positive drainage away from structures and process areas, and stormwater conveyance infrastructure including ditches, culverts, and catchment areas—will be designed to prevent ponding, minimize erosion, and maintain adequate freeboard and downstream conveyance capacity under the selected design conditions.

In addition to perimeter diversion and ditch drainage, the Project will consider a dedicated rainwater collection system from the roofs of applicable buildings within the Industrial Facility. This collected roof will be directed to an onsite stormwater/effluent pond and or to the discharge water pond. Annual rainfall in the area is forecast to be approximately 1,208 mm, which supports consideration of roof-water harvesting as a supplementary water-management

measure. At the current stage, however, this remains a design option to be refined during FEED rather than a fully fixed design feature.

Accordingly, the stormwater, rainwater, and water diversion component of the Industrial Facility comprises the perimeter diversion ditch system, clean-water drainage ditches, catch basins, culverts, outflow diversion ditches, and any associated stormwater conveyance piping, roof-drain collection systems, and graded drainage features required to route non-contact runoff around and away from industrial process areas (Drawing 7.1-1, Appendix A).

Wastewater/Effluent Treatment

Effluent treatment and discharge at the Industrial Facility will be managed through an integrated wastewater collection, treatment, storage, and discharge system designed to segregate different wastewater streams and ensure that any water released from the site meets applicable regulatory requirements. In general terms, the Industrial Facility will include separate individual treatment systems for oily or hydrocarbon-affected water, ammonia-contaminated wastewater, sanitary wastewater, and other process-affected effluents, together with an on-site stormwater/effluent pond for temporary storage, flow equalization, and controlled discharge (Drawing 7.1-1, Appendix A). Wastewater/effluent streams will each be dealt with individually prior to discharging into the stormwater/effluent pond.

The main effluents identified for treatment within the Industrial Facility are oily water, neutralized non-sulfuric spent caustic, potentially contaminated stormwater collected from paved process areas, wash-downs and spills from plant areas, and ammonia-contaminated wastewater. In addition, reject water from the water treatment and reverse osmosis unit, potable water system discharge, and boiler blowdown are plant water streams that must be managed through the site drainage and effluent system. Sludge generated during treatment will be periodically removed from the treatment package and transferred to suitable containers or trucks for off-site disposal by an approved third party.

The central effluent treatment package will consist of neutralization, clarification, and filtration. Acid and caustic dosing systems will supply the reagents required to adjust the pH of the various collected effluents in a neutralization tank, and a polymeric flocculant may be added to improve solids settling. Following pH adjustment and clarification, the treated water will be pumped through filters to remove fine suspended particles before discharge to the on-site stormwater/effluent pond. Solids removed during the treatment process will be collected as sludge and containerized for off-site disposal. Detailed treatment specifications will be finalized during FEED based on applicable local regulations and industry best practices.

Oily Water Systems

Areas that are potentially contaminated with hydrocarbons or oil will be managed through a dedicated oily water sewer (OWS) and related treatment facilities. These potentially oily areas will be curbed, and the first flush of rainfall, defined as the first 25 mm, will either be collected locally by hydro-vac truck or routed to the OWS. Curbed area drains connected to the OWS include the electrolyzer trains, APU Units A and B, and ASU Units A and B. Additional effluents

directed to the OWS include wastewater from the electrolyzer systems, condensate drains from the ASU main air compressors and selected clean wastewater from buildings.

Several areas are sufficiently remote from the main OWS collection system that local or independent oily-water collection is preferred. These include the diesel generator area, diesel filling station, hydrogen storage compression area, and BoG refrigeration area. In these locations, first-flush rainwater will be collected and directed to a wastewater equalization tank equipped with an oil skimmer. Wastewater feed pumps will then transfer this water to the oily wastewater treatment package, while stormwater after the first flush will be controlled using water seals and underflow weirs so that only clean water is diverted to the clean stormwater ditch and evaporation pond.

The oily wastewater treatment package is designed to reduce oil and suspended solids concentrations and is sized for a flow rate of approximately 4 m³/h. This flow rate has been used as the sizing basis for the main package components, including a corrugated plate interceptor (CPI) separator and an induced gas flotation (IGF) separator. Treated effluent from the oily-water treatment package will be sent to the stormwater/effluent pond, while recovered oil will be stored and processed and waste solids and sludges will be transported off site to a facility capable of treating those materials.

Ammonia-Contaminated Wastewater

Areas that could be contaminated with ammonia will be managed through a separate ammonia-contaminated water sewer system. These areas will be curbed to contain runoff from a 24-hour, 100-year rainfall event. Curbed areas connected to the ammonia-contaminated wastewater system include the APUs, the ammonia booster and loading pumps, and the ammonia storage BoG refrigeration package. These areas will drain to an ammonia contaminated water sump located in the APU area.

Ammonia-contaminated wastewater collected in this sump will be pumped by ammonia contaminated water pumps to the APU stripper columns for processing prior to release to the stormwater/effluent pond. The collection sump will be located north of APU Unit B and will be covered, blanketed with nitrogen, and vented to the ammonia storage flare. This arrangement is intended to keep ammonia-affected water segregated from the clean-water and oily-water systems and to ensure that ammonia-bearing wastewater is treated through the ammonia-process system before discharge to the stormwater/effluent pond.

Sanitary Wastewater

Sanitary wastewater from human-occupied buildings will be managed separately from the industrial wastewater systems. Sanitary wastewater will be collected and conveyed to an on-site sanitary effluent treatment system comprising flow equalization, aeration, clarifier, chlorination and effluent, and sludge digester tanks, using a biological treatment process based on microorganisms consuming dissolved organic contaminants.

Sanitary wastewater from the main office building, warehouse building, and maintenance

building will be collected locally to dedicated biological treatment packages. These systems will treat greywater from wash and kitchen facilities and blackwater from toilets and urinals.

Treated sanitary wastewater will discharge to a pressurized sanitary waste main and then enter a municipal sewer system, while biological sludge will be collected and removed from site by a third party. The final sanitary discharge arrangement may still be refined during FEED.

Stormwater/Effluent Pond, Water Recycling, and Discharge

A stormwater and effluent water pond is located within the Industrial Facility (Drawing 7.1-1, Appendix A). This pond is designed to receive, store, and manage a combination of water streams generated within the facility, including some non-contact surface runoff (overflow from the evaporation pond), treated oily and treated ammonia-contaminated effluents, rejected (process) water, and fire-fighting water associated with emergency response events, prior to controlled discharge.

The stormwater/effluent pond is designed to manage:

- Containment of the maximum combined effluent stream flow rate for a minimum duration of 72 hours, including process water generated during normal plant operations.
- Secondary source of fire-suppression water, assuming a design fire water supply of approximately 10,000 gallons per minute (gpm, or 2,271 m³/hr.) sustained for 4 hours, associated with emergency response and fire suppression activities.
- Collection and detention of surface runoff originating from paved, non-contaminated areas during peak design storm conditions, based on an approximate 4-hour critical storm duration.
- Allowance for seasonal ice accumulation, incorporating up to 0.5 m of ice coverage in accordance with regional climatic conditions.

Pond Performance Under Storm Events-Modelled Results:

- For a 2-year storm, the pond will reach a maximum ponded volume of 22,528 m³ (46% full), remaining well within the available storage capacity with no surface flooding and maintaining positive freeboard throughout the event.
- For a 10-year storm, the pond will reach a maximum volume of 31,387 m³ (64% full), with no surface flooding and the peak water level remaining well below the maximum allowable ponded elevation. The pond will maintain positive freeboard, and routed outflows remained within downstream conveyance capacity.

For a 100-year storm, the pond will reach a maximum ponded volume of 43,748 m³ (89% full), with no exceedance of storage capacity and no surface flooding observed in the results. Peak outflow was 0.57 m³/s, remaining within modelled outlet performance, and the pond will maintain remaining freeboard (11% of total storage) throughout the event. Outflow routing did not exceed pond size limitations, confirming adequate performance under the 100-year design storm.

Controlled Discharge/Water Recycling to Peters Pond

The stormwater/effluent pond forms the final collection and equalization point for treated effluent and stormwater prior to reuse or controlled discharge through the designated outfalls.

The Project has completed a hydrological assessment (Appendix H.3) to determine the water availability in Peters Pond under baseline conditions and with the proposed Project withdrawal incorporated. During low-flow periods, an outlet threshold associated with the 7Q10 defined as the lowest stream flow for seven consecutive days that would be expected to occur once in a 10-year period. The 7Q10 was required to be maintained to avoid impacts on downstream flow conditions in the receiving watercourse (Peters River). During periods where this requirement was not met, a portion of the treated water from the stormwater/effluent pond will be recycled back to Peters Pond rather than discharged into WC15-104.

A daily and monthly water balance has been developed to illustrate these conditions which is described in Appendix H.3. This water balance will be further refined and validated during detailed engineering. In parallel, water quality will be reassessed to ensure that any discharge to Peters Pond or the receiving environment complies with applicable Schedule A regulatory requirements and other relevant environmental guidelines.

Discharge is planned from the stormwater/effluent pond to the north into Wc 15-104, once discharge water meets applicable guidelines.

Discharge Criteria

Water discharged to the environment will meet the parameters in Schedule A of the Newfoundland and Labrador Environmental Control Water and Sewage Regulations (2003), and the facility will also adhere to the relevant CCME freshwater aquatic guidelines before effluent is discharged to the receiving environment.

The expected effluent discharge limits identified for the facility are outlined in Table 7.1.1.

Table 7.1.1: Preliminary Effluent Discharge Limits

Parameter	Value
pH	6-6.9
Biological oxygen demand (BOD) (ppm)	30
Chemical oxygen demand (COD) (ppm)	125
Oil and grease (ppm)	10
Total Suspended Solids (TSS)	50
Total Nitrogen (ppm)	10
Total Phosphorous (ppm)	13
Total Coliform Bacteria	400/100 ml

7.1.2.10 Solid Waste Management

Solid waste generated by the Industrial Facility will be managed through an integrated waste management system designed to support proper segregation, temporary storage, handling,

transport, recycling, recovery, and final disposal of waste materials generated during operation of the facility. All waste originating from the facility will be managed in compliance with applicable federal, provincial, municipal, and local regulatory requirements, and a comprehensive Waste Management Plan will be developed during FEED to define the final procedures for waste classification, storage, treatment, transport, and disposal.

The principal solid waste streams associated with the Industrial Facility are expected to include general non-hazardous industrial waste, municipal-type domestic waste from offices, warehouses, maintenance areas, and common facilities, packaging materials, scrap metal, damaged or spent parts and components, used containers and absorbent materials, sludges and solids generated from wastewater treatment systems, and other regulated or controlled waste streams associated with operation and maintenance of the hydrogen, ammonia, water treatment, electrical, and utility systems. Packaging materials, damaged items, and other waste products will be handled through the Project's waste management practices, and solids removed from the effluent treatment system and sludge from sanitary treatment will be collected for off-site disposal.

In addition to general and domestic waste, the Industrial Facility is expected to generate specialized maintenance and process-support waste. These may include spent filtration media, ultrafiltration and reverse osmosis membranes, ion exchange or electro-deionization resin and related treatment media, spent catalyst materials, used batteries, universal waste such as lamps and electrical components, and oily or contaminated maintenance wastes generated during plant upkeep and equipment replacement.

Solid waste will be managed using a segregated storage approach. Waste will be separated at source based on type and hazard classification to ensure that recyclable, non-hazardous, hazardous, and special waste streams are handled appropriately. The Industrial Facility will include designated waste storage areas within or adjacent to warehousing, maintenance, and utility areas. These areas will be equipped with suitable bins, containers, skips, tanks, or enclosed storage units, and will incorporate features such as weather protection, secondary containment, impermeable surfaces, and access control, as required based on the nature of the waste.

Non-hazardous domestic and industrial waste including office waste, canteen waste, packaging, pallets, wood, paper, plastics, cardboard, and non-contaminated construction or maintenance debris will be collected in designated containers and removed from the site on a regular basis by approved waste contractors or municipal service providers, as applicable. Recyclable materials, including ferrous and non-ferrous scrap metals and recoverable equipment parts, will be segregated where practical to maximize reuse and recycling opportunities. Recycling and material recovery will form a key component of the Project's waste management strategy.

Sludges and solids generated by the wastewater and sanitary treatment systems will be handled as separate waste streams. Solids removed during effluent treatment will be collected

as sludge in a designated container for off-site disposal, and biological sludge generated from sanitary wastewater treatment is also anticipated to be periodically disposed of at an approved off-site facility. Biological sludge from the sanitary treatment packages will be collected and removed from the facility by a third party. These wastes therefore form part of the Industrial Facility solid waste management system and will require dedicated containment, temporary storage, and off-site transport arrangements.

Hazardous, regulated, or special waste generated by the facility will be stored and removed in accordance with applicable approvals and transportation requirements. Approvals associated with transportation of dangerous goods and hazardous waste and environmental approvals related to waste management systems will be obtained as required. Accordingly, any hazardous solid waste streams, including contaminated absorbents, oily wastes, chemical residues, spent process consumables, universal wastes, and other controlled materials, will be containerized, labelled, stored in designated secure areas, and transported from site by licensed carriers to approved treatment, recycling, or disposal facilities.

7.1.3 Project Phases

The Industrial Facility will be developed, operated, and ultimately decommissioned through a phased project life cycle. The Project comprises three main phases: pre-construction and construction, including commissioning; operations and maintenance; and decommissioning and rehabilitation. Those broader life-cycle phases are described in greater detail through the sections that follow, namely site preparation, project construction, commissioning, operations and maintenance, and decommissioning and rehabilitation. This approach is intended to describe the key activities associated with each stage of the Project from initial site development through end-of-life closure.

The phase descriptions in this section apply specifically to the Industrial Facility and its ancillary infrastructure, including the pre-construction support infrastructure, hydrogen plant, ammonia plant, electrical energy storage system, water supply and treatment systems, fuel and hazardous materials storage, ammonia transport (pipeline) and ship loading infrastructure, support buildings, roads including the heavy haul road, utilities, and other associated works required to construct, operate, maintain, and eventually decommission the facility.

The Industrial Facility is intended to be constructed and commissioned in a phased approach rather than through a single one-time turnover of the entire facility. The Facility will be brought into service through staged completion, turnover, commissioning, and ramp-up of systems and plant areas, allowing separable and operable portions of the facility to enter service progressively as construction and pre-commissioning activities are completed. This phased approach is intended to support an orderly startup sequence, facilitate integration of common systems and utilities, and allow gradual ramp-up toward stable full-capacity operation.

Early works and enabling infrastructure will be developed first to support access, logistics, utilities, laydown, accommodation, and other construction requirements. These works will be followed by construction of the main industrial process systems and associated export

infrastructure, after which the Facility will proceed through commissioning, operations and maintenance, and, ultimately, decommissioning and rehabilitation at end of life. The following Project lifetime for the Industrial Facility is outlined in Table 7.1.2.

Table 7.1.2: Industrial Project Timeline

Phase	IPA
Site Preparation and Construction	February 2028 to August 2030 (30 months)
Operation	February 2028 to August 2030 (33 years)
Decommissioning	January 2062 to January 2064 (24 months)

7.1.3.1 Site Preparation, Pre-Construction, Construction and Commissioning

Site preparation for the Industrial Facility will consist of the early enabling activities required to prepare the site and associated ancillary corridors for construction. Site preparation includes surveying and staking of work areas, environmental and geotechnical verification, vegetation clearing and grubbing, stripping and management of overburden and organics, excavation, grading and compaction, installation of temporary drainage and erosion and sediment control measures, and other ground-preparation activities required before permanent civil works can begin. Certain supporting infrastructure will also be developed early to enable subsequent construction activities, with some elements remaining for the life of the Project and others being temporary and removed after construction.

Prior to any ground disturbance, surveyors will clearly mark the perimeter of all areas to be developed. This will include, at a minimum, the Industrial Facility footprint, hydrogen and ammonia plant areas, ammonia storage area, electrical energy storage area, access road and heavy haul road corridors, grid connection work areas, water supply and treatment corridors and facilities, laydown areas, and land-based port-related upgrade areas within the Project scope. These field surveys will be used to define construction limits, establish temporary exclusion zones, guide contractor mobilization, and reduce the risk of unnecessary disturbance outside approved work areas. Adequate buffers will be retained near wetlands, watercourses, sensitive environmental features, adjacent roads, and nearby facilities.

Site preparation will also include completion and implementation of the key environmental protection measures required before major earthworks begin. An Erosion and Sediment Control Plan will be developed and implemented in accordance with the Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador (DFO 2022). Rare plant surveys will be completed, where required, in accordance with Newfoundland and Labrador direction. In practice, these early environmental preparation activities are expected to include installation of temporary erosion and sediment control measures such as silt fencing, check dams, ditch checks, sediment traps, stabilized outlets, temporary diversion berms, and other controls appropriate to the terrain and drainage conditions where necessary. These measures will be installed in advance of, or concurrent

with, initial clearing and stripping works so that exposed soils, runoff, and sediment can be managed from the outset of site development.

Prior to vegetation clearing and grubbing, EVREC will work to complete necessary fish rescue in affected streams (Wc15-104 and Wc15-159) within the Industrial Facility footprint and construct diversion ditches to divert water (and fish) around the proposed PF, where the diversion ditch will converge with Wc15-104 north of the PF.

Vegetation clearing and grubbing will be carried out within the defined construction footprints only. All merchantable timber will be salvaged, and non-merchantable timber will be disposed of off site or otherwise managed in accordance with the Project's waste and vegetation management approach. Following clearing, roots and stumps will be removed to grade, and vegetative material may be shredded or mulched on site where appropriate. Topsoil and organics will be stripped and managed separately so that suitable material can be reused later in rehabilitation and stabilization works where practical.

Earthworks associated with site preparation will include removal or securing of boulders and similar obstructions, excavation of unsuitable material where encountered, substitution with suitable construction material, proof-rolling of prepared subgrades, and placement and compaction of engineered fill to achieve the bearing capacity required for subsequent construction. These works are expected to occur across the Industrial Facility footprint and within the early road, laydown, utility, and support-infrastructure areas. The purpose of these activities is to establish safe, stable, and constructible working platforms for the next phase of civil and structural works while limiting long-term settlement, rutting, drainage issues, and maintenance problems. Sound soil conservation practices will be followed throughout these activities to preserve reusable soil and organic material for later reinstatement and rehabilitation. Dust control measures will also be implemented during site preparation, particularly during clearing, grubbing, excavation, fill placement, and haul road use under dry conditions.

Temporary drainage and stabilization works will be installed as part of site preparation to manage runoff during early construction. Site preparation includes the installation of temporary drainage systems and stabilization measures before the commencement of major construction activities. Within the Industrial Facility and associated corridors, this is expected to include temporary ditches, swales, culverts, ditch reliefs, sediment control structures, stabilized entrances, and surface grading designed to direct runoff away from active work areas and toward controlled drainage paths. These measures are particularly important for the Industrial Facility because major site preparation will occur in areas that will later contain process facilities, storage systems, roads, laydown areas, and water and wastewater infrastructure. Early control of runoff and sediment will therefore be required to minimize erosion, protect nearby water features, and prepare the site for installation of permanent drainage, stormwater, and effluent systems in the subsequent construction phase.

Where bedrock excavation is required, controlled blasting may form part of site preparation. Should blasting be required for any infrastructure, a certified blasting contractor holding a valid Newfoundland and Labrador blaster's certificate will be retained to develop a conservative blast design for review and approval prior to blasting. That blast design will be required to meet vibration limits at appropriate distances from existing infrastructure, buildings, and fish habitat. If temporary explosives storage is required, it will be provided in accordance with the requirements of the Explosives Regulatory Division of Natural Resources Canada, including prescribed separation distances and use of approved explosive storage facilities. A project-specific Explosives and Blasting Management Plan will also be developed by the licensed blasting contractor to guide the safe storage, handling, and use of explosives and to address protection of workers, the public, infrastructure, and the environment.

Because the Industrial Facility includes multiple distinct but connected work areas, site preparation is also expected to occur in a phased and geographically distributed manner. Early site preparation is expected to be concentrated in the main Industrial Facility footprint, access road and heavy haul road corridors, laydown and staging areas, construction support areas, and the water-supply corridor and intake-related works. The access road and heavy haul road are intended to be delivered early to support mobilization and arrival of major equipment, and the grid interconnection will also be sequenced to make construction power available as early as practicable. Site preparation activities in those areas will therefore include clearing, grading, temporary drainage, engineered pads or working surfaces, and other enabling works needed to support subsequent construction activities and construction logistics.

As site preparation progresses, temporary controls for access, safety, and site management will also be established. Although the detailed design of these temporary works will be finalized during detailed engineering and contractor planning, they are expected to include temporary fencing or barriers where needed, signage, controlled access points, designated equipment movement routes, staging of temporary construction support areas, and early site-security and environmental-protection measures. These temporary arrangements will help separate active work areas from undisturbed lands, improve worker safety, manage public access, and support orderly mobilization into the Industrial Facility and associated corridors.

7.1.3.2 Construction

Project construction will comprise the full buildout of the Industrial Facility and its ancillary infrastructure. Construction includes the development of the pre-construction support infrastructure, the hydrogen plant, the ammonia plant, the electrical energy storage system, the water supply and treatment systems, the fuel and hazardous materials storage areas, the internal utility systems, the ammonia transport (pipeline) and ship loading infrastructure, the heavy haul road, and the related roads, buildings, electrical systems, storage systems, and safety systems required to bring the Facility into service.

Early in the construction phase, priority will be placed on completing the support infrastructure needed to sustain the main plant buildout, including access and heavy haul roads, laydown and marshalling areas, warehousing, worker accommodations, early construction power,

temporary drainage, and other logistics and utility systems. Once these enabling works are sufficiently advanced, major civil works for the process areas and utility areas will proceed, followed by erection and installation of the hydrogen and ammonia production systems, electrical infrastructure, water infrastructure, storage systems, and export-related facilities. The Industrial Facility will be constructed and commissioned in a phased approach, based on a staged execution strategy intended to support efficient construction and commissioning.

Construction activities across the Industrial Facility will generally begin with earthworks and civil works, including excavation, backfilling, grading, piling where required, installation of foundations and footings, construction of engineered pads and working surfaces, and installation of underground services such as water lines, sewer systems, drainage systems, electrical conduits, and other utility and safety infrastructure. Once civil works are sufficiently advanced, the next major construction activities are expected to include installation of structural steel, process buildings, electrical rooms, control rooms, offices, pipe racks, process piping, tanks, vessels, compressors, electrical equipment, instrumentation, and associated utility systems. These activities form the backbone of the Industrial Facility construction phase.

The Project intends to capitalize on the close proximity of the Industrial Facility to the Port of Botwood by making use of a dedicated heavy haul road and a logistics approach that may incorporate module and super-module design to expedite construction, reduce field work, improve quality, and mitigate execution risk. In practical terms, this means that certain large equipment packages, structural assemblies, or skid-mounted systems may be fabricated or pre-assembled off site and then delivered by marine vessel and transported to the Industrial Facility for installation using the heavy haul corridor and designated laydown and staging areas. This modularization approach is particularly relevant to the hydrogen, ammonia, electrical, and export systems.

Construction of the Industrial Facility will also require substantial temporary works and services. These may include temporary laydown and assembly areas, temporary warehousing, temporary fuel storage and refueling arrangements, temporary power generation where grid construction power is not yet available, temporary water supply arrangements for selected work fronts, temporary drainage and erosion and sediment control systems, and temporary access controls and safety systems. Some of these temporary facilities will be removed once no longer required, while others will transition into permanent operational infrastructure where the final Project design calls for their retention. This distinction applies to several support components, including warehousing, fuel storage, and laydown areas.

Environmental protection and construction management measures will be implemented throughout the construction phase. These will include maintenance of the erosion and sediment control measures installed during site preparation, staged clearing and grading, controlled handling and storage of fuels and hazardous materials, dust suppression on exposed areas and unpaved roads, waste segregation and removal, temporary drainage management, and protection of adjacent watercourses, wetlands, and other sensitive features. Best management practices and construction-stage environmental plans will be implemented

to ensure effective response to aspects of the Project that could adversely affect the environment. These measures will continue to apply across the various construction work fronts as the buildout progresses.

A significant portion of the construction phase will also involve installation of the Project's electrical and utility interfaces. This includes construction of the grid interconnection and terminal substation works to make construction power available, installation of high-voltage and low-voltage electrical systems, grounding grids, transformers, switchgear, rectifiers, instrumentation and control cabling, communications systems, and other auxiliary electrical infrastructure needed to energize and support the Industrial Facility. Construction of the grid interconnection will be sequenced so that construction power is available early enough to reduce reliance on temporary diesel generation and to support later construction and commissioning activities.

Construction of the water systems will occur in parallel with the process-plant and utility buildout and will include the Peters Pond intake and pump station, raw water conveyance infrastructure, raw water storage, water treatment facilities, firewater systems, stormwater and clean-water diversion works, wastewater collection systems, treatment systems, the evaporation pond, the stormwater/effluent pond, water return line to Peters Pond, and associated outfall. In the same way, construction of the ammonia export infrastructure will include the ammonia transfer line between the Industrial Facility and the Port of Botwood, loading-system components, metering and control systems, venting and flaring systems, and the other land-based and jetty-based infrastructure required to export ammonia by vessel.

Pre-Construction Support Infrastructure

This component of the construction phase includes development of the quarry and borrow areas, concrete production batch plants, worker accommodations, access road and heavy haul road, construction power and grid connection works, warehousing and fueling infrastructure, and temporary laydown and staging areas. These works are intended to be delivered in advance of, or in parallel with, the major process-plant construction activities so that the Project has the access, materials, labour support, storage capacity, and utility services needed to support the full construction program. Some of these facilities will be temporary and removed after construction, while others will remain in place as permanent supporting infrastructure.

Development of this support infrastructure is expected to proceed in a staged manner. Early activities will include establishment of construction access, preparation of laydown and marshalling areas, mobilization of temporary services, and development of the worker accommodation strategy using local lodging where available before construction of the centralized temporary camp. In parallel, early road and port-related enabling works are expected to proceed so that major cargos can be received through the Port of Botwood and transported to the Industrial Facility using the heavy haul road and internal site access routes. Early works therefore include mobilization to site, preparation of laydown areas, accommodation development, road work, and port and heavy-haul infrastructure to facilitate equipment arrival by vessel.

Quarry and borrow pit construction and activation will form a key early component of the support-infrastructure buildout (Drawing 7.1-1, Appendix A). Construction activities in this area will generally include clearing and grubbing within the approved footprints, stripping and stockpiling of overburden where feasible, installation of temporary drainage and sediment controls, preparation of working benches and access roads, and installation of crushing, screening, and stockpiling areas. Where needed, controlled blasting by certified personnel will be used to develop quarry faces and recover suitable aggregate. The quarry areas will provide crushed rock, gravel, and other aggregate materials required for road construction, engineered fill, laydown areas, concrete production, and other civil works associated with the Industrial Facility. Where feasible, excavated material from site cuts and road corridors will also be reused to reduce the overall demand for new quarry disturbance. Water management, dust suppression, access control, and erosion and sediment control will be implemented as part of quarry construction and operation throughout the construction phase.

Temporary concrete production batch plants will be established once sufficient aggregate supply, access, and working areas are available. Construction of the batch plant facilities will generally include preparation of compacted granular pads, installation of cement silos, aggregate stockpile areas, admixture storage, weigh-batching and mixing equipment, truck loading systems, and washout and containment areas. The primary batch plant is expected to be located near the Industrial Facility footprint (Drawing 7.1-1, Appendix A), where the largest concentration of civil and foundation works is anticipated, with the possibility of additional temporary satellite batch plants if required by construction sequencing. Batch plants may initially rely on temporary diesel-powered generation where grid construction power is not yet available, with later transition to grid-supplied construction power as early electrical infrastructure is completed. Concrete production at these plants will support foundations, slabs, buildings, pipe racks, culverts, retaining structures, electrical pads, storage facilities, and other civil works associated with the Industrial Facility and its ancillary infrastructure.

During early mobilization and initial works, accommodation may be provided through local hotels, outfitter camps, and cabin rentals. As construction activity increases and workforce demand grows, a centralized temporary accommodation facility near the southeast corner of the Industrial Facility is expected to be developed to support the peak construction workforce (Drawing 7.1-1, Appendix A). Construction of this temporary camp will include installation of modular accommodation units, common-use buildings, canteen and laundry facilities, recreation and welfare space, internal roads and parking areas, utility connections, temporary or permanent water supply and treatment systems, wastewater handling systems, lighting, telecommunications, and emergency power and safety systems. Worker transportation links between the accommodation camp and active work areas will be supported by the Project road network and bus or shared-vehicle arrangements.

Construction of the access road and heavy haul road will be among the earliest critical works because these roads are required to support mobilization, delivery of construction materials, movement of heavy equipment, and receipt of major cargos through the Port of Botwood. The access road will be built as the main overland connection between the Botwood Highway and

the Industrial Facility and will support workforce traffic, routine deliveries, emergency access, and construction traffic. The heavy haul road will be constructed as a dedicated corridor linking the Port of Botwood to the Industrial Facility for oversized and heavy project cargo.

Construction of these roads will generally include clearing and grubbing, stripping of organic soils where feasible, cut-and-fill earthworks, preparation of stable subgrades, installation of geotextile or geogrid reinforcement where required, placement and compaction of engineered granular materials, installation of ditches, culverts, and cross-drains, and implementation of erosion and sediment control measures. Construction of the heavy haul road will be coordinated with port operations and delivery schedules so that it is available before arrival of major equipment packages and large fabricated modules.

The access road will be constructed as a granular roadway, incorporating a prepared subgrade, engineered granular subbase and surface materials, roadside drainage features, and cross-drainage structures such as culverts where required. Ground improvement measures including geotextile or geogrid reinforcement may be applied in areas of weak or variable solid to enhance stability and bearing. The design will emphasize effective drainage, erosion control, and minimization of environmental disturbance while maintaining the load-bearing performance. Where crossings of watercourses or drainage features are required, the final crossing type and sizing will be determined through detailed engineering and applicable regulatory review.

Construction power infrastructure will also form part of the early support works. The Project is evaluating a dedicated grid interconnection using the existing regional electrical system to provide construction power to the Industrial Facility so that early and main construction activities can rely less on temporary diesel generation. Construction of this interconnection is expected to include surveys and design, civil works at the point of interconnection and terminal substation area, installation of foundations, grounding, fencing, transformers, switchgear, controls, and associated electrical infrastructure, and, where required, installation of an interconnection feeder or overhead line segment to the Industrial Facility. Where construction power is not yet available work areas, temporary generators may be used on an interim basis. The purpose of this early electrical infrastructure is to support site facilities, batch plants, warehouses, lighting, pumps, power tools, instrumentation, and later pre-commissioning activities.

Temporary and permanent warehousing, staging, and fueling infrastructure will be constructed to support materials management throughout the construction phase. These works are expected to include engineered pads or slab foundations, modular or pre-engineered warehouse buildings, containerized storage units, racking systems, receiving and inspection areas, temporary storage for critical spares and consumables, internal circulation space, security fencing, lighting, and associated office and communications facilities. Central fuel storage and dispensing infrastructure may also be established within the Industrial Facility to support emergency generators, light vehicles, and selected construction equipment, with smaller temporary fueling arrangements or mobile refueling vehicles serving localized work fronts such as batch plants, quarries, or laydown areas. These facilities will incorporate

containment, controlled drainage, and spill prevention features consistent with the Project's environmental management commitments.

Temporary laydown and marshalling areas will be developed as heavy-duty granular yards capable of receiving, storing, and staging large or bulky materials and components. Construction of these areas will include clearing and grubbing, grading, compaction, engineered fill placement where needed, granular surfacing, drainage controls, internal traffic routing, and access control measures. These laydown areas are intended to support rapid vessel turnaround at the Port of Botwood and to provide sufficient capacity for staging structural steel, pipe racks, vessels, electrical equipment, large skids, cable drums, transformers, and other oversized construction materials before installation. Multiple laydown areas will be developed within the Industrial Facility logistics footprint, including larger marshalling yards for major project cargo and a smaller staging yard for Industrial Facility installation materials. As construction advances, the specific allocation of materials and equipment to each laydown area will be refined through the Project logistics study and detailed construction planning.

Temporary services and construction management systems will be established across these support areas as they are developed. Depending on location and timing, this may include temporary water supply, wastewater systems, lighting, communications, waste collection areas, dust suppression arrangements, temporary drainage controls, fencing, signage, security, and emergency response equipment. Construction equipment used across the support-infrastructure works is expected to include excavators, bulldozers, dump trucks, compactors, graders, loaders, crushers, concrete trucks, pump trucks, generators, light towers, forklifts, cranes, drills, water pumps, and related support vehicles and hand tools, depending on the specific work front. These support systems will be progressively adjusted as the Project moves from early enabling works into the main Industrial Facility buildout.

Hydrogen and Ammonia Plant

Construction of the hydrogen and ammonia plant will form the core of the Industrial Facility buildout and will include the staged installation of the hydrogen production systems, hydrogen purification and storage systems, air separation units, ammonia synthesis trains, ammonia refrigeration and steam systems, ammonia storage tanks, flare and vent systems, control buildings, electrical buildings, utility connections, and associated balance-of-plant infrastructure. The Facility will be constructed and commissioned in a phased approach, which is important for sequencing the hydrogen and ammonia plant works.

Construction of the hydrogen and ammonia process areas is expected to begin once site preparation, access, laydown, construction power, and the principal support infrastructure are sufficiently advanced. Early work in the process areas will include detailed survey layout, final geotechnical verification, bulk grading, rock excavation where required, subgrade improvement, piling or ground improvement where necessary, and construction of the major foundations and slabs required for process equipment, buildings, pipe racks, compressors, tanks, and electrical infrastructure. These early civil works will establish the permanent working

surfaces and structural bases needed for erection and mechanical installation of the plant. In parallel, underground services such as stormwater systems, oily water drains, ammonia-contaminated water drains, sanitary services, firewater mains, raw and treated water lines, electrical duct banks, grounding grids, and communications conduits will be installed beneath or adjacent to the future process areas.

Within the hydrogen plant area, construction will include installation of the electrolyzer package foundations, associated structural supports, vendor-supplied package modules, and the interconnecting mechanical, electrical, and control systems needed to integrate the packages into the wider facility. The current design basis identifies 18 120MW hydrogen plants, each supplied as a modular system with package electrical equipment, dedicated RO/DI treatment capability, and a cooling system. Construction of the hydrogen plant will therefore include delivery and setting of the electrolyzer packages, installation of package piping and manifolds, connection of treated water, hydrogen, oxygen, vent, drainage, and cooling lines, and installation of the local electrical, instrumentation, control, and safety interfaces required to tie each package into the site network. Because the Project is actively pursuing modularization as a construction strategy, portions of the hydrogen plant may be fabricated or pre-assembled off site and transported to the Industrial Facility for final installation.

Construction of the hydrogen purification, compression, and molecular storage systems will follow installation of the main electrolyzer arrays and associated utilities. These works will include erection of the hydrogen purification package, deoxygenation and dehydration equipment, hydrogen compression systems, storage vessels or storage arrays, associated manifolds, valves, vent systems, instrumentation, fire and gas detection equipment, and blast or fire-protection features where required by final design. Hydrogen purification will be provided upstream of the ammonia plant, and above-ground hydrogen storage will be installed as part of the facility. Construction of this area will also include the relevant concrete pads, structural supports, interconnecting pipework, control systems, and tie-ins to both the hydrogen plant and the ammonia synthesis area.

Construction of the ammonia plant will include the air separation units, ammonia synthesis loop equipment, refrigeration systems, steam-generation systems, ammonia storage and boil-off gas systems, flare systems, and the related buildings and utilities required to support ammonia production. The current design basis provides two independent 2,500 mtpd trains, which means that construction is expected to proceed in train-based packages or work fronts, allowing the first train and common systems to advance while later systems continue to be installed. Major ammonia-plant civil works will include foundations for compressors, vessels, columns, heat exchangers, chillers, boilers, flare structures, tank pads, control buildings, electrical buildings, and support structures, together with the associated roads, drainage, and access areas within the ammonia process footprint.

Construction of the air separation units will include installation of the main air compressors, pre-cooling and purification equipment, cold box structures, booster and turbine systems, distillation columns, nitrogen compression systems, nitrogen receiver systems, associated pipe

racks, and the necessary electrical and control interfaces. These systems are critical to ammonia production and will require careful sequencing because they are mechanically and electrically integrated with both the ammonia synthesis trains and the broader site utility systems. The ASU is expected to operate as a relatively steady process unit, and the construction scope will therefore include not only major mechanical equipment erection, but also high standards of piping, insulation, instrumentation, and control installation suited to cryogenic process service.

Construction of the ammonia synthesis loop will include erection and installation of the synthesis gas compression systems, recycling and circulation equipment, ammonia converters, heat exchangers, separators, start-up heating systems, steam superheaters, waste heat boilers, boiler feedwater preheaters, air coolers, refrigeration interfaces, and the associated structural steel and pipe supports required to assemble the process trains. These systems will be connected through extensive high-pressure and process-critical piping networks that will require fabrication, fit-up, welding, non-destructive examination, pressure testing, cleaning, and final reinstatement prior to pre-commissioning. Pipe racks and interconnecting corridors will also be installed to carry hydrogen, nitrogen, ammonia, water, steam, vent, flare, and utility services between the hydrogen plant, air separation units, ammonia trains, storage systems, and utility areas.

Construction of the ammonia refrigeration and steam-generation systems will occur in parallel with the synthesis loop and will include installation of the ammonia receiver, ammonia chillers, separators, ammonia compressors, inert gas chiller, ammonia absorption column, cold ammonia pumps, deaerator, boiler feedwater pumps, waste heat boiler, blowdown tank, medium-pressure steam header, steam turbine generator, and associated utility systems. Because these systems are closely integrated with the ammonia trains and the storage and export systems, their construction will require coordinated installation of process equipment, piping, controls, electrical supply, insulation, and structural supports so that the refrigeration and steam systems can be commissioned as part of the overall ammonia plant rather than as isolated packages.

Construction of the ammonia storage system will include development of tank pads and containment works, erection of the refrigerated ammonia storage tanks, installation of insulation and associated boil-off gas equipment, transfer pumps, piping, instrumentation, and connections to both the ammonia plant and the export pipeline system. The current design basis identifies two 65,000 m³ tanks as the present basis, although final sizing and configuration remain subject to FEED confirmation. Construction of these tanks will involve large-scale concrete and foundation works, steel erection, tank roof and shell installation, refrigeration-related connections, boil-off gas handling systems, vapour and relief connections, and the associated electrical, monitoring, and safety systems.

Construction of the flare and vent systems will include flare headers, knockout drums, seal drums, flare stacks or common derrick structures as applicable, flare pilots and ignition systems, purge connections, flare gas metering and monitoring systems, and the associated

foundations, access platforms, and control interfaces. These works will need to be integrated with the hydrogen plant, ammonia plant, storage systems, and port and export systems so that all non-routine relief and vent paths are available for later pre-commissioning and commissioning.

Control buildings, electrical buildings, substations, and utility interfaces required for the hydrogen and ammonia plant will be constructed throughout the process-plant buildout. These works will include foundations, structural and architectural building works, installation of HVAC where required, switchgear, transformers, rectifiers, control and automation hardware, instrument and electrical cabling, communications systems, fire and gas interfaces, emergency shutdown systems, and the connections to the broader site substation and electrical distribution network. Because the hydrogen and ammonia systems are electrically and operationally sensitive, completion of these buildings and electrical systems will be a major prerequisite for later pre-commissioning, loop checks, energization, and commissioning.

Construction of the hydrogen and ammonia plant will also include the full range of associated utility and environmental systems needed to support process operations. This includes tie-ins to treated water and demineralized water systems, firewater systems, plant and instrument air, nitrogen utility distribution, drainage and sewer systems, wastewater collection, spill containment features, hazardous and non-hazardous drain systems, and the safety systems associated with leak detection, emergency response, and plant safeguarding. These systems will not necessarily be constructed in isolation; rather, they will be progressively installed and integrated as the individual process areas and common utility corridors advance.

During construction, the hydrogen and ammonia plant areas will require extensive heavy lifting, specialized transport, and coordinated equipment-setting operations. Major process equipment, prefabricated modules, vessels, compressors, tank components, cold-box elements, and electrical packages are expected to arrive through the Port of Botwood and be transported to site using the heavy haul road and laydown system established under the earlier construction subsection. Once on site, these items will be received, inspected, staged, and then lifted into place using cranes and specialized rigging equipment. The Project's modularization strategy, proximity to the port, and dedicated haul infrastructure are therefore fundamental to the construction approach for the hydrogen and ammonia plant.

Construction management and environmental protection measures will be maintained throughout the hydrogen and ammonia plant buildout. These measures are expected to include continued erosion and sediment control, temporary drainage management, dust suppression, controlled handling of fuels and hazardous materials, waste segregation, concrete washout control, protection of installed equipment, and construction-stage health, safety, and emergency response systems. As the process-plant buildout progresses, mechanical completion will be achieved system by system, allowing turnover into pre-commissioning and commissioning in accordance with the Project's phased delivery strategy.

Energy Storage System

The BESS is planned as a 106 MW / 1,100 MWh system and will form part of the main electrical infrastructure supporting the Industrial Facility. Electrical energy storage is included in the base design to enhance plant stability, improve operational efficiency, and provide power for critical and emergency loads. The BESS is intended to stabilize variations in power quality and provide a consistent and stable power supply to sensitive equipment within the Industrial Facility.

Construction of the BESS will begin with development of the dedicated BESS site area within or adjacent to the main Industrial Facility footprint (Drawing 7.1-1, Appendix A). The electrical energy storage area will require site grading and foundation works, and the BESS is intended to be centrally located at the hydrogen facility, subject to confirmation during later design. Early construction activities in the BESS area are therefore expected to include detailed survey and layout, grading to the minimum extent necessary, establishment of stable working surfaces, subgrade improvement where required, installation of foundations or engineered pads, underground electrical and communications ducting, and installation of the grounding grid and associated earthing infrastructure. These works will provide the structural and electrical base needed for later installation of the battery containers, power conversion equipment, and substation interfaces.

The main equipment installation phase will include delivery and placement of the battery enclosures or containerized battery units, together with the associated power conversion systems, medium voltage power stations or equivalent inverter-transformer skids, switchgear, auxiliary electrical systems, and control equipment. Large-scale battery systems are typically arranged as 20-foot or 40-foot containerized solutions incorporating battery racks, cooling and heating systems, and safety systems. The BESS construction scope will include installation of the inverter and transformer systems, electrical components and cabling, controls, and the high-voltage collector substation connection. Depending on the final OEM and selected battery chemistry, these works may involve prefabricated container delivery and setting, skid-mounted power equipment installation, interconnection cabling, control-system integration, and enclosure-level safety-system installation.

Construction of the BESS will also include installation of the electrical interfaces required to connect the battery system to the broader Industrial Facility electrical network. The BESS construction works will include installation of the high-voltage collector substation and a gen-tie connection to the on-site substation, with the Project substation serving as the main electrical interface delivering power to the major plant systems. Accordingly, the BESS construction scope is expected to include medium- and high-voltage cabling, transformers, switchgear, protection systems, control panels, communications links, auxiliary power systems, and all other electrical infrastructure required to integrate the BESS with the site substation, the critical-load distribution system, and the wider plant control architecture.

Because the final battery chemistry is still under evaluation, the Project will retain a flexible description of the enclosure and safety systems. Notwithstanding that uncertainty,

containerized battery systems typically include cooling and heating systems, fire detection and mitigation systems, and associated safety controls, and the Project will include multiple automatic and manual safety and power-down mechanisms. Construction of the BESS will therefore also include installation of enclosure-level fire detection and suppression or mitigation systems, ventilation and thermal-management equipment, emergency isolation devices, local alarms, monitoring systems, and the interlocks required to integrate these systems with the broader fire, gas, and emergency shutdown systems of the Industrial Facility.

Ancillary civil and site works for the BESS will include access roads, internal circulation areas, gates, parking or service areas where required, perimeter fencing, screening, drainage controls, and site-security infrastructure. Construction scope for the BESS includes fencing and screening, access roads, internal and perimeter roadway improvements, gates, parking areas, and site walls. Grading will be limited to the minimum required for placement of pilings and foundations to reduce changes to naturally occurring runoff and lessen long-term maintenance issues. In practice, this means that BESS construction will include localized grading, stormwater management features, drainage conveyance, and any erosion and sediment control measures needed to protect adjacent areas while keeping the BESS footprint as compact and controlled as practicable.

The principal construction equipment expected to be used for the BESS installation includes scrapers, excavators, dump trucks, drum rollers, forklifts, cranes, pump trucks, concrete trucks, manlifts, and boom trucks. These pieces of equipment will be used for site preparation within the BESS footprint, foundation and pad installation, delivery and placement of battery containers and electrical skids, cable installation, and erection of associated site infrastructure. As with other parts of the Industrial Facility, all stationary equipment or machines with the potential to generate significant noise or vibration will be located away from receptors to the extent practicable during construction.

Construction of the BESS will conclude with equipment terminations, control-system integration, energization checks, functional testing, and post-construction performance testing prior to turnover into pre-commissioning and commissioning. In keeping with the overall phased project delivery strategy, the BESS may be installed and made ready for service in coordination with the completion of the substation, critical-load systems, and other early utility and process systems so that it can support later commissioning and plant startup activities.

Ammonia Transport and Ship Loading

Construction of the ammonia transport and ship loading system will include the buildout of the dedicated export infrastructure linking the Industrial Facility ammonia storage area to the Port of Botwood and the marine loading facilities at the ship-shore interface. Under the current project basis, refrigerated liquid ammonia produced and stored at the CPF will be transferred to the port through a dedicated underground ammonia pipeline collocated with the heavy haul road footprint and then loaded to specialized ammonia carriers through a controlled marine loading system. The scope of this EIS for Project development includes all onshore and jetty-based systems up to the ship-shore connection point, including the ammonia storage tanks,

booster and loading pumps, vapour return and cooldown lines, jetty structures, loading arms, emergency flare, and associated utility, control, and safety systems.

The ammonia transport and ship loading construction scope will therefore comprise the land-based transfer system between the Industrial Facility and the Port of Botwood, together with the jetty and marine loading infrastructure required to export ammonia by vessel (Drawing 7.1-2, Appendix A). The Project will utilize existing port infrastructure and enhance the Port by designing a specific loading jetty for ammonia service, including the associated piping, venting and isolation systems, emergency response facilities, backup power systems, control and administration offices, and security infrastructure. Liquid ammonia stored at the main processing facility will be piped to the Port via an underground ammonia line, with ammonia cooling remaining at the plant site in the vicinity of the bulk tanks.

Construction of the land-based ammonia transfer system will begin with survey, detailed routing confirmation, corridor preparation, and installation of the underground ammonia pipeline between the Industrial Facility and the marine loading area. This line is currently described as approximately 4 km in length and is collocated with the heavy haul road, although the final length, alignment, and crossing details will be confirmed during FEED and detailed engineering. Construction of this line is expected to include trenching or other approved installation methods, bedding preparation, installation of the insulated ammonia transfer pipe, valves, fittings, anchors and supports where required, backfilling, pressure testing, inspection, and reinstatement of disturbed areas. The completed line will provide the primary route for transfer of liquid ammonia from the storage tanks and loading pumps at the CPF to the ship loading system at the Port of Botwood.

The export system includes a vapour return line and a cooldown line as key parts of the jetty loading arrangement. The Jetty BoG system would be no normal flow, and a direct vapour return line would connect the ship and jetty interface to the CPF so that vapours generated during loading are returned to the plant BoG system rather than being routinely processed at the jetty. This will require installation of a vapour return line of approximately 1.9 km between the ship or jetty and the CPF (Drawing 7.1-2, Appendix A), with an initial sizing basis in the order of 20-to-24-inch nominal bore in the absence of booster compression. Final selection of the vapour-management arrangement will be made during FEED, but currently, the export system includes the ammonia pipeline together with cooldown and vapour-return infrastructure co-located between the CPF and the jetty.

Construction at the CPF side of the export system will include installation of the ammonia booster and loading pumps, tie-ins to the ammonia storage tanks, the CPF boil-off gas system, the CPF flare interface, and the associated piping, controls, metering, and isolation systems required to transfer ammonia off site. The principal CPF-side facilities include the ammonia storage tanks, ammonia booster and loading pumps, the boil-off gas system for pressure control and vapour reliquification, and the CPF flare for abnormal or upset conditions. These facilities will be mechanically and electrically connected to the buried transfer infrastructure and will form the upstream end of the ammonia export system.

Construction at the port and jetty will include the marine loading facilities required for custody transfer and safe connection to the vessel. The proposed marine facilities include a jetty platform, ship berthing and trestle structure, loading facilities, and a marine offloading facility located within the water lot. The main jetty-side facilities include the vapour return line, cooldown line, jetty flare, fiscal metering system, ship loading arms, and nitrogen bottles for purging of the product lines prior to loading or maintenance activities. Construction of the jetty system will therefore include marine and structural works for the jetty and berth, installation of loading arms and associated manifolds, installation of transfer and return piping, support structures, emergency shutdown devices, valves, controls, and all associated utility and safety systems needed to enable ammonia loading at the ship-shore interface.

The current design basis contemplates that the final ship-loading arrangement may use either a loading arm or a loading hose structure located on the previous Irving Oil jetty or on a purpose-built structure to be defined through the port design process. Loading is expected to be undertaken at high transfer rates, and loading pumps will be sized to fill a ship within approximately 24 hours, with overall loading durations expected to be in the range of 12- to 24-hours per vessel. Construction of the loading system will therefore need to provide the structural support, mechanical interfaces, piping integrity, and metering and control systems necessary to support refrigerated liquid ammonia transfer at the final selected design rate.

The loading system establishes a closed-loop vapour-management philosophy and a no-normal-flaring objective for EVREC-owned infrastructure. Construction of this system will therefore include the jetty flare header, jetty flare stack and associated flare equipment, relief connections, vapour return piping, tie-ins to the CPF BoG system where applicable, and the necessary safety and control devices to route non-routine reliefs safely. Emergency-only flaring at both the CPF and the jetty is a key environmental design feature.

The loading system design also defines a number of protective systems that will shape the construction scope of the export infrastructure. These include the ship-shore emergency shutdown link, sectional emergency shutdown valves between the tank Project and the jetty, routing of pressure relief valves and pressure safety valves to the vapour return line and ultimately to flare, insulated liquid ammonia piping to minimize warm-up and vapour generation, UPS supply to the loading arms, and ammonia gas detection along the pipeline and transfer corridor. Construction of the ammonia transport and ship loading system will therefore include installation of the electrical, control, instrumentation, communication, gas-detection, and shutdown interfaces needed to integrate the CPF, transfer line, jetty, and ship-shore systems into a single safeguarded export system.

Construction of the port export facilities will also require associated utility, safety, and support infrastructure. The port system will include emergency response facilities, backup power systems, control and administration offices, and security arrangements, together with associated utility, control, and safety systems such as ESD links, gas detection, and containment drainage. Construction works in the port area will therefore include, as required by final design, electrical supply and backup-power connections, fire protection and firewater

interfaces, communications, lighting, control buildings or control rooms, emergency response equipment, access improvements, drainage and containment systems, and security fencing or controlled-access systems.

Construction of the ammonia export system will be closely tied to the Project's logistics and heavy-haul strategy. Major loading-system components, jetty structures, loading arms, piping spools, flare components, metering equipment, electrical packages, and other specialized materials are expected to be delivered through the Port of Botwood and staged through the laydown and access systems developed earlier in the Project. Marine-side construction will therefore need to be coordinated with the heavy haul road, port access, laydown space, and marine logistics planning so that both land-based and jetty-based works can proceed efficiently and without interfering unduly with the broader Project construction program.

Once mechanical installation is complete, the ammonia transport and ship loading system will be subject to the normal sequence of inspection, pressure testing, line cleaning, instrument testing, electrical and control checks, safeguarding verification, and system turnover into pre-commissioning and commissioning. This is particularly important for the export infrastructure because the loading philosophy depends on proper functioning of the vapour return, cooldown, BoG, ESD, flare, and metering systems before marine loading can occur safely. Final relief loads, settle-out pressures, pressure-safety-valve requirements, and certain control-valve fail-safe positions still need to be refined during FEED and later detailed design, meaning that the detailed configuration of some safeguard elements may continue to develop as the design matures.

Water Management

Construction of the water management system will include the full buildout of the raw water supply, storage, treatment, distribution, stormwater diversion, wastewater collection, effluent treatment, recycling and discharge infrastructure required to support the Industrial Facility.

Water Sources / Intake, Pumphouse and Raw Water Conveyance

Construction of the raw water supply system will begin with the development of the Peters Pond intake and pumphouse works. The water source works will be one of the early utility construction packages because the raw water system must be available before commissioning of the permanent water treatment and distribution systems for the Industrial Facility.

Construction of this component is expected to begin following completion of the relevant access, survey, and site-preparation activities for the Peters Pond shoreline works and the raw water corridor, and will proceed in stages comprising shoreline and intake-area preparation, construction of the pumphouse and intake structure, installation of the raw water conveyance pipeline, connection to the on-site holding reservoir and raw water storage system, and final testing and commissioning of the pumping and transfer system. Peters Pond is the Project water source, and raw water will be pumped to the Industrial Facility and discharged into a holding reservoir before further treatment and use (Drawing 7.1-1, Appendix A).

Construction at Peters Pond will include development of a permanent intake and pumphouse

at the selected shoreline location. The pump station is planned to occupy approximately 1,000 m² and to comprise three high-power pumps of approximately 500 kW each, together with two standby pumps, fitted with variable speed drives to adjust flow in response to electrolyzer and ammonia plant operating requirements. The principal physical materials and equipment expected to be installed at the water-source location include the intake structure, intake piping, intake screening equipment, reinforced concrete foundations and slabs, structural building materials for the pumphouse or equipment enclosure, pumps and motors, suction and discharge headers, isolation valves, strainers and appurtenances, electrical switchgear and motor controls, instrumentation, controls, and the medium-voltage electrical connection and step-down equipment required to power the raw water pumps. The intake structure will incorporate screening and debris-removal measures, including rotary screening, to protect the pumps and downstream treatment systems, as well as necessary screening to limit impact to fish.

Construction methods at the intake and pumphouse will typically include survey and staking of the permanent works area, temporary erosion and sediment control installation, localized clearing and grading, excavation for the intake works and pumphouse foundations, placement of structural fill and concrete, installation of intake pipework and screening equipment, erection or placement of the pumphouse structure and process equipment, and installation of the associated power, control, and communication systems. Depending on final shoreline conditions and detailed engineering, temporary dewatering, cofferdams, sheeted excavations, shoreline stabilization, or other temporary civil controls may be required during installation of the intake works.

The raw water conveyance system between Peters Pond and the Industrial Facility will consist of a dedicated high-density polyethylene pipeline, with a preliminary size of 610 mm diameter. At this stage, the conveyance infrastructure can be described as a permanent raw water pipeline extending approximately 6 km between Peters Pond and the Industrial Facility, to be installed either underground, above ground, or in a combination of both depending on detailed engineering, constructability, environmental constraints, and final route selection. The principal materials associated with this component will therefore include HDPE pipe sections and fittings, valves, pipeline markers, supports or sleepers where above-ground installation is used, bedding and backfill materials where buried installation is used, thrust restraint and anchoring where required, and any cathodic, electrical, or communications interfaces needed for monitoring and operation.

Pipeline construction methods will depend on the final selected installation basis, but are expected to include route staking and clearing where required, stripping and stockpiling of overburden or organics within the construction footprint, trench excavation where buried installation is selected, placement of bedding material, pipe laying and joining, installation of fittings and appurtenances, hydrostatic or pressure testing, line cleaning and disinfection where required, backfilling and compaction, and reinstatement of disturbed areas. For any above-ground sections, construction would include preparation of stable supports, installation of pipe sleepers, anchor blocks, or support frames, thermal expansion allowances as required, and

placement of the pipeline on the support system before final tie-in and testing. Temporary work areas may also include laydown for pipe strings, temporary access spurs, dewatering arrangements in wet areas, and temporary drainage or erosion-control measures along the pipeline corridor.

Within the Industrial Facility, the pipeline will terminate at the holding reservoir and/or raw water storage system that forms the next stage of the plant water supply infrastructure. Water from Peters Pond will be pumped to the main site and discharged into a holding reservoir, and the main Industrial Facility will provide power to the new raw water pumphouse via an overhead line. As such, the water-source construction scope also includes the terminal tie-in works at the Industrial Facility and any associated overhead or buried power supply required between the Industrial Facility electrical system and the raw water pumphouse.

From a schedule perspective, construction of the Peters Pond intake, pumphouse, electrical feed, and raw water pipeline should be described as early-to-mid construction-phase utility works, undertaken early enough to allow subsequent completion and commissioning of the on-site raw water storage, water treatment, potable water, and demineralized water systems. The intake and pumping works are expected to proceed after access and site preparation are available and before the Industrial Facility enters the later stages of mechanical completion and commissioning, since both the electrolyzer systems and the ammonia steam-generation system depend on reliable raw water supply.

Raw Water Storage

At the Industrial Facility, raw water will be received into the on-site raw water storage system, and construction of this component will include development of the holding reservoir and/or atmospheric raw water storage tank, together with the inlet and outlet piping, level controls, overflow arrangements, drainage, and access infrastructure.

Construction of the raw water storage system will be undertaken as an early-to-mid water-infrastructure work package, following the start of the Peters Pond intake and raw water conveyance works and early enough to support subsequent completion and commissioning of the permanent water treatment and distribution systems at the Industrial Facility. In practical terms, the raw water storage facilities must be available before the central water treatment systems, potable water system, and the permanent process-water supply systems for the hydrogen and ammonia facilities can be brought into service.

The raw water storage facilities will be located within the Industrial Facility water-management area (Drawing 7.1-1, Appendix A), immediately downstream of the raw water conveyance system from Peters Pond and upstream of the permanent water treatment systems.

Construction of the raw water storage component is expected to include the holding reservoir and/or atmospheric raw water tank, together with all associated inlet and outlet works, piping, valves, overflow provisions, drainage arrangements, level instrumentation, access platforms, and maintenance access. At this stage of design, the system has not yet finalized whether the

full storage function will be achieved by a single atmospheric tank, a reservoir plus tank combination, or another refined arrangement; however, the design basis establishes that the system will provide a full 24-hour raw water storage buffer. The principal permanent materials associated with this component are therefore expected to include reinforced concrete for tank foundations, slabs, ringwalls, valve pits, and structural supports; engineered fill and granular materials for subgrade preparation and working surfaces; steel or other code-compliant tank materials for the atmospheric storage tank, if a steel tank configuration is selected; HDPE, steel, or equivalent large-diameter pipework and fittings for the inlet, outlet, and overflow piping; valves and appurtenances; and any liner, seepage-control, or embankment materials required if an open holding reservoir configuration is retained in the final design.

Construction methods for the raw water storage area will typically begin with survey and staking of the storage footprint, clearing and grubbing as required within the work area, stripping and stockpiling of organics or unsuitable overburden, and excavation and grading to establish the final storage and working levels. Depending on the final geotechnical conditions and storage configuration, construction may also require subgrade improvement, proof-rolling, placement and compaction of engineered fill, installation of underdrainage or seepage-control features, and preparation of concrete foundations or ringwalls for a tank structure. If the final design includes an open holding reservoir, construction would also involve excavation of the reservoir footprint, shaping of side slopes, construction of embankments where required, installation of inlet and outlet structures, overflow control, erosion protection, and any low-permeability base treatment or lining specified by the detailed design. If the final design relies primarily on an atmospheric tank, the works would include tank foundation construction, tank erection, roof installation if applicable, nozzle and appurtenance installation, hydrotesting, and tie-in to the incoming raw water line and outgoing treatment-water feed lines.

Because the raw water storage facilities form part of the permanent water-management system, their construction will also include the associated electrical, monitoring, and control interfaces needed for operation of the Industrial Facility. This is expected to include level measurement, alarms, overflow indication, valve actuators where required, local controls, communications tie-ins, and the piping and pumping interfaces needed to route raw water to the downstream treatment systems. Where the final design integrates firewater demand into the raw water storage inventory, the final arrangement may also require provision for firewater suction or dedicated tie-ins; however, because that remains an option to be evaluated during FEED rather than a fixed design feature, it should be described as a potential refinement rather than as a finalized part of the current construction scope.

Temporary construction infrastructure associated with the raw water storage system may include temporary access tracks, crane pads, dewatering systems, temporary erosion and sediment control measures, temporary stockpile areas for stripped soils and excavated material, and temporary bypass or drainage controls needed to keep the work area stable during construction. These temporary works will be required so that the storage facilities can be built safely and without causing uncontrolled runoff, sediment release, or interference with adjacent Industrial Facility construction areas. Once the permanent storage facilities are

completed and stabilized, these temporary works will either be removed or incorporated into the permanent site-grading and drainage system, as appropriate.

From a construction-sequencing perspective, the raw water storage system will be built in parallel with the raw water intake, pumphouse, and pipeline, and completed in advance of final commissioning of the permanent water treatment systems. This is important because the raw water storage facilities provide the buffer needed to equalize fluctuations between water withdrawal from Peters Pond and demand from the treatment and process systems, and because the major facility water consumers, namely the electrolyzers and the ammonia synthesis steam system, depend on a stable upstream raw water supply.

Water Treatment

Construction of the water treatment systems will include the facilities needed to convert raw water into filtered, demineralized, and potable water for the various plant users.

Construction of the permanent water treatment system will be undertaken as a critical early utility package within the Industrial Facility and will proceed after the raw water source, conveyance, and raw water storage facilities are sufficiently advanced to provide a reliable feed supply. In practical terms, the raw water treatment facilities must be in place before the hydrogen plant, ammonia plant steam systems, and occupied buildings can enter pre-commissioning and commissioning. Raw water from Peters Pond will be processed using ultrafiltration, reverse osmosis, and electro-deionization to meet the water-quality requirements of the electrolyzers and the ammonia synthesis steam system, while potable water will also be produced on site and distributed throughout the Industrial Facility.

Construction of the central water treatment facilities is expected to include the raw water pre-treatment package, ultrafiltration skids, reverse osmosis skids, electro-deionization polishing equipment where centralized treatment is retained, potable water treatment equipment, chemical dosing systems, treated-water pumps, interconnecting pipework, treated-water storage tanks where required, instrumentation and control systems, and the associated electrical distribution and control interfaces. The principal permanent materials and equipment associated with this construction package are expected to include packaged membrane skids, pressure vessels, pumps, valves, filters, chemical storage and dosing skids, electrical panels and motor controls, stainless steel or HDPE process piping depending on service, cable trays and instrumentation cabling, structural steel supports, concrete foundations and plinths, building or enclosure materials where treatment equipment is housed indoors, and treated-water tanks or vessels as required by the final design.

Construction methods for the central treatment plant will typically include survey and layout of the treatment area, excavation and grading, construction of reinforced concrete foundations and slabs, erection of structural frames or prefabricated treatment buildings where applicable, installation of membrane and polishing skids, pumps, tanks, and pipework, installation of chemical dosing and control systems, connection to the raw water feed from storage, and tie-in to the filtered-water, potable-water, and demineralized-water distribution systems. Because the

treatment plant is expected to be supplied largely as packaged process equipment, construction is also likely to involve delivery of skid-mounted treatment units, crane placement onto prepared foundations, piping and cable terminations, flushing, pressure testing, electrical energization, and system-by-system functional testing prior to turnover into pre-commissioning.

The ultrafiltration system is the first major treatment stage downstream of raw water storage. It will be designed to treat raw water for both process and potable water supply to the Industrial Facility. Construction of this part of the plant will therefore include ultrafiltration membrane skids or racks, backwash piping, pumps, valves, control panels, and the associated feed and filtrate headers. The raw water pre-treatment facility is designed to remove suspended materials only, and backwash water from the pre-treatment facility will be routed to the stormwater drains and then to the stormwater/effluent water pond, with backwash estimated at approximately 5 percent of the raw water volume. In construction terms, this means the ultrafiltration facilities must also be connected to the site drainage and wastewater systems as part of their installation, and these pipe connections, drains, and tie-ins should be treated as part of the permanent water-treatment construction scope.

The reverse osmosis and electro-deionization systems will serve as the principal high-purity water-production stages for the facility. Construction of these systems will therefore include installation of reverse osmosis pressure vessels and membranes, high-pressure pumps, permeate and reject headers, electro-deionization modules and power supplies, clean-in-place or flushing connections where required, instrumentation for conductivity, pressure, flow, and quality monitoring, and all associated structural, electrical, and control interfaces. The permanent materials associated with these systems are likely to include stainless steel and/or non-metallic corrosion-resistant piping, membranes, resin-containing electro-deionization modules, pumps, power and control cabinets, and treated-water tanks or intermediate storage vessels where required by the detailed process design.

Construction of the package-level electrolyzer RO/DI treatment units will occur within the hydrogen plant construction sequence but still form part of the overall facility water-management system. Each hydrogen plant package will include dedicated RO/DI units and dedicated storage facilities. Accordingly, once the electrolyzer foundations and packages are installed, the RO/DI systems associated with each package will be delivered, set, connected, and integrated with the central raw or filtered water supply and the local hydrogen plant utilities. In construction terms, these works will include installation of package treatment skids, small, dedicated storage tanks, local piping manifolds, drains, electrical and controls terminations, and final tie-ins to the electrolyzer feedwater systems. These package-level systems are therefore permanent process-water infrastructure.

Construction of the ammonia plant treated-water and demineralized-water system will also be a distinct treatment work package. Treated water storage will be provided to support steam generation within the ammonia synthesis plant, and an atmospheric tank will be installed to store 24 hours of treated water supply to the ammonia synthesis facility. Demineralized-water units located close to the ammonia plant will supply the required demineralized water to the

ammonia process units. Construction of this part of the water-treatment system will therefore include the treatment skids serving the ammonia steam and boiler-feed demand, treated-water storage tanks, boiler-feed-quality piping and pumping, instrumentation, and the associated foundations, electrical connections, and control-system interfaces. Because the ammonia steam system is a major water user, this construction package will be completed before ammonia-plant commissioning and integrated with the ammonia utility and steam-generation systems.

Construction of the potable water treatment system will include the facilities required to supply drinking water and service water for occupied buildings and selected plant uses. The main materials and equipment for this part of the system are expected to include ultrafiltration treatment or equivalent pre-treatment, potable water storage, pumps, sampling points, disinfection or final conditioning equipment as required by design, building-service connections, and the distribution piping serving offices, washrooms, maintenance areas, warehouse facilities, and other occupied buildings. Construction sequencing for this portion of the system will be tied to the construction of those buildings, so that potable water service is available before occupancy and before routine construction and operations staffing move into the permanent Industrial Facility buildings.

Temporary construction infrastructure associated with the water treatment systems may include temporary power supply, temporary hoses or bypass piping, temporary chemical storage, temporary drainage controls, and temporary clean-water supply arrangements for testing, flushing, hydrotesting, and initial treatment-system startup before the entire permanent water system is fully in service. These temporary facilities are short-term enabling works only, to be removed or absorbed into the permanent utility layout once the central treatment systems, package-level treatment units, and final distribution systems have been brought online.

From a construction schedule perspective, the water treatment facilities will be built after the raw water source, raw water conveyance, and raw water storage systems are sufficiently advanced, and before final pre-commissioning and commissioning of the hydrogen plant, ammonia steam systems, and permanent buildings. In practice, central treatment facilities may be installed in parallel with the hydrogen and ammonia civil works, but they must be available early enough to support flushing, package testing, utility commissioning, potable water service to occupied buildings, and final feedwater supply to the electrolyzers and ammonia plant.

Potable Water / Firewater / Water Distribution

Construction of potable water, firewater, and water distribution systems will form part of the permanent utility buildout of the Industrial Facility and will proceed in coordination with the construction of the water treatment plant, occupied buildings, process areas, and plant safety systems. These systems will provide the permanent distribution network required to deliver treated water to human-occupied facilities, process and utility users, and fire protection systems throughout the Industrial Facility.

Construction of the potable water system will include installation of the potable water treatment package, treated-water storage where required, distribution pumps, valves, meters, sampling points, and the building-service piping needed to connect the potable water system to the offices, washrooms, maintenance building, warehouse building, and other occupied areas of the Industrial Facility. The principal materials and equipment for this component are expected to include packaged treatment skids, small process vessels or storage tanks, stainless steel, HDPE, or other approved potable-water pipework as appropriate to the service, building-entry service connections, controls, instrumentation, and the associated electrical supply and communications interfaces needed to operate and monitor the system. Construction methods will typically include installation of treatment skids on prepared slabs or foundations, connection to the filtered-water supply from the central treatment facilities, installation of storage and pump systems, laying of potable-water mains and branch connections, pressure testing, flushing, disinfection, and final water-quality verification before the system is placed into service.

From a construction-sequencing perspective, the potable water system will be installed in parallel with the permanent buildings and occupied facilities and completed in advance of building occupancy for late construction, pre-commissioning, commissioning, and early operations activities. Temporary potable water supplies may still be required during earlier construction stages or in work fronts not yet connected to the permanent system, but those temporary systems will be removed or retained only as contingency supply once the permanent potable water package and building distribution network are available.

In construction terms, the principal permanent materials and equipment associated with the firewater system are expected to include the firewater tank or integrated storage arrangement, reinforced concrete foundations and ringwalls where required, diesel-driven or electrically driven firewater pumps, jockey pumps, suction and discharge pipework, dedicated buried and/or above-ground firewater mains, sectional isolation valves, hydrants, monitors, deluge or fixed-system tie-ins where required, test headers, electrical supply and controls, and alarm and monitoring systems integrated with the broader Industrial Facility safety systems. Although future hydraulic calculations and firewater-demand calculations will finalize system sizing, the firewater system is a permanent built utility forming part of the Industrial Facility safety infrastructure.

Construction methods for the firewater system will include excavation and foundation works for the tank and pump installations, erection or placement of the firewater storage tank if a dedicated tank is adopted, installation of the firewater pumps and jockey pumps, laying of the firewater ring main or distribution main across the Industrial Facility, installation of hydrants and branch connections to process areas and buildings, pressure testing, flushing, and hydraulic and functional testing of the system. From a construction schedule perspective, the firewater system will be installed in parallel with the major process areas, ammonia storage area, occupied buildings, and other hazardous or critical infrastructure, so that fixed fire protection capacity becomes progressively available as equipment, hazardous inventories, and energized systems are introduced during late construction and commissioning.

Construction of the permanent water distribution network will include installation of the mains and branch lines that route filtered water to cooling-system make-up and firewater-related users, demineralized water to the electrolyzers and ammonia steam-generation systems, and potable water to buildings and common-use facilities. The principal materials associated with this network are expected to include buried and above-ground process and utility piping, valves, fittings, meters, pressure and level instrumentation, pipe supports and sleepers, bedding and backfill materials where buried piping is used, branch connections to process packages and buildings, local booster pumps where required, and the associated control-system interfaces. Construction methods will typically include trench excavation for buried mains, installation of bedding and backfill, laying and joining of pipe sections, installation of valves and appurtenances, erection of above-ground supports or rack-mounted sections where required, tie-ins to tanks, treatment packages, pumps, process systems, and buildings, pressure testing, flushing, and final controls integration.

The water distribution system will be installed progressively through the main civil, mechanical, and building-construction phase of the Industrial Facility. Main distribution corridors are expected to be installed early with the underground services and utility corridors, while branch connections to the hydrogen plant, ammonia plant, electrical and utility systems, offices, warehouse, and maintenance facilities will be completed in coordination with the construction of the individual users. Temporary hoses, bypass lines, or local temporary water services may be required at selected stages before the permanent system is fully available, but these will be short-term construction measures only. Once completed, the potable water, firewater, and general water distribution systems will form the permanent internal network that supports the Industrial Facility through commissioning and into operations.

Stormwater / Rainwater and Water Diversion

Construction of the stormwater, rainwater, and water-diversion system will form an early and continuing part of the Industrial Facility civil-works program and will be undertaken to separate clean, non-contact runoff from process-affected or potentially contaminated water, protect the site from erosion and flooding, and limit the volume of clean surface water entering the contact-water and wastewater systems.

Construction of the stormwater and diversion system will begin during the early civil works phase, alongside site grading and the initial establishment of permanent and temporary drainage controls. In practice, this is one of the first major permanent water-management systems to be constructed because the ditches, swales, culverts, and diversion features are needed to manage runoff during the rest of construction and to protect newly disturbed areas from erosion and sediment transport. Construction methods will generally include survey and staking of ditch alignments and outfall locations, clearing and grubbing within the ditch footprints where required, excavation and shaping of ditches and swales, placement and compaction of fill or embankment materials where needed to establish grades and separation from plant areas, installation of culverts and catch basins, construction of outlet structures, installation of riprap or erosion-protection measures at high-velocity areas, and stabilization of slopes and disturbed areas through seeding, matting, or other approved methods. Natural and

graded ditches form the core method of clean-water diversion.

The clean-water diversion system will be designed and built so that uncontaminated runoff is kept separate from areas served by contact-water sewers, chemical sewers, and chemical storage areas and directed to the evaporation pond. Areas where uncontaminated surface water is collected must slope away from areas served by dedicated contact surface water sewers, chemical sewers, and chemical storage areas, and runoff from pipe racks, transformers, and other facilities without rotating equipment or other leakage sources will be drained to the evaporation pond. Accordingly, construction of the stormwater and diversion system will be coordinated closely with the grading and underground-services work so that finished surfaces, building pads, paved areas, and utility corridors drain toward the correct clean-water collection system and not toward contact-water collection areas.

The evaporation pond will typically be sized for peak runoff based on a minimum 10-year / 24-hour storm frequency. Construction of the stormwater system must therefore be undertaken in a manner consistent with the final hydraulic design, including the required ditch cross-sections, slopes, culvert sizing, outlet capacities, and freeboard allowances. In practical terms, that means the permanent stormwater and diversion works will be installed progressively as major site grading is completed and before the corresponding process areas, roads, or building areas are fully built out, so that the hydraulic drainage paths are established before large paved or compacted surfaces begin shedding runoff into the permanent system.

In addition to perimeter diversion and ditch drainage, the Project will consider a dedicated rainwater collection system from the roofs of applicable buildings at the Industrial Facility. At the current stage of design, however, this remains a design option rather than a finalized project feature. If carried forward, construction of this component would include roof leaders and collection piping, first-flush diversion where required, storage or tie-in to the designated pond, and the associated valves and controls needed to segregate roof runoff from other stormwater streams.

Temporary infrastructure associated with stormwater and water-diversion construction may include temporary diversion berms, temporary drainage ditches, sediment traps, ditch checks, silt fencing, temporary culverts, temporary pumping and dewatering arrangements, and temporary stabilized construction entrances or temporary outfall protection during the period before the permanent drainage network is complete. These temporary works are important because the permanent stormwater system will be built progressively, and runoff must still be managed safely during earthworks, grading, and utility installation. Once the permanent ditches, culverts, and catchment features are completed, the temporary measures will be removed, upgraded, or incorporated into the final stormwater configuration as appropriate.

From a construction schedule perspective, the stormwater, rainwater, and water-diversion works will be installed from site preparation onward, with the main permanent ditching, culverts, and outfall-control features constructed during the early and middle civil-works phase and then refined as the Industrial Facility footprint, roads, buildings, and process areas are

completed. This sequencing is important because the diversion system must function throughout the remainder of construction to keep clean runoff away from active work areas and from the contact-water systems that serve the process areas. The stormwater works therefore begin early, continue in parallel with the other civil and utility works, and are finalized before commissioning of the permanent plant drainage and effluent systems.

Effluent Treatment, Water Recycling and Discharge

Construction of the effluent treatment, recycling and discharge system will include the permanent infrastructure required to collect, segregate, convey, treat, store, recycle, and discharge wastewater and process-affected water generated within the Industrial Facility. Construction of the drainage and sewerage collection systems will be one of the earlier underground services packages installed within the Industrial Facility, because these systems must be in place before full mechanical installation and before process areas begin shedding runoff or generating construction-stage wash water and wastewater. The minimum design will include non-hazardous open drains, hazardous open drains, and a closed drains system. In construction terms, this means installation of underground sewer lines, trench drains, catch basins, area drains, curbed slabs, sumps, valve pits, manholes, piping networks, and the relevant pump and control interfaces needed to direct the different wastewater streams to the correct treatment or containment destination.

Construction of the central effluent treatment package will include the permanent treatment facilities used to treat the mixed industrial effluents prior to discharge to the stormwater/effluent pond. Construction methods will include excavation and grading of the treatment area, installation of foundations and slabs, placement of tanks and skids, piping and valve installation, electrical and instrumentation installation, interconnection with the incoming drain systems and the stormwater/effluent pond, pressure and leak testing, and functional testing prior to turnover.

Construction of the oily water collection and treatment system will be undertaken in parallel with the main process-area civil works and underground drain installation. Construction of this system will therefore include curbed concrete slabs or containment perimeters around designated oily areas, underground oily-water sewer lines, sumps, equalization tanks, oil skimmers, feed pumps, and the permanent treatment package. The oily wastewater treatment package is designed for a flow of approximately 4 m³/h and includes a corrugated plate interceptor separator and an induced gas flotation separator, both of which are permanent installed treatment equipment within this system.

Several areas remote from the main oily water sewer collection system will use local or independent oily-water collection systems, including the diesel generator area, diesel filling station, hydrogen storage compression area, and boil-off gas refrigeration area. Construction of these local systems will therefore include small local sumps, equalization tanks, oil-skimming equipment, pump sets, piping tie-ins, curbed containment, water seals, and diversion weirs, together with the associated foundations and controls. These local collection systems are permanent physical features.

Construction of the ammonia-contaminated wastewater system will occur in parallel with the ammonia process-area civil works and underground service installation. Construction of this component will include curbed and coated process slabs, underground drain piping, the covered collection sump, pumps, nitrogen blanketing and vent connections, instrumentation, and the tie-ins to the ammonia-process treatment route.

Construction of the sanitary wastewater system will be coordinated with the construction of the occupied buildings and welfare facilities at the Industrial Facility. Construction of the sanitary system will include sanitary collection piping, package biological treatment units, wet wells, pumps, odour-control equipment, sludge-handling arrangements, pressurized sanitary mains where applicable, and the relevant building-service connections. At the present stage, treated sanitary wastewater may discharge into a pressurized sanitary waste main and then enter a municipal sewer system, but the construction scope is focused primarily on the physical sanitary treatment and collection infrastructure that will be built at the site.

Construction of the stormwater/effluent pond will be a major civil-water work package within the Industrial Facility and will occur during the main site civil works phase once sufficient grading information, drainage inputs, and hydraulic design are available. Construction of this pond will include excavation, grading, embankment shaping where required, inlet and outlet structures, internal low-permeability treatment or lining if specified by design, erosion protection, level-monitoring systems, access roads or maintenance berms, and the outfall-control structures needed to route treated or non-contact water onward in a controlled manner.

Construction of the recycling, outfall and discharge infrastructure will follow completion of the pond and the main drainage network. Construction of the outfall system will include outlet piping or channels, headwalls or energy-dissipation structures, erosion protection at discharge points, any required flow-control structures, and the monitoring or sampling points needed to verify discharge performance.

Temporary construction infrastructure associated with the effluent and wastewater systems may include temporary sumps, temporary pumps, temporary drainage diversions, temporary holding tanks, hydro-vac services, temporary sludge bins, and temporary bypass piping or containment while the permanent collection and treatment systems are being installed. These temporary measures are particularly relevant in areas such as the remote oily-water sump locations and during the period before the central treatment plant and stormwater/effluent pond are fully operational. Once the permanent treatment systems, sewers, pumps, and pond are commissioned, these temporary facilities will be removed or retained only where needed for maintenance contingency.

From a construction schedule perspective, the effluent treatment, recycling and discharge system will be installed progressively through the main civil, underground-services, and utility-construction phase, beginning with the permanent drains, sewers, and collection systems, followed by installation of the treatment packages and pond, and concluding with the final outfall, testing, and tie-ins. In practical terms, the hazardous and non-hazardous drains, oily

water sewer, ammonia-contaminated drains, and sanitary collection systems must be installed before late-stage process installation and before large areas of the plant begin generating runoff, wash water, and test water. The central treatment facilities, evaporation pond, and stormwater/effluent pond must then be completed before final pre-commissioning and commissioning so that process and utility systems can be flushed, tested, drained, and operated with the permanent wastewater-management infrastructure available. Wastewater handling and effluent management are permanent facility utilities, not temporary afterthoughts.

Grid Connection

The Project will include permanent electrical interconnection works to connect the Industrial Facility to the provincial transmission system, enabling the import of electricity for operations, auxiliary loads, commissioning, and black-start capability. The existing regional grid in the Botwood area is based on a 138 kV system, with current capacity constrained primarily by transformer limitations at the Botwood Substation. Upgrades or additional transformers will likely be required to support the Project's electrical demand and enable sufficient power availability at both the Facility and port areas.

The interconnection works will consist of several key components, including a point of interconnection near the existing Botwood Substation or another utility-designated location, upgraded transformation and switching infrastructure, a high-voltage interconnection line or feeder corridor, and a main terminal substation at the Industrial Facility. This terminal substation will integrate the facility's internal electrical systems, including wind, solar, battery storage, and plant distribution, forming the central electrical interface for the Project.

At the Industrial Facility, the interconnection will terminate at a high-voltage switchyard designed using either a breaker-and-a-half or ring-bus configuration, depending on final design requirements. The interconnection line itself is expected to be an overhead high-voltage transmission line connected to the regional 138 kV system, with final voltage levels, conductor sizing, protection systems, and communications infrastructure to be determined during detailed engineering and utility coordination.

Construction of the interconnection will involve surveying, route confirmation, and utility-led engineering studies, followed by site preparation, civil works, and electrical installation. Activities will include clearing and grading, installation of foundations, grounding systems, transmission structures, and substations, as well as conductor stringing and installation of protection, control, SCADA, and communication systems. These works will be integrated with the broader facility infrastructure and executed in coordination with utility requirements.

The permanent interconnection will function as part of a broader integrated electrical system, linking the Industrial Facility with its renewable energy sources, including wind Projects, solar PV, and battery energy storage systems. It will support both operational and commissioning requirements and will be developed as long-term infrastructure rather than a temporary construction power solution. The interconnection will be implemented in phases aligned with the overall project schedule, with early works potentially required to support commissioning

and staged energization of the facility.

7.1.3.3 Commissioning

Commissioning of the Industrial Facility will occur after completion of the main construction and installation activities and will comprise the structured process of verifying that the hydrogen plant, ammonia plant, electrical systems, water systems, electrical energy storage system, ammonia export infrastructure, utility systems, control systems, and associated ancillary infrastructure are complete, safe, integrated, and capable of operating as intended. The Industrial Facility will be constructed and commissioned in a phased approach, rather than through a single turnover of the entire facility, so that systems and plant areas can be progressively completed, turned over, commissioned, and brought into service in a controlled manner.

The commissioning phase will follow mechanical completion of individual systems, subsystems, or plant areas and will include a series of pre-commissioning, turnover, commissioning, verification, start-up, and ramp-up activities. The envisioned turnover process is for pre-commissioned systems to be turned over by the construction teams to the Owner's commissioning team after mechanical completion, and the commissioning team will accept care, custody, and control of the systems following review of turnover documentation, inspection reports, and punch-list items. Turnover will be a formal and documented process utilizing a works management system.

Pre-commissioning activities will be undertaken on individual equipment items, package units, and subsystems once construction is sufficiently advanced and will be intended to confirm that each system is safe and ready for start-up. Pre-commissioning will generally include inspection and verification of equipment installation, cleaning and flushing of piping and tanks, pressure testing and leak testing, calibration of instruments, loop checks, electrical continuity and insulation testing, motor solo runs, verification of interlocks and alarms, control-system checks, safety-system testing, and confirmation that temporary construction systems have been removed or isolated as required for safe operation. For the Industrial Facility, these activities will apply to the hydrogen production systems, hydrogen purification and storage systems, air separation units, ammonia synthesis trains, ammonia refrigeration and steam systems, ammonia storage tanks, battery energy storage system, substations, control buildings, water treatment systems, wastewater systems, flare systems, and ammonia loading and export systems.

Turnover from construction to commissioning will occur in separable and operable portions of the facility. Turnover of the plant facilities from Engineering, Procurement, and Construction Management (EPCM) to the commissioning team will generally take place in separable and operable portions so that commissioning activities can commence with whole circuits or areas, rather than relying solely on turnover of isolated pieces of equipment. Turnover on discrete equipment, subsystem, or system level would generally only occur where specifically requested by the commissioning team. This approach is particularly relevant for the Industrial Facility because the Project will need to commission a combination of common systems, early

utility systems, and process systems in an orderly sequence before full production can begin.

Commissioning of the Industrial Facility is expected to begin with the common utility and enabling systems required to support safe energization and startup of the rest of the facility. In practical terms, this is expected to include commissioning of the permanent electrical systems and substation interfaces, the grid interconnection and station service supply where applicable, control buildings and control systems, plant communications, water supply and treatment systems, potable water system, firewater system, drainage and wastewater systems, flare systems, and other common infrastructure required before hydrocarbon-free or process start-up activities can proceed. Once these common systems have been commissioned and verified, the Project can proceed with commissioning of the major process systems and export infrastructure in a staged manner. This sequencing aligns with the overall approach of early operation of common systems while later systems remain under construction, pre-commissioning, or commissioning.

Commissioning of the hydrogen plant will include staged introduction of treated water, electrical power, control logic, cooling systems, hydrogen purification systems, compression systems, vent systems, and hydrogen molecular storage systems. For the electrolyzer packages, commissioning activities are expected to include energization and control-system verification, package testing, water-quality confirmation, initial start-up of package water treatment and cooling systems, verification of hydrogen and oxygen separation and safe venting, testing of purification systems, and controlled introduction of hydrogen to downstream systems and/or storage. The hydrogen storage and compression systems will also require commissioning of compressors, valves, interlocks, gas detection, venting and purge systems, and safeguarding features before hydrogen can be reliably routed to the ammonia plant.

Commissioning of the ammonia plant will be undertaken in stages, beginning with the air separation units and other major utility-dependent systems, followed by the ammonia synthesis trains, refrigeration and steam systems, product storage systems, and associated flare and vent systems. Commissioning activities for the ammonia plant are expected to include startup and verification of the air separation units, nitrogen supply and pressure-control systems, compressor and circulator commissioning, converter and synthesis-loop readiness checks, steam and boiler-feed-water system commissioning, ammonia refrigeration system startup, ammonia tank and boil-off gas system commissioning, and integration of the plant flare and vent systems. The Project's phased delivery approach means that early plant systems and common infrastructure may be commissioned and stabilized before later trains or later capacity increments are fully brought online.

Commissioning of the electrical energy storage system will include energization of the battery enclosures or containers, verification of the battery management system, power conversion systems, protection and isolation systems, cooling and HVAC systems, fire detection and suppression or mitigation systems, communications interfaces, and integration with the substation and the broader plant control architecture. Because the battery energy storage system is intended to support critical and emergency loads and improve plant stability, it will

need to be commissioned in coordination with the main electrical and control systems so that it is available to support sensitive plant systems during later commissioning and ramp-up.

Commissioning of the water systems will include verification and startup of the Peters Pond intake and pumphouse, raw water conveyance system, raw water storage, water treatment facilities, potable water system, firewater system, process-water distribution, wastewater collection systems, treatment systems, stormwater/effluent pond, recycling, and outfalls. These systems must be fully functional before the hydrogen plant and ammonia steam systems can enter full startup activities. Commissioning of the water treatment systems will need to verify that water quality meets the requirements of the electrolyzers and ammonia plant boiler and steam systems, and that wastewater, stormwater, and contaminated water systems are operational before flushing, testing, draining, and startup activities generate permanent water and effluent loads.

Commissioning of the ammonia transport and ship loading system will include testing and verification of the ammonia transfer line, loading pumps, cooldown and vapour return lines, fiscal metering, loading arms, flare and vent interfaces, gas detection, emergency shutdown logic, and ship-shore control and communication links. This commissioning sequence must verify that the export system can operate safely as a contained transfer system before marine loading is permitted. Because the loading system relies on coordinated operation of the CPF, jetty, vapour return, boil-off gas, flare, emergency shutdown, and ship-shore systems, commissioning of the export system will necessarily be an integrated activity rather than a simple standalone mechanical test of the jetty equipment alone.

The commissioning phase will also include integrated system testing, in which independent subsystems are coupled together and verified to function as a complete operating facility. Care, custody, and control will remain with the Owner's commissioning team until commissioning activities for the relevant circuits or areas have been completed, including all identified commissioning verification tests and proving of equipment and circuits, and where possible areas, to be capable of functioning as designed. The commissioning team will ensure that the operational coupling of independent systems and facilities has been achieved and that steady-state operation during facility ramp-up has been demonstrated. This is a key element of the Industrial Facility commissioning phase because the Project depends on integration between wind and solar supply, the grid and battery energy storage system interfaces, water treatment systems, hydrogen production, nitrogen production, ammonia synthesis, storage, and export systems.

Once individual systems and integrated areas have completed the required pre-commissioning and commissioning checks, the facility will progress into start-up and ramp-up. Systems will undergo mechanical, electrical, and operational checks as part of the unit start-up sequence, after which they will be placed into operation and retested prior to initiating full-load performance tests. Operations will commence in a phased approach, with early systems identified in the construction sequence, completed, and brought into operation while other systems remain in construction, pre-commissioning, or commissioning. A ramp-up schedule

providing early operation of common systems and transition into early ammonia production upon completion of the base production systems is already contemplated within the Project design basis and should be reflected here.

Commencement of commissioning is currently anticipated in summer 2030, subject to continuing development of the integrated project schedule through FEED and final engineering. The project has developed an integrated schedule that will continue to be refined, and service providers supporting operations and maintenance scopes are expected to prepare detailed start-up and commissioning schedules for review and approval by the commissioning team. As such, the commissioning program for the Industrial Facility should be described as a structured phase expected to begin once major construction and mechanical completion are sufficiently advanced, with detailed timing and sequence to be finalized through FEED, vendor planning, and the Project Execution Plan.

Service-provider contracts are expected to include start-up, commissioning, and performance testing support, and the service provider will prepare specific startup and ongoing operating procedures and designate a startup leader to lead and manage the Start-up Team. Representatives from the service provider, operations and maintenance suppliers, the owner's operations team, and the operating project group may all have commissioning responsibilities for their subsystems, but these individuals will functionally report to the Startup Leader with respect to commissioning work. The Owner will also assign representatives to ensure that startup and commissioning are performed according to the Owner's expectations and the approved schedules and plans. This provides the basis for describing commissioning governance and organizational responsibility within the Project Description.

At the completion of commissioning verification for plant areas or sections of the facility, transfer of care, custody, and control will take place from the commissioning team to the owner's operations group. seamless transfer of complete operating sections of the plant is envisioned from commissioning control to direct operations control. This means that the commissioning phase will conclude progressively, with completed plant areas being handed over to operations as they demonstrate satisfactory performance, while later plant areas may remain under commissioning or ramp-up. This approach is consistent with the Project's broader phased startup strategy and allows early stable operation of completed systems while the remainder of the Facility continues toward full output.

7.1.3.4 Operations and Maintenance

The operations and maintenance phase will involve the safe, reliable, and efficient operation of the Industrial Facility and its ancillary infrastructure to support the long-term production, storage, and export of green ammonia. In general terms, this phase will include routine operation of the hydrogen and ammonia production systems, electrical energy storage system, water and wastewater systems, ammonia transport and ship loading infrastructure, retained support infrastructure, and the associated electrical, utility, safety, monitoring, and environmental protection systems that enable the Industrial Facility to function as an integrated facility. The operation phase will involve maximizing renewable energy generation for use in

the production of green hydrogen and green ammonia in a safe and environmentally responsible manner. The Industrial Facility is intended to operate as a permanent production facility with a minimum 33-year design life and a required overall availability of at least 96 percent, inclusive of planned and unplanned maintenance and shutdown activities.

A detailed operations and maintenance strategy will be developed during FEED and operational readiness planning and will be based on manufacturer specifications, equipment maintenance requirements, performance warranties, lender requirements, sponsor preferences, and site-specific operating conditions. The Proponent intends to enter into long-term service agreements with qualified contractors for critical equipment requiring specialized skillsets, including compressors, catalyst-related systems, and other specialist plant equipment, and vendor agreements for technology and engineering support will also form part of the maintenance strategy. Operating and maintenance contracts are also expected to include support for start-up, commissioning, performance testing, and preparation of specific start-up and ongoing operating procedures.

Maintenance activities during operations will be carried out on a proactive, periodic, predictive, and as-needed basis, using a combination of preventive maintenance, condition-based maintenance, corrective maintenance, and planned outages or turnaround activities. Maintenance activities will conform to manufacturer equipment specifications, industry best management practices, and standard operating procedures, and the Project will rely on local contractors and service groups to provide maintenance support where appropriate. The operations and maintenance phase will therefore include routine inspections, remote monitoring, scheduled servicing, testing and calibration, major planned shutdowns, emergency repairs, spare-parts management, OEM support, and periodic review and updating of operating procedures as actual operating experience is gained.

Operations and maintenance activities will be organized so that the various plant systems can continue to function as an integrated facility while maintaining safety, environmental compliance, and equipment reliability. This will include maintaining the availability of common systems such as roads, warehousing, electrical interconnection works, substations, fuel and hazardous-material storage, fire protection systems, drainage and wastewater systems, plant controls, communications, and security systems, together with the specialist operating and maintenance procedures needed for the hydrogen plant, ammonia plant, battery energy storage system, and ammonia export facilities. The following subsections describe the principal operations and maintenance procedures for each major component group of the Industrial Facility.

Pre-Construction Support Infrastructure

During operations and maintenance, a portion of the pre-construction support infrastructure developed for the Industrial Facility will remain in service as permanent support infrastructure for access, logistics, maintenance, storage, fueling, electrical utility support, and emergency response. While several construction-only facilities, such as temporary accommodation camps and temporary concrete batch plants, will be removed once they are no longer required, other

support components will remain active throughout the operational life of the Project. These permanent or retained components are expected to include selected quarries and borrow areas, including the quarry planned for the Industrial Facility, the access road and heavy haul road, permanent warehousing and maintenance-related storage areas, permanent fuel and hazardous-materials storage, selected laydown or marshalling areas retained for major maintenance activities, and the permanent electrical interconnection and associated utility-support systems. Roads, substations, warehouses, fuel storage, and related utility infrastructure will therefore continue to support the Project through the operating period.

Operations and maintenance activities associated with this support infrastructure will be undertaken on a proactive, periodic, and as-needed basis in accordance with manufacturer requirements, standard operating procedures, long-term service agreements where applicable, and good industry practice. Maintenance work will conform to manufacturer specifications, best management practices, and standard operating procedures, and long-term service agreements and local contractor support will form part of the maintenance strategy. This general maintenance philosophy applies equally to the retained support infrastructure of the Industrial Facility, particularly for road systems, grid and electrical support systems, warehouses, storage facilities, fuel infrastructure, and other operational support assets.

A subset of quarries and borrow areas are expected to remain accessible during operations because aggregate materials will continue to be required over the life of the Project for maintenance of roads, pads, drainage features, and other site infrastructure. Quarries and site access roads remain critical infrastructure during operations, and a subset of quarries must remain available for ongoing extraction of Class A granular material, sub-base, and surface topping material for road resurfacing and re-topping, shoulder repairs, ditch cleanouts, slumping remediation, and pad repairs around power stations, laydown yards, and related infrastructure. Even at lower extraction volumes, active or standby quarries will require continued access, drainage management, slope and loose-rock inspection, erosion and sediment control, and compliance with the applicable provincial quarry permit. Accordingly, operations and maintenance procedures for retained quarry areas are expected to include periodic inspection of benches, faces, and access routes; localized extraction of maintenance aggregate as required; maintenance of quarry drainage and sediment controls; public-access restriction through gates, fencing, and signage; seasonal inspections following freeze-thaw cycles; and progressive reclamation of any portions of the quarry footprint no longer required for future Project use.

The access road and heavy haul road will remain among the most important pieces of support infrastructure during operations because they provide routine access for inspections, corrective maintenance, emergency response, heavy-component replacement, and movement of materials and equipment between the Industrial Facility, the port, and other Project areas. Operational roads will require periodic grading, re-topping, pothole remediation, surface shaping, and regular drainage maintenance, with activities increasing during spring thaw, following major weather events, and ahead of heavy equipment mobilization. This will also include ditch clearing and deepening, culvert inlet and outlet maintenance, replacement of

damaged culverts, shoulder cutting, localized undercutting and rebuilding in weak segments, geotextile repairs where required, edge repairs, and, over time, widening or strengthening of certain road segments to preserve geometry and load-bearing capacity for major maintenance campaigns. Access roads will also be maintained through snow clearing, grading, gravel placement, and vegetation management, and high-use roads will be plowed, sanded, and/or salted as required for safe operation.

In operational terms, maintenance of the road system will therefore include regular inspections to identify settlement, rutting, erosion, washboarding, potholes, blocked drainage, or reduced sight lines; seasonal grading and surface restoration; addition of granular topping from approved quarry sources as required; ditch and culvert cleaning; localized repair of embankments, shoulders, and drainage crossings; and winter road maintenance for the roads required to support routine and emergency operations. The heavy haul road will be retained as a strategic corridor for movement of oversized equipment, specialized maintenance vehicles, and replacement components arriving through the Port of Botwood. For that reason, the operational maintenance program for the heavy haul road is expected to include periodic review of load-bearing capacity, surface condition, geometry, culvert capacity, and any route pinch points that could affect future heavy-haul transport.

Concrete batch plants are not expected to remain as principal permanent operational components of the Industrial Facility unless later design requires this. A worker accommodations camp will remain on site at the Industrial Facility.

Permanent warehousing, maintenance storage, and logistics areas will remain in service throughout the operating life of the Industrial Facility and will support receipt, inspection, storage, staging, and dispatch of spare parts, consumables, maintenance tools, safety equipment, and replacement components. These facilities are intended to store consumables, high-turnover items, low-value spare parts, and critical components, and they will include racking systems, offices, security, emergency-response equipment, and receiving and inspection functions. Warehousing areas can also serve as staging areas for cranes, forklifts, ATVs, drone equipment, graders, backhoes, snow-clearing equipment, and other service equipment required for maintenance. Applied to the Industrial Facility, operations and maintenance procedures for warehouses and storage areas are expected to include inventory control, incoming inspection, controlled storage of critical spares and consumables, preventive maintenance of lifting and handling equipment, housekeeping and waste segregation, emergency equipment inspection, access control, and periodic review of spare-parts holdings based on OEM recommendations and operational experience.

Permanent fuel and hazardous materials storage associated with support infrastructure will also remain active during operations and maintenance. Fuel storage will be located at warehouse areas for light vehicle fleets, and mobile fuel trucks may be used for larger equipment, generators, and other fuel-fired equipment. For the Industrial Facility, these retained fuel-storage and fueling systems will support operational vehicles, emergency generators, maintenance equipment, and selected mobile plant. Operations and maintenance

procedures are expected to include routine tank and dispensing-equipment inspections, leak and containment checks, inventory control, periodic testing or calibration of dispensing systems where required, inspection and replenishment of spill-response equipment, maintenance of fencing and access control, scheduled housekeeping of fueling areas, and strict compliance with site fuel-handling procedures and applicable provincial requirements. Packaging waste, damaged materials, spent absorbents, and related wastes generated from these areas will be managed in accordance with the Project waste-management procedures.

Selected laydown and marshalling areas may also remain in service after construction where needed to support major maintenance, heavy equipment mobilization, storage of oversized components, temporary staging of cranes and contractor equipment, or future replacement campaigns. Some of the support areas may therefore remain for operations and maintenance. Where laydown areas are retained, operations and maintenance activities are expected to include periodic grading and surface upkeep, drainage maintenance, vegetation control, snow clearing where required, access control, and management of temporary storage to ensure that these areas remain available for planned shutdowns, major maintenance, and emergency response.

The permanent electrical interconnection and associated utility-support infrastructure will also require ongoing operations and maintenance as part of the retained support-infrastructure package. Collector systems, gathering systems, and substations will require scheduled and unscheduled maintenance, including activities such as thermographic surveys or infrared scans, earth-wire integrity checks, hardware inspections, isolation-switch testing, grounding-system integrity checks, transformer oil sampling, and station-service transfer-system checks, with substations remotely monitored and controlled through SCADA and video surveillance. The same maintenance philosophy applies to the permanent operational interconnection and support substations associated with the Industrial Facility. Operations and maintenance procedures for retained electrical support infrastructure are therefore expected to include remote monitoring, alarm response, routine substation and line inspection, vegetation management within rights-of-way where applicable, preventative maintenance of switchgear and transformers, grounding and battery-system checks, and emergency repair protocols in the event of faults, trips, or storm damage.

Operations and maintenance of all retained support infrastructure will also be integrated with the broader site safety, environmental protection, and security programs. This includes maintenance of fencing, gates, signage, lighting, and controlled access; upkeep of drainage and erosion-control features; snow clearing and seasonal weather response; vegetation management along roads, quarries, and electrical corridors; and continued implementation of spill prevention, waste management, and emergency-response procedures at warehouses, fueling points, and other support areas. Signage will be maintained throughout the life of the Project to provide emergency and hazard information, and access routes and transmission corridors will continue to be used by maintenance personnel over the operating life of the facility.

Hydrogen and Ammonia Plan

Operations and maintenance of the hydrogen and ammonia plant will be undertaken to maximize safe, reliable, and efficient production of green hydrogen and green ammonia over the operating life of the Industrial Facility. The operation phase will involve maximizing renewable energy generation for use in the production of green hydrogen and green ammonia in a safe and environmentally responsible manner, and a detailed operations and maintenance strategy and associated guidelines will be defined in accordance with manufacturer specifications and maintenance requirements. Maintenance activities will be conducted on all assets throughout the life of the Project, and the maintenance strategy will be influenced by equipment performance warranties, lender requirements, sponsor preferences, and site-specific factors. The facility is intended to be designed for a minimum 33-year service life and to achieve a required availability of at least 96 percent, with the Project definition of availability expressly including both planned and unplanned maintenance and shutdown activities.

The Project's maintenance philosophy for the hydrogen and ammonia plant will be based on a combination of preventive, predictive, condition-based, and corrective maintenance. The Proponent intends to enter into long-term service agreements with qualified contractors for critical equipment requiring specialized skillsets, including compressors and catalyst-related systems, and vendor agreements for technology and engineering support will form part of the overall maintenance strategy. Maintenance work will be carried out on a proactive, periodic, and as-needed basis, and local contractors and service groups will be used to support long-term operations. These principles are particularly important for the hydrogen and ammonia process areas because the plant includes specialized electrolyzer systems, cryogenic air separation units, high-pressure compression systems, catalytic ammonia synthesis equipment, refrigerated ammonia storage, and integrated utility and safety systems.

Operational control of the hydrogen and ammonia plant is expected to be centered on a permanent on-site operations and maintenance organization supported by OEM specialists, long-term service providers, and specialist contractors for major shutdown and overhaul activities. Third-party operations and maintenance contracts will be implemented through operational readiness planning developed during FEED and identifying and developing those supply chains forms part of the Project's broader operational strategy. The operation of the hydrogen and ammonia plant is expected to include operations personnel, field engineers, control-room and electrical and instrumentation staff, mechanical technicians, reliability and inspection personnel, and specialist OEM or licensor support for the electrolyzer packages, compression systems, ASUs, ammonia synthesis trains, storage systems, and critical rotating equipment.

Operations and maintenance procedures for the hydrogen plant will include routine monitoring of electrolyzer performance, inspection and maintenance of package-level RO/DI systems and cooling systems, inspection and testing of rectifiers and transformers, verification of electrical connections and cabling, periodic inspection of hydrogen purification equipment, routine compressor inspections and servicing, valve and instrument checks, vent-system inspections, and periodic integrity inspections of the hydrogen storage system and associated piping and

manifolds.

Because the electrolyzer plant is designed to follow the renewable power profile and to ramp up, down, and into shutdown or start-up conditions, the operations and maintenance procedures for the hydrogen plant must also address the operational transitions associated with variable power availability. The PEM electrolyzer process allows for ramping, shutdown, start-up, and lower turndown capabilities, and hydrogen production output is prioritized to the ammonia plant, with excess hydrogen routed to storage. Operating procedures are expected to include controlled start-up and shutdown sequences, safe purge and deoxygenation procedures, isolation and lockout/tagout for maintenance, management of hydrogen routing between the ammonia plant and storage, and verification of water quality and package conditions before restart following maintenance or outage. Maintenance planning will need to take into account that portions of the hydrogen system may remain available or restart quickly while other portions are isolated for inspection or corrective work.

The hydrogen purification and compression systems will be critical reliability items because they protect downstream catalyst systems and determine the quality and pressure of hydrogen supplied to the ammonia plant and storage system. Hydrogen purification is required to remove residual oxygen and water from the hydrogen stream to achieve the required specification and avoid catalyst poisoning in the ammonia synthesis units, and hydrogen compression is required to pressurize hydrogen to storage pressure. Operations and maintenance procedures for these systems are therefore expected to include continuous monitoring of hydrogen purity and residual contaminants, inspection and replacement of purification media or consumables as applicable, calibration of analyzers and instrumentation, periodic servicing and vibration monitoring of compressors, seal and bearing maintenance, lubrication management where applicable, cooling-system checks, and inspection of relief, vent, and safeguarding systems associated with the compression trains.

The ASUs will be operated and maintained as critical plant systems because they provide nitrogen feedstock to the ammonia plant and other plant users and, under the current design basis, are not intended to cycle rapidly. The air separation units are cryogenic systems, they should not be shut down or ramped quickly, they are expected to maintain production at their turndown level using power from the grid, and they also provide nitrogen for electrolyzer maintenance purge, compressor seal gas, utility stations, and other plant users. Operations and maintenance procedures for the ASUs will therefore include continuous performance monitoring, compressor and turbine maintenance, inspection and calibration of cryogenic instrumentation and analyzers, valve and cold-box monitoring, periodic inspection of insulation and cryogenic piping, management of nitrogen receiver and utility distribution systems, and careful planning of any shutdowns so that loss of nitrogen feedstock or utility nitrogen does not create unsafe conditions elsewhere in the facility. Because the current sparing philosophy applies N+0 sparing to the ASUs, proactive maintenance and planned outages will be especially important to preserving facility availability.

The ammonia synthesis plant will be the primary downstream production system and will be

operated to synthesize ammonia from hydrogen and nitrogen at elevated temperature and pressure. Operations and maintenance procedures for the ammonia synthesis trains are expected to include continuous monitoring of process conditions and equipment performance, routine inspection and servicing of compressors and rotating equipment, catalyst performance monitoring and management, inspection of reactors, exchangers, chillers, boilers, pumps, and associated piping systems, calibration and maintenance of field instrumentation and analyzers, routine testing of trips and interlocks, and planned plant shutdowns or turnarounds for inspection, cleaning, catalyst assessment or replacement, and major mechanical work.

Because catalyst performance is central to ammonia production reliability, catalyst and synthesis-loop performance management will be a key part of operations and maintenance procedures. Catalyst systems are a specialist area likely to be covered by long-term service agreements, and catalyst poisons such as halogens, arsenic, sulphur compounds, oil, and similar contaminants must be absent from the feed streams. The Project's operations and maintenance procedures for the ammonia plant will therefore need to include routine review of feed-gas quality, process analytics, catalyst performance indicators, and operating history, together with planned inspection and maintenance activities for catalyst protection systems, feed purification systems, oil-free or low-contamination equipment selection, and management of planned catalyst change-out or rejuvenation campaigns as determined by vendor requirements and operating performance.

The ammonia refrigeration, steam-generation, and energy-recovery systems will also require regular operation and maintenance procedures because they are closely integrated with the synthesis trains and product storage. Operations and maintenance procedures for these systems are expected to include monitoring of steam-system chemistry and boiler-feed-water quality, inspection and maintenance of pumps and rotating equipment, inspection of chillers, separators, and heat exchangers, blowdown system checks, condenser and cooling-system inspections, turbine-generator maintenance, insulation inspections, and routine testing of controls and alarms. Treated water storage will be provided to support the ammonia synthesis facility during trips or maintenance of the water treatment system, which reinforces the need for coordinated operations and maintenance procedures between the ammonia utility systems and the broader plant water systems.

The ammonia storage system will be operated and maintained as the interface between ammonia production and marine export. Operations and maintenance procedures for the ammonia storage area are expected to include tank-level and pressure monitoring, boil-off gas system operation and maintenance, periodic inspection of tank foundations, shell and roof systems, insulation and containment, relief and vent systems, transfer pumps, loading pump interfaces, instrumentation, and overfill and safeguarding systems. Planned maintenance activities are expected to be coordinated with shipping schedules and ammonia inventory management so that one tank or part of the storage system can be inspected or serviced without compromising facility availability.

The flare, vent, drain, and safeguarding systems associated with the hydrogen and ammonia

plant will also require routine operation and maintenance. Two flares are required for the Project, they are not intended for normal operation, and they will be used for emergency scenarios and maintenance. Local hydrogen and oxygen vents will be provided at safe locations, hydrogen may be vented during start-up, shutdown, maintenance, or upset conditions, and drain systems will be provided across the site. Operations and maintenance procedures for these systems are therefore expected to include inspection and maintenance of flare headers, flare tips, ignition systems, seal drums, purge systems, valves, vent stacks, relief devices, drain systems, and flare and vent instrumentation; periodic functional testing of ignition and detection systems; inspection of nitrogen purge arrangements; and review of flaring and venting events as part of process safety and environmental reporting. Because the flares are tied to emergency and maintenance use rather than continuous service, maintenance procedures must ensure that they remain fully available and functional even during long periods of non-use.

The hydrogen and ammonia plant will also be maintained as part of a broader utility, controls, and safety-system framework. The ammonia plant utilities include electrical power, normal and emergency power, UPS, plant and instrument air, nitrogen, fire water, hydrogen and oxygen vent systems, flare systems, drains, and cooling medium. Continuous control and monitoring systems will monitor the production process, power supply, and other critical parameters. Operations and maintenance procedures for the hydrogen and ammonia plant will therefore include maintenance of instrument air systems, nitrogen utility systems, chilled-water and air-cooling systems, normal and emergency electrical supply systems, UPS systems, process control systems, fire and gas systems, and communications interfaces. Preventive maintenance will include calibration of instruments and analyzers, inspection and testing of valves and actuators, maintenance of control-system hardware and software, battery and UPS checks, and routine verification of alarm, trip, and shutdown logic.

Because the current design basis applies a defined sparing philosophy and a demanding availability target, operations and maintenance planning for the hydrogen and ammonia plant will be closely tied to reliability and outage management. The sparing philosophy applies N+0 sparing to the air separation units, main compression systems within the ammonia plant, and electrolyzer stacks, while N+1 sparing is applied to pumps and utility and hydrogen-to-storage compression systems. This means that the Project's operations and maintenance procedures will need to place particular emphasis on reliability-centered maintenance, planned outages, predictive monitoring, inventory of critical spare parts, and timely OEM intervention for equipment without installed redundancy. Maintenance planning will also need to balance scheduled shutdowns, unplanned equipment failures, and the Facility's target availability.

Routine operation of the hydrogen and ammonia plant will also require close integration with environmental and safety management systems. Robust safety systems, leak detection, emergency response plans, greenhouse-gas minimization measures, and waste management procedures will be implemented as part of operational activities, and the design and safety basis includes spill-containment measures, spill-clean-up systems, personnel training, and emergency-response plan enactment. Operations and maintenance procedures for the

hydrogen and ammonia plant are therefore expected to include routine inspection of spill-containment systems, bunds and drains, emergency equipment, gas detection and leak-detection systems, waste handling arrangements, water and effluent interfaces, and procedures for emergency shutdown, isolation, purging, confined-space entry, hot work, and maintenance in hazardous areas. Regular drills, refresher training, and permit-to-work systems will also form part of the operational maintenance framework.

Electrical Energy Storage

The BESS will be operated and maintained to ensure safe, reliable, and continuous support of critical and emergency loads within the Industrial Facility. The system is expected to have an operational lifespan of approximately 20 to 25 years and will play a key role in stabilizing power supply, smoothing variability from renewable generation, and supporting sensitive loads such as the air separation and ammonia plants. Operations will be primarily managed remotely through an on-site control facility, supplemented by periodic on-site inspections and maintenance activities.

The BESS OEM team will consist of a combination of EVREC personnel and OEM specialists, including operators, engineers, and technicians. Maintenance will be conducted in accordance with OEM guidelines and will include both preventative and corrective activities. While the overall maintenance philosophy is defined, the specific procedures, intervals, and requirements will be finalized once the BESS technology and supplier are selected, as the Project is currently evaluating multiple battery chemistries.

Day-to-day operation of the BESS will rely on continuous remote monitoring systems, including battery management systems, power conversion systems, and enclosure-level controls. These systems will track key performance indicators such as state of charge, temperature, system health, and alarm conditions. On-site personnel will respond to alarms, conduct inspections, and perform maintenance, ensuring that the system remains available and operates within safe parameters.

Routine maintenance will focus on battery modules and associated balance-of-plant systems, including HVAC systems, fire detection and suppression systems, power conversion equipment, and electrical infrastructure. Regular inspections, testing, and servicing will be carried out to maintain system integrity, including verification of safety systems, thermal management, electrical connections, and control systems. Predictive and condition-based maintenance will also be implemented using performance data and system diagnostics to proactively address potential issues and optimize long-term reliability.

Over the long term, BESS operations will also address system degradation, capacity management, and lifecycle replacement. Capacity refresh or augmentation is anticipated around year 20, depending on system performance and OEM guidance. Corrective maintenance procedures will include fault isolation, component replacement, and system restoration, supported by spare parts inventory and contractor support. Overall, the BESS O&M strategy will integrate safety, reliability, and lifecycle management to ensure sustained

performance and alignment with Facility operational requirements.

Ammonia Transport and Ship Loading

Operations and maintenance of the ammonia transport and ship loading system will be undertaken to ensure the safe, reliable, and controlled transfer of refrigerated liquid ammonia from the CPF to the ship-shore interface at the Port of Botwood. The system is based on a closed-loop loading philosophy intended to prevent routine releases, with vapours captured and returned to storage via the BoG system and only emergency or upset conditions routed to flare. This design prioritizes safety, containment integrity, and environmental protection over the life of the facility.

The export facilities will be operated by trained personnel located at the jetty, Industrial Facility, or through an integrated control system. The operations and maintenance team will include operators, technicians, and specialized vendor support for critical systems such as loading arms, pumps, BoG systems, and safety equipment. Operations will focus on safe coordination between the CPF and marine terminal, with clearly defined roles and responsibilities for both EVREC and vessel operators.

Routine operations will center on controlled ammonia loading procedures, including system cooldown, verification of ship-shore connections, gradual ramp-up of loading rates, and management of vapours and residual ammonia. Two scenarios are considered: normal loading of ammonia-ready vessels and less frequent handling of air-filled vessels returning from dry dock, which require additional purging and conditioning. Detailed operating procedures and coordination protocols will be required for both scenarios to ensure safe and efficient transfer operations.

The ammonia pipeline and transfer system between the CPF and jetty will require continuous monitoring and maintenance to ensure containment, temperature control, and pressure stability. Key components include storage tanks, loading pumps, vapour return systems, and jetty-side equipment such as loading arms and metering systems. Operations and maintenance activities will include inspection of piping, valves, instrumentation, leak detection systems, and verification of vapour return performance, along with an ongoing integrity management program for the transfer corridor.

Critical safety systems including gas detection, emergency shutdown valves, pressure relief systems, and electrical isolation systems will be regularly inspected and tested to ensure reliable operation. The BOG system plays a central role in preventing routine flaring by returning vapours to the CPF for reliquification, and maintenance procedures will include monitoring pressures, testing standby systems, and ensuring rapid recovery from system trips. The jetty flare will be maintained as a backup safety system for abnormal or emergency conditions.

Key operational equipment such as loading pumps, loading arms, fiscal metering systems, and nitrogen purge systems will require routine preventative and corrective maintenance. This

includes monitoring performance, inspecting mechanical and electrical components, calibrating measurement systems, and ensuring proper operation of purge and inert systems. These systems are both safety-critical and commercially critical, requiring high reliability and strict adherence to maintenance and inspection protocols.

Overall operations and maintenance will be closely integrated with marine logistics, safety systems, and facility operations. Coordination with vessel schedules, maintenance planning around shipping windows, and readiness for both normal and upset conditions will be essential. Long-term maintenance planning will include spare parts management, OEM support, inspection programs, and contingency procedures to ensure the export system remains reliable, safe, and aligned with both operational and environmental objectives.

Water Management System

Operations and maintenance of the water system will be undertaken to provide a safe, reliable, and continuous supply of raw water, treated process water, potable water, and firewater to the Industrial Facility, while also ensuring that stormwater, process-affected water, sanitary wastewater, and treated effluent are collected, managed, treated, stored, and discharged in compliance with applicable requirements.

The overall operational objective of the water system will be to maintain continuous availability of water to the Industrial Facility while preserving compliance at the final discharge points and protecting surrounding surface-water resources. Operations and maintenance procedures for the water system will include continuous monitoring, routine inspection, preventive maintenance, periodic testing and sampling, corrective maintenance, seasonal weather response, and environmental compliance verification across all water-related utilities and treatment facilities.

The Peters Pond intake, pumphouse, and raw water conveyance system will be operated and maintained as the permanent raw water source for the Industrial Facility. Peters Pond is located approximately 6 km from the Industrial Facility, and a pump station with three high-power pumps and two standby pumps will deliver water to the main site and discharge it into a holding reservoir. Operations and maintenance procedures for this source system are expected to include regular inspection and maintenance of the intake structure, rotary screens or other debris-removal equipment, suction and discharge headers, raw water pumps, variable speed drives, electrical panels, local transformers or step-down equipment, isolation valves, and instrumentation. Routine operations will include monitoring intake performance, raw water flow, pump availability, electrical status, and debris loading at the intake, together with periodic cleaning of screens, seasonal inspection of intake conditions, and corrective maintenance of pumps, motors, and controls as required. The raw water pipeline between Peters Pond and the Industrial Facility will also require periodic patrols and integrity inspections, including checks for leakage, support or alignment issues where above-ground segments are used, and verification of pipe condition, valves, and tie-ins.

The raw water storage system will be operated to buffer fluctuations between pond withdrawal

and on-site consumption and to maintain continuity of supply to the water treatment system. Raw water will be discharged into a holding reservoir, and an atmospheric tank will be installed to store 24 hours of peak raw water supply. Operations and maintenance procedures for this component are expected to include monitoring of storage levels, inlet and outlet flows, overflow conditions, and storage quality; inspection of tanks, reservoirs, foundations, valves, and level instrumentation; maintenance of overflow and drainage arrangements; sediment management where applicable; and seasonal inspection of storage structures for ice-related effects, embankment stability, or seepage issues. Because the raw water storage system provides the first on-site buffer for the facility, operators will use it to balance source availability against treatment demand and to maintain a reserve during short interruptions to intake or pumping operations.

The water treatment system will be operated and maintained to produce the filtered, demineralized, and potable water qualities required by the Industrial Facility. Operations and maintenance procedures for the central and package-level treatment facilities are therefore expected to include routine monitoring of raw water quality, membrane performance, flow rates, pressures, conductivity, rejection performance, and treated-water quality; scheduled cleaning or replacement of ultrafiltration, reverse osmosis, and electro-deionization membranes or consumables; inspection and servicing of pumps, valves, instruments, analyzers, and chemical dosing systems; management of reject water and backwash streams; and calibration of quality-monitoring instruments. Because feedwater quality directly affects both electrolyzer performance and ammonia steam-generation systems, water-treatment operations and maintenance will also include response procedures for off-spec water, membrane fouling, equipment trips, and temporary operation on stored treated-water inventory during maintenance or upset conditions.

The potable water system will be operated to provide treated water for drinking, washrooms, offices, kitchens, warehouse and maintenance areas, and other common facilities. Operations and maintenance procedures for the potable water system are expected to include routine quality sampling and testing, inspection and maintenance of the potable water treatment package, storage and distribution systems, flushing of lines where necessary, maintenance of pumps and controls, and periodic verification that all potable-water outlets, service connections, and storage facilities remain clean, functional, and protected from cross-contamination with non-potable systems.

The filtered-water, demineralized-water, and plant water distribution systems will be operated to supply the relevant process and utility users throughout the Industrial Facility. Operations and maintenance procedures for these distribution networks are expected to include monitoring of flows, pressures, levels, and demand patterns; inspection and maintenance of pumps, valves, strainers, and branch connections; leak detection and repair; management of make-up water to cooling systems; and periodic flushing, cleaning, and integrity inspection of the main and branch pipework serving the hydrogen and ammonia facilities. Because the water system is tied to steam generation, cooling, electrolysis feedwater, and utility service, plant operators will also coordinate the water-distribution system closely with process startup, shutdown,

maintenance isolation, and restart activities.

The firewater system will be maintained as a dedicated safety utility serving the process areas, ammonia storage area, buildings, and other fire protection users. Operations and maintenance procedures for the firewater system are expected to include inspection and testing of firewater pumps, jockey pumps, tank levels or storage reserves, hydrants, valves, ring mains, and associated alarms and controls; periodic pump run tests and flow tests; maintenance of pipework and freeze protection as required by climate; and coordination with the broader facility emergency-response and firefighting systems. Because the firewater system is safety-critical, it will be maintained in a state of immediate availability even during periods of low routine demand.

The stormwater and rainwater diversion system will be operated and maintained to keep clean, non-contact runoff separate from process-affected water and to prevent erosion, flooding, and sediment transport around the Industrial Facility. Operations and maintenance procedures for the stormwater and diversion system are expected to include inspection and maintenance of perimeter ditches, culverts, catch basins, outlet structures, erosion protection, and any rainwater collection features; sediment removal from ditches and culverts; vegetation management to preserve drainage capacity; inspections following major rainfall or spring thaw; and repair of erosion, slumping, blocked outlets, or damaged riprap. Where roof-rainwater collection is implemented for reuse, that system would also require routine inspection, cleaning, and water-quality management.

The oily water collection and treatment system will be operated to collect and treat rainwater and wastewater potentially contaminated with hydrocarbons or oil before discharge to the stormwater/effluent pond. Operations and maintenance procedures for this system are expected to include inspection and cleaning of curbed areas, drain inlets, oily water sewer lines, local oily-water sumps, equalization tanks, oil skimmers, corrugated plate interceptor and induced gas flotation units, wastewater feed pumps, water seals, and underflow weirs; monitoring of influent and effluent quality; management of recovered oil, solids, and sludge; and routine testing and maintenance of the treatment package to ensure continued removal of oil and suspended solids.

The ammonia-contaminated wastewater system will be operated to collect and process water potentially contaminated with ammonia before release to the stormwater/effluent pond. Operations and maintenance procedures for this system are therefore to include inspection of curbed areas and drains, monitoring and maintenance of the covered sump, pumps, nitrogen blanketing and flare vent interfaces, and operation of the stripper-column treatment path. Because this system is tied directly to ammonia process safety and environmental protection, operators will also need procedures for isolating ammonia-contaminated drains during maintenance, verifying nitrogen blanket integrity, and responding to spills or abnormal drain loading events.

The sanitary wastewater system will be operated and maintained separately from the industrial

wastewater systems. Operations and maintenance procedures for the sanitary system are expected to include routine inspection and operation of treatment packages, wet wells, grinders and pumps, clarifiers, aeration systems, disinfection systems, odour-control equipment, sludge handling, and sanitary mains, together with periodic sampling and verification that treated sanitary effluent meets applicable discharge criteria before routing to the final discharge system or municipal sewer arrangement confirmed during detailed design.

The stormwater/effluent pond will be operated as the final on-site storage, equalization, and management point for a combination of non-contact runoff, treated effluents, reject process water, and firefighting water before reuse or controlled discharge. Operations and maintenance procedures for the pond are therefore expected to include regular inspection of water levels, embankments, inlet and outlet structures, freeboard, erosion protection, and sediment accumulation; monitoring of inflows and discharges; removal of recovered oil where applicable; vegetation management; seasonal inspection for freeze-thaw or ice-related effects; and coordination with emergency response in the event firefighting water or abnormal process discharges are routed to the pond.

The outfall and effluent discharge system will be operated and monitored to ensure that any water released from the Industrial Facility meets applicable Newfoundland and Labrador and Canadian Council of Ministers of the Environment requirements. Operations and maintenance procedures for the outfall system are therefore expected to include routine effluent sampling, water-quality testing, monitoring of discharge frequency and timing, inspection and maintenance of outfall structures, recordkeeping and reporting to regulators as required, and response procedures for off-spec water or abnormal discharge conditions.

Ongoing water-system operations and maintenance will also include management of reject water, backwash streams, sludges, and process wastewater generated during maintenance activities. Backwash water from the filter-water system will be directed to the stormwater drains and then to the stormwater/effluent pond, removed solids from the effluent treatment package will be collected as sludge in a designated container for off-site disposal, and any process wastewater collected during maintenance activities will be collected in a holding tank and periodically removed by a licensed hauler. Operations and maintenance procedures should therefore include management of these residual streams, scheduling of sludge and waste removal, maintenance of holding tanks or temporary containment used during maintenance outages, and coordination with licensed waste haulers or approved disposal facilities.

Because the water system interfaces with nearly every major part of the Industrial Facility, operations and maintenance of the water system will be closely coordinated with the hydrogen plant, ammonia plant, buildings, drainage systems, and emergency response procedures. This includes planning and permitting temporary water isolation during maintenance, maintaining treated-water supply during treatment-system outages, using stored treated-water inventory where provided, coordinating water-quality verification before restarting critical process systems, and ensuring that wastewater and effluent systems remain available during flushing, draining, or plant shutdown activities. Overall, water-system operations and maintenance will

focus on maintaining source reliability, treated-water quality, drainage performance, wastewater treatment effectiveness, and compliant discharge performance over the life of the Project.

Emergency Diesel Generators

The Industrial Facility will include emergency diesel backup generators to provide power for safe standby, controlled shutdown, black-start capability, and critical-load support during periods when renewable generation, battery storage, and grid supply are unavailable. These generators are safety-critical systems and are not intended for continuous operation, but rather for emergency events, commissioning, and periodic testing.

The Facility will include multiple diesel generators, supported by additional diesel-driven systems. These units are expected to operate intermittently under abnormal conditions or low renewable availability and will use Tier 4 low-NOx engines with low-sulphur diesel fuel to minimize emissions.

Operations and maintenance will focus on ensuring high reliability and immediate availability, given the standby nature of the equipment. This will include continuous monitoring, routine inspections, and preventative maintenance of engines, alternators, fuel systems, cooling systems, control systems, and associated electrical infrastructure, supported by qualified personnel and maintenance programs.

Periodic reliability testing will be a key requirement, including scheduled test runs, verification of auto-start functionality, testing of emergency power transfer systems, and performance checks under load conditions. Fuel systems will be closely managed to ensure quality and availability, including inspection of storage tanks, fuel sampling, and maintenance of sufficient inventory for emergency use.

The generators will also be integrated into the Facility's broader electrical, safety, and environmental management systems. Maintenance will include testing of control interfaces, switchgear, and protection systems, as well as compliance with emissions requirements and operational controls to minimize unnecessary runtime. Procedures will also address abnormal operation and post-event recovery to ensure the generators remain in a ready and reliable standby condition.

7.1.3.5 Decommissioning and Rehabilitation

Decommissioning and rehabilitation of the Industrial Facility will occur at the end of the Project life, or earlier if the facility is permanently shut down, repowered, repurposed, or otherwise retired from service. The main facility elements are expected to have a minimum 33-year life cycle, and an Asset Retirement Obligation (Appendix Q.7) plan has been prepared to guide future decommissioning and demolition activities. Decommissioning and demolition are understood as a structured end-of-life program intended to place the facility in a safe, zero-energy, and environmentally neutral state, remove or retire plant assets, manage wastes and salvage, and restore the site to a stable post-project condition.

Decommissioning and rehabilitation should be understood as two related but distinct stages. Decommissioning comprises the activities required to place the facility in a zero-energy and environmentally neutral state and to prepare the plant for demolition, while demolition comprises the physical removal, by mechanical means, of above- and below-grade structures, utilities, equipment, and associated appurtenances. The overall closure phase for the Industrial Facility is expected to include safe isolation and purging of equipment; draining and removal of liquids and residual chemicals; characterization and segregation of waste streams; equipment liquidation or sale where feasible; dismantling and removal of process equipment, buildings, storage systems, pipelines, and associated infrastructure; recycling or reuse of recoverable materials to the extent practical; disposal of residual waste at approved facilities; final grading and stabilization of disturbed areas; and revegetation or handover of retained assets, depending on the final closure strategy adopted at that time.

The final closure strategy may not be limited to full removal of all infrastructure. Certain assets may retain value at the end of the initial Project life and could potentially be repurposed, sold, transferred, or left in place for future industrial or redevelopment uses. Port facilities and some core assets, such as energy storage systems, have already been identified as potential candidates for future reuse or repurpose, and certain facilities and equipment may remain in place temporarily or permanently to support demolition activities, station service, fire protection, security, water supply, or future redevelopment. Accordingly, the decommissioning and rehabilitation strategy for the Industrial Facility should be described as a flexible end-of-life framework that prioritizes safety, environmental protection, regulatory compliance, and optimal reuse or recovery of assets where feasible, rather than assuming that every component will necessarily be removed in all circumstances.

Prior to the start of decommissioning, a detailed decommissioning plan will be prepared and submitted to the NLECCC, Director of Regulatory Compliance. This future decommissioning plan will identify and discuss the proposed decommissioning activities and schedule for the energy center site, transmission line corridor, and all appurtenant facilities constructed as part of, or because of, the Project. It will also identify the laws, ordinances, regulations, standards, and local or regional plans applicable at the time of closure; explain how the proposed decommissioning activities will comply with those requirements; and include an analysis of decommissioning alternatives, including restoration to the pre-construction natural state, together with the rationale for the selected approach.

Current retirement planning anticipates that decommissioning and demolition of the Project could take approximately 16 to 24 months, with certain planning, valuation, and equipment-marketing activities occurring before physical execution begins. For the Industrial Facility, decommissioning is expected to occur over a multi-month to multi-year period, with the final duration dependent on the extent of asset removal, the amount of equipment sold or retained, the pace of demolition and waste removal, seasonal construction constraints, and the degree of future reuse or redevelopment pursued at the site.

Environmental protection during decommissioning and rehabilitation will remain a core Project

requirement. Decommissioning and demolition activities will comply with all applicable laws, ordinances, regulations, and standards. For the Industrial Facility, decommissioning and rehabilitation activities will be expected to include control of residual chemicals and contaminated materials, management of demolition debris and wastewater, spill prevention and response, dust suppression, erosion and sediment control, protection of drainage features and retained ponds, and final stabilization of disturbed areas.

A key principle of the decommissioning and rehabilitation strategy is that materials and equipment will be reused, recycled, refurbished, salvaged, or disposed of according to their condition, marketability, and regulatory status at the time of retirement. Recovered equipment, materials, and other assets are expected to partially fund the asset retirement obligations, and ferrous and non-ferrous metals, electrical equipment, process equipment, and other high-value materials may be removed for resale, refurbishment, or off-site recycling. The preliminary disposition philosophy for major project components is disconnect, disassemble or remove, and sell to a new user where feasible, with demolition and sale as recycled metal as the fallback approach where resale is not feasible.

Several assets and systems may remain in place either temporarily or permanently through the closure period. These include, under the current high-level plan, the warehouse, selected lower-voltage service connections needed to serve the control room, warehouse, or fire systems, firewater pumps and associated underground piping and hydrants, the main substation and connection to grid power, battery systems placed in a safe storage condition in accordance with manufacturer recommendations, site security equipment, raw-water and stormwater ponds, the main water pumphouse and main water supply line, and any equipment or assets that may be useful for future redevelopment. This is important because it means the Industrial Facility decommissioning approach is not simply full removal of every asset. Instead, the strategy contemplates phased retirement, temporary retention, safe storage, and future-use handover where appropriate.

Pre-Construction Support Infrastructure

Decommissioning pre-construction support infrastructure will involve the staged retirement, removal, repurposing, or retention of facilities that supported construction and operation of the Industrial Facility, including laydown areas, camps, warehouses, roads, quarries, batch plants, and fueling systems. Activities will be sequenced to ensure that essential infrastructure remains available to support demolition, logistics, utilities, and worker services until no longer required.

Initial activities will include demobilization of personnel, removal of temporary facilities such as camps, offices, fencing, and construction trailers, and clearing of materials, equipment, and stored inventory from laydown and storage areas. Warehouses and permanent buildings may be retained temporarily for demolition support or future use, or demolished once no longer required, with reusable materials salvaged and remaining structures dismantled and recycled.

Site infrastructure will be decommissioned selectively based on future land use. Laydown and

staging areas will be cleared, regraded, and rehabilitated, while access roads, bridges, and culverts may remain in place and the heavy haul road will be regraded to meet municipal requirements. Quarries and borrow areas will be stabilized and rehabilitated, batch plant facilities removed and cleaned up, and fuel storage areas decommissioned through removal of fuels, cleaning of tanks, and remediation of any contaminated soils.

Certain utilities and site services, including lower-voltage systems and firewater infrastructure, may remain temporarily or permanently to support demolition or future redevelopment. Environmental protection measures will focus on waste management, contamination control, erosion and sediment management, and restoration of disturbed areas through grading, placement of organics, and revegetation, with all activities conducted in accordance with applicable regulatory requirements.

Hydrogen and Ammonia Plant

Decommissioning of the hydrogen and ammonia plant will involve the safe isolation, de-energization, purging, cleaning, dismantling, and removal of all major process systems and associated infrastructure to place the facility in a zero-energy and environmentally neutral state. This will occur only after permanent shutdown and regulatory approvals are in place and will be executed in three phases: initial isolation and material removal, demolition of plant systems and equipment, and final site restoration and closure.

Initial decommissioning activities will focus on controlled shutdown of all process units, including the hydrogen plant, ammonia plant, air separation units, storage systems, and utilities. All systems will be disconnected from power and utilities, drained of fluids, purged of gases, and verified free of hazardous materials prior to dismantling. Regulated materials, including chemicals, oils, sludges, catalysts, and contaminated residues, will be identified, removed, and transported off site for appropriate disposal or recycling.

Following isolation, the Project will assess all major equipment for potential reuse, resale, or recycling. Key assets such as electrolyzers, air separation units, compressors, heat exchangers, and water treatment systems may be selectively dismantled and removed for reuse where feasible, while other components such as storage tanks and heavily integrated structures will be demolished and recycled. Hydrogen systems, including electrolyzers and compression equipment, will be disassembled and removed, while hydrogen storage systems will be depressurized, dismantled, and recycled.

The ammonia plant and associated systems will be decommissioned after all ammonia has been removed and equipment has been cleaned and gas-freed. Process equipment, including synthesis trains, compressors, refrigeration systems, and piping, may be selectively dismantled for reuse, while ammonia storage tanks and certain structural components will typically be demolished and recycled. Air separation and gas treatment systems will be similarly dismantled or demolished depending on their condition and potential for reuse. Foundations, subsurface piping, and utilities will be removed or abandoned in place based on accessibility and future land use, with appropriate capping, filling, and documentation.

Environmental protection during decommissioning will focus on preventing releases, managing contaminated materials and wastewater, controlling dust and debris, and restoring disturbed areas. Certain infrastructure may be retained temporarily or permanently to support demolition or future redevelopment. The overall decommissioning program is expected to be completed over approximately 16 to 24 months, including phased demolition, site grading, and final stabilization in accordance with applicable regulatory requirements.

Electrical Energy Storage System

Decommissioning of the BESS will involve the safe de-energization, isolation, discharge, and removal of battery systems and associated infrastructure following cessation of operations. Initial activities will focus on placing the system into a zero-energy, stable condition, including controlled shutdown, isolation from the electrical network, and adherence to manufacturer requirements for safe storage, thermal management, and fire protection. Equipment may be temporarily retained in a safe storage state to support demolition activities or future reuse.

The primary decommissioning approach will be selective disassembly and removal of BESS components for reuse, resale, or refurbishment where feasible, including battery containers, modules, power conversion systems, transformers, and electrical equipment. Where reuse is not viable, systems will be dismantled and recycled, with recovery of metals and other valuable materials. All regulated materials, including battery modules and associated wastes, will be safely removed, packaged, and transported off-site through licensed contractors in accordance with applicable requirements.

Decommissioning will proceed in phases, including initial shutdown and material removal, dismantling of equipment and electrical infrastructure, and final site restoration. Foundations, cabling, and subsurface infrastructure will be removed or abandoned in place depending on future land use, with site grading and stabilization completed at closure. Environmental protection measures will focus on electrical and fire safety, containment of hazardous materials, proper waste management, and restoration of disturbed areas.

Ammonia Transport and Ship Loading

Decommissioning of the ammonia transport and ship loading system will commence following permanent cessation of export operations and once the ammonia plant, storage, and transfer systems have been safely isolated, depressurized, drained, and gas-freed. Residual ammonia will be recovered through the boil-off gas system or returned to storage prior to dismantling, ensuring all systems are verified ammonia-free before further work proceeds.

The decommissioning program will focus on removal of ammonia-specific infrastructure, including export pipelines, vapour return and cooldown lines, loading arms, pumps, metering systems, and associated control and safety equipment. These components will be cleaned, disconnected, and either removed for reuse, recycling, or disposal, while underground pipelines may be selectively removed or abandoned in place. Jetty-side equipment will be dismantled with appropriate precautions, and the jetty flare system will be retired once all ammonia-service systems are fully decommissioned. Marine structures such as the jetty and

berth may be retained or removed depending on future redevelopment plans.

Decommissioning will be carried out in phases, including system isolation, equipment removal, and final site restoration. Environmental protection measures will focus on preventing ammonia release, managing contaminated materials and wash water, protecting marine and shoreline environments, and stabilizing disturbed areas. All waste will be handled and disposed of through licensed facilities in accordance with applicable regulatory requirements.

Water Management System

Decommissioning and rehabilitation of the water system will be undertaken through a staged program involving shutdown, isolation, draining, cleaning, disconnection, and selective removal or retention of infrastructure associated with raw water supply, treatment, storage, distribution, stormwater, and wastewater systems. Initial activities will include disconnection from utilities, draining of fluid systems, and removal of residual materials, while certain systems (e.g., firewater, potable water, and selected storage or conveyance infrastructure) may remain temporarily in service to support demolition activities and site safety.

A key principle of the decommissioning approach is selective retention and reuse. Infrastructure such as the raw water intake and pumphouse, main water supply lines, storage tanks, and stormwater management systems may be retained, repurposed, or dismantled depending on future site use and feasibility. Water treatment systems and storage tanks will generally be drained, cleaned, and either disassembled for reuse or demolished and recycled where reuse is not practical. Waste materials, including residual chemicals, sludges, and contaminated liquids, will be removed and managed through licensed waste disposal pathways.

Wastewater, oily water, and ammonia-contaminated systems will be decommissioned with particular care, including removal of residual liquids and sludges, cleaning and decontamination, and controlled dismantling. Sanitary systems will remain operational as required to support workforce needs and will be decommissioned once no longer required. Subsurface piping and utilities will be removed where accessible or otherwise abandoned in place following cleaning, capping, and documentation in accordance with applicable requirements.

Stormwater management systems, including diversion ditches and retention ponds, are expected to remain in place and operable where feasible. Environmental protection during decommissioning will focus on preventing uncontrolled releases, maintaining stormwater controls, managing contaminated materials, and restoring disturbed areas through grading and revegetation.

Decommissioning of the water system will occur over multiple phases, including initial shutdown and material removal, dismantling of treatment and distribution systems, and final site restoration and stabilization. The overall decommissioning program is expected to be completed over an approximate 16- to 24-month period.

7.2 Air Quality

7.2.1 Overview

The assessment of the atmospheric environment will incorporate weather and climate, as well as ambient air quality considerations. Weather and climate baseline conditions have been obtained from regionally available meteorological data. Air quality baseline data has been collected from a local ambient air quality monitoring station.

To characterize anticipated project-related impacts and determine the potential effects, a preliminary air study report conducted by io consulting was developed using an inventory of air emissions (io consulting, 2026a, 2026b). These reports considered four facility operating cases, including:

- Normal Operations,
- Commissioning,
- Abnormal Operations (Section 14.0), and
- Operational Upset/Emergency Relief (Section 14.0)

Note that additional operational scenarios (Abnormal Operations and Emergency Upset Operations) are discussed in greater detail in Section 14.0.

7.2.2 Regulatory Context

Relevant legislation includes:

- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)
- Air Pollution Control Regulations (Newfoundland and Labrador, 2022b)

Relevant standards include:

- Canadian Ambient Air Quality Standards (CAAQS) (CCME, n.d.-b)

7.2.3 Desktop Assessment Methodology

The assessment was completed through a review of the following resources:

- ECCC Canadian Climate Data (ECCC, 2026)
- NL Ambient Air Quality Data (provided by NLECCC)
- Determination of Compliance with the Ambient Air Quality Standards (Barrie Lawrence, 2012)

7.2.4 Desktop Assessment Results

7.2.4.1 *Weather and Climate*

Four meteorological data sources were considered for use, including Badger (Climate ID 8400301), Twillingate (Climate ID 8404025), Comfort Cove-Newstead (Climate ID 8401259) and Gander International Airport (Climate ID 8401703). Parameters such as heat flux, mixing

height, wind speed, wind direction, ambient air temperature, precipitation rate, relative humidity and cloud cover were reviewed. The meteorological data obtained from the Gander International Airport, located approximately 60 km southeast of the IPA, were analyzed to generate seasonal climate parameters as this data set provided the most continuous and representative meteorological conditions near the Project Area (Table 7.2.1) (ECCC, 2026; io consulting, 2026a). Although data sets were available for Badger, Twillingate, and Comfort-Cove Newstead, they contained data gaps or were not representative (i.e., were more reflective of coastal vs. inland conditions) (io consulting, 2026a).

This analysis considered meteorological data collected from the Gander International Airport over a continuous three-year period from 2022 to 2024 (io consulting, 2026a).

Table 7.2.1: Climate Data from the Gander International Airport Meteorological Stations (2022-2024)

Time Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (°C)													
Daily Avg.	-4.9	-6.1	-2.0	2.1	6.7	13.2	19.7	18.3	13.9	8.7	1.7	-1.2	5.8
Daily Max.	-0.9	-2.1	1.3	6.0	11.9	18.5	25.0	23.2	18.2	12.8	4.5	1.7	10.0
Daily Min.	-8.9	-10.0	-5.3	-1.8	1.5	7.8	14.2	13.3	9.4	4.5	-1.2	-4.1	1.6
Extreme Max.	10.7	9.9	12.2	15.8	23.4	33.3	32.2	31.4	27.9	22.2	18.4	14.7	21.0
Extreme Min.	-19.2	-21.5	-15.5	-9.0	-2.2	-1.0	8.3	6.5	2.0	-2.2	-10.9	-12.8	-6.5
Precipitation (mm)													
Precipitation	55.8	64.1	51.8	39.1	70.8	89.3	60.0	71.7	73.7	76.4	154.8	69.4	876.8

(ECCC, 2026)

Between 2022 and 2024, the mean annual temperature was 5.8°C, with a mean daily maximum of 10.0°C and a mean daily minimum of 1.6°C. January and February were the coldest months (mean daily average of -4.9°C and -6.1°C, respectively), while the warmest months were July and August (mean daily average of 19.7°C and 18.3°C, respectively). The mean annual precipitation was 876.8 mm, with June and November having the highest precipitation (89.3 mm and 154.8 mm, respectively) (ECCC, 2026).

Wind speed and direction data were also obtained from the Gander International Airport meteorological station (Table 7.2.2) for the three-year period from 2022 to 2024.

Table 7.2.2: Wind Data from the Gander International Airport Meteorological Station (2022-2024)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Hourly Speed (km/h)	110	100	113	94	84	80	73	77	99	73	101	100
Most Frequent Direction	SW	NW	NW	NE	NE	SW	SW	SW	NW	SW	NW	SW

(ECCC, 2026)

The maximum hourly wind speeds recorded at the Gander International Airport meteorological station ranged from 73 km/h in July and October to 113 km/h in March. The most prevalent wind direction observed is from the southwest. Wind directions will vary; and the direction during calm wind flows is not recorded at the meteorological station (ECCC, 2026).

A windrose plot of the annual wind speed and direction at Gander International Airport from 2022 to 2024 was generated by io consulting (2026a) (Figure 7.2.1). Calm to moderate wind speeds (0 m/s to 10.80 m/s) were predominant in the southwest (Appendix D.1).

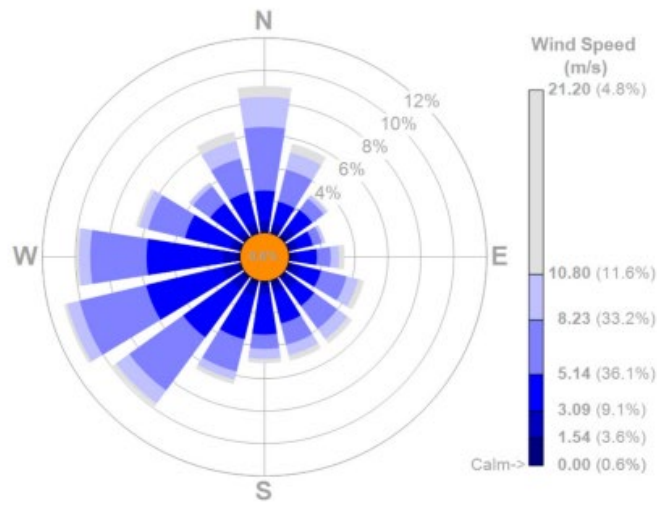


Figure 7.2.2: Windrose Plot – Annual Wind Speed and Direction 2022 to 2024 (Appendix D.1).

7.2.4.2 Air Quality

The Government of NL has legislated the Air Pollution Control Regulations (Newfoundland and Labrador, 2022b), under the *Environmental Protection Act* (Newfoundland and Labrador, 2002a). The air quality standards published (Schedule A, Table I) in the NLAPCR set the maximum permissible ground-level concentration limits. In addition, the NLAPCR also sets air quality standards for air zone management (Schedule A, Table II), which provide air quality limits for larger airshed management. These are similar to those targets set out by the CCME for the CAAQS (Table 7.2.3).

Table 7.2.3: Summary of Regulations Pertaining to Ambient Air Quality in NL

Contaminant ⁽¹⁾	Averaging Period	Regulatory Threshold			Unit
		NLAPCR (Schedule A, Table I)	NLAPCR (Schedule A, Table II)	CAAQS	
Ammonia	24-hour	144	-	-	ppb
CO	1-hour	30,582	-	-	ppb
	8-hour	13,107	-	-	ppb
H ₂ S	1-hour	11	-	-	ppb
	24-hour	4	-	-	ppb
NO ₂	1-hour	213	42	42	ppb
	24-hour	106	-	-	ppb
	Annual	53	12	12	ppb
PM _{2.5}	24-hour	25	25	27 ⁽²⁾	µg/m ³
	Annual	8.8	8.8	8.8 ⁽²⁾	µg/m ³
PM ₁₀	24-hour	50	-	-	µg/m ³
Particulate matter (total)	24-hour	120	-	-	µg/m ³
	Annual	60	-	-	µg/m ³
SO ₂	1-hour	344	65	65	ppb
	3-hour	229	-	-	ppb
	24-hour	115	-	-	ppb
	Annual	23	4.0	4.0	ppb

Source: Air Pollution Control Regulations, 2022, N.L.R. 11/22

⁽¹⁾ The summary shows only the most relevant contaminants, as applicable to the Project.

⁽²⁾ Values are shown as the 2020 numerical value.

Baseline ambient air quality data were not available from the site location at the time of the Air Dispersion Study Report (Appendix D.1). As such, a review of the ambient air quality data collected at a nearby provincial AAQMS was conducted instead.

NL monitors air quality at seven AAQMS throughout the province (NLECCC, 2024a). Measured parameters vary by location and may include the following:

- PM_{2.5}
- PM₁₀
- O₃
- NO
- NO₂
- NO_x
- CO
- SO₂
- VOC

The NO₂, O₃, and PM_{2.5} values from five of the seven AAQMSs are used to calculate a score on the Air Quality Health Index (AQHI). The AQHI is a scale from 1 to 10+, whereby scores represent the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+) (Meteorological Service of Canada, 2026).

The closest AAQMS to the Industrial Facility with available data is the Grand Falls-Windsor station, 35 km southwest of the IPA. The baseline maximum ambient air quality conditions observed at the Grand Falls-Windsor AAQMS from 2022 to 2024 were compared to the current NLAPCR Schedule A, Table I, as these air quality standards are the maximum permissible ground-level concentration limits (Table 7.2.4).

Table 7.2.4: Maximum Ambient Air Quality Conditions Observed at Grand Falls-Windsor (2022 to 2024)

Parameter	Averaging Period	NO ppb	NO ₂ ppb	NO _x ppb	O ₃ ppb	SO ₂ ppb	CO ppm ⁽¹⁾	PM _{2.5} µg/m ³	PM ₁₀ µg/m ³	TSP ⁽²⁾ µg/m ³	H ₂ S ppb	NH ₄ ppb
Grand Falls-Windsor AAQMS	1-hour	60.6	23.2	81.8	53.7	2.0	0.8	154.7	1189.7	-	-	-
	3-hour	40.4	22.9	57.8	52.5	2.0	0.7	130.0	541.2	-	-	-
	8-hour	25.2	22.9	35.9	51.5	1.9	0.6	84.4	303.8	-	-	-
	24-hour	9.9	5.9	14.6	50.7	1.7	0.3	45.4	185.4	-	-	-
	Annual	0.9	1.9	2.7	29.3	0.6	0.1	5.2	15.7	-	-	-
NLAPCR (Schedule A, Table 1)	1-hour	-	213	-	-	344	30.58	-	-	-	11	-
	3-hour	-	-	-	-	229	-	-	-	-	-	-
	8-hour	-	-	-	-	-	13.11	-	-	-	-	-
	24-hours	-	106	-	-	115	-	25	50	120	4	144
	Annual	-	53	-	-	23	-	8.8	-	60	-	-
Fraction of NLAPCR (Schedule A, Table 1)	1-hour	-	10.9%	-	-	0.6%	2.7%	-	-	-	-	-
	3-hour	-	-	-	-	0.9%	-	-	-	-	-	-
	8-hour	-	-	-	-	-	4.2%	-	-	-	-	-
	24-hours	-	5.5%	-	-	1.5%	-	181.5%	370.9%	-	-	-
	Annual	-	3.5%	-	-	2.8%	-	59.1%	-	-	-	-

Source: Data provided by NLECCC

Values calculated as maximum values from rolling arithmetic averages of hourly data.

Shaded values denote exceedances of NLAPCR.

⁽¹⁾ Parts per million

⁽²⁾ Total suspended particulates, or otherwise known as total particulate matter.

Per Table 7.2.4, existing air quality conditions (i.e., ambient air quality conditions at Grand Falls-Windsor; 2022 to 2024) indicate that most of the measured contaminants are well below their respective NLAPCR Schedule A, Table 1 limits. However, the maximum 24-hour concentrations of PM_{2.5} and PM₁₀ exceeded the NLAPCR 0.5% and 2.4% of the time, respectively, based on the existing air quality data provided by NLECCC and compiled by Strum. The single maximal values observed were 45.4 µg/m³ (PM_{2.5}) and 185.4 µg/m³ (PM₁₀) during a rolling 24-hour period (Table 7.2.4).

7.2.5 Process Emissions Modelling

To understand the impacts on air quality from process emissions, io consulting completed an emissions inventory report based on information provided by EVREC, or parties acting on behalf of EVREC (io consulting, 2026b). This report identified various operating scenarios for the Industrial Facility and included air emissions from:

- propane-fired flare pilots of the ammonia storage flare, jetty flare, and ammonia process flare;
- flash gas/purge gas from the ammonia synthesis trains routed to the ammonia storage flare;
- syngas blowdown routed to the ammonia process flare;
- emergency diesel generators;
- electrolyzer diesel generators; and,
- diesel-driven firewater pump.

Information from the emissions inventory report was then incorporated into an Air Dispersion Study Report which considered emissions based on four scenarios: normal operations, commissioning, abnormal operations and emergency upset (Appendix D.1).

The air quality dispersion modelling assessment for normal operations and commissioning was performed using the United States Environmental Protection Agency (U.S. EPA) air dispersion modelling software AERMOD (version 13.1). AERMOD provides a steady-state Gaussian air dispersion model that estimates pollutant concentrations and deposition from industrial emissions sources based on atmospheric turbulence, surface characteristics, and terrain complexity. AERMOD was used to model estimated emissions and determine whether the predicted maximum off-property concentrations complied with the NLAPCR Schedule A, Table I, air quality standards.

AERMOD was used to model ground-level concentrations of all substantive air contaminants including, NO_x, SO_x, CO, PM_{2.5} and PM₁₀, for the three process flares used by the Industrial Facility (process flare, ammonia storage flare, jetty flare) as well as the various diesel generators (electrolyzer generators, and emergency backup power generators) and diesel firewater pump. Concentrations of ammonia (NH₃), O₃, and H₂S were not modelled as ammonia is not anticipated to be vented under any of the modelled scenarios and no sources of ozone or hydrogen-sulphide are expected.

The assessment of air quality addresses Project-related effects on human receptors. The receptors used for the air dispersion modelling assessments were the industrial receptors (IRIDs) as presented in Section 3.2.

The methodology employed to model the estimated impacts included the following:

- Stack Emissions:
 - Three propane pilot flares (process flare, ammonia storage flare, jetty flare).

- Assumed flare stack height 50 m.
 - Modelled using conservative assumptions based on available design information.
- Emissions Data:
 - Modelled air contaminants are:
 - NO_x
 - Conservatively assumed all NO_x are released as NO₂.⁴
 - SO_x – Oxides of Sulphur
 - Conservatively assumed all SO_x are released as SO₂.
 - CO
 - PM_{2.5}
 - PM₁₀
 - Emission rates and model inputs are summarized in Tables 2-5, 2-6 of the Air Dispersion Study Report (Appendix D.1).
 - Detailed source and emission data representing each of the four scenarios can be found in the Air Dispersion Study Report (Appendix D.1).
- Meteorological data:
 - Model used pre-processed hourly sequential meteorological data (from 2022-2024), from Gander International Airport, as it was considered the most complete data set and the most representative of the IPA.
- Baseline Air Quality:
 - No baseline air quality data were incorporated into the screening-level air dispersion model, as no site-specific data were available; local background air pollutant concentrations were anticipated to be relatively low given the limited industrial activities in the Botwood area (Appendix D.1).
- Modelled Domain:
 - Modelled Area: The modelled domain was a 10 km × 10 km area centered on the Industrial Facility and adjusted as required to account for receptors outside this area. The Study Area for each modelled contaminant is shown in the drawing (Drawing 7.2-1).
 - Grid spacing:
 - 200 m within the modelling domain
 - Terrain Consideration: Terrain obtained from a Digital Elevation Model (DEM).
 - The DEM ground level elevations are on a resolution of approximately 100 m.

The assumptions and limitations made for the screening-level air dispersion model were as follows:

- TSP was not considered as detailed vendor data was not available during pre-FEED.

⁴Combustion sources typically emit NO_x predominantly as NO, which can subsequently oxidize in the atmosphere to form NO₂. Where limited project and onsite ambient air quality data exist, a conservative assumption has been adopted whereby NO_x emissions are modelled as 100% converted to NO₂.

- Building Downwash was not incorporated into the screening-level model.
- Flash gas purge rates, detailed flare and generator performance are subject to FEED and vendor engagement.
- Background ambient air quality has not been included as no site-specific ambient air quality data was available.

It is essential to note that the emission rate calculations are based on preliminary design data and will require updates once detailed engineering is completed and definitive equipment specifications, operating modes, and control efficiencies are confirmed.

For a detailed account of the technical approach, including modelling methodology, assumptions, and boundary conditions, refer to Appendix D.1.

7.2.5.1 Scenario 1 - Normal Operations

The normal operating scenario assumes that power is supplied to the Industrial Facility from renewable sources, with diesel emergency and electrolyzer generators on standby. Emissions during normal operations are represented by both continuous and intermittent sources, including:

- Continuous pilot fuel combustion from three flares (ammonia storage flare, jetty flare, and ammonia process flare);
- Continuous flash gas purge release from the ammonia washing column to remove inert gas accumulation;
- Intermittent weekly firewater pump testing; and
- Intermittent monthly diesel generator testing (both emergency diesel generators (30 x 2 MW) and electrolyzer diesel generators (18 x 1 MW))

It should be noted that only continuous sources identified in the normal operations scenario were included in the air dispersion modelling report as intermittent sources were operated for only 20 minutes per week (firewater pump) and 30 minutes per month (emergency and electrolyzer diesel generators), resulting in insignificant emissions contributions compared to the continuous sources (io consulting, 2026a, 2026b).

7.2.5.2 Scenario 2 - Commissioning

During commissioning, power is assumed to be supplied from the emergency and electrolyzer diesel generators as renewable power sources are presumed to not yet be available. The commissioning is, by its nature, temporary and expected to last approximately 2 months; it is a one-time event at the end of the construction phase. The emissions during commissioning are intermittent and are expected to include the following:

- propane-fired flare pilots of the ammonia storage flare, jetty flare, and ammonia process flare;
- syngas stream purged via blowdown and directed to the ammonia process flare;
- emergency diesel generators (30 x 2 MW); and,

- electrolyzer diesel generators (18 x 1 MW)

Emission sources described under this scenario are short-term, non-routine, and are not anticipated to continue once normal plant operations commence (io consulting, 2026a, 2026b).

Note that additional operational scenarios (Abnormal Operations and Emergency Upset Operations) are discussed in greater detail in Section 14.0.

7.2.6 Effects Assessment

Project activities have the potential to interact with the atmospheric environment through fugitive dust, exhaust, and process emissions during the following construction and operational activities (Table 7.2.5).

Table 7.2.5 Potential Project-Air Quality Interactions – Industrial Facility

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works	X
Access Road Upgrading and Construction	X
Water Pipeline Construction	X
Facility Civil Works	X
Transportation of Facility Components	X
Equipment Installation	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance (33 years)	
Facility Operations and Maintenance	X
Site Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

7.2.6.1 *Assessment Boundaries*

Administrative Boundary

Administrative boundaries include air emission regulations, as described in the regulatory context section above, which informs the development of construction and operational air

emission assessment.

Technical Boundary

The determination of air quality impacts for construction was completed based on a qualitative assessment of anticipated construction impacts. Furthermore, the Air Dispersion Study Report (Appendix D.1) is based on preliminary design data and will require updates once detailed engineering is completed and definitive equipment specifications, operating modes, and control efficiencies are confirmed.

Spatial Boundary

The LSA for the atmospheric environment is an approximate 10 km × 10 km area centered on the Industrial Facility. The LSA is specific to the modelled parameter and is shown on Drawing 7.2-1 (Appendix A) The RSA is the Newfoundland Air Zone.

Temporal Boundary

Temporal boundaries would include the timelines of each Industrial Facility phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

7.2.6.2 Assessment Criteria

The VC-specific definition for magnitude is as follows:

- Negligible: No detectable change from ambient air quality levels expected as a result of the Industrial Facility.
- Low: Air quality is expected to remain less than 50% of the maximum permissible ground-level concentrations as defined by the NLAPCR.
- Moderate: Air quality is expected to remain below guidelines, but more than 50% of the maximum permissible ground-level concentrations, as defined by the NLAPCR.
- High: Air quality is expected to exceed the maximum permissible ground-level concentrations as defined by the NLAPCR.

7.2.6.3 Effects

Fugitive Dust and Exhaust Emissions

Fugitive dust emissions consist of PM and may be generated from open-air activities (e.g., moving earth/disturbing soil, wind erosion, and increased traffic). Fugitive dust emissions are composed mainly of soil minerals, but can also contain salt, pollen, spores, and tire particles. PM is measured as TSP and is defined as the mass of airborne particles having a diameter of less than 100 µm (though measured concentrations are typically dominated by particles <45 µm). There are two forms of PM that pose the greatest concern for human health: PM with a diameter of 10 µm or less (PM₁₀) and PM with a diameter of 2.5 µm or less (PM_{2.5}).

Depending on its composition, concentration, and proximity to a human receptor, fugitive dust can affect lung and heart functions when it enters the atmosphere. Particulate matter has been

linked to premature death (due to lung and/or heart disease), non-fatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms such as irritation of the airways, coughing, or difficulty breathing. People with underlying lung and heart disease, children, and the elderly are the most susceptible to particulate pollution exposure (US EPA, 2024b).

Fugitive dust may also affect visibility and cause environmental damage. Fine particles are the leading cause of reduced visibility in many cities, national parks, and wilderness areas. In addition, fugitive dust particles can be carried over long distances (via wind), deposited in other locations, and within surface water features. Some of the potential effects of particulate deposition may include the following (US EPA, 2024b):

- Increasing lake and stream acidity.
- Altering the nutrient balance in large river basins.
- Depleting the nutrients in the soil.
- Damaging sensitive forests and farm crops.
- Affecting the diversity of ecosystems.
- Reducing quality of wild food sources
- Contributing to acid rain effects.

Anticipated sources of fugitive dust emissions from the IPA will be associated with the construction of the Industrial Facility, heavy haul road (crushed compacted rock), pipelines (water and ammonia) and a quarry and accommodation camp and may include the following activities:

- Soil disturbance during site preparation (e.g., excavation).
- Wind erosion from soil or rock stockpiles during grading.
- Increase in traffic on roadways from travel by personnel (to/from the site).
- Management of on-site materials transfers (i.e., loading/unloading).

The distance particles can travel is influenced by factors such as the height at which they are released, their deposition velocity, wind speed, and the degree of atmospheric turbulence. Fugitive dust was not modelled for but expected to increase, especially during construction of the heavy haul road and ammonia pipeline. Impacts during the construction phase are considered short-term, intermittent, and within the LSA.

In addition to fugitive dust, construction may increase combustion residuals and/or exhaust tailpipe emissions, primarily PM, NO_x, SO₂, and CO from vehicles (i.e., travel by personnel, transport/delivery activities) and heavy equipment. Increased vehicle exhaust emissions were not modelled but are not anticipated to impact nearby receptors.

Operations Process Emissions

The identified sources of emissions from the Industrial Facility are as follows:

- propane-fired flare pilots of the ammonia storage flare, jetty flare, and ammonia process flare;
- flash gas/purge gas from the ammonia synthesis trains routed to the ammonia storage flare;
- syngas blowdown routed to the ammonia process flare;
- emergency diesel generators;
- electrolyzer diesel generators; and,
- diesel-driven firewater pump.

Please note that EVREC has applied to NF Power and NL Hydro for grid connections for construction and operational power (to provide backup power to safety and critical systems, as available). The application to NF Power is for 10 MW firm, and the application to NL Hydro is for up to 150 MW of interruptible non-firm power. However, if this grid connection cannot supply sufficient power, diesel generators have been conservatively modelled for use in process emissions calculations.

Maximum operational emission rates from the Industrial Facility were determined by io consulting (2026a) and are presented in the Air Dispersion Study Report (Appendix D.1).

Scenario 1 – Normal Operations

AERMOD assessments were completed for the normal operations scenario and the results of which were used to model concentrations within the LSA (Appendix D.1). Results are summarized in the Table 7.2.6 and are compared with the limits set in the NLAPCR.

Table 7.2.6: Normal Operations Scenario – Modelled Emission Concentrations Summary

Contaminant	Averaging Period	Maximum GLC (µg/m³)	NLAPCR Limits (µg/m³)	Percent of Limit (%)
NO _x	1 hour	11.0	415	2.7%
	24 hours	1.0	206	0.5%
	Annual	0.6	103	0.6%
SO _x	1 hour	-	932	-
	3 hours	-	620	-
	24 hours	-	312	-
	Annual	-	62	-
CO	1 hour	4.1	36,228	0.0%
	8 hours	0.9	15,527	0.0%
PM _{2.5}	24 hours	0.06	25	0.2%
	Annual	0.008	9	0.1%
PM ₁₀	24 hours	-	50	-

Adapted from the 2026 Air Dispersion Study Report (io consulting, 2026, Appendix D.1)

Maximum ground level concentrations (GLCs) were determined based on annual maximum concentrations obtained from the 2022 to 2024 meteorological dataset.

Some rounding errors may occur when values are translated between different table formats.

'-' no emissions anticipated.

Under normal operational conditions, the Industrial Facility does not exceed the NLAPCR limits beyond the Industrial Facility Boundary and at any receptor locations (Table 7.2.6).

Scenario 2 – Commissioning

AERMOD assessments were completed for the commissioning scenario and the results of which were used to model concentrations within the LSA (Appendix D.1). Results are summarized in the Table 7.2.7 and are compared with the limits set in the NLAPCR.

Table 7.2.7: Commissioning Scenario – Modelled Emission Concentrations Summary

Contaminant	Averaging Period	Maximum GLC (µg/m³)	NLAPCR Limits (µg/m³)	Percent of Limit (%)
NO _x	1 hour	1,892	415	455.9%
	24 hours	1,131	206	549.0%
	Annual	N/A	103	N/A
SO _x	1 hour	500	932	53.6%
	3 hours	479	620	77.3%
	24 hours	306	312	98.1%
	Annual	N/A	62	N/A
CO	1 hour	9,695	36,228	26.8%
	8 hours	8,211	15,527	52.9%
PM _{2.5}	24 hours	0.253	25	1.0%
	Annual	N/A	9	N/A
PM ₁₀	24 hours	300	50	600.0%

Adapted from the 2026 Air Dispersion Study Report (io consulting, 2026, Appendix D.1)

Maximum ground level concentrations (GLCs) were determined based on annual maximum concentrations obtained from the 2022 to 2024 meteorological dataset.

Bold indicates exceedances of the NLAPCR limits

Some rounding errors may occur when values are translated between different table formats.

'-': no emissions anticipated,

'N/A': no annual emissions anticipated due to the limited duration (2 months) of the commissioning phase.

During commissioning (approximately 2 months in duration), the Industrial Facility is shown to exceed the NLAPCR limits beyond the Industrial Plant Boundary for NO_x (1-hour and 24-hour) by 455.9% and 549.0%, respectively and PM₁₀ (24-hour) by 600.0% (Table 7.2.7).

Modelled NO_x (1-hour) exceedances are shown on Drawing 7.2-2 which extends to residential receptors IRID37, IRID38, and polygons IRID50, IRID51, IRID52, IRID53, IRID54, IRID55, IRID56, and IRID57.

Modelled NO_x (24-hour) exceedances are shown on Drawing 7.2-3 which extends beyond the IPA but does not impact any of the receptors.

Modelled PM₁₀ (24-hour) exceedances are shown on Drawing 7.2-4 which extends beyond the Industrial Plant Boundary to the south slightly but does not exceed the IPA or impact any of the receptors.

It should be noted that for the commissioning, the modelled exceedances are short-term and intermittent and will be reviewed through regulatory consultation. Furthermore, the air quality model includes conservative assumptions and will require refinement (i.e., a detailed-level air dispersion model) at subsequent stages of the Industrial Facility's design and development. EVREC will ensure that the final engineering design of the Industrial Facility reduces all ground-level concentrations of pollutants below the NLAPCR limits as required through consultation with NLECCC, through a phased commissioning approach, where exceedances are allowable, and minimize this risk if grid connection is established.

7.2.7 Mitigation

The following measures will be employed to minimize and mitigate the creation and emission of pollutants during the Industrial Facility's construction and operation phases.

In addition, general mitigation measures for fugitive dust emissions are provided below:

- Minimize the footprint of disturbance to the extent practicable.
- Conduct grading and site preparation in phases to minimize disturbed soil areas until just prior to construction activities.
- Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust and airborne particles.
- Compact and/or ridge disturbed soil to prevent dust formation.
- Consider ceasing dust-generating construction activities during dry periods (i.e., during drought) when winds are high, where practical.
- Wet aggregate and soil stockpiles with water to control dust, as required.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Wet roadways and heavy traffic areas with water or other approved dust suppressant technologies to minimize airborne emissions, as required.
- Post and maintain speed limits for on-site transportation and mobile equipment.
- Tie down, cover, and/or store loose site materials and/or products prior to inclement weather and wind events to prevent materials from becoming airborne.
- Wash down vehicles and equipment with water to remove accumulated mud/dirt on undercarriages, tracks, wheel wells, etc.
- Require that Industrial Facility personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) in the event of significant fugitive emissions events (i.e., windstorms, dust storms).

General mitigation measures for exhaust emissions include:

- Require that equipment meets all applicable provincial and air quality regulations and emissions standards.
- Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.
- Remove malfunctioning equipment and/or equipment generating excess amounts of smoke, odour, or noise from service until an assessment and necessary repairs can

- be completed.
- Remove construction equipment with improperly functioning emissions control systems from service.
- Restrict the idling of equipment where feasible.

General mitigation measures for process emissions are provided below:

- Inspect and maintain gas lines, seals, and control equipment in accordance with an established maintenance program to prevent leaks and malfunctions.
- Ensure burners undergo regular maintenance to achieve efficient combustion and minimize pollutants.
- Ensure personnel are adequately trained and specialized to perform daily inspections and maintenance on the combustion and emissions control equipment.

7.2.8 Monitoring

- An updated air dispersion model will be completed at a later permitting stage based on revisions to the Industrial Facility engineering design.
- An AQM Plan (including monitoring commitments) will be developed and submitted to NLECCC for approval prior to Industrial Facility commissioning.
- Pre-operation ambient air quality levels will be measured on-site to establish baseline conditions.
- Upon commissioning, operational air quality monitoring will be conducted at the Industrial Facility for the first year of operation to verify modelling results and ensure compliance with ambient air quality levels.
- The monitoring results will be reviewed, and depending on the findings, ongoing operational monitoring may be required.

7.2.9 Conclusion

After mitigations, predicted residual effects on atmosphere and air quality are characterized in Table 7.2.8.

Table 7.2.8: Air Quality Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Fugitive Emissions Increased level of airborne particulate	Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust. Apply water as a dust suppressant as required.	A	L Direct increase of fugitive emissions	LSA	ST Effects are expected throughout construction and decommissioning	I Effects may occur during the Project's construction and decommissioning phases, but only intermittently.	R	Not significant
Exhaust Emissions Increased level of combustion related emissions	Maintain equipment and limit idling where feasible.	A	L Direct increase of exhaust emissions	LSA	ST Effects are expected throughout construction and decommissioning	I Effects may occur during the Project's construction and decommissioning phases, but only intermittently.	R	Not significant
Process Emissions Commissioning	Ensure personnel are adequately trained.	A	H Pollutants are above the NLAPCR limits	RSA	ST Effects are expected during the construction phase only	SE Effects to occur once	PR	Not significant
Process Emissions Normal Operations	Install emission monitoring systems to track real-time concentrations of NO _x and PM during operations.	A	L Pollutants are maintained below 50% of NLAPCR limits	LSA	MT Effects are expected throughout the operational phase	C Effects to occur continuously	R	Not significant

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

7.3 Greenhouse Gases

7.3.1 Overview

Climate change refers to long-term, detectable changes in weather patterns and conditions, often including alterations to temperature and precipitation regimes. Climate change typically involves changes in average conditions and variability. GHGs from anthropogenic sources are the main contributors to climate change. Since GHGs disrupt natural heat transfer processes within the Earth's atmosphere, a build-up of these gases has enhanced the natural greenhouse effect. These human-induced enhancements are especially of concern since ongoing GHG emissions have the potential to warm the planet to levels that have yet to be experienced (ECCC, 2019d).

The effects of the Industrial Facility on climate change are described in terms of GHG emissions.

The impacts of climate change on the Industrial Facility are assessed separately under Section 13.0.

7.3.2 Regulatory Context

The climate change assessment considered the following Acts and Regulations:

- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)
- *Management of Greenhouse Gas Act* (Newfoundland and Labrador, 2016)
- Management of Greenhouse Gas Regulations (Newfoundland and Labrador, 2018a)
 - *Canadian Environmental Protection Act* (Canada, 1999)
 - Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations (Canada, 2010)
 - Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations (Canada, 2013)
 - Ozone-depleting Substances and Halocarbon Alternatives Regulations (Canada, 2016)

7.3.3 Desktop Assessment Methodology

The objectives of this assessment include the following:

- Establish Project-related GHG sources.
- Quantify baseline and Project-generated GHG emissions.
- Mitigate and minimize GHG generation from Project-related activities.

Sources of GHG emissions were identified through a review of Project phases, components, and equipment.

Project-generated GHGs were quantified in accordance with the specifications described in the International Standard ISO 14064 (2019) and the NLECCC Guidance Document for Reporting

Greenhouse Gas Emissions for Large Industry in Newfoundland and Labrador (2017).

All emissions, unless otherwise stated, are reported in tonnes of carbon dioxide equivalents (tCO₂e).

7.3.3.1 Sources of GHG Emissions

The main GHGs of concern include:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Halocarbons
- Water vapour

GHGs may be natural or anthropogenic in origin, except halocarbons, which are human-made (ECCC, 2019a). The following subsections describe the GHGs and their contributors (sources) as anticipated during each Project phase. Given that decommissioning will occur in the future, potentially under improved technologies that could reduce GHG emissions, its emissions inventory remains uncertain. To ensure a conservative assessment, emissions during the construction phase are used as a proxy for decommissioning.

Methane

Primary sources of anthropogenic CH₄ include landfills, sewage, and the incomplete combustion of fossil fuels with insufficient oxygen (ECCC, 2019a). The Industrial Facility's construction phase requires various heavy and light-duty equipment, which contributes to CH₄ emissions.

During operations, methane emissions will be generated by maintenance activities (e.g., transportation) and, potentially, by incomplete combustion of pilot flares. These activities are intermittent and short-term, and, with appropriate process design and operational practices, emissions are expected to be minimal. The carbon equivalent emissions associated with the pilot flares are considered below.

Nitrous Oxides

The primary sources of anthropogenic N₂O are related to the use of nitrogen-based synthetic fertilizers and manure. These sources have added significant amounts of reactive nitrogen to Earth's ecosystems. Other contributors include the release of N₂O into the atmosphere during the combustion of fossil fuels and biomass (e.g., trees or wood-based fuels) and from some industrial sources (ECCC, 2019a).

The Project's construction phase requires heavy- and light-duty equipment, which can contribute to N₂O emissions. Land restoration activities (i.e., fertilizers) following construction will also contribute to N₂O emissions. Overall, the production of N₂O in association with this Industrial Facility is anticipated to be minimal, in relation to other sources of GHGs.

Halocarbons

Halocarbons are a group of synthetic chemicals containing a halogen group (e.g., fluorine, chlorine, and bromine) and carbon (ECCC, 2019a). They are typically used in refrigerants, fire-extinguishing agents, and solvents (ECCC, 2013b). There are various industrial sources, but the main contributor is aluminum production (US EPA, 2024a).

During the construction phase, the primary source of halocarbon emissions would likely be accidental releases or leaks (losses) associated with coolants in air conditioning units found in vehicles, portable construction buildings (i.e., trailers), and equipment. Fire-extinguishing agents (containing halocarbons) may also be used in the event of an emergency which requires a fire-fighting response. Overall, halocarbon release is anticipated to be minimal and not considered further.

Water Vapour

Water vapour is the most important naturally occurring GHG. Human activities do not directly influence the amount of water vapour in the atmosphere, as it is a function of the atmosphere's temperature. The atmosphere can hold approximately 7% more water vapour for every additional degree Celsius in air temperature. When the air becomes saturated with water vapour, the water vapour condenses and falls as rain or snow, leading to climate change effects (i.e., variations in weather patterns).

As climate-warming gases (i.e., CO₂, CH₄, N₂O) increase in the atmosphere, the rising temperatures increase water evaporation from the Earth's surface and raise atmospheric water vapour concentrations. This increased water vapour, in turn, amplifies the warming from the initial GHGs, causing the cycle to repeat and temperatures to keep rising (ECCC, 2019a).

Industrial Facility activities contributing to GHG emissions are not expected to affect water vapour concentrations in the atmosphere; therefore, this is not considered further.

Carbon Dioxide Equivalent (CO₂e)

The primary sources of anthropogenic CO₂ are burning carbon-containing fossil fuels (e.g., coal, oil, natural gas, and propane) and deforestation/land clearing.

Site preparation and construction for the Industrial Facility will include several activities that are likely to produce CO₂, including, but not limited to:

- Use of heavy equipment (excavators, dozers, cranes, etc.).
- Use of light-duty vehicles and equipment (pick-up trucks, generators, etc.).
- Land clearing, including the decay of cut foliage (which slowly releases CO₂).
- Cement production heats limestone, which releases CO₂ (ECCC, 2019a).
- Pilot flare operation.

7.3.4 Desktop Assessment Results

7.3.4.1 *Quantification of the GHG Baseline Conditions*

The GHG baseline refers to sources, sinks (removing), and reservoirs (storing) occurring in the Industrial Facility's absence and is used to compare pre- and post-Project conditions. The baseline demonstrates the quantity of CO₂e emitted from current electricity production methods for the same electrical generating capacity as the Industrial Facility.

For this component, quantifying GHGs in tCO₂e requires applying GHG intensity factors for conventional fossil-based ammonia production and comparing them to the production capacity of the Industrial Facilities' renewable ammonia. The Industrial Facility will produce up to 1,000,000 tons (907,185 tonnes) of green-certified ammonia per year. This product will be shipped to Europe; therefore, the European Commission (2021) conventional fossil-based emission intensity of 1.57 tCO₂e per tonne of ammonia (tCO₂e/tNH₃) will be used as the baseline for this assessment.

The GHG emissions associated with the conventional fossil-based ammonia production for the same quantity of ammonia produced by the Industrial Facility are 1,424,280 tCO₂e/year or 47,001,241.38 tCO₂e over the lifespan of the Industrial Facility (33 years).

GHG Emissions Quantification – Construction Phase

Access Roads and Laydown Areas

Internal access roads and maintenance pathways will be constructed to provide access to the Industrial Facility infrastructure. This will require removing vegetation and overburden, creating fugitive dust and GHG emissions. Laydown areas are intended to temporarily store equipment. Construction activities and equipment used to develop laydown areas may generate fugitive dust and GHG emissions.

However, fugitive dust and GHG contributions from these activities, which are temporary and short-term, represent a small incremental addition to the overall Industrial Facility emissions and therefore were not quantified. Section 7.2 (Atmosphere and Air Quality) discusses fugitive dust and air emissions as they relate to the Industrial Facility.

Industrial Facility

Concrete

Various construction materials will be required for the Industrial Facility; however, for this assessment and as a conservative GHG estimate, they will be lumped into concrete and steel. The materials required for the Industrial Facility are based on anticipated material requirements provided by EVREC. Where specific details were unknown, Strum provided conservative estimates to quantify GHG emissions where possible. All concrete materials are assumed to come from local suppliers.

The Industrial Facility will require a significant quantity of concrete to be produced and delivered to the IPA for its foundation. However, all concrete is assumed to be produced at an on-site concrete mobile batch plant; therefore, all emissions associated with its transportation are assumed to be negligible. EVREC provided the anticipated amount of concrete required for the Industrial Facility.

The quantification of the GHG emissions requires the following input:

- The quantity of concrete produced for each structure's foundation base.

Table 7.3.1 summarizes the GHG emission factors for the different components used for concrete-related activities.

Table 7.3.1: Concrete Manufacturing Emission and Physical Property Factors

Component	Emission Factor / Density Factor
Concrete Production	2.63×10^{-4} tCO ₂ e/kg
Concrete Density	2,250 kg/m ³

Emission Factors: (Squared Consultants Inc, 2025; The Engineering ToolBox, n.d.)

Given the mass of concrete required for the Industrial Facility and the emission factors (Table 7.3.1), the CO₂e emissions for the concrete needed are expected to be approximately 346,157.59 tCO₂e.

Detailed CO₂e calculations are provided in Table 2A of Appendix E.2.

Steel

Steel rebar is also assumed to be required for the Industrial Facility foundation. A conservative estimate of the rebar required was based on the IPA site area, assuming 19.05 mm-diameter rebar spaced 0.21 m in a single grid across the Industrial Facility footprint. These parameters were fed into a simplified rebar calculator for concrete pours (Finity, 2024). The total amount of steel required for all foundation rebar was estimated at 5,784.87 m³ (46,278.94 tonnes).

Given the steel required to construct the Industrial Facility and the emission factor (1.5 tCO₂e/tonne) (Hammond & Jones, 2011), the CO₂e emissions from the manufacturing of all the structures are expected to be approximately 69,418.41 tCO₂e.

Steel for the Industrial Facility is assumed to be supplied by local steel metal fabricators. The material is assumed to be transported from a local supplier in Grand Falls-Windsor, NL, via a heavy diesel hauler to the IPA.

To determine the emissions associated with travel for steel, the following assumptions were made:

- Each heavy hauler can transport 38 tonnes of steel per trip.
 - Each trip comprises 35 km 1-way.

GHG emission factors for the material transportation are provided in Table 7.3.2.

Table 7.3.2: Steel Transportation Emission Factors

Component	Emission Factor
Heavy Duty Truck (Diesel) with freight	1.35×10^{-4} tCO ₂ e/tonne·km
Heavy Duty Truck (Diesel) with no freight	1.106×10^{-3} tCO ₂ e/km

Emission Factors: (US EPA, 2025)

Given the transportation distances and the emission factors (Table 7.3.2), the CO₂e emissions from the transportation of steel are expected to be approximately 265.84 tCO₂e.

Construction Equipment

The Industrial Facility will employ mobile equipment during construction.

EVREC provided a list of equipment anticipated to be used for the Industrial Facility construction, including the number of required pieces of equipment, anticipated hours of operation and anticipated fuel consumption. This equipment includes:

- Excavators
- Loaders
- Dozers
- Haul Trucks
- Harvesting Equipment
- Graders

While the construction phase of the Industrial Facility will last approximately 3 years and may occur 24 hours per day, seven days per week, it is not anticipated to be constructed continuously. Therefore, for the GHG emission calculations of the mobile equipment, it was assumed to operate 21 hours per day, six days per week, during the construction period. It was further assumed that the construction period would occur over 1 year of continuous construction (construction will not occur continuously). Finally, EVREC provided the associated mobile equipment to construct the Industrial Facility in combination with the Solar Project. Therefore, Strum assumed half of the equipment would be used for the construction of the Solar Project, and the other half would be used for the construction of the Industrial Facility. As a result, the 50% reduction was applied to the Industrial Facility mobile equipment list to account for GHG emissions and fuel consumption.

GHG emission factors for the combustion of diesel are provided in Table 7.3.3.

Table 7.3.3: Equipment List Emission Factors

Parameter	Emission Factor
Diesel Fuel	2.66 (kgCO ₂ e/L)

Emission factors: (NLECCC, 2017)

Given the proposed equipment usage for the construction of the Industrial Facility and the

emission factor (Table 7.3.3), GHG emissions are expected to be approximately 14,432.36 tCO₂e.

Detailed CO₂e calculations are provided in Table 2B of Appendix E.2.

For the construction phase of the Industrial Facility, the anticipated GHG emissions and fuel consumption are summarized in Table 7.3.4 for each consumption type (i.e., on-site or off-site mobile equipment).

Table 7.3.4: Construction Phase – Estimated Fuel Consumption

Consumption Type	Fuel Type	Emission Factor (tCO ₂ e/L)	Total GHG Emissions (tCO ₂ e)	Annualized GHG Emissions (tCO ₂ e)	Fuel Consumption (L)	Annualized Fuel Consumption (L)
On-site Mobile Equipment	Diesel	2.66E-03	14,413.22	4,810.79	5,418,504.00	1,806,168.00
Off-Site Mobile Equipment	Diesel	2.66E-03	265.84	88.61	99,940.11	33,313.37

Note: Concrete trucks and heavy haulers are assumed to require diesel fuel.
Emission Factors: (NLECC, 2017)

Note that Table 7.3.4 includes only those emissions provided through the combustion of fossil fuels. A detailed GHG inventory is provided in Table 2A of Appendix E.2.

Note that the construction GHG assessment is a simplified GHG inventory based on information provided by EVREC and does not consider embodied emissions associated with Industrial Facility components, including its battery, air separation units, electrolyzers, or facility structures (aside from the foundation).

Operations Phase

The Industrial Facility will burn propane fuel as part of its three flare systems (ammonia storage flare, jetty flare, ammonia process flare). These flares are intended for intermittent use; however, the pilot burners will operate continuously and burn propane.

An emissions inventory was completed as part of a component study to conduct air dispersion modelling of these flares (io consulting, 2026b). The emissions inventory indicated that the process flares are anticipated to be designed for a fuel consumption rate of 7.8 kg/hr per pilot flare. These flares are assumed to operate continuously. In addition to pilot flares, the Industrial Facility will possess 30 emergency (2 MW) and 18 electrolyzer (1 MW) diesel generators. These generators are intended to operate in abnormal or emergency situations when renewable energy is unavailable. This GHG assessment does not consider emergency or abnormal scenarios where these generators may be used intermittently. Instead, this assessment considers normal testing of these generators as part of routine maintenance. These generators are expected to be tested for 30 minutes each month.

In considering these routine process emissions, the Industrial Facility's operational phase will produce 1,032.36 tCO₂e annually.

For the operational phase of the Industrial Facility, the anticipated GHG emissions and fuel consumption are summarized in Table 7.3.5 for each consumption type (i.e., on-site stationary equipment).

Table 7.3.5: Operational Phase – Estimated Fuel Consumption

Consumption Type	Fuel Type	Emission Factor (tCO ₂ e/unit) ⁽¹⁾	Total GHG Emissions (tCO ₂ e/yr)	Fuel Consumption (unit/yr) ⁽¹⁾
On-site Stationary Equipment	Propane	3.05E-03	625.20	204,984.00
On-site Stationary Equipment	Diesel	2.66E-03	407.16	152,864.64

Emission Factors: (Climatq, 2024; NLECCC, 2017)

⁽¹⁾ Propane fuel provided in units of kilograms, diesel provided in units of litres.

Detailed CO₂e calculations are provided in Table 3 of Appendix E.2.

Note that the operational GHG assessment is a simplified GHG inventory based on information provided by EVREC and does not include emissions from all operational and maintenance activities (e.g., the use of light- and heavy-duty vehicles by personnel, waste transport and disposal of spent materials). This assessment considers normal operational processes under a full renewable energy scenario.

7.3.4.2 Effects Assessment

Table 7.3.6: Potential Project-GHG Interactions – Industrial Facility

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works	X
Access Road Upgrading and Construction	X
Water Pipeline Construction	X
Facility Civil Works	X
Transportation of Facility Components	X
Equipment Installation	X
Utility Connections	X

Project Phase	Potential for Interaction
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance (30 years)	
Facility Operations and Maintenance	X
Site Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

7.3.4.3 Assessment Boundaries

Administrative Boundary

Administrative boundaries include GHG reporting considerations, as described in the regulatory context section above and in regulatory guidance documentation (NLECCC, 2017), which informs the development of construction and operational GHG assessments.

Technical Boundary

The assessment of climate change impacts was conducted using estimated construction impacts (e.g., shipments and materials) and operational impacts (e.g., pilot flares). Where detailed construction methodologies are not yet determined, reasonable estimates for construction materials, suppliers, and transportation distances were used. Furthermore, because the emissions inventory was developed during pre-FEED, subsequent engineering design may alter these operational emission estimates.

Spatial Boundary

The LAA for GHG emissions is the province of NL. The RAA for GHG emissions is the global environment.

Temporal Boundary

Temporal boundaries would include the timelines of each Project phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

7.3.4.4 Assessment Criteria

The MGGA requires facilities with annual emissions exceeding 15,000 tCO₂e to report their emissions annually. The MGGA also sets a GHG reduction target for industrial facilities that emit 25,000 tonnes or more of GHGs per year. The 15,000 tCO₂e benchmark has been compared with the NL GHG emissions of 8,600,000 tCO₂e (in 2022), representing approximately 0.2% of total grid emissions (CER, 2026). This comparison is used to assess the magnitude of Project-related GHG emissions.

The VC-specific definition for magnitude is as follows:

- Negligible: GHG emissions are expected to change by $\leq 0.2\%$ annually of the 2022 NL GHG Emissions.
- Low: GHG emissions are expected to change by $> 0.2\%$ and $\leq 2\%$ annually of the 2022 NL GHG Emissions.
- Moderate: GHG emissions are expected to change by $> 2\%$ and $\leq 20\%$ annually of 2022 NL GHG Emissions.
- High: GHG emissions are expected to change by $> 20\%$ annually of the 2022 NL GHG Emissions.

7.3.4.5 Effects

The Industrial Facility is expected to have a low to moderate effect on the GHG environment (Table 7.3.7).

Table 7.3.7: Industrial Facility GHG Emission Summary

Component	Emissions (tCO ₂ e)
Baseline	
EU Ammonia Fossil-based GHG Intensity	1,424,280
Total	1,424,280
Construction Phase	
Foundations	415,841.84
Construction Works	14,432.36
Total	430,274.20
Operations Phase	
Pilot Flares	625.20
Diesel Generators	407.16
Total	1,032.36

The values in this table may differ from those presented in Appendix E.4 due to rounding errors; however, these errors are negligible and do not change their representation.

As mentioned, the GHG emissions emitted for the quantity of ammonia anticipated to be produced by the Industrial Facility, using the European Commission (2021) fossil-based ammonia generation emission intensity amounts to 1,424,280 tCO₂e per year of operation.

The Industrial Facility's construction phase will generate the greatest GHG emissions compared to the operational phase. The total GHG emissions from the construction phase are 430,274.20 tCO₂e, or 143,424.73 tCO₂e per year of construction (3 years in total). The annual construction-related GHG emissions will account for approximately 1.7% of NL GHG emissions, meaning that the construction phase of the Industrial Facility will generate a low magnitude of emissions.

The operations phase will generate GHGs from pilot flares and diesel generators. The anticipated annual GHG emissions during the operational phase are 1,032.36 tCO₂e.

While the ammonia produced by the Industrial Facility is intended to be sent to Europe to offset emissions there, these GHG emissions reductions are anticipated to have a global impact. Therefore, following the Industrial Facility commissioning, the annual GHG emission reduction of 1,424,280 tCO₂e will begin; however, the annual operational emissions of 1,032.36 tCO₂e must be subtracted from any annual reduction. The corrected annual GHG emission reduction is therefore 1,423,248 tCO₂e, and over the Industrial Facilities' lifespan (30 years) is up to 42,697,430.42 tCO₂e.

The assumptions considered in this assessment are an estimate of GHG emissions; the estimate may differ if Industrial Facility component suppliers are located closer or farther from the IPA, or if manufacturing materials are lower or higher than assumed. Or if operational emissions associated with the production, operation, and maintenance of the Industrial Facility are different from those assumed for this assessment.

7.3.5 Mitigation

Mitigation measures to reduce the Industrial Project's contributions to GHG emissions, reducing the overall impact on climate change, include:

- Incorporate the shortest construction/transport routes where possible to minimize the use of fossil fuels during construction.
- Recover and recycle construction and demolition waste, where possible.
- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations.
- Require equipment to meet all applicable provincial and air quality regulations and emissions standards.
- Require that engine and exhaust systems are maintained according to the manufacturer's specifications and applicable maintenance schedule.
- Remove malfunctioning equipment or equipment generating excess amounts of smoke, odour, or noise from service until an assessment and necessary repairs can be completed.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Require preventative maintenance and inspections (e.g., leak testing) of equipment containing coolant (i.e., air conditioning units).
- Train Project personnel (as appropriate) in the proper disposal of halocarbon-containing materials.
- Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements.
- Implement an anti-idling policy to limit GHG emissions from vehicles and equipment and limit the use of fossil fuels, where feasible.

General mitigation measures for process emissions are provided below:

- Inspect and maintain gas lines, seals, and control equipment regularly to prevent leaks and malfunctions.
- Ensure burners undergo regular maintenance to achieve efficient combustion and minimize pollutants.
- Ensure personnel are adequately trained and specialized to perform daily inspections and maintenance on the combustion and emissions control equipment.

7.3.6 Monitoring

No monitoring programs are proposed.

7.3.7 Conclusion

The predicted residual effects of the Industrial Project on Climate Change (after mitigation) are characterized in Table 7.3.8.

Table 7.3.8: GHGs Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Construction Burning of fossil fuels	Use of locally sourced materials, where possible, to reduce CO ₂ , CH ₄ , and NO _x emissions associated with transport.	A	L VC interaction causes direct combustion of fossil fuels and indirect emissions from the supply chain.	LSA Within the LSA	ST Effects are expected throughout the construction and decommissioning phases.	C Continuous	PR Partially Reversible	Not significant
Operation Reduction in GHG emissions	N/A	P	M VC interaction directly reduces GHG emissions.	RSA Within the RSA	MT Effects are expected throughout the operational phase.	C Continuous	PR Partially Reversible	Not significant

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA - Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term MT – Medium Term, LT – Long Term, P – Permanent

Frequency: SE – Single Event, I - Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

7.4 Noise

7.4.1 Overview

The assessment of sound/noise considered both construction and operational-generated noise from the Industrial Facility. During construction, heavy equipment, machinery, and light vehicles will emit sound to the surrounding environment from activities associated with the development of the Industrial Facility, as well as the development of roads, and ammonia pipeline. To quantify potential impacts, sound levels of equipment anticipated to be used for the Industrial Facility's construction were used to calculate sound levels at set distances from the IPA, considering nearby receptors. Sound generated during decommissioning activities will be similar to construction, based on the same process/activities (except for dismantling the infrastructure). Therefore, for this assessment, when describing construction sound/noise and project interactions, it will act as a proxy for the decommissioning phase of the Industrial Facility.

During the operational phase of the Project, the Industrial Facility will emit sound to the surrounding environment from the operation of the ammonia storage flares and generators. Design and engineering of the Industrial Facility components (e.g., siting of flares) have reduced, but not eliminated, noise and its associated impacts. To quantify the potential effects of facility-generated noise on nearby receptors, detailed sound modelling was completed.

7.4.2 Regulatory Context

Changes to the acoustic environment during construction and operational activities could result in annoyance and interference with communication, sleep, or working efficiency.

Table 7.4.1: Summary of Sound/Noise Level Regulations and Guidelines

Regulated/ Considered By	Regulation/Guidance	Sound Level (dBA)	Criterion/Note
For Residential Receptors			
Health Canada	Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada, 2023)*	45	Sleep Disturbance: Indoor sound levels should not exceed 30 dBA (45 dBA outdoor noise) for continuous noise events to reduce impacts on sleep.
		45	Short Term Construction: Outdoor sound levels should not exceed 45 dBA for continuous noise events to reduce impacts on sleep.

Regulated/ Considered By	Regulation/Guidance	Sound Level (dBA)	Criterion/Note
		47	Mitigating Short-Term Construction Noise Exposure: Outdoor noise should not exceed 47 dBA L_{dn} for quiet suburban or rural receptors.**
For Occupational Safety			
Newfoundland and Labrador Occupational Health and Safety.	Occupational Health and Safety Regulations, 2012 N.L.R. 5/12, ACGIH TLVs	85	8-hour maximum, 40-hour work week, without hearing protection.

* Health Canada (2023) provides an estimated outdoor-to-indoor transmission loss of 15 dBA for noise.

** Quiet rural and suburban receptors as defined in Health Canada (2017) and based on population density.

There are no municipal or provincial regulations related to operational Industrial Facility noise in NL. However, Health Canada (2023) has developed considerations and guidance for noise related to Environmental Assessments (Table 7.4.1).

7.4.3 Baseline Ambient Sound

A baseline sound assessment was conducted in 2024, within the IPA, and the maximum modal 1-hour value was 32 dBA (Strum Consulting, 2025). This is less than the Health Canada (2023) estimated L_{dn} value for a quiet rural area (≤ 45 dBA) or a quiet suburban residential area (48 dBA to 52 dBA) as would apply to the Town of Botwood, based on its population density (Statistics Canada, 2022d).

Sounds associated with the area include recreational and local traffic, along roads, which increases ambient sound levels from cars, trucks, and other vehicles. Furthermore, there are several existing commercial quarry permits. These suggest that active quarrying is already underway at least periodically within the area surrounding the IPA. Lastly, in addition to anthropogenic sources, there are also natural sources of sounds originating from wildlife, wind, water, and vegetation.

The baseline sound assessment was conducted to determine baseline sound levels for use in possible post-construction sound and noise assessments.

7.4.4 Effects Assessment

Table 7.4.2: Potential Project-Sound/Noise Interactions – Industrial Facility

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land surveys	-
Geotechnical investigations	X

Project Phase	Potential for Interaction
Implementation of erosion and sediment control measures	X
Tree clearing and grubbing	X
Excavating grading and compacting soils for construction	X
Construction of temporary works – quarries, batch plants, accommodations	X
Access road upgrades and construction	X
Laydown yard and Industrial Facility construction, including foundation excavation, construction and blasting where necessary	X
Pipeline construction	X
Transmission system installation and commissioning	X
Removal of temporary works & site restoration	X
Operations and Maintenance (33 years)	
Operations and maintenance	X
Conveyance of product to port via pipelines, including loading onto ships	X
Vegetation management	-
Environmental monitoring	-
Decommissioning and Rehabilitation (3 years)	
Infrastructure removal	X
Site reclamation	X

7.4.4.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries include Health Canada (2023) considerations, as described in the regulatory context section above, which are used for the development of construction and operational noise assessments. Furthermore, marine-related noise, which might be produced as a result of the use of the jetty, was not assessed as part of the EIS.

Technical Boundary

Technical constraints for assessing sound/noise effects include a lack of detailed construction equipment and sound power levels for the operational equipment (e.g., flare specifications) for the Industrial Facility. Additionally, baseline ambient noise data is limited and constrains the noise modelling of the IPA.

Spatial Boundary

The LSA for sound includes the maximum modelled extent for operational noise (Appendix F.3) (Drawing 7.4-1, Appendix A). The RSA is not applicable for sound/noise.

Temporal Boundary

Temporal boundaries would include the timelines of each Project phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

7.4.4.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to sound/noise. The VC-specific definition for magnitude is as follows:

Construction Sound

- Negligible: sound levels from Project activities are expected to always be indiscernible at receptor locations.
- Low: sound levels from Project activities are discernible and may exceed 47 dBA L_{dn} but are expected to be ≤ 45 dBA at receptor locations during evening and overnight hours (19:00 to 07:00).
- High: sound levels from Project activities are expected to exceed 45 dBA at receptor locations during evening and overnight hours (19:00 to 07:00).

Operational Sound

- Negligible: sound levels from Project activities are expected to always be indiscernible at receptor locations.
- Low: measurable sound levels predicted at receptor location(s), but results are below Health Canada (2023) guidance (45 dBA).
- High: sound levels predicted to exceed Health Canada (2023) guidance at receptor locations (45 dBA).

7.4.4.3 Modelling Methodology

The assessment of sound/noise is based on desktop studies and addresses Project-related effects on human receptors. The receptors used for the noise modelling assessments were the industrial receptors (IRIDs) as presented in Section 3.2.

Construction Sound

The assessment of construction sound/noise is based on desktop studies and addresses Project-related effects on human receptors. This was completed by a construction noise modelling assessment conducted by io consulting in 2025 (Appendix F.2), which was developed based on the pre-FEED of the Industrial Facility provided by EVREC (io consulting, 2025a). The io consulting report was completed with the following objectives:

- Establish the construction sound/noise levels produced within the IPA.
- Identify nearby receptors that may be exposed to construction sound produced by the Industrial Facility.
- Determine if applicable guidance is met.
- Mitigate impacts experienced by nearby IRID receptors, if required.

Operational Sound

To understand the Project-related impacts on noise emission from the operational Industrial Facility, io consulting conducted a noise modelling assessment (Appendix F.3) based on the pre-FEED of the Industrial Facility provided by EVREC (io consulting, 2025b). The io consulting report was completed with the following objectives:

- Identify key contributors to environmental noise emissions.
- Identify and assess comprehensive sound levels at the exterior of identified receptors.
- Include low-frequency sound/noise within the assessment.
- Propose mitigation of Project-generated sound on nearby receptors, if required.

Noise Modelling

The sound assessments (Construction and Operational) were completed using the iNoise software package, which incorporates the standards set out in ISO 9613-1 and ISO 9613-2.

The models followed ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method and calculations, and were based on the following input information:

- Locations of Industrial Facility components or equipment.
- Octave band sound power level data.
 - Estimate for construction equipment based on the equipment list from EVREC and published literature for noise emissions.
 - Flare noise data is not currently available. Flare noise calculated using the VDI 3732 procedure for steam injection flares (ground or elevated) as used in the chemical and petrochemical industry for disposing of combustible gases without hazard (GlobalSpec, n.d.).
- UTM coordinates for IRID receptors.
- Topographic data for the surrounding area.

The meteorological conditions used to model sound emission were determined based on the Project Basis of Design (BOD) and discussions with EVREC and other subcontractors to assess a worst-case sound propagation scenario. These include a minimum air temperature of 5°C and a maximum relative humidity of 70%. A ground factor of 0.5 was applied to the model, representing a mix of hard and soft groundcover (i.e., vegetative growth [soft surface] and water [hard surface]).

Note, sound levels and impacts from blasting activities have not been included in this assessment as blasting requirements have not been confirmed. If blasting is determined to be required during construction, EVREC will notify NLECCC and apply for any required permits and approvals. Any potential impacts, mitigation, and subsequent required monitoring will be described in a Project-specific Blasting Plan.

7.4.4.4 Modelling Results

Construction Sound

During construction activities, sound will predominantly be generated through the operation of construction equipment and heavy machinery such as cranes, backhoes, excavators, and concrete trucks.

An estimated list of construction equipment for the Industrial Facility was prepared by EVREC and provided to io consulting (Appendix F.2) and used to estimate sound power levels to calculate the total noise generated during the construction phase of the Industrial Facility. The construction sound was then modelled as an area source across the IPA to account for equipment movement within the area.

The construction of the ammonia pipeline and heavy haul road was modelled as a series of line sources along the route to account for the iterative construction of the infrastructure. The model produced by io consulting assumed that at any given time, only half of the construction equipment would be operating, reducing the total estimated sound power level (Table 7.4.3).

Table 7.4.3: Estimated Construction Equipment Sound Power Levels – Industrial Facility

Parameter	dBA	Octave Band Centre Frequency (Hz) (dB)							
		63	125	250	500	1,000	2,000	4,000	8,000
Total sound power level for all construction equipment	128	130	127	125	122	123	121	121	117
Correction (50% equipment in use)	-3	-3	-3	-3	-3	-3	-3	-3	-3
Corrected Sound Power Level	125	127	124	122	119	120	118	118	114

Source: io consulting Report (Appendix F.2)

The nearest residential receptor to the Industrial Facility boundary is located approximately 962 m away along Pumphouse Road (IRID37). The predicted noise level at this receptor is 39 A-weighted decibels, equivalent continuous sound level, averaged over one hour (dB $L_{Aeq(1h)}$) during the construction of the IPA. These predicted levels are below any of the Health Canada (2023) Guidelines (Table 7.4.1), and as such, construction activities are not anticipated to cause regulatory exceedances or disturbances to sleep at any nearby receptors. Therefore, it is anticipated that the construction of the Industrial Facility will be compliant with regulatory guidance (Drawing 7.4-2, Appendix A).

The nearest residential receptor to the ammonia pipeline and heavy haul road considered in the modelling is IRID36 located along Pumphouse Road (180 m from the ammonia pipeline and heavy haul road). The predicted noise level at this receptor is 57 dB $L_{Aeq(1h)}$ during the construction of the IPA. This predicted sound level for the construction of the ammonia pipeline and heavy haul road exceeds the Health Canada (2023) Guidelines (Table 7.4.1) for sleep disturbance and noise mitigation (Drawing 7.4-3, Appendix A).

The ammonia pipeline and heavy haul road construction in IRID 51 (the Town of Botwood residence cluster) was not assessed in the io consulting construction assessment. This includes residential receptors along Water Street, north of Valley Road. However, construction noise is assumed to be intermittent and temporary.

Operational Sound

The equipment vendors for the IPA have not yet been confirmed; however, the pre-FEED was provided to io consulting to estimate the anticipated noise levels generated by the operational Industrial Facility. Sound from the IPA will predominantly be generated through the operation of mechanical equipment (e.g., pumps), diesel generators (emergency) and flares (ammonia storage, jetty and process flares).

The operation of the Industrial Facility was modelled in conjunction with the Solar Project. However, the Solar Project produces far fewer noise emissions than the Industrial Facility. No significant noise is anticipated to be made by the operation of the haul road and pipeline. Therefore, no operational noise was modelled for the heavy haul road and ammonia pipeline.

Several operational scenarios were modelled for noise emissions from the Industrial Facility, including:

- Normal Operation: flares on pilot gas only
- Normal Operation: ammonia flare on purge gas
- Normal Operation: jetty flare on off-spec ammonia flaring
- Diesel Generators Operating with One Air Separator Unit (ASU)

Each scenario was considered to understand possible noise emissions across various predicted operational frameworks, including emergency scenarios. These predicted noise levels were measured against the nearest residential receptor IRID 37 to the Industrial Facility (Table 7.4-4).

Note that an additional scenario (Emergency Blowdown Relief) is discussed in Section 14.0.

Table 7.4.4: Industrial Facility Operational Noise Emissions at Nearest Residential Receptor - Unmitigated

Scenario	Description	Details	Noise Level at IRID 37 (dBA)
Scenario 1	Normal Operation: flares on pilot gas only	The Industrial Facility is under normal operating conditions with both flares on pilot gas.	42
Scenario 2	Normal Operation: ammonia storage flare on purge gas	The Industrial Facility is under normal operating conditions with the ammonia storage flare on 0.1178 tonnes per hour (t/hr) of purge gas.	42
Scenario 3	Normal Operation: jetty flare on off-spec ammonia flaring	The Industrial Facility is under normal operating conditions with the jetty flare on 107 t/hr of off-spec ammonia.	68
Scenario 4	Diesel Generators Operating with One ASU	All 34 of the emergency diesel generators are operating, along with one ASU.	40

Source: (Appendix F.3) Note: Jetty flare modelled within the IPA for the operational noise assessment.

The predicted sound levels for the operation of the Industrial Facility under Scenarios 1, 2 and 4 fall within the acceptable Health Canada (2023) Guidelines (Table 7.4.1) for sleep disturbance. Scenarios 3 exceeds the Health Canada (2023) Guidelines (Table 7.4.1) for sleep disturbance.

Several mitigation measures were proposed and are expected to decrease noise emissions from the Industrial Facility (io consulting, 2025b) (Table 7.4.5). The measures proposed by io consulting are broad in scope, as the actual need for noise reduction will be assessed once the Industrial Facility equipment is identified and specific noise emission details are known. The proposed noise-reduction measures include enclosed, attenuated, or low-noise flares and improved noise-reduction performance packages for diesel generators.

Table 7.4.5: Industrial Facility Operational Noise Emissions at Nearest Residential Receptor - Mitigated

Scenario	Description	Details	Noise Level at IRID 37 (dBA)	Drawing (Appendix A)
Scenario 1	Normal Operation: flares on pilot gas only	The Industrial Facility is under normal operating conditions with both flares on pilot gas.	37	7.4-4
Scenario 2	Normal Operation: ammonia storage flare on purge gas	The Industrial Facility is under normal operating conditions with the ammonia storage flare on 0.1178 tonnes per hour (t/hr) of purge gas.	38	7.4-5
Scenario 3	Normal Operation: jetty flare on off-spec ammonia flaring	The Industrial Facility is operating normally, with the jetty flare reporting 107 t/hr of off-spec ammonia.	40	7.4-6
Scenario 4	Diesel Generators Operating with 1 ASU	All 34 of the emergency diesel generators are operating, along with one ASU.	37	7.4-7

Source: (Appendix F.3).

Note: Jetty flare modelled within the IPA for the operational noise assessment.

Once the noise mitigations proposed by io consulting have been implemented, the Industrial Facility is no longer anticipated to generate noise emissions in excess of the Health Canada (2023) Guidelines (Table 7.4.1).

7.4.4.5 Effects

Sound levels exceeding 45 dBA at residential receptors can disrupt sleep at night. Sounds produced during construction of the ammonia pipeline and heavy haul road have the potential to exceed these thresholds at nearby residential receptors located within close proximity to construction (outside of IRID 51). The ammonia pipeline and heavy haul road construction within the IRID 51 polygon was not assessed in detail. Construction of this infrastructure may

occur 24 hours a day, 7 days a week; however, construction is not expected to be continuous and is therefore assumed to be intermittent and temporary. Furthermore, EVREC will conduct noisier construction activities (e.g., pneumatic breakers) during daytime shift hours (where required) to minimize impacts on nearby receptors. Nonetheless, additional noise mitigation (e.g., temporary screening) should be considered as part of a construction noise management plan once further engineering design of the Industrial Facility, ammonia pipeline and heavy haul road is complete and detailed construction works have been planned.

Modelled operational sound at the nearest residential locations shows the potential for noise exceedances. However, io consulting provided a series of mitigations (Appendix F.3), which, when applied, reduce noise levels below Health Canada (2023) Guidelines for all scenarios with the exception of an emergency flare event, which is discussed in Section 14.0. The proposed noise reduction mitigations include enclosed, attenuated, or low noise flares and improved noise reduction performance packages of diesel generators.

Potential environmental effects associated with quarrying and borrowing are expected to be primarily related to fugitive dust, noise and vibration from blasting and material processing, surface water quality effects associated with sediment mobilization, and risks associated with fuel use, equipment operation, and waste handling. These effects will be reduced through standard best management practices, including controlled blasting practices.

7.4.5 Mitigation

To minimize construction sound/noise and the potential disturbance of receptors during the construction phase of the Project, the following mitigation measures will be implemented, as required:

- Use noise controls (e.g., mufflers) on machinery and equipment, where applicable, to limit disturbance.
- Limit unnecessary vehicle idling.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Conduct noisier construction activities (e.g., drilling or blasting) within daytime shift hours to the greatest extent possible.
- Consider additional noise mitigation (e.g., temporary screening, rehousing) where necessary, as part of a construction noise management plan.
- Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.
- Commit to re-model noise once detailed engineering is complete.

To minimize disturbance from sound/noise during operation, the following mitigations will be implemented if determined to be necessary after the detailed design phase:

- Utilize enclosed, attenuated, or low noise flares (as required).

- Procure diesel generators with a higher performance package, including noise controls (as required).
- Ensure during detailed design that compressors are enclosed and compressor piping is acoustically insulated or underground (as required).

The Project will develop a “good neighbor program” to register and respond to concerns related to sound and outline a process to investigate complaints. Mitigation to resolve complaints, if determined to be necessary, will be completed on a case-by-case basis in consultation with the affected complainant. Improved baseline noise monitoring will be incorporated as part of this process to assess ambient and operational noise levels in areas of concern.

7.4.6 Monitoring

No monitoring programs are recommended at this time.

7.4.7 Conclusion

After mitigations, predicted residual effects on sound/noise are characterized in Table 7.4.6.

Table 7.4.6: Sound/Noise Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Construction Sound/Noise Impacts to residential receptors	Conduct construction activities within the recommended daytime hours of 07:00 to 19:00 to the greatest extent possible.	A	L	LSA	ST	I	R	Not significant
Operational Sound/Noise Impacts to residential receptors	Determine the need for noise mitigation after the equipment for the Facility is selected during the detailed design phase.	A	L	LSA	MT	C	R	Not significant

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA - Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term, MT – Medium Term, LT – Long Term

Frequency: SE – Single Event, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

7.5 Groundwater

7.5.1 Overview

Groundwater resources are identified as a VC for the Industrial Facility due to their significance to ecological, social, and economic systems. Ecologically, groundwater provides baseflow to surface water bodies and maintains the hydrologic function of wetlands. Socioeconomically, while the primary industrial process water is sourced from Peters Pond, groundwater is a potential source for localized potable supply at the worker accommodation camp and various un-serviced ancillary buildings. Furthermore, although the IPA is located nearby municipal water supply infrastructure, groundwater serves as a source of potable water for a number of private domestic wells within the LSA.

Project activities have the potential to affect the quantity (availability) and quality (chemistry) of this resource for local users and the surrounding environment. These activities include excavation dewatering for foundations and the underground ammonia pipeline and blasting and general earthworks for site development. Operational activities, including the discharge of industrial plant effluent and the potential operation of sub-surface water drains for water table management, represent additional interactions with the local hydrogeological flow regime and water quality.

The objective of the hydrogeology assessment was to collect the information necessary to assess potential interactions between the Industrial Facility and groundwater resources. This was accomplished using the following approach:

- Identify potential hydrogeological features within the IPA using desktop resources.
- Use the information collected to identify potential Project interactions and inform possible mitigation measures.

7.5.2 Regulatory Context

Management and protection of groundwater resources are provincially regulated in Newfoundland and Labrador. Legislation relevant to groundwater resources includes:

- Water Resources Act (Newfoundland and Labrador, 2002c)
- Environmental Protection Act (Newfoundland and Labrador, 2002a)

7.5.3 Desktop Assessment Methodology

The characterization of existing groundwater conditions within the IPA was established through a review of relevant literature, publicly available provincial datasets, and reported water use information. While no Project-specific field studies were conducted, the assessment utilized a combination of historical and current records to define the hydrogeological baseline.

A literature review was performed to define the geological setting and regional hydrogeological conditions. These publications are listed in Section 3.0. Key data sources included:

- AMEC Earth & Environmental Ltd. (AMEC, 2013). Hydrogeology of Central Newfoundland.
- The provincial Drilled Water Well Database (NLECCC-WRMD, 2025), supplemented by consultation with NLECCC-WRMD representatives; and,
- The provincial Water Rights/Water Use License database (NLECCC-WRMD, 2025).

There were no previous hydrogeological assessment reports available specifically for the IPA.

Several data limitations exist regarding the provincial well records. Although well drilling regulations have required the submission of construction records since 1981, data for wells drilled prior to this date relies on individual drilling company files and may be incomplete. Consequently, the Drilled Water Well Database may not capture all existing wells in the region. Additionally, the publicly available database only contains records up to 2008. As such, a formal request was submitted to the NLECCC-WRMD for supplemental records of wells drilled in the vicinity of the Project since that time.

Furthermore, spatial data within the provincial database is often limited; geographic coordinates for many older records are either unavailable or incorrectly referenced. As a result, the exact locations of the identified wells are not confirmed and would require field verification to establish precise proximity to Project infrastructure.

Based on the compiled information provided by the province, one dug well and two drilled wells were identified within the 500 m of the IPA (Drawing 7.5-1, Appendix A). Of note, the provincial database assigns identical geographic coordinates to the two drilled wells (Well Nos. 20915 and 20916). The differing well construction, lithology, and yield specifications suggest these are distinct, adjacent wells rather than a duplicate entry, although a coordinate reference error remains a possibility. In addition, the geographic coordinates for the dug well appear inaccurate as satellite imagery shows the reported location situated in an undeveloped boggy area approximately 45 m east of the Peters Pond shoreline, where well development is unlikely. These well locations will be field verified prior to the initiation of Project development activities.

7.5.4 Desktop Assessment Results

7.5.4.1 *Groundwater Flow Conditions*

Hydrostratigraphy

The hydrogeology of the IPA is described in the regional hydrogeological study of central Newfoundland by AMEC (2013). This desktop study summarized the physical characteristics of major geological units in relation to groundwater occurrence, availability, and quality, utilizing provincial water well records for 3,080 drilled wells including 26 wells from three communities in the vicinity of the IPA to categorize areas into hydrostratigraphic units. Analysis of these water well records allowed for the subdivision of surficial deposits into two hydrostratigraphic units and the identification of five bedrock hydrostratigraphic units, one of which is present in

the LSA. Groundwater yields varied significantly, from low (<1 L/min) to high (>650 L/min), a variance that correlates with the encountered surficial deposits and bedrock types. Table 7.5.1 provides a summary of the hydrostratigraphic units defined in AMEC (2013) that are present in the IPA.

Table 7.5.1: Surficial Deposits and Bedrock Hydrostratigraphic Units in the IPA

Hydrostratigraphic Unit	Lithology	Number Of Wells (Regional Study)	Well Yield Characteristics (L/min)		Well Depth Characteristics (m)	
			Average	Median	Average	Median
Surficial Deposits						
Unit A	till	46	29	18	17	15
Moderate Yield Till Deposits						
Unit B	sand & gravel	99	102	50	23	22
Moderate to High Yield Sand and Gravel Deposits						
Bedrock						
Unit 2	siltstone, conglomerate, argillite, greywacke, with minor volcanic flows and tuff.	1,403	20	7	51	46
Low to Moderate Yield Sedimentary Strata						

(AMEC, 2013)

Surficial deposits within the IPA are subdivided into two broad hydrostratigraphic units: till deposits (Unit A) and predominantly glaciofluvial sand and gravel deposits (Unit B). The till blanket deposits in the IPA are greater than 1.5 m thick and are locally eroded and dissected (Kirby et al., 2011). These deposits dominate the western portion of the IPA and underlie the majority of the PF of the Industrial Facility of the IPA.

These till blanket deposits may support viable aquifer systems. The AMEC (2013) report characterizes Unit A as having moderate well yield potential, with 46 regional well records showing an average yield of 29 L/min with a median of 18 L/min. Yields in these records range from 2 L/min to 136 L/min. Well depths average 17 m with a median of 15 m and range from 9 m to 50 m. Of these 46 records, one well drilled in Botwood in 1996 represents local conditions within the assessment area. This record indicates a yield of 90 L/min, which is higher than the regional typical, and a shallower well depth of 12 m.

Hydrostratigraphic Unit B sand and gravel deposits occur in the eastern portion of the IPA and underlie the proposed accommodation camp, project roads, and the southern extent of the heavy haul road leading to the Port of Botwood. Regionally, these deposits occur extensively in the Exploits River basin, where thicknesses of up to 27 m have been recorded AMEC (2013). Locally, these deposits occur along the Peters Pond drainage system and consist of glacial

outwash and marine terraces (Kirby et al., 2011). This unit is identified as having the most significant groundwater supply potential in the PA, with a moderate to high yield potential. Regional yields from 99 records average 102 L/min with a median of 50 L/min. These yields range from 4 L/min to 683 L/min. Well depths average 23 m with a median of 22 m and range from 9 m to 49 m.

Of the 99 records for Unit B, three representing local conditions within the LSA include one from Woodale and two from Peterview. Although both Woodale and Peterview are located outside the LSA, these records serve as a proxy for anticipated conditions in the IPA and indicate a median yield of 68 L/min, which is higher than the regional typical for Unit B, and a slightly shallower median well depth of 21 m.

The bedrock underlying the IPA is mainly classified as Hydrostratigraphic Unit 2. This unit includes several moderately metamorphosed sedimentary formations, primarily of Ordovician to Silurian age, comprising sandstone, siltstone, conglomerate, argillite, and greywacke, with minor volcanic flows and tuff. While intergranular flow may occur within the sedimentary matrix, groundwater movement in this unit is expected to be primarily dictated by secondary porosity associated with structural discontinuities such as fractures, joints, and faults.

Unit 2 is assessed as having a low to moderate well yield potential. Yields from 1,403 regional well records average 20 L/min with a median of 7 L/min and range from 0.1 L/min to 491 L/min. Well depths average 51 m with a median of 46 m and range from 6.6 m to 219 m. Of the 1,403 well records for Unit 2, 44 records representing local conditions within the assessment area are from the communities of Botwood, and Wooddale, with wells drilled between 1992 and 2007. These local well records indicate a yield higher than the regional typical for Unit 2, with a median reported yield of 14 L/min and a shallower median well depth of 42 m.

No known hydraulic conductivity testing has been completed in the hydrostratigraphic units of the LSA. However, these regional units comprise a wide variety of overburden materials and bedrock types, each characterized by unique hydraulic properties. Surficial deposits range from low permeability glacial tills to highly transmissive glaciofluvial sands and gravels. Similarly, the underlying bedrock consists of sedimentary formations where flow is primarily controlled by secondary structural features. Consequently, the geological materials in the LSA are expected to display a broad range of hydraulic conductivity values that potentially differ by multiple orders of magnitude.

Groundwater Levels and Flow Directions

Based on information from existing water wells, which indicates an absence of significant low permeability layers directly overlying the water bearing zones, the IPA is inferred to be underlain by an unconfined aquifer system. This system is contained within the underlying surficial materials of Unit A and Unit B, as well as the sedimentary bedrock of Unit 2. Groundwater flow in these diverse materials occurs mainly via primary porosity in the Unit B sands and gravels and primarily via secondary porosity, such as fractures, joints, and faults, in the Unit 2 bedrock. While Unit A till deposits are often characterized by lower permeability, they

remain a part of the unconfined system and contribute, along with localized deposits of organic soils, to the storage and slow release of groundwater. Flow characteristics across the IPA are variable, depending on the density and interconnectivity of the overburden depositional features and bedrock structural discontinuities. Semi-confining to confining conditions may be present at depth due to an increase in lithostatic pressure resulting in fracture closure and reduced permeability.

Groundwater flow within the IPA is assumed to be primarily controlled by water table conditions and variations in topography. Shallow groundwater is interpreted to follow short flow paths from recharge areas along northeast trending ridges to adjacent lowlands. Discharge occurs into various surface water features including wetlands, ponds, lakes, and rivers as well as along the coastline near the heavy haul road. The shallow groundwater system in the IPA is expected to be largely controlled by surface runoff and local recharge, while at moderate depths the flow system in the PF may be influenced by lateral inflow of groundwater from the regional up-gradient area to the west in the New Bay Pond area of the WPA.

Information from water well records in the vicinity of the IPA, coupled with the presence of multiple streams and standing water, suggests groundwater levels are generally shallow and are a subdued reflection of the topography in the area. These levels are typically within 6 m of the ground surface. Based on information provided in the Fracflow (2026) report (Appendix H.4), groundwater levels are assumed to be near surface within the industrial plant stream drainage area.

7.5.4.2 Local Groundwater Users and Public Water Supplies

There are no public groundwater supply wells in the IPA. A review of the provincial Drilled Water Well Database (NLECCC-WRMD, 2025) and a potable well search conducted by NLECCC for this project identified a total of two drilled wells and one dug well within a 500 m buffer of the IPA. As discussed previously, the dug well appears to be located within an undeveloped area adjacent to Peters Pond, and as such is assumed to have inaccurate coordinates. This well location will be field verified prior to the initiation of Project development activities. However, regardless of the actual location of the dug well, it would not be expected to be impacted by Project activities given that such wells are typically completed at shallow depths to intercept the water table. This construction results in a localized area of influence that relies on immediate surface recharge rather than the deeper groundwater systems potentially affected by industrial activities.

The two drilled wells are inferred to be located next to each other and are located along Swanee Pool Road in Peterview.

All of the reported wells in these areas are used as private domestic water supplies. Assuming the correct locations for the two adjacent drilled wells, these are located within the IPA but approximately 825 m away from the nearest IPA infrastructure (heavy haul road).

The locations of all groundwater source Water Rights/License holders in the provincial

database (NLECCC-WRMD, 2025) were mapped to determine if major non-domestic groundwater users were present in the IPA. Based on this analysis, no registered active non-domestic groundwater withdrawal approvals were identified within 500 m of the IPA.

There are no public surface water supplies within 500 m of the IPA

7.5.4.3 Groundwater Quality

No known groundwater quality data exists directly for the IPA. Characterization of groundwater quality is therefore based on a regional compilation of public drinking water well quality data for Central NL prepared by the NLECCC (2020). This dataset is informed by public supply water well data from communities across the region, including Laurenceton (15 km), Stanhope (24 km), and Campbellton (35 km), which represent the closest communities with available well data. Public drinking water wells are sampled every two to three years to provide an overview of groundwater quality across the province. The summary of the Central Region dataset used for this assessment includes data collected up to October 30, 2020. A summary of groundwater quality data for Central Newfoundland is provided in Table 7.5.2.

Table 7.5.2: Summary of Provincial Public Water Well Groundwater Quality Data for Central Newfoundland

Parameter	Samples	Minimum	Maximum	Average	Median	GCDWQ ¹	Units
Alkalinity	175	7	496	48.28	19	na	mg/L as CaCO ₃
Color	175	0	340	14.53	0	15 (A)	TCU
Conductivity	175	36	1310	191.79	128	na	µS/cm
Hardness	176	0	223	48.53	24	na	mg/L as CaCO ₃
pH	175	5.89	8.47	7.03	6.66	7.0–10.5 (A)	N/A
TDS	175	23	852	122.41	83	500 (A)	mg/L
Turbidity	175	0	22	0.72	0.20	1 (C)	NTU
Boron	176	0	0.28	0.01	0.01	5 (C)	mg/L
Bromide	175	0	0.72	0.02	0.00	na	mg/L
Calcium	176	0	73	15.46	8	na	mg/L
Chloride	175	3	336	26.28	17	250 (A)	mg/L
Fluoride	175	0	0.36	0.05	0.00	1.50 (C)	mg/L
Potassium	176	0	3	0.68	1	na	mg/L
Sodium	176	0	230	17.97	11	200 (A)	mg/L
Sulphate	175	3	78	9.03	6	500 (A)	mg/L
Ammonia	176	0	0.32	0.02	0.00	na	mg/L
DOC	176	0	35.40	2.00	0.50	na	mg/L
Nitrate+Nitrite	175	0	1.92	0.26	0.17	10 (C)	mg/L
Kjeldahl nitrogen	176	0	0.760	0.083	0.000	na	mg/L

Parameter	Samples	Minimum	Maximum	Average	Median	GCDWQ ¹	Units
Total phosphorus	176	0	0.12	0.020	0.01	na	mg/L
Aluminum	176	0	1.25	0.09	0.00	2.9	mg/L
Antimony	168	0	0.0005	0.0001	0	0.0060 (C)	mg/L
Arsenic	177	0	0.0060	0.0010	0.0000	0.01 (C)	mg/L
Barium	176	0	0.03	0.01	0.00	2.0 (C)	mg/L
Cadmium	177	0	0.000	0.0000	0	0.0070 (C)	mg/L
Chromium	176	0	0.003	0.0000	0.0000	0.05 (C)	mg/L
Copper	176	0	5.430	0.042	0.001	2.0 (C)	mg/L
Iron	176	0	2.40	0.16	0.000	0.1 (A)	mg/L
Lead	177	0	0.029	0.001	0	0.0050 (C)	mg/L
Magnesium	176	0	11	2.44	1	na	mg/L
Manganese	176	0	0.59	0.034	0.010	0.12 (C)	mg/L
Mercury	176	0	0.00005	0.00001	0	0.0010 (C)	mg/L
Nickel	176	0	0.008	0.0007	0	na	mg/L
Selenium	176	0	0.004	0.0002	0	0.05 (C)	mg/L
Uranium	168	0	0.016	0.0009	0	0.02 (C)	mg/L
Zinc	176	0	0.330	0.0064	0	5 (A)	mg/L

⁽¹⁾ Guidelines for Canadian Drinking Water Quality Summary Table (Health Canada, 2025)

Based on the regional dataset, which includes analytical results for up to 177 samples depending on the specific parameter, groundwater in Central NL exhibits a range of results, with several parameters exceeding the GCDWQ (Health Canada, 2025). Analytical results for pH range from 5.89 to 8.47, with a median of 6.66, which is below the aesthetic objective range of 7.0–10.5. Aesthetic parameters including color (maximum 340 TCU), turbidity (maximum 22 NTU), and TDS (maximum 852 mg/L) show localized elevations exceeding guidelines. Concentrations of metals also exhibit exceedances. Concentrations of iron and manganese are measured at levels up to 2.40 mg/L and 0.59 mg/L, respectively, exceeding their applicable aesthetic and health-based guidelines. In addition, the regional data indicates that lead (maximum 0.029 mg/L) and copper (maximum 5.43 mg/L) concentrations exceed applicable guidelines in specific locations.

7.5.5 Effects Assessment

An overview of the potential interactions between the Project and groundwater resources by Project phase (construction, operation, and decommissioning) in the IPA are presented in Table 7.5.3. These interactions were identified by integrating the Project description with baseline conditions established through the desktop assessment.

Table 7.5.3: Potential Project – Hydrogeology Interactions – Industrial Facility

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	-
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works	X
Access Road Upgrading and Construction	X
Water Pipeline Construction	X
Facility Civil Works	X
Transportation of Facility Components	-
Equipment Installation	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	
Facility Operations and Maintenance	X
Site Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

The Project components and activities anticipated to interact with groundwater resources within the IPA include:

- Construction activities such as clearing and grubbing of vegetation and soils, blasting, earthworks, and site preparation for the development of the Industrial Facility infrastructure (including the hydrogen and ammonia plants, the underground ammonia pipeline, the heavy haul road, the bulk hydrogen and ammonia storage tanks, the stormwater/effluent water pond, the accommodations camp and various other ancillary site buildings).
- Construction excavation dewatering required for the site building foundations, the stormwater/effluent water pond and the installation of the underground ammonia pipeline.
- Possible water withdrawal of groundwater for potable supply at the accommodation camp during both the Project construction and operations phases, and at the quarry near the Industrial Facility during construction.
- Discharge of treated effluent within the stormwater/effluent pond during operations.
- Discharge of treated domestic sewage from septic systems serving the accommodation camp and office spaces during both the Project construction and operations phases.

- Potential accidental releases of hazardous substances, such as ammonia, untreated plant operations water (comprising combined effluent and Reverse Osmosis (RO) rejects), or fuels, and the application of dust-suppression agents during construction and maintenance across all Project phases.
- Decommissioning activities involving earthworks and potential dewatering for the removal of industrial infrastructure, including the restoration of site surfaces and foundation areas.

These interactions have the potential to result in measurable changes to groundwater quantity and quality. Based on the hydrological modeling results presented in Section 7.6, average monthly water levels for Peters Pond are expected to remain relatively stable with the proposed Project withdrawal incorporated. Because these surface water stage levels are maintained within their natural range, the hydraulic gradients and head pressures that drive local groundwater are expected to remain unchanged. As a result, there are no anticipated effects on local groundwater levels and existing groundwater users due to the proposed industrial withdrawal.

7.5.5.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries for groundwater resources in the IPA are established by several provincial and federal requirements, as well as the Project-specific EIS Guidelines (NLECCC, 2025). Under the Water Resources Act (2002), the NLECCC-WRMD holds legislative authority for provincial water management. Relevant regulations under this Act include:

- Environmental Control Water and Sewage Regulations (Newfoundland and Labrador, 2003b): Sets effluent limits for discharges to surface water, including groundwater baseflow (NLR 65/03).
- Well Drilling Regulations (2003): Defines technical standards for the construction and abandonment of water supply wells (NLR 63/03).

Management of accidental releases is governed by the NLECCC, (2014) Guidance Document for the Management of Impacted Sites through the Atlantic RBCA Version 4.0 process (Atlantic RBCA, 2022a). This approach utilizes Tier I EQS and Tier II PSS. The Ecological Tier II PSS for groundwater >10 m from surface water is applied to protect freshwater aquatic life, based on the assumption of groundwater discharge to a receiving water body.

Groundwater suitability and baseline assessments for potable use and the protection of human health follow the GCDWQ (Health Canada, 2025). These establish MAC for health and AO for physical and chemical parameters, serving as the basis for potability.

Technical Boundary

Technical boundaries for the assessment of groundwater resources are defined by specific information and data constraints. A spatial coverage gap exists due to the absence of Project-specific hydrogeological field data (e.g., including borehole logs, in-situ hydraulic conductivity

testing, groundwater level monitoring, and groundwater quality sampling) within the IPA. Current characterization relies on regional geological mapping and community and private well records. As such localized water table depth, soil and bedrock permeability and groundwater quality at specific Project infrastructure sites remain unconfirmed. As a result, the confidence level for localized spatial predictions is moderate.

A temporal gap is also present as available groundwater quality data represents historical sampling events rather than continuous monitoring. This limits the characterization of seasonal fluctuations in groundwater quality. Due to the lack of long-term continuous monitoring data, the confidence level regarding the range of natural variability is low to moderate.

Furthermore, an analytical gap exists because the assessment utilizes topography as a proxy data set to predict groundwater behavior in the absence of groundwater elevation monitoring. It is assumed that an unconfined aquifer system underlies the IPA and that groundwater flow follows surface terrain and that flow aligns with surface drainage basins. This assumption may not account for localized hydraulic conditions or variations in groundwater flow associated with perched or confined aquifers, resulting in a moderate confidence level for flow direction interpretations.

To manage these uncertainties, the assessment employs a conservative characterization strategy. Assumptions are weighted to ensure that potential risks to receptors, particularly local potable well water supplies, are accounted for in the analysis. These technical boundaries will be addressed through site-specific drilling and hydrogeological testing and monitoring during Project pre-construction geotechnical programs.

Spatial Boundary

Spatial boundaries for the assessment of groundwater resources are established to define the geographic extent within which Project-related effects are evaluated (Drawing 7.5-2, Appendix A). These boundaries are determined by the physical footprint of the project and the hydraulic characteristics of the surrounding landscape.

The LSA is generally defined by a 500 m buffer extending from the IPA. This boundary is established to evaluate the geographic extent where direct and indirect subsurface interactions with groundwater resources such as changes in infiltration, soil and bedrock disturbance, or localized water table and groundwater quality variations are likely to occur. A 500 m radius is utilized as a conservative radius of influence to specifically account for potential blasting effects on groundwater resources, including vibration-induced turbidity and alterations to fracture connectivity within bedrock aquifers, as well as effects due to localized construction-related dewatering. This distance aligns with the *NLECCC-WRMD Groundwater Supply Assessment and Reporting Guidelines for Subdivisions Serviced by Individual Private Wells* (2009), which require a 500 m characterization radius to identify sensitive receptors and potential sources of interference related to residential development. For this assessment, the LSA has been extended 500 m beyond the southeastern shoreline of Peters Pond. Because the pond serves as the industrial water supply, this extension ensures the entire feature and its surrounding

area are included to fully evaluate any hydrogeological effects associated with water withdraw.

The RSA encompasses the limits of the drainage catchment areas that overlap with the PA. This boundary is based on the principle that groundwater flow and potential migration pathways are governed by watershed-level drainage patterns. By utilizing catchment limits, the assessment accounts for the hydrogeological context and evaluates potential connectivity with receptors that fall within the same drainage basins as the Project components.

The LSA and RSA defined for the assessment of groundwater resources are shown in Drawing 7.5-1 and 7.5-2 (Appendix A), respectively, along with the locations of existing water wells reported in the provincial Drilled Well Database for these areas.

Temporal Boundary

The temporal boundaries for the groundwater effects assessment include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

7.5.5.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to groundwater. The VC-specific definition for magnitude defines the degree of change to groundwater resources relative to baseline conditions. For this assessment, these changes are evaluated specifically in the context of well yield (L/min) for existing water well users, the reduction in groundwater-derived baseflow (as a percent) for surface water features, and the concentration of chemical parameters compared to applicable water quality guidelines as follows:

- Negligible: No measurable change to groundwater resources relative to baseline. There is no detectable reduction in well yields, no change in the percentage of groundwater contributing to baseflow, and no change in the concentration of chemical parameters.
- Low: A measurable change is detectable but remains within the normal variability expected relative to baseline. This includes minor fluctuations in well yield, baseflow percentage, or chemical concentrations that do not impair the long-term integrity of a water supply or ecological receptor or exceed the natural range of baseline water quality.
- Moderate: A measurable change occurs that is considered elevated above, or depressed below, baseline but remains within acceptable limits or regulatory objectives. This includes a distinct reduction in well yield or baseflow percentage that does not impair the overall function of the water supply or ecological receptor, and chemical concentrations that remain within applicable regulatory guidelines, specifically the GCDWQ for wells and CCME FAL for ecological receptors.
- High: A measurable change occurs that is considered elevated above acceptable limits or regulatory objectives. This includes a reduction in well yield that interferes with domestic or industrial supply, a substantial reduction in baseflow percentage, or chemical concentrations that exceed the GCDWQ or CCME FAL at a receptor location.

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

7.5.5.3 Effects

The Project interactions with groundwater noted above have the potential to result in measurable changes to groundwater quantity and quality. These potential effects are discussed separately in the following sections.

Changes in Groundwater Quantity

Groundwater resources may be affected by Project site preparation, infrastructure construction, and decommissioning activities through both direct and indirect pathways. Direct effects occur through immediate physical interaction with the subsurface, such as excavation dewatering, the extraction of water for potable supply, and the physical alteration of the aquifer during blasting. These activities can cause a measurable change in groundwater quantity at the time and location of the activity.

Indirect effects result from Project-related changes to the land surface that subsequently alter regional hydrogeological processes. Groundwater is recharged from the surface via infiltration through porous rock, soils, and bedrock fractures. As such ground disturbance during site preparation, construction, and decommissioning activities within the IPA have the potential to affect groundwater quantity by altering recharge volumes. These secondary consequences of site development may eventually affect the yield of well water supplies and the percentage of baseflow supporting ecological receptors.

Effects of Excavation Dewatering on Groundwater Quantity

The primary Project activity expected to result in a direct effect on groundwater quantity within the IPA is construction-related excavation dewatering. In the IPA, dewatering will be primarily associated with construction of foundations for the accommodation camp and other ancillary site buildings. Foundations for the industrial plant facility itself are anticipated to be pile-supported, requiring minimal excavation and, as a result, limited dewatering.

Where a shallow water table is encountered during excavation, temporary dewatering will be required to allow for foundation installation and the proper curing of concrete. This process will require physical removal of groundwater to maintain a dry work area, creating a localized lowering of the water table (drawdown) and altering flow pathways immediately surrounding the excavation. If water supply wells or fish-bearing streams are situated within the resulting cone of depression, this could temporarily reduce the available well yield (L/min) or the percentage of baseflow supporting aquatic receptors.

The distance over which water table drawdown could be measurable in response to dewatering for the construction of foundations is known as the ROI. Consistent with the methodology used in the approved GH2 EIS (Stantec, 2023), the ROI was estimated using the Sichardt and Kryieleis method (Powers et al., 2007) as follows:

$$ROI = 3000(H - h)\sqrt{K}$$

Where:

ROI = Radius of influence of dewatering from the edge of the excavation (m)

H = Depth of the excavation (m)

h = Depth to water table (m)

K = Hydraulic conductivity of the aquifer (m/s)

In the absence of Project-specific field data, the parameters for the ROI calculation were conservatively estimated based on regional data and literature values. The depth of excavation (H) was set at 3 m, providing a conservative estimate for a standard slab on grade foundation. To account for a "worst-case" scenario regarding dewatering requirements, the depth to the water table (h) was assumed to be at surface (0 m), as noted in Appendix H.4. The hydraulic conductivity (K) was assumed to be 1×10^{-3} m/s. This value is based on the upper range K estimate for well-sorted sand or glacial outwash provided in Fetter (2001) and is considered a conservatively representative estimate for the high-permeability soils of Hydrostratigraphic Unit 2 and the underlying fractured bedrock that are expected to be encountered during excavation based on geological mapping. These values ensure that the resulting ROI provides a conservative spatial boundary for assessing potential interactions with existing water wells and aquatic receptors in the LSA.

Based on the analytical parameters described, the calculated ROI for foundation dewatering is 285 m from the edge of the excavation. This ROI also applies to the stormwater/effluent water pond, which has a design depth of 3 m (USACE, 2025). The design depth for the underground ammonia pipeline is not currently finalized; however, it is assumed that this will be shallower than the 3 m depth used in the above analysis.

As the LSA extends at least 500 m from the IPA footprint, this calculated ROI distance remains well within the assessment boundaries. Further, given that all documented water wells in the LSA are situated at distances greater than 285 m from planned infrastructure locations, no measurable reduction in well yield for existing local users is anticipated. A number of surface water drainage features are present in the Industrial Facility area that lie within the calculated 285 m ROI for potential dewatering impacts. Because the dewatering activities for the site buildings and the underground ammonia pipeline are associated with relatively shallow excavations (maximum 3 m) and are expected to occur over short periods of time, no significant impacts to ecological receptors are expected. Additionally, Project construction involves rerouting several large streams and potentially installing subsurface drains. These measures will lower the near-surface water table to facilitate construction in the Industrial Facility area. This local lowering of the water table will reduce foundation dewatering efforts and contract the ROI calculated here. Consequently, dewatering activities are expected to have a limited effect on the availability of groundwater for existing users in the IPA.

Effects of Extraction of Water for Potable Supply

To support the construction workforce, the Project includes the construction of one proposed

accommodation camp in the IPA located directly southeast of the Industrial Facility. This facility will provide housing for approximately 4,200 people during the construction phase, reducing to 835 people during the operations phase. A possible groundwater supply is being considered to meet the potable water requirements for this camp, with a projected demand of 350 L/day per person. In addition, potable groundwater supply may also be utilized at the quarry near the Industrial Facility during construction.

The proposed use of groundwater at these locations will require localized withdrawals to meet potable needs. The evaluation of these groundwater supply systems, including pumping tests to confirm sustainable well yield and assessments of potential interference with existing users, will be completed as part of the provincial Water Use License and the non-domestic well construction permit application processes. These regulatory requirements involve the technical validation of final well locations and pumping rates to manage potential effects on the local aquifer and nearby receptors prior to operation.

Effects of Blasting on Groundwater Quantity

Blasting may be required during the construction and decommissioning phases of the Project to facilitate access to road construction, industrial plant and other site building foundations, and the underground ammonia pipeline. These activities have the potential to impact groundwater quantity by altering bedrock fracture networks, which may result in changes to flow for water wells in the LSA and the volume of baseflow supporting surface water features.

Physical changes to the rock mass during blasting could partially or fully seal fractures that currently provide water to nearby wells or discharge as baseflow to streams and wetlands. Conversely, blasting may open new fracture networks or expand existing ones, potentially increasing or redirecting the volume of water available to these receptors.

Blasting may be necessary for the industrial plants and other site building foundations, and the ammonia pipeline where competent bedrock is encountered at shallow depths, as well as in select locations where the road network including the heavy haul road needs to achieve design grade. It is anticipated that none of the identified wells will be located within 500 m of a blasting point. Furthermore, vibration levels decrease with distance from the source, reducing the potential for significant structural or hydraulic changes at greater radii.

Impacts to baseflow from blasting are generally anticipated to be localized. While alterations to the bedrock can shift groundwater flow paths, the overall catchment area contributing to surface water features is expected to remain largely unchanged. Any measurable changes to the percentage of baseflow in nearby streams are expected to be minor and restricted to the immediate vicinity of the blasting zone.

Should blasting be required, a certified contractor holding a valid NLECCC certificate will develop a blast design for approval. This design must maintain vibrational limits relative to infrastructure, buildings, and fish habitat, with a predicted zone of influence defined confirmed prior to work. An Explosives and Blasting Management Plan will be implemented to govern the

safe handling of explosives and protect Project personnel, the public, and the environment. As part of this plan, a pre-blast survey of all structures and water wells within the predicted blasting zone of influence will be conducted to establish baseline performance and integrity.

Effects of Site Preparation and Construction

In addition to the direct effects from dewatering, water supply extraction, and blasting, indirect effects may occur due to ground disturbance during construction and decommissioning (such as clearing, grubbing, and grading). Surface alterations can affect groundwater quantity by changing recharge volumes, which may influence well supply and baseflow supporting ecological receptors.

General earthworks can modify infiltration rates as surface permeability is altered across the PA. While these changes could impact the volume of water recharging water-bearing fractures, the planned infrastructure accounts for only 18% of the total surface area of the IPA. Furthermore, runoff from less permeable surfaces, such as roadways, will be directed to constructed ditches or undisturbed areas. This will result in redistribution of water within the IPA and contribute to restoration of aquifer recharge to pre-construction conditions.

Changes in Groundwater Quality

Potential changes to groundwater quality in the IPA are associated with physical disturbances to the subsurface and the introduction of substances during the construction, operation, and decommissioning phases. These interactions have the potential to affect the underlying aquifer and associated receptors, including water supply wells and ecological features. The potential interaction pathways are described below.

Dewatering activities during foundation and underground pipeline excavation or infrastructure removal can alter local hydrogeological systems. These changes can lead to negative impacts on groundwater quality, primarily through the mobilization of contaminants and increased sedimentation. The most common quality change associated with these activities is increased turbidity and TSS.

Blasting required for site grading or foundation work can impact quality through chemical and physical pathways. Physical vibrations can expand bedrock fracture networks and mobilize fine sediments, potentially increasing turbidity and concentrations of chemical parameters. Additionally, nitrogen-based explosive residues could be introduced into the groundwater system if not fully detonated.

General earthworks, including clearing, grubbing, and grading, can indirectly affect groundwater quality by enhancing infiltration through disturbed soils and bedrock with altered permeabilities. In areas with highly permeable, coarse soils or fractured bedrock near the surface, there may be a reduction in natural filtration capacity, making the subsurface more susceptible to rapid contamination

The operation of on-site septic systems at the accommodation camp and serviced ancillary

buildings will result in the discharge of domestic sewage into the subsurface. This activity has the potential to alter the chemical and bacteriological quality of the underlying aquifer. However, sewer effluent will be treated through an on-site biological package system, including aeration, clarification, and chlorination, to ensure the discharge meets required quality standards before entering the subsurface or municipal system. The effluent and RO rejects from the industrial plant facility will undergo treatment to ensure discharge water quality meets all regulatory standards. There will be no intentional discharge of impacted plant water to the environment; however, the potential for accidental release remains.

Further, ammonia and fuel will be housed in double-walled contained storage systems, and other ancillary chemicals will be stored in dedicated secure areas equipped with integrated containment.

Beyond these managed storage systems, the potential for accidental surface releases of hazardous substances, other contaminants, and dust-suppression agents exists across all Project phases. Such releases could infiltrate the underlying soil and bedrock fracture network, leading to localized degradation of groundwater quality. Detailed protocols for the management of these risks are provided in Section 14.0 of this EIS.

7.5.6 Mitigation

Groundwater Quantity

The following mitigation and environmental protection measures will be implemented during Project site preparation, infrastructure construction, and decommissioning to minimize or eliminate residual effects on groundwater quantity:

- **Dewatering Management:** Should dewatering be required for foundation and pipeline excavation or infrastructure removal, the extracted groundwater will be directed to vegetated areas or sediment control structures to facilitate natural infiltration. Given that all documented water wells in the LSA are situated at distances greater than 285 m from planned infrastructure, no measurable reduction in well yield is anticipated.
- **Potable Water Supply Extraction:** Prior to the operation of the accommodation camp and potential potable groundwater supply at the quarry near the Industrial Facility, the proposed groundwater supply systems will undergo technical validation, including pumping tests, to confirm sustainable well yields. These assessments will be completed during the provincial Water Use License and non-domestic well construction permit application processes to manage potential interference with existing users and ensure the local aquifer can support the projected demand of 350 L/day per person.
- **Explosives and Blasting Management:** conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits. To protect established bedrock fracture networks, the project will utilize stemming (inert material packing) and controlled detonation.
- **Recharge and Surface Water Management:** To maintain regional hydrogeological

processes, runoff from less permeable Project surfaces, such as access roads and industrial plant facility infrastructure areas, will be directed to constructed ditches or undisturbed areas. This allows for the redistribution of water within the IPA and contributes to the restoration of aquifer recharge to pre-construction conditions. The PF will be limited to the minimum area necessary accounting for only 18% of the total IPA to preserve natural infiltration through porous rock, soils, and bedrock fractures. Draft and implement a Surface Water Management Plan to support drainage, and ensure water quality conforms to applicable regulations and guidelines.

- **Decommissioning and Site Restoration:** During the decommissioning phase, Project infrastructure will be removed to a depth determined by final engineering and regulatory requirements, and the areas will be graded and contoured to restore natural drainage where possible. Temporary construction areas will be de-compacted to restore soil permeability, allowing long-term groundwater recharge volumes and baseflow supporting ecological receptors to return to baseline levels.

Groundwater Quality

The following mitigation and environmental protection measures will be implemented during Project site preparation, construction, operation, and decommissioning activities to minimize or eliminate residual effects on groundwater quality:

- **Dewatering Management:** Should dewatering be required for foundation and pipeline excavation or infrastructure removal, the extracted groundwater will be pumped to a vegetated area or a sediment control structure to allow for natural filtration before re-entering the groundwater system. This ensures water quality at receptor locations does not deviate from baseline conditions for an extended duration.
- **Explosives and Blasting Management Plan:** Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.
- **Septic System Compliance:** The accommodation camp and other serviced ancillary site building septic systems will be designed, sited, and operated in accordance with provincial Environmental Control Water and Sewage Regulations. These systems will be properly decommissioned and the sites restored following the construction phase.
- **BMPs:** Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed. Maintain a minimum 30 m vegetated buffers surrounding watercourses, where possible.
- **Erosion and Sediment Control:** Runoff from disturbed areas and less permeable surfaces, such as roadways, will be directed toward vegetated buffers or constructed ditches to facilitate natural filtration of fines before recharge occurs.

7.5.7 Monitoring

Aligned with the 2025 EIS Guidelines and to verify the accuracy of the effects predictions

presented above, a groundwater monitoring program will be established. This program will be designed to manage technical uncertainties and will provide data on the integrity of local existing water wells and ecological receptors.

- Hydrogeology data will be collected as part of the planned Project geotechnical programs. These programs will include the installation of monitoring wells at select infrastructure locations to confirm localized depth to the water table, hydraulic conductivity, and baseline water quality.
- Pumping tests and water quality sampling will be conducted for new groundwater supply wells to verify sustainable yield and meet provincial permitting requirements. Monitoring of groundwater levels and quality during testing will ensure new Project wells do not interfere with existing private well supplies in the LSA.
- Consistent with the requirements of the NLECCC-WRMD, the Project will evaluate the installation and operation of real-time water monitoring stations intended to monitor groundwater levels and select chemical parameters to detect changes in quantity or quality. The specific number, location, and technical specifications of these stations will be determined based on further consultation with the NLECCC.
- For infrastructure requiring blasting, a monitoring program will be implemented for water wells within the predicted zone of influence. This will include pre- and post-blast water quality sampling and structural inspections to monitor vibrational effects and bedrock integrity.
- In the event of a recorded release of hazardous materials, the Hazardous Substances Management and Spill Prevention Plan will trigger subsurface investigation and, if necessary, the installation of wells to monitor for the migration of constituents.

7.5.8 Conclusion

Foundation and pipeline dewatering is calculated to have a predicted radius of influence of approximately 285 m, placing all identified private wells, located at least 825 m away, beyond the extent of drawdown. Potential influences on groundwater quality from construction and operations, such as increased turbidity or the management of treated effluent and septic discharge, will be mitigated through engineered secondary containment, treated discharge protocols, and the application of industry best management practices to maintain the integrity of local potable well supplies.

Project infrastructure occupies approximately 18% of the total IPA, ensuring the majority of the land surface remains available to facilitate natural infiltration and maintain regional recharge capacity, existing well yields, and groundwater discharge to surface water features. New Project supply wells for the accommodation camp, and possibly the quarry near the Industrial Facility will be subject to technical validation, including pumping tests and provincial permitting, to ensure no interference with existing users or the surrounding environment. Based on these factors, residual environmental effects on groundwater resources in the IPA related to this Project are predicted to be low in magnitude, localized, and reversible, with no significant adverse effects anticipated.

After mitigations, predicted residual effects on groundwater are characterized in Table 7.5.4.

Table 7.5.4: Hydrogeology Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Changes in Groundwater Quantity (supply, dewatering, blasting, site recharge)	Sustainable yield testing and provincial permitting of Project supply wells; calculated ROI for dewatering; monitoring of private wells; blast management best practices and pre-blast surveys within zone of influence; minimize footprint (18%); and direct runoff to vegetated areas and perimeter ditches to facilitate natural infiltration.	A	L	LSA	ST to LT	I	R	Not Significant
Changes in Groundwater Quality (sedimentation, blasting residues, septic, accidental spills)	Engineered controls; secondary containment; explosives management plan; pre-blast well surveys and sampling; hazardous substances management and spill prevention plan.	A	L	LSA	ST to MT	I	R	Not Significant
Infrastructure Decommissioning (infrastructure removal, site reclamation)	Removal of infrastructure to required depth; grading/contouring to restore natural drainage; decompacting soils to restore permeability and recharge.	A	N	PA	ST	SE	R	Not Significant

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA - Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term, MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

7.6 Surface Water

7.6.1 Overview

The objective of the surface water assessment was to inform the Project's design and collect the information necessary to assess potential impacts to surface water and fish habitat (assessed separately in Section 7.7) resulting from the Project within the IPA. This was accomplished using the following approach:

- Identify and characterize potential water resources and use within the IPA using desktop resources and predictive methods.
- Use the information collected to inform Project design (e.g., avoid/minimize impacts to surface water).
- Assess the capacity of Peters Pond to supply water needs for Industrial Facility and describe the potential impacts of water withdrawal on the surface water resource.
- Characterize wastewater discharge from the facility and describe potential impacts on the receiving environment.
- Use the information collected to inform mitigation and monitoring programs.

7.6.2 Regulatory Context

Surface water is protected under the following provincial legislation and regulatory guidelines:

- *Water Resources Act* (Newfoundland and Labrador, 2002c)

Although the *Water Resources Act* defines a body of water as “surface or subterranean”, this section focuses on surface water features. Potential effects to groundwater as a result of Industrial Facility activities are described in Section 7.5. Similarly, potential effects to wetlands as are discussed in Section 7.8.

7.6.3 Desktop Assessment Methods

A desktop study was conducted to identify all potential permanent and intermittent bodies of water that intersect or are located within 5 km of the IPA. Potential surface water features were identified using the following sources:

- Provincial Land Cover (NLFAL, 2025h)
- Federal CanVec watercourse and waterbody shapefiles (NRCan, 2023)
- Provincial digital elevation model (NRCan, 2024a)
- Newfoundland and Labrador Land Use Atlas (Newfoundland and Labrador, 2025d)
- Newfoundland and Labrador Angler's Guide (DFO, 2025d)
- Water Resources Portal (NLECCC, 2022)

Modelled watercourses were classified and characterized to support the development of field surveys. Protected water supply areas in the vicinity of the Project were also identified. Desktop review methods, including surface water flow modelling, are discussed in more detail in the Baseline Aquatic Environment Report (Appendix H.2).

7.6.4 Desktop Assessment Results

7.6.4.1 Watersheds and Water Resources

The desktop review identified 7 local watersheds within the IPA, with most flowing into Peters Arm (Drawing 7.6-1, Appendix A). Local watershed 4 is the largest watershed, encompassing the southeast half of the IPA. Its main river system, Peters River, flows northeast into Peters Arm. Local watershed 84 intersects the eastern edge of the IPA and also drains north into Peters Arm. Local watershed 15 is the second largest watershed, encompassing the northwest half of the IPA. Runoff from watershed 15 flows northeast into Northern Arm, along with local watershed 5 which intersects the northwest corner of the IPA flows southeast into Northern Arm. Local watersheds 32, 35, and 50 intersect the proposed road to the Port of Botwood and flow southward, into Peters Arm.

No current protected water supply areas intersect the IPA. The protected water supplies closest to the IPA are Northern Arm Lake, Muddy Hole Pond, Indian Cove Pond, and Mille Lake, which are located 14.35 km west, 4.71 km north, 4.45 km north, and 11.08 km east, respectively adjacent to the WPA (NLECCC, 2022). Peters Pond is the proposed water withdrawal location for the Industrial Facility. Peters River, the throughflow of Peter Pond, is the only scheduled salmon river that intersects the IPA (Drawing 7.7-1, Appendix A). Peters River is also the former water supply area for the towns of Botwood and Peterview (Newfoundland and Labrador, n.d.).

A detailed analysis of watersheds, protected water supplies, and CanVec waterbody and watercourse databases is provided in the Baseline Aquatic Environment Report (Appendix H.2).

7.6.4.2 Surface Water Classification

Through the desktop review, 30 potential watercourse crossings were identified within the IPA. All potential watercourses were classified as intermittent ('N') (Drawing 7.6-2, Appendix A). Refer to Appendix H.2 for a detailed description of surface water classification methods.

The estimated width of watercourses at crossing locations could not be determined for most of the watercourses due to the limitations of aerial imagery; however, watercourses that could be visually assessed were determined to be predominantly 0.5 m wide. Riparian areas were observed to be shrub-dominant, which indicates the most likely substrate is a mix of coarse substrate and fines.

7.6.5 Field Assessment Methods

Field verification of surface water resources was performed for all modelled watercourses within the PF of the Industrial Facility (excluding pipelines and access/haul roads). Detailed fish habitat surveys were completed on all field-verified watercourses to aid in the quantification of fish habitat impact (see Section 7.7). In-situ water quality parameters were also collected during these surveys.

Peters River is not at a crossing location; however, it is a scheduled salmon river that flows through the IPA and forms the primary water supply for the Industrial Facility (specifically Peters Pond). A watercourse survey following crossing assessment methods was performed downstream of Peters Pond (with transects adjusted to representative habitat types), in addition to the surveys within the PF of the Industrial Facility, to support the assessment of withdrawal on Peters River (and associated fish habitat; Section 7.7). Field assessment methodology is discussed in detail in the Baseline Aquatic Environment Report (Appendix H.2).

Surface water quality was collected at 10 WQM in August 2024, and 12 WQM locations in April and November 2025 to provide a reasonable characterization of seasonal surface water quality in the Project Area. Of the 10 WQM locations sampled in 2024, four were located within watersheds that intersect the IPA, and in 2025, five of the 12 WQM locations were located within watersheds that intersect the IPA.

In addition to the site-wide seasonal water sampling program, more frequent sampling of water quality was carried out at the three monitoring stations (WQM-3, WQM-4, WQM-5) in the Peters Pond drainage system in 2025 to provide a detailed characterization of Plant influent water quality (Drawing 6.7-3, Appendix A). Water quality sampling was performed weekly over a period of eight weeks beginning in April 2025, then extended to biweekly for an additional eight weeks, followed by monthly for the remainder of 2025 based on relatively stable water quality results.

In-situ water quality parameters (temperature, pH, dissolved oxygen, conductivity, and turbidity) measured during watercourse crossing assessments, fish collection surveys, and surface water sampling within the IPA are described in the Baseline Aquatic Environment Report (Appendix H.2).

Table 7.6.1: Surface Water Sample Locations

Sample ID	Local Watershed ID	Sample Location Description	Sample Location (UTM)	
			Easting	Northing
WQM-3	4	Peters Pond inlet	613349	5436876
WQM-4	4	Peters Pond	615428	5438788
WQM-5	4	Peters Pond outlet	617272	5440269
WQM-12	15	Downstream of proposed wastewater discharge area in WC15-104	617244	5444430

All water samples were kept cool and were transported to Bureau Veritas Laboratories in St. John's, NL for processing. Surface water samples were analyzed for the following parameters:

- general chemistry (including reactive silica)
- metals (total/dissolved)
- BTEX/TPH

- VOCs
- PAHs
- TSS
- bacteriological

Surface water sample results have been compared to the CCME Guidelines for the Protection of FWAL (CCME, n.d.-a). For parameters that do not have CCME Guidelines, results are compared to Schedule A of the Environmental Control Water and Sewage Regulations (Newfoundland and Labrador, 2003b).

7.6.6 Field Assessment Results

Table 7.6.2 summarizes the results of baseline desktop and field surveys completed within the IPA.

Table 7.6.2: Summary of Results within the IPA

Survey	Summary
Desktop Review	
Surface Water Classification	Across 7 watersheds, 30 potential watercourse crossings were identified.
Water Resource	Peters Pond is located in local watershed 4, and Peters River, a scheduled salmon river, is the pond's throughflow. Peters Pond used to be the water supply area for the towns of Botwood and Peterview. Peters Pond is not located within a protected watershed. Refer to Appendix H.3 for further details on Peters Pond.
Surface Water Characterization	
Watercourse Crossing Assessment	No Class N watercourses were assessed.
	Peters River received a watercourse assessment following an adjusted crossing survey protocol (no actual crossing proposed).
Detailed Fish Habitat Assessment	Detailed habitat was completed within the two watercourses in the Industrial Facility PF and 500 m downstream of the Industrial Facility PF within the proposed discharge creek (WC15-104).
In-Situ Water Quality	
Water Quality	Temperature range: 19.7 to 20 °C (summer) 3.1 to 11.8 °C (spring)
	pH range: 7.56 to 8.30 (summer) 6.26 to 6.90 (spring)
	DO range: 6.71 mg/L to 9.96 mg/L (summer) 10.04 mg/L to 13.41 mg/L (spring)
	Specific Conductivity range: 84.7 to 121.3 µS/cm (summer) 32.6 µS/cm to 77.7 µS/cm (spring)

Baseline conditions are further discussed in the Baseline Aquatic Environment Report (Appendix H.2) and Fish and Fish Habitat VC (Section 7.7).

No watercourse crossing assessments were completed within the IPA. All watercourses identified using the model were classified as N and only required desktop analysis (as per DFO guidance). A watercourse assessment was completed for Peters River, which is a scheduled

salmon river that intersects the IPA, but has no associated crossing.

Within the surveyed reach of Peters River, the channel exhibits an average bankfull width of 19.75 m, forming a broad, well-defined corridor with stable banks. Habitat structure in this section is dominated by a run. Deeper pools and shallow riffles are also present but less frequent. During the June 2024 assessment, the river was at a relatively high discharge stage, reflected in an average velocity of 1.24 m/s, and an average depth of 0.5 m. Cobble substrate was the dominant substrate recorded.

Detailed fish habitat assessments were completed for WC15-104 and WC15-159 within the PF of the Industrial Facility, and for an additional 500 m of WC15-104 downstream of the PF, which is located outside and north of the IPA, downstream of the proposed discharge location (See Fish and Fish Habitat Section 7.7; Drawing 7.7-1, Appendix A).

WC15-104 is a perennial stream that originates from a wetland near the SPA and flows northeast, through the Industrial Facility PF, before eventually flowing into Northern Arm and the Bay of Exploits. WC15-104 has an average bankfull width of 1.92 m and is slightly entrenched. The maximum depth was 0.59 m at the time of the assessment. The dominant habitat type was a riffle-run; however, other habitat types such as runs, flats, riffles, pools, and cascades were present. Dominant substrates recorded throughout the assessment area were muck, cobble, gravel, and sand; coarser substrates dominate high-velocity habitat types (e.g., cascades), while smaller material (muck) dominated slower habitat (e.g., flats). Instream, aquatic plants, and overhead cover were all present throughout the reaches. WC15-104 occupies a total area of 2,309.5 m² within the PF. The portion of WC15-104 that was assessed downstream of the PF represents 1,747 m² (See Fish and Fish Habitat Section 7.7; Drawing 7.7-1, Appendix A).

WC15-159 is a perennial tributary that originates from outside of the PA and flows northeast. The watercourse splits into two channels just west of the IPA; one channel flows through the Industrial Facility PF (flow path broadly consistent with the predicted watercourse layer; Drawing 7.6-4, Appendix A), before eventually converging with WC15-104 within the PF – while the second channel flows north then northeast around the Industrial Facility, eventually converging again with WC15-104 approximately 1 km north of the Facility (path based on satellite imagery shown on Drawing 7.6-4, Appendix A). Only the portion of WC15-159 that falls within the PF was mapped and characterized. WC15-159 has an average bankfull width of 2.71 m and is slightly entrenched. The maximum depth was 0.38 m at the time of the assessment. Dominant substrates were boulder, rubble, muck, cobble, gravel, and sand. The dominant habitat type was a riffle-run, however, other habitat types such as flats and pools were present, but less frequent. Instream, aquatic plants, and overhead cover were all present throughout the mapped reaches. WC15-159 occupies a total area of 2,066.3 m² within the PF (See Fish and Fish Habitat Section 7.7; Drawing 7.7-1, Appendix A).

Surface water samples were collected and analyzed to establish a baseline for future surface water quality comparison and to inform pre-treatment requirements for plant influent. Results

have been tabulated and are presented in Appendix H.1. Sample results have been compared to CCME Guidelines for the Protection of Freshwater Aquatic Life (CCME, n.d.-a) or Schedule A of the Environmental Control Water and Sewage Regulations, when applicable (Newfoundland and Labrador, 2003b).

Water quality results exceeded CCME Guidelines for aluminum (100 µg/L if pH ≥ 6.5) at all IPA monitoring locations with the exception of the August 2024 sampling event. With more frequent sampling at Peters Pond, aluminum concentrations showed greater variability between sampling events but generally declined from spring through late summer. As noted in Section 6.7, naturally elevated aluminum concentrations are expected in local surface water features during periods of higher flow. Iron was also exceeded in 5 of the total 16 samples taken from Peters Pond inlet, and in 2 samples taken from pond itself, Iron was not exceeded in samples taken from the Peters Pond outlet. All other parameters were within CCME Guidelines for the Protection of Freshwater Aquatic Life (CCME, n.d.-a) or Schedule A of the Environmental Control Water and Sewage Regulations (Newfoundland and Labrador, 2003b). Full results of water quality sampling are provided in Appendix H.1. The results of surface water samples collected from Peters Pond to inform pre-treatment requirements for plant influent (weekly-biweekly-monthly sampling) are also provided in Appendix H.3.

7.6.7 Effects Assessment

Project activities, primarily those that involve earth moving, vegetation removal, Industrial Facility installation, water withdrawal, wastewater discharge, and road construction, have the potential to impact surface water (Table 7.6.3). These potential impacts could include changes to surface water quantity and quality.

Table 7.6.3: Potential Project- Surface Water Interactions – Industrial Facility

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works	X
Access Road Upgrading and Construction	X
Water Pipeline Construction	X
Facility Civil Works	X
Transportation of Facility Components	X
Equipment Installation	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	

Project Phase	Potential for Interaction
Facility Operations and Maintenance	X
Site Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

7.6.7.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries for surface water include the *Water Resources Act*, CCME Water Quality Guidelines for the Protection of FWAL, and Newfoundland and Labrador Environmental Control Water and Sewage Regulations (CCME, n.d.-a; Newfoundland and Labrador, 2003b).

Technical Boundary

The assessment of potential effects on surface water resulting from Project development is constrained by the accuracy of the watercourse modelling and by the limitations of aerial imagery in identifying surface water features. All surface water features overlaid by the Industrial Facility were field-verified and characterized; however, watercourse crossing locations (inclusive of potential watercourses within 100 m buffers of the proposal quarry and 30 m buffers of the proposed accommodation camp, though not true crossings) within the IPA were only classified by aerial photography as per DFO guidance (all intermittent)..

Spatial Boundary

The LSA for surface water includes the IPA and surface water features integrated into the Project's design (i.e., withdrawal and discharge systems). This includes Peters Pond and Peters River from the outlet of the pond to the river's mouth at Peters Arm, and the unnamed watercourse (WC15-104) from the IPA to the river's confluence with Northern Arm Brook. The RSA for surface water includes all modelled local watersheds that intersect the IPA (Drawing 7.6-3).

Temporal Boundary

The temporal boundaries for the surface water effects assessment include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

7.6.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to watercourses. The VC-specific definition for magnitude is as follows:

- **Negligible:** Less than 1% change in hydrology from baseline. Average water quality of site discharge or runoff is within applicable guidelines (CCME, n.d.-a).
- **Low:** 1-10% change in hydrology from baseline. Average water quality of discharge or

- runoff is within applicable guidelines (CCME, n.d.-a).
- Moderate: 10-25% change in hydrology from baseline. Average water quality of site discharge or runoff exceeds applicable guidelines (CCME, n.d.-a).
- High: >25% change in hydrology from baseline. Average water quality of site discharge or runoff exceeds applicable guidelines (CCME, n.d.-a).

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

7.6.7.3 Effects

Direct effects to surface water such as channel destruction, alteration, or diversion from infrastructure placement are likely to be most prominent during the site preparation and construction phase. Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects. Infrastructure within the IPA will directly overprint two watercourses (WC15-104 and WC15-159). The Project may also interact with up to 30 watercourses through construction of heavy haul road and ammonia pipeline, additional project roads, water intake pipeline and accommodation (Drawing 7.6-4, Appendix A). The loss of fish habitat associated with potential direct effects to surface water features within the IPA is discussed in Section 7.7.

Indirect effects - including changes in water quantity (e.g., alterations to hydrological inputs) and water quality (e.g., increased sedimentation or changes in water chemistry) - can extend across a broader spatial and temporal scale. During operations, the principal pathways of potential environmental effects are associated with the Industrial Facility's water withdrawal requirements and wastewater discharge. These effects are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes, and the magnitude at which they are felt (DFO, 2022).

Changes in Surface Water Quantity

In the absence of mitigation, the potential effects identified in Table 7.7.3 can alter surface water quantity through changes in runoff, modifications to watershed areas (including evapotranspiration and infiltration characteristics), watercourse alteration (including channel destruction) and realignment. These potential effects on surface water quantity are expected to occur primarily during activities associated with site preparation and construction. Operational water withdrawal and discharge requirements also have the potential to alter surface water quantity within local surface water features (i.e., Peters Pond/River and WC15-104). Decommissioning and rehabilitation activities may also impact surface water quantity as land use will be returned to a more naturalized condition. Potential effects to surface water quantity associated with specific IPA components are discussed further in the following sections. Effects of potential changes in water quantity in the context of fish and fish habitat are discussed further in Section 7.7.

Note that blasting may be required to facilitate a number of Project components, including access and haul roads, site building foundations, and quarry operations. These activities have

the potential to impact groundwater quantity by altering established bedrock fracture networks, which may result in changes in the volume of baseflow supporting surface water features. The effects of blasting on groundwater quantity and baseflow are described in Section 7.5. In summary, any measurable changes to the percentage of baseflow in nearby streams are expected to be minor and restricted to the immediate vicinity of the blasting zone. The potential effects of blasting on fish and fish habitat are described in Section 7.7.

Road and Pipeline Construction

Of the 30 modelled watercourse crossing locations within the IPA, 27 are associated with road and pipeline crossing locations (access road/water withdrawal and recycling line; and heavy haul road/ammonia line).

Of these potential crossings, one is associated with the heavy haul road route along Water Street. EVREC does not anticipate any upgrades to existing road crossing infrastructure.

Project engineers will make culvert installation determinations during the detailed design phase. Each crossing will be designed to avoid any permanent diversion, restriction, or blockage of natural flow, such that the hydraulic function of the watercourse is maintained. Specific details of each crossing will be finalized during the detailed design phase and will be included in a RFR for DFO and any necessary applications for alteration or notifications to NLECCC. All watercourses will be field assessed as part of the permitting process. Roads will be micro-sited to minimize impacts by working to design the roads perpendicular to watercourse crossing locations and designing roads to cross watercourses along a straight section of stream, where practicable.

The raw freshwater above ground pipeline and water recycling line will follow the proposed access road to the pump station. Therefore, effects associated with road construction are also anticipated to occur for above ground pipeline construction. However, no direct impacts to watercourse channels as a result of pipeline construction are anticipated as all watercourses will be spanned.

Of the 30 modelled and two confirmed watercourses within the IPA, 12 intersect the proposed underground ammonia pipeline from the Industrial Facility to the Port of Botwood (Drawing 7.6-4, Appendix A). All watercourse crossings associated with the pipeline will be field verified and described during the detailed design phase. Specific details of pipeline interactions with surface water will be finalized during the detailed design phase, and any necessary applications for alteration or notifications to NLECCC will be completed during the permitting process.

Quarry Area

No modelled watercourses are mapped within 100 m of the proposed quarry development locations (Drawing 7.6-4, Appendix A). During the permitting process, the absence of surface water features within and in proximity to the quarry development area will be field confirmed. The siting and operation of the quarry has been carried out with consideration for nearby

waterbodies, watercourses, wetlands, and other environmentally sensitive features. Surface drainage and runoff will be managed through a combination of site grading and engineered erosion and sediment control measures designed to prevent sediment-laden water from leaving the active quarry area. Such measures may include drainage ditches, sediment settling areas, silt fencing, rock check dams, berms, and other site-specific controls as required. Where water is needed for crushing, washing, or dust suppression, water sourcing and use will be subject to applicable approvals, and water will be recirculated where practical to reduce withdrawals and minimize discharge volumes. Any water discharged from quarry or borrow areas will be managed in accordance with applicable regulatory requirements.

Accommodation Camps

Construction of the accommodation camps can affect surface water through activities such as clearing, grubbing, and infrastructure placement. These activities can lead to water quantity changes through the destruction of overprinted surface water features or through grading, watercourse diversions, and water management. Furthermore, potable water needs and wastewater management have the potential to alter surface water quantity through groundwater drawdown or withdrawal/discharge into aquatic receivers if not disposed of in approved septic tanks.

Of the 30 identified modelled watercourses and two mapped watercourses within the IPA, there are three either partially or fully within a 30 m buffer of the planned accommodation development location (Drawing 7.6-4, Appendix A). The 30 m buffer on accommodation camps has been established based on BMPs created by DFO (DFO, 2022) for fish habitat protection. All modelled surface water features within this buffer will be field confirmed and characterized during the detailed design phase.

The accommodation camp will be micro-sited to avoid direct impacts on surface water features, where possible. Specific details of accommodation placement and associated activities such as water management and wastewater discharge locations will be finalized during the detailed design phase and will be included in any necessary applications for alteration or notifications to NLECCC. The impact of accommodation camp development on local watershed characteristics and drainage patterns is expected to be minimal due to the limited size of camp footprints, and natural drainage patterns will largely be maintained.

Flowers Pond is proposed to supply potable and domestic water for the accommodation camp (Drawing 7.6-4, Appendix A) (refer to Section 7.5). The evaluation of water withdrawal on this system will be completed during the provincial Water Use License application process (Drawing 7.7-1, Appendix A).

Industrial Facility Installation

The Industrial Facility footprint will overprint two field-verified watercourses: WC15-104 and WC15-159 (Drawing 7.6-4, Appendix A). Impact areas for these surface water features are quantified in Table 7.6.4.

Table 7.6.4: Summary of Surface Water Quantity Impact Area

Feature	Stream Order	Flow	Impact Extent (full or partial)	Dominant Habitat Type(s)	Infrastructure Associated	Type of Impact	Impact Area (m ²)
WC15-104	1-2	P	Partial	Riffle-run, Run, Flat	Industrial Facility	Destruction	2,309.5
WC15-159	1	P	Partial	Riffle-run	Industrial Facility	Destruction	2,066.3
Total Impact Area (m²)							4,375.8

Surface water from WC15-104 and WC15-159 will be intercepted by perimeter ditching and rerouted west around the Industrial Facility, to be released at a discharge location in WC15-104 north of the PF (Drawing 7.6-4, Appendix A). Hydrological connectivity to the upstream portions of the watercourses will be maintained. The area of WC15-104 that will be altered due to rerouting accounts for 2,309.5 m² and the area of WC15-159 that will be altered due to rerouting accounts for 2,066.3 m². Effects to fish and fish habitat as a result of these impacts are discussed in Section 7.7. Impacts to wetlands are discussed in Section 7.8.

Specific details of Industrial Facility placement and associated activities will be finalized during the detailed design phase and will be included in any necessary applications for alteration or notifications to NLECCC.

Water Withdrawal – Peters Pond Hydrological Assessment

Water required to produce hydrogen and ammonia will be withdrawn from Peters Pond, approximately 6 km from the Industrial Facility (Drawing 7.6-4, Appendix A). To assess the effects of this withdrawal on surface water quantity within the Peters Pond/River system, a hydrological assessment was performed (Appendix H.3) as per EIS Guidelines (NLECCC, 2025).

The hydrological assessment was used to quantify allowable daily withdrawal rates from Peters Pond in compliance with associated regulations. The scope of the hydrological assessment includes:

- Characterizing local climate and hydrological conditions within the Peters Pond watershed.
- Summarizing results from the baseline surface water monitoring program within Peters Pond watershed.
- Determining a safe yield in Peters Pond for the proposed Project.
- Quantifying water availability with and without the proposed withdrawal volumes.

The hydrological analysis completed for the assessment was developed using the Hydrologic Engineering Centre – Hydrologic Modelling System (HEC-HMS) software by the US Army Corps of Engineers (USACE, 2025). It has been widely adopted as the standard hydrologic model as it simulates rainfall, direct runoff, and routing at short- and long-time scales.

For this study, the model was configured to use daily climate inputs, with results summarized at monthly intervals. Inputs included 26 years of daily precipitation and average temperature data, solar radiation, pond evaporation, and calculated potential evapotranspiration, along with modelled representations of snowpack and soil water storage. Model calibration was completed using daily streamflow data from the WSC hydrometric station on Peters River. Additional details on the hydrological assessment methodology for Peters Pond are provided in Appendix H.3.

The hydrological assessment provides an analysis of water availability in Peters Pond under both baseline conditions and with the proposed Project withdrawal. Water demands of the facility will fluctuate daily due to facility generation demands, which are primarily tied to wind availability. EVREC proposes an annual operation water demand of 3,018,340 m³ (0.096 m³/s), with withdrawal rates varying from 0.59 million litres per day (MLPD) (0.0068 m³/s) to 13.68 MLPD (0.147 m³/s). Daily variable withdrawal rates were incorporated into the model and were simulated from 2000 to 2025. The results of the hydrological model were summarized for the average, driest, and wettest month of the simulated period (2000-2025).

A low-flow analysis was completed to assess whether adequate ecological flows in Peters River would be maintained during Project withdrawal. The analysis compares modelled outflows from Peters Pond under baseline conditions and the proposed withdrawal conditions using the continuous daily hydrological model. Comparison of baseline and withdrawal flow duration curves were used to quantify reductions in low-flow percentiles and to evaluate potential alteration of environmental flows. Minimum outflow requirements were further evaluated based on the statistical low-flow frequency metric 7Q10, defined as the lowest stream flow for seven consecutive days that would be expected to occur once in a 10-year period. The 7Q10 is widely used as a minimum instream flow threshold because it reflects natural drought-like conditions and is a standard low-flow metric considered for water use license applications in Newfoundland and Labrador.

It should also be noted that the mean annual flowrate derived from the hydrological model for Peters Pond watershed was calculated to be 2.90 m³/s, which is lower than the observed streamflow data from the nearby hydrometric station downstream on Peters River. All modelled monthly flow averages are less than the measured monthly flow averages for Peters River near Botwood, indicating that the model is conservative in estimating water availability.

The desktop review completed as part of the hydrological assessment identified four approved water withdrawals in Peters River watershed (Appendix H.3). All water withdrawals are located upstream of Peters Pond and therefore are not anticipated to be impacted by the proposed water withdrawal for the Facility.

Overall, the hydrological model determined that Peters Pond has sufficient water available to accommodate the proposed Project withdrawal, with few instances where recirculation of treated water is required to meet minimum instream flow requirements (7Q10). Over the

modelled period, recirculation of treated water from the Industrial Plant was required during low flow periods in July, August, September, and October. For the entire model simulation period (2000-2025), a total of 7 events required recirculation. During the driest year on record (2001), water recirculation was required in the summer for a duration of 22 days. During the wettest year on record (2016), no water recirculation was required throughout the entire year. It is expected that some recirculation will be required during Project operations to ensure minimum instream flow requirements in Peters River are maintained.

As part of the Groundwater and Surface Water Monitoring Management Plan (table of contents included in Appendix.10), water level monitoring thresholds and adaptive water management strategies will be established to ensure the protection of ecological flows downstream in Peters River. Monitoring will continue on the outflow of Peters Pond to further understanding of the system's hydrological regime.

Water Discharge – WC15-104

Wastewater from the Industrial Facility will be discharged to the stream which exists north of the facility (WC15-104; Drawing 7.6-4, Appendix A). To support the assessment of potential effects on surface water, a hydrologic evaluation was conducted to determine the stream's capacity to receive this discharge (Appendix H.4). The initial objective was to understand how adding plant effluent, including reject water and operational runoff, could influence downstream flood conditions. A secondary objective was to use modeled streamflow data to assess potential impacts of added discharge on low flow and average flow, and how elevated suspended sediments and temperatures in discharge may affect stream water quality under these scenarios (discussed further in Changes in Surface Water Quality).

To assess the potential influence of added discharge on flood conditions, a 2D HEC-RAS model was developed to simulate flows with and without plant discharge for the 1:20 and 1:100 rainfall events (Appendix H.4). Modeled baseline flows for these events, prior to any added discharge, were 26.4 m³/min and 33.0 m³/min, respectively. Given that the proposed plant discharge is approximately 3.1 m³/min, this additional flow represents a small fraction of the total flood volume and is therefore not expected to produce any measurable change in downstream velocities or inundation extents during these events. The addition of plant discharge will not produce any measurable change in flooding risk to residences along Botwood Highway on the most westerly end of IRID51.

Further to modelling extreme flood events, a HEC-HMS model was created for the discharge creek to estimate daily and monthly streamflow (Appendix H.4). This relied on updates to the earlier HMS model to allow for continuous simulations. Because the discharge creek was not gauged prior to the assessment, a Drainage-Area Ratio Method was used to estimate streamflow at WC15-104 from gauged data collected from the Peters River watershed. Model parameters were adjusted to match the specific drainage area of WC15-104 including land cover, soils, sub-basins, and field conditions observed during the geotechnical investigation.

At the point of discharge, WC15-104 is generally characterized as low-flow watercourse, with

predicted average discharges from the hydrologic model ranging from approximately 0.016 to 0.130 m³/s. Under higher-flow (95th-percentile) conditions, modeled flows range from 0.07 to 0.40 m³/s, indicating that the stream is somewhat hydrologically flashy and naturally experiences a range of flow conditions. In this context, the proposed discharge of approximately 0.06 m³/s falls within the range of flows the stream already experiences under natural high-flow conditions. Although modelling demonstrates limited conveyance during low-flow periods, the magnitude of the proposed discharge is comparable to naturally occurring seasonal average and higher flows, indicating that the added water volume is not expected to exceed the stream's typical hydraulic regime. Furthermore, the addition of 0.06 m³/s during seasonal low-flow periods may help sustain aquatic habitat by increasing available water depth and improving conditions for biological processes. Effects to fish and fish habitat from wastewater discharge are further described in Section 7.7.

Cross-section profiles indicate that the discharge creek is a narrow, low-freeboard, and hydrologically flashy channel that frequently reaches bankfull and overtops its banks during runoff events. When the channel is full, the added discharge is expected to increase velocity at the discharge point (where the cross-sectional area is approximately 1 m²) by no more than 0.05 m/s, as excess water would spread into relatively flat floodplain rather than remain confined within the channel. Predicted increases in velocity diminish downstream as the channel widens. These small velocity impacts - well below the magnitude of natural peak flows, which exceed the proposed discharge by more than an order of magnitude - are not expected to affect bank stability or cause any physical alteration of stream habitat relative to natural conditions.

Changes in Surface Water Quality

Changes in the quality of surface water can arise from alterations to the surrounding environment and can include an increase in water temperature from decreased shade, an increase in pollutants from machinery and infrastructure, and the mobilization of sediments (MTO, 2009). Given the dynamic nature of channeling water, effects upon water quality can quickly spread throughout different reaches of the respective watershed.

The primary sources of potential water quality issues within the IPA are expected to stem from wastewater discharge from the facility; quarry activities, specifically stockpiling and blasting; general earthworks associated with road construction and upgrades, pipeline construction, and site preparation; and malfunctions and accidents. Water quality issues associated with potential blasting requirements (i.e., chemical composition of water and increase in dissolved metals, etc.) are also a threat to surface water quality.

The mobilization of sediment within aquatic environments can cause shifts in ecological integrity, including changes to the plant species composition, the distribution of primary and secondary producers, and the habitat suitability for vulnerable species (Tilman et al., 1997). Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, routine road maintenance, daily traffic, and site reclamation. During construction, sedimentation may result from the development of access roads (including the

installation of crossing structures), pipeline construction, quarry development, accommodation development, and the site preparation and installation of the Industrial Facility. The general alteration or removal of riparian vegetation can also result in bank instability and erosion.

Elevated suspended solids in site runoff is a primary concern associated with quarrying activities. The desktop review found no surface water features within 100 m of the quarry, which reduces the risk of runoff affecting nearby water quality (DFO, 2022). Still, surface runoff and drainage occurring on the site will be directed via sloping and grading, or other water management infrastructure (e.g., rock-lined ditches, swales, culverts) to a settling pond. Settling ponds will be designed with adequate residence time to treat the expected TSS load and attenuate flow during storm events. Individual quarry settling pond sizing will be defined during the detailed design phase.

Erosion and sedimentation may be caused by clearing, grubbing, and trenching during road and pipeline construction. Similarly, changes in surface water quality may occur due to riparian area alterations and use of machinery near or in surface water during construction.

In addition to the large-scale erosion and sedimentation reduction measures to be outlined in site-specific erosion and sediment controls plans, it is expected that localized control measures will be implemented whenever earth works occur (i.e., silt fences, reducing amount of time disturbed soil is exposed, grading controls, seeding of disturbed soils to enhance soil stabilization, and directing runoff towards vegetated buffers or constructed ditches/settling ponds). These environmental controls will be repaired and replaced as needed and will be implemented throughout all Project phases.

During operations, reject water from the Industrial Facility is expected to contain elevated TSS compared to the receiving environment, and some process water will have higher-than-ambient temperatures. To evaluate how these changes in water chemistry and temperature may affect the receiving stream (WC15-104), the hydrologic modeling study was used to assess potential impacts under three conditions: (1) low-flow or drought periods, (2) average flow conditions, and (3) flood events (Appendix H.4), prior to any mitigation. For this study, the temperature of the reject water was assumed to be 25°C, whereas TSS concentrations are variable and dependent on seasonal chemistry and pre-treatment/demineralization processes.

While summer stream temperatures can naturally exceed 24°C, the additional discharge is expected to further increase temperatures during low- to average-flow periods, which may require mitigation. Modelled low flows (5th percentile) are an order of magnitude smaller than the constant flow of reject water, so the temperature of reject water is anticipated to remain relatively undiluted at the point of discharge under low-flow conditions. The same can be said for the various water quality parameters such as TSS. It is important to note, however, that modelled temperature and TSS increases results are presented only at the point of mixing and do not infer the spatial extent that any warming or TSS load may extend. Temperature and TSS effects are expected to diminish with increased mixing as water moves downstream. It should also be noted that the observations presented by this analysis are based on inferred

data. Prior to development, real-time monitoring of the discharge creek will be carried out to characterize its hydrology, water quality, and temperature regimes. This information will be used to refine the hydrologic model and identify any additional mitigation measures that may be required.

Surface water management infrastructure and effluent treatment systems associated with the Industrial Facility are described in Section 7.1. In general, the facility's surface water management system includes a series of features designed to direct non-contact water and on-site runoff to appropriate control structures. These structures capture and contain flows when required, ensuring that non-contact water remains clean before being released to the natural downstream receiving environment, while also protecting against erosion, flooding, and sediment transport.

Effluent treatment and discharge at the Industrial Facility will be managed through an integrated wastewater collection, treatment, storage, and discharge system designed to segregate different wastewater streams and ensure that any water released from the site meets applicable regulatory requirements. As noted in Fracflow Report (Appendix H.4), the pre-treatment and demineralization of raw water can result in concentrated wastewater that exceeds CCME parameters for certain constituents, particularly for those constituents that are close to or already exceed guideline values from the raw water source. Wastewater will be treated to meet the parameters in Schedule A of the Newfoundland and Labrador Environmental Control Water and Sewage Regulations (2003) and relevant CCME FWAL guidelines through the Wastewater Treatment Plant. As the last step of the wastewater treatment and discharge plan, effluent will join internal contact water within the stormwater/effluent pond (see Section 7.1). Preliminary pond performance modelling results demonstrate that the pond can receive and manage the designated storm and effluent loads prior to controlled discharge (Appendix H.4). Together, this water will be treated for TSS (if required) before controlled release. Monitoring will be conducted prior to release to ensure any water discharged or recycled back to Peters Pond meets applicable Newfoundland and Labrador regulatory requirements and relevant environmental guidance.

The potential for accidental releases of hazardous substances including petroleum hydrocarbons and other contaminants exists across all Project phases. These substances have the potential to quickly migrate to water resources. Ammonia released into water, even in small concentrations, can be harmful to fish and other aquatic organisms (ECCC, 2024b). The Project will include an underground liquid ammonia pipeline designed as a double-walled (pipe-in-pipe) system, providing secondary containment in the unlikely event of an inner pipe leak. This configuration adds an additional engineered barrier between the product and the environment, significantly reducing the likelihood of a release to soil or groundwater and enabling enhanced leak detection/monitoring within the annulus space, where implemented. Double-walled piping is a common risk-reduction approach in the chemical and energy industries for higher-consequence fluids or in environmentally sensitive settings because it provides containment if the primary pipe fails. In addition, blasting required for site leveling, foundation work, or quarrying can impact water quality through both increases in turbidity and

introduction of nitrogen-based explosive residues (if not fully detonated). Mitigations specific to accidents and malfunctions are described in Section 14.0.

Mitigation and monitoring, which are described below, will ensure discharge from accommodations is within approved septic tanks and disposed accordingly or within the Newfoundland Environmental Control Water and Sewage Regulations (Newfoundland and Labrador, 2002c) and that water management structures are functioning as intended.

7.6.8 Mitigation

Avoidance of direct impacts to surface water is the highest priority in the mitigation sequence. Throughout the iterative process of developing the current Project infrastructure layout, avoidance of effects to surface water was attained through several key design considerations. Initial identification and characterization of surface water within the IPA helped inform an optimized site layout and reduce potential impacts to surface water. During the detailed design and regulatory permitting phases, field verification of surface water features will help further inform micro-siting of infrastructure to avoid and lessen impacts to water resources to the greatest extent possible.

Mitigation measures will be employed to further reduce potential indirect effects to surface water resources. The following mitigation measures will be included in the design of the Project:

Changes to Surface Water Quantity

- Implement water level monitoring thresholds and adaptive water management strategies (including adjusting plant operations to reduce water needs) as per the Groundwater and Surface Water Monitoring Management Plan (Appendix Q.10) to ensure the protection of ecological flows downstream in Peters River.
- Complete further micro-siting of infrastructure during the detailed design and permitting phase, where feasible, with the intent to avoid impacts to surface water features.
- Complete culvert installations and upgrades (where applicable) in accordance with the Environmental Guidelines for Watercourse Crossings (NL WRMD, 2017).
- Identify surface water features and ensure they are clearly marked.
- Redesign/upgrade existing watercourse crossings to facilitate hydraulic function.
- Fit any watercourse crossings with appropriately sized infrastructure, as prescribed by a certified professional.
- Design any necessary alterations in a way that maintains the natural grade of a watercourse.
- Integrate water management systems including diversion and collection ditches, roadside drainage channels, vegetated swales, and stormwater retention ponds.
- Maintain existing drainage patterns and hydrological connectivity through the extent feasible minimal grading and water management infrastructure.
- Develop a maintenance schedule for regular maintenance and inspection of Project water management infrastructure.
- Conduct blasting activities in accordance with best management practices, including

the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.

- Conduct instream works associated with underground stream crossings during dry conditions.
- Ensure the trench created in the stream bed is partially filled with suitable materials; these materials can then be compacted and the stream bed brought back to its previous elevation and grade using a topping of clean, non-erodible materials containing a minimum of fines.
- Ensure the materials used for the “topping” in the crossing area is consistent with the material substrate of the stream in this area and should be large enough to resist displacement by peak flows.

Changes in Surface Water Quality

- Treat wastewater discharge prior to release to ensure it meets applicable regulatory requirements. Implement the Groundwater and Surface Water Monitoring Management Plan (table of contents in Appendix Q.10). This will include collection and treatment of water, as necessary, for Industrial Facility discharge as well as the accommodation camp.
- Draft and implement a Groundwater and Surface Water Monitoring Management (Appendix Q.10) to support drainage and ensure water quality conforms to applicable regulations and guidelines.
- Sample water prior to discharge as per the Groundwater and Surface Water Monitoring Management (Appendix Q.10) to ensure water quality conforms to applicable regulations and guidelines.
- Use rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life.
- Develop site-specific Hazardous Materials Response and Training Plan (Appendix Q.11) and an Emergency Response Plan (Appendix Q.2) to address potential impacts of spills, hazardous substances, and other emergencies on surface water resources.
- Develop site-specific Erosion and Sediment Control Plan (Appendix Q.9) during the detailed design phase. Properly install, inspect, and repair erosion and sediment controls.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Require that workers are fully trained in spill response (Appendix Q.11).
- Ensure operators remain with equipment during refueling.
- Plan any construction activities that may impact stream banks and substrate to align with low-flow periods, when possible.
- Revegetate along the watercourse edge and above the ordinary high-water mark to facilitate bank stabilization, where applicable.
- Maintain a minimum 30 m vegetated buffer surrounding watercourses, where possible.
- Locate stockpiles a minimum of 30 m from any surface water feature and stabilize to

- reduce the likelihood of erosion and sedimentation.
- Collect or direct runoff containing suspended materials into settling ponds, diversion ditches, or well vegetated areas.
- Integrate outlet protection features on settling ponds to dissipate flow velocities and decrease erosion at the outflow.

General

- Adhere to all Approval conditions outlined in all regulatory approvals.
- Complete site kick-off meetings with relevant staff/contractors to educate and confirm policies related to working near surface water resources, and that all Approval conditions are clearly communicated and adhered to.

7.6.9 Monitoring

All surface water features that are expected to be directly or indirectly impacted will be field verified, and the impacts will be quantified as part of the detailed design and permitting process. As watercourses are verified, Project infrastructure will be micro-sited to avoid impacts to surface water features whenever possible. Any expected alterations to surface water resources will be permitted in accordance with the *Water Resources Act* through NLECCC.

A Groundwater and Surface Water Monitoring Management Plan (table of contents in Appendix Q.10) will be implemented to ensure water quality meets the regulatory requirements and that potential impacts to surface water do not occur from quarry and accommodation development, Industrial Facility development, and wastewater discharge. The Groundwater and Surface Water Monitoring Management Plan will also include water level monitoring for Peters Pond and will outline adaptive water management strategies to ensure the protection of ecological flows downstream in Peters River. Hydrological monitoring of Peters Pond and Peters River will continue to compare actual conditions with predicted changes in Peters Pond elevations and outflows. Similarly, hydrological monitoring of WC15-104 will also be conducted to update and calibrate predictive modelling using measured flow and water quality data. A site-specific Erosion and Sediment Control Plan and Water Management Plan will also be developed – the table of contents have been prepared for this EIS and are included as Appendix Q.9 and Q.13 respectively. These will be living documents and evolve with the Project and be updated as needed.

7.6.10 Conclusion

After mitigations, residual effects on surface water are characterized in Table 7.6.5.

Table 7.6.5: Surface Water Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Changes to water quantity	Water management	A	M	LSA	LT	I	PR	Not significant
	Surface water monitoring							
Changes to water quality	Erosion and sediment control	A	L	LSA	LT	I	PR	Not significant
	Water management							
	Spill preparedness							
	Surface water monitoring							
LEGEND (Refer to Section 5.0 for definitions)								
Nature of Effect: A – Adverse, P – Positive								
Magnitude: N – Negligible, L – Low, M – Moderate, H – High								
Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area								
Duration: ST – Short Term, MT – Medium Term, LT – Long Term								
Frequency: O – Once, I – Intermittent, C – Continuous								
Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

7.7 Fish & Fish Habitat

7.7.1 Overview

The objective of the fish and fish habitat assessment was to inform the Project's design and collect the information necessary for the assessment of fish species and associated habitat within the IPA. This was accomplished using the following approach:

- Identify potential fish habitat (waterbodies, watercourses, and wetlands) within the IPA using desktop resources.
- Use the information collected to inform the Project design (e.g., avoid/minimize impacts to watercourses and water bodies).
- Assess the quality of fish habitat within the IPA via field surveys.
- Inventory and assess abundance and diversity of fish within the IPA.
- Describe the potential impacts of water withdrawal and discharge on fish and fish habitat.
- Use the information collected to inform mitigation and monitoring programs.

7.7.2 Regulatory Context

The Project has potential to interact with fish and fish habitat that may be protected under federal and/or provincial legislation and regulatory guidelines. Legislation relating to fish and fish habitat includes:

Federal Legislation

- *Fisheries Act* (Canada, 1985)
- *SARA* (Canada, 2002b)

Provincial Legislation

- *NL ESA* (Newfoundland and Labrador, 2001)
- *Water Resources Act* (Newfoundland and Labrador, 2002c)
- Newfoundland and Labrador Fishery Regulations (Newfoundland and Labrador, 2018b)

7.7.3 Desktop Assessment Methods

Desktop assessment methodology used to identify surface water features (and potential fish habitat) is discussed in Section 7.6.

7.7.3.1 *Fish Community*

A desktop review to identify fish species that are potentially present within the IPA was completed using the same methodology as described in Section 6.8.

7.7.4 Desktop Assessment Results

A review of the ESA list determined that the IPA includes habitat for two inland SAR:

- Banded killifish (ESA Vulnerable)
- American eel (ESA Vulnerable)

A review of data from a biomonitoring site at Peters River near Botwood indicated that the following species may be found within the associated local watershed 4 (Drawing 7.6-1, Appendix A; Newfoundland and Labrador, n.d.):

- Atlantic salmon – Northeast Newfoundland population (both sea run and ouananiche - land locked Atlantic salmon)
- Brook trout
- Arctic char
- Threespine stickleback
- Ninespine stickleback
- Rainbow smelt
- American eel
- Sea lamprey

The ACCDC database did not identify any fish species considered to be SOCC or SAR within 5 km of the IPA (ACCDC, 2023).

Keefe et al. (2019) reported the first records of finescale dace (SNA) in four ponds within a first order tributary of Exploits River, which is located within 5 km south of the IPA.

The results of the desktop review are described in detail in the Baseline Aquatic Environment Report (Appendix H.2).

7.7.5 Field Assessment Methods

Detailed fish habitat surveys were completed for all potential habitats field verified as situated within the PF of the IPA, including a 500 m stream segment north and downstream of the proposed discharge location (Drawing 7.7-1, Appendix A). Each watercourse surveyed was delineated into individual reaches defined by discrete homogeneous units (e.g., riffle, run, pool, flat, etc.) as determined in the field in an upstream to downstream direction. Each habitat type contains discrete gradient, substrate types, water depth, and velocity ranges which have been determined using the described biological 'preferences' outlined in Grant and Lee (2004), whenever possible. A modified watercourse assessment was completed for Peters River, which is described in Section 7.6. No other watercourse crossings were characterized in-field (all intermittent - 'N').

Fish collection via trapping was conducted within four key habitats within or adjacent to the IPA: Peters Pond, Peters River, Flowers Pond, and WC15-104 (Drawing 7.7-1, Appendix A). Fish collection surveys were completed to determine species presence and estimate relative abundance within the IPA. Sampling locations were selected based on representative habitats with potential to support fish along a section of an accessible watercourse or pond, while prioritizing the sampling of features expected to be impacted by Project infrastructure or activities (e.g., water withdrawal and discharge).

Water quality parameters were measured in-situ during detailed habitat surveys, fish collection, and surface water sampling at water quality monitoring stations. Seasonal surface water sampling is discussed further in Section 7.6.

Field assessment methodology is further described in the Baseline Aquatic Environment Report (Appendix H.2).

7.7.6 Field Assessment Results

Table 7.7.1 summarizes the results of fish collection and detailed habitat surveys within the IPA. Refer to Section 7.6 for the Peters River watercourse assessment and water quality results.

Table 7.1.1: Summary of Results within the IPA

Section	Summary
Fish Collection	
Trapping	Four sites were trapped resulting in the capture of the following species: • 15 Atlantic salmon • 5 American eel • 1 brook trout • 83 threespine stickleback
Electrofishing	Electrofishing was not completed within this component due to field surveys occurring outside of the electrofishing window (June 1 to September 30).
Fish Habitat Characterization	
Detailed Habitat	Detailed habitat was completed within the two watercourses in the PF and 500 m downstream of the proposed discharge location.

The watercourse assessment of Peters River identified suitable habitat supportive of various life stages of Atlantic salmon and brook trout, including spawning. Habitats observed are also likely to support juvenile and adult American eel.

Within the assessment areas, WC15-159 and WC15-104 are considered to provide suitable habitat for all life stages of brook trout, Atlantic salmon, and American eel (Drawing 7.7-1, Appendix A). Finer substrates provide juvenile and adult habitat for American eel. Suitable spawning substrate was present for Atlantic salmon and brook trout in the form of sand, gravel, and cobble within suitable habitat types such as riffles and tails of pools. Lower velocity areas with aquatic vegetation provide suitable habitats for various life stages of threespine stickleback. Habitat reaches mapped for each watercourse segment assessed are described in the Baseline Aquatic Environment Report (Appendix H.2).

Trapping surveys conducted within the IPA resulted in the capture of 104 individual fish representing four species. Threespine stickleback accounted for approximately 80% (83 individuals) of all captures and were the only species detected in Peters Pond and Flowers

Pond. Their dominance is likely attributable to the survey design, which focused more heavily on lacustrine habitats relative to riverine environments. American eel—classified as Vulnerable under the ESA and Threatened by COSEWIC—comprised approximately 5% (five individuals) of the total catch. Additional captures included 15 Atlantic Salmon (14%) and one brook trout (1%). Species descriptions are provided in the Baseline Aquatic Environment Report (Appendix H.2).

In-situ water quality results are summarized in Section 7.6 and described in the Baseline Aquatic Environment Report (Appendix H.2). Overall, the measured water quality parameters—temperature, pH, and dissolved oxygen—are considered suitable for fish species present. Note that these results represent conditions at a specific moment and do not indicate any spatial or temporal trends in water quality. In-situ water quality is used only to support a general description of habitat quality.

7.7.7 Effects Assessment

The works, undertakings, and activities associated with the construction, operation, and decommissioning of the Project can impact fish and fish habitat through multiple direct and indirect pathways (Table 7.7.2). The identification of potential Project interactions with fish and fish habitat have been guided by DFO's Pathways of Effects (2024).

Table 7.7.2: Potential Project-Fish and Fish Habitat Interactions – Industrial Facility

Project Phase	Potential for Interaction
Site Preparation and Construction (three years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works	X
Access Road Upgrading and Construction	X
Water Pipeline Construction	X
Facility Civil Works	X
Transportation of Facility Components	X
Equipment Installation	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	
Facility Operations and Maintenance	X
Site Management	X

Project Phase	Potential for Interaction
Decommissioning and Rehabilitation (two years)	
Infrastructure Removal	X
Site Reclamation	X

7.7.7.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries for fish and fish habitat include the framework offered by the *Fisheries Act* (Canada, 1985) and supporting policy statements and management objectives from DFO. DFO interpretation of HADD of fish habitat supports the evaluation of this VC. The fish and fish habitat effects assessment is undertaken in accordance with the specific requirements prescribed for the Aquatic Environment in the Environmental Impact Statement Guidelines for the Botwood and Area EVREC Green Energy Project (NLECCC, 2025).

Technical Boundary

The assessment of potential effects to fish and fish habitat as a result of Project development is limited by the accuracy of the models developed to identify fish habitat across the landscape. Fish habitats were field verified under the PF, but as per DFO guidance, potential intermittent watercourses at crossing locations were not field assessed, which limits the level of detail at which fish habitat across the IPA can be described. To manage these uncertainties, the assessment employs a conservative characterization strategy. All modeled watercourses are considered to support fish and fish habitat until proven otherwise through field verification.

Spatial Boundary

The LSA for fish and fish habitat includes the IPA and fish habitat features integrated into the Project's design (i.e., withdrawal and discharge systems). This includes Peters Pond and Peters River from the outlet of the pond to the river's mouth at Peters Arm, and the unnamed watercourse (WC15-104) from the IPA to the river's confluence with Northern Arm Brook. The RSA for fish and fish habitat includes all modelled local watersheds that intersect the IPA (Drawing 7.6-3, Appendix A).

Temporal Boundary

Temporal boundaries associated with fish and fish habitat include the site preparation and construction (three years), operation and maintenance (33 years), and decommissioning and rehabilitation (two years) phases of the Project.

7.7.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for fish and fish habitat. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable change to fish habitat quantity (m²) or quality. No loss of fish.

- Low: A change in fish habitat quantity or quality or impacts to fish that are within natural variation.
- Moderate: A change in fish habitat quantity or quality, above the range of natural variation, which partially limits the ability of fish to use the habitat or carry out one or more life processes. Impacts to fish will only be experienced by individuals rather than entire populations and can be managed with routine measures.
- High: A change in fish habitat quantity or quality that limits the ability of fish to use the habitat to carry out one or more life processes. Impacts to fish will be experienced by entire populations and cannot be managed with routine measures.

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

7.7.7.3 Effects

Direct effects to fish and fish habitat (i.e., habitat loss) will most likely occur during the site preparation and construction phase. This potential loss of fish habitat corresponds to the assessment of Project infrastructure-surface water interactions presented in Section 7.6 through which two watercourses (WC15-104 and WC15-159) were identified under the IPA PF. The Project may also interact with up to 30 watercourses through construction of road and pipeline crossings, quarry construction, or accommodation construction, and ammonia pipeline construction (Drawing 7.6-4, Appendix A). Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

Indirect effects such as changes in habitat quality through flow alterations or sedimentation can be farther reaching. These effects are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes, and the magnitude at which they are felt (DFO, 2022).

Wetland alterations required for the Project during the construction phase also have the potential to impact fish and fish habitat. Wetlands that are contiguous with a watercourse or other areas of open water may provide areas of fish feeding, spawning, and/or rearing (DFO, 2023b). The dense macrophytic vegetation that often comes with these wetland environments can offer refuge to fish including shelter from predators, a substrate to which eggs can be adhered, and a source of food (DFO, 2008). Wetland types present within the IPA and potential effects are discussed further in Appendix I.1. Wetland Mosaic A, which will be overprinted by the Plant Site, is not considered fish habitat based on isolation of the habitat from other fish bearing features (Appendix H.2).

Project activities are expected to result in a HADD of fish habitat due to direct watercourse losses associated with the construction of the Industrial Facility. The assessment of effects on fish and fish habitat was therefore completed with the expectation that an authorization under the *Fisheries Act*, along with appropriate fisheries offsetting, will be required. Modelling has been conducted, and will be refined as needed, to predict changes in habitat quality related to

water intake and discharge and to determine if changes to Peters Pond and/or Peters River will result in an authorization under the *Fisheries Act*. Additional field verification and hydrological modelling will be carried out as necessary to support predictions of effects from other project components such as quarry and accommodation areas.

Change in Habitat Quantity

The Project design has been optimized to reduce interactions between Project infrastructure and surface water that may support fish and fish habitat. These avoidance efforts will continue through the detailed design phase. However, where interactions cannot be avoided, some habitat loss may occur. For this VC, habitat loss is defined as any fish habitat feature that is directly overlain by Project infrastructure.

As detailed in Section 7.6 infrastructure within the IPA will directly overprint two watercourses (WC15-104 and WC15-159). The Project may also interact with up to 30 watercourses through construction of road and pipeline crossings, quarry construction, accommodation construction, or ammonia pipeline construction (Drawing 7.6-4, Appendix A). All habitat loss is expected to occur during the construction phase. To be conservatively inclusive, all modelled watercourses are presumed to be accessible to fish, even though there may be barriers or seasonal restrictions on ephemeral and intermittent watercourses. Fish habitat will be confirmed and characterized at every modelled watercourse expected to be impacted in advance of Project permitting.

Road and Pipeline Construction

As detailed in Section 7.6 of the 30 modelled and two field verified watercourses in the IPA, there are 27 potential interactions associated with road and pipeline crossings based on the modelled watercourse layer and verifications performed through aerial imagery (Drawing 7.6-4, Appendix A). Additional micro-siting during the detailed design phase will minimize impacts to fish habitat from road and pipeline construction.

There are no scheduled salmon river crossings or upgrades proposed within the IPA.

Each crossing will be designed to avoid any permanent diversion, restriction, or blockage of natural flow, such that the hydraulic function of the watercourse is maintained. Specific details of each crossing will be finalized during the detailed design phase and will be included in any necessary applications for alteration or notifications to NLECCC. Based on Strum's experience with culvert design, crossing construction, monitoring, and implementation of BMPs (DFO, 2022), it is anticipated that standard design and construction practices can be applied to avoid a HADD of fish habitat. Furthermore, all pipeline crossings will be installed in such a way as to minimize impacts to fish habitat. All watercourses will be assessed as part of the permitting process. Roads and pipelines will be micro-sited to minimize the number of crossings required.

Quarry and Laydown Areas

No modelled watercourses are mapped within 100 m of the proposed quarry development location (Drawing 7.6-4, Appendix A). During the permitting process, the absence of fish

habitat within and in proximity to the quarry development area will be field confirmed.

Accommodation Camps

Of the 30 modelled and two field verified watercourses within the IPA, there are three modelled watercourses either partially or fully located within a 30 m buffer of accommodation development location (DFO, 2022) (Drawing 7.6-4, Appendix A). The accommodation location is considered preliminary and will be adjusted to avoid impacts to fish habitat. Watercourses (and associated fish habitat) will be field verified during the detailed design phase to ensure avoidance by infrastructure.

Following micro-siting of infrastructure, the accommodation camp is not expected to result in permanent losses to fish habitat. A 30 m vegetative buffer between camp infrastructure and watercourses will be maintained wherever possible to reduce potential indirect impacts to fish habitat (DFO, 2022). Potential impacts of the accommodation camp on habitat quality (through flow alterations, potable water needs, and wastewater discharge) are discussed further under Changes in Habitat Quality.

Industrial Facility Installation

There are two watercourses that will be partially overprinted due to the construction of the Industrial Facility. Fish habitat provisions and impact areas are described and quantified in Table 7.7.3 (Drawing 7.6-4, Appendix A).

Table 7.7.3: Summary of Impacts to Fish Habitat

Feature	Stream Order	Flow	Impact Extent (full or partial)	Habitat Type(s)	Species and life stages expected to be impacted	Infrastructure Associated	Type of Impact	Impact Area (m ²)
WC15-104	1-2	P	Partial	Riffle-run, Run, Flat	EEL – J/A BKT – S/Y/J/A ATS – S/Y/J/A 3SP – Y/J/A	Industrial Facility	Destruction	2,309
WC15-159	1	P	Partial	Riffle-run	EEL – J/A BKT – S/Y/J/A ATS – S/Y/J/A 3SP – Y/J/A	Industrial Facility	Destruction	2,066
Total Impact Area (m²)								4,375.8

P= Perennial

S = Spawning, Y = Young-of-Year, J = Juvenile, A = Adult

BKT = brook trout, EEL = American eel, ATS = Atlantic salmon, 3SP = threespine stickleback

As described in the Baseline Aquatic Environment Report (Appendix H.2), detailed habitat assessments were completed on all fish habitats directly overlaid by the Industrial Facility. Detailed transect measurements were recorded at a 25 m frequency within each individual watercourse reach. The bankfull width of each transect survey point was used along with reach length to calculate the impact area (in m²). In total, approximately 4,376 m² of fish habitat is

expected to be lost due to Facility infrastructure placement.

Fish habitat identified within WC15-104 and WC15-159 is considered suitable for most life stages of species expected present (American eel, Atlantic Salmon, brook trout, and threespine stickleback), with the exception of stickleback spawning. Note that detailed habitat descriptions were limited to the survey extent (within the boundaries of the PF and a 500 m segment downstream); however, based on consistent channel gradients and geomorphic conditions, comparable habitat types are expected to occur both upstream and downstream of proposed Project infrastructure. Ditching used to reroute surface water from WC15-159 and WC15-104 around the Industrial Facility will be constructed to maintain fish passage to upstream portions of the watercourse. Fish passage is also anticipated to be maintained to the upper portions of WC15-159 through its secondary channel, which flows around the west/northwestern edge of the Industrial facility (Drawing 7.6-4, Appendix A).

For the effects assessment, watercourse crossings, intakes, discharges and spillways are not included within the overall calculation of permanent losses of fish habitat. These works will be designed to reduce impacts to the extent feasible, while ensuring that guidance relating to watercourse crossings are fully considered (DFO, 2022; NL WRMD, 2017). These impacts will be assessed through applications for watercourse alteration to NLECCC and will also be submitted directly to DFO through the Request for Review process.

Changes in Habitat Quality

Changes in fish habitat quality can occur through any mechanism that alters or disrupts the habitat's ability to support one or more life processes of fish. Indirect effects to fish and fish habitat will be explored through the following pathways:

- Flow modification (i.e., changes in water quantity) from a combination of surface water management (withdrawal and discharge), groundwater drawdown, and changes to contributing drainage areas.
- Water quality changes through erosion and sedimentation, increases in temperature, wastewater discharge and recirculation, blasting, or an accidental release of a deleterious substance.

Flow Modification

Changes in the amount of water entering a water resource can affect the suitability of that resource to support fish and fish habitat. The Pathways of Effects diagram developed by DFO outlines potential impacts to fish and fish habitat as a flow modification (DFO, 2024). Flow modification can influence fish habitat in several interconnected ways. When water levels or flow patterns are altered, the continuity of aquatic habitat can be disrupted, limiting or completely blocking fish passage between critical areas such as spawning, rearing, and feeding habitats. Reduced discharge can also shrink the extent of wetted area within a channel, decreasing the amount of physically available habitat.

Project infrastructure will be micro-sited to avoid direct impacts to fish and fish habitat where possible (i.e., accommodation camp, quarry area). Whenever possible, the maintenance of

natural drainage patterns will be prioritized through grading and water management infrastructure. Despite avoidance by infrastructure, watercourses may experience flow alterations due to associated changes in runoff and watershed area. This is particular concern for quarry development due to potential impacts of quarrying on the groundwater table, surface runoff/drainage patterns, and infiltration rates. If substantial changes in catchment areas are anticipated, a water balance assessment may be completed to evaluate any potential changes in surface water quantity affecting nearby water features as directed by DFO and to support necessary provincial or federal permitting. As all quarrying is planned to occur above the water table, there is no anticipated impact on fish or fish habitat from lowering of the water table associated with quarry development.

The impact of accommodation camp development on local watershed characteristics and drainage patterns is expected to be minimal due to the limited size of camp footprint, and natural drainage patterns will largely be maintained. However, the use of a groundwater supply at the accommodation camp will be required to meet potable and domestic water needs (Section 7.5). The evaluation of these groundwater supply systems, including pumping tests to confirm sustainable well yield and assessments of potential interference with surface water will be completed during the provincial Water Use License and well construction permit application processes. Additionally, any wastewater to be discharged from accommodations into either approved septic tanks and disposed of according to legislation or to the surrounding environment in such a way as to prevent impacts to fish and fish habitat (e.g., directing discharge to well-vegetated areas or other containment measures). Wastewater discharge will be quantified and assessed during permitting.

Note that blasting may be required during the construction and decommissioning phases of the Project to facilitate a number of Project components, including access and haul roads, site building foundations, and quarry operations. Blasting can impact surface flow through change groundwater quantity (i.e., baseflow) available to infiltrate a watercourse. The effects of blasting on groundwater quantity and baseflow are described in Section 7.5. In summary, any measurable changes to the percentage of baseflow in nearby streams are expected to be minor and restricted to the immediate vicinity of the blasting zone. The potential effects of blasting on water quality and fish health and survival are described below.

Water Withdrawal – Peters Pond

Water required to produce hydrogen and ammonia will be withdrawn from Peters Pond, approximately 6 km from the Industrial Facility (Drawing 7.6-4, Appendix A). To support the effects of this withdrawal on fish and fish habitat within Peters Pond/River system, a hydrological assessment was performed as per EIS Guidelines (NLECCC, 2025). Methods and results are fully described in the Peters Pond Hydrological Assessment Report (Appendix H.3). The assessment methods, findings, and effects on surface water are summarized in Section 7.6.

The hydrological assessment was used to determine the safe yield for Peters Pond in compliance with associated regulations. As part of this assessment, a low flow analysis was

completed to evaluate whether adequate ecological flows in Peters River would be maintained during Project withdrawal. Comparison of model predictions to baseline stream discharges was completed in consideration of the federal “Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada” (DFO, 2013) to determine potential harmful alterations or disruptions of fish habitat associated with flow reduction.

Low flow conditions are ecologically sensitive periods in freshwater systems. These conditions naturally occur seasonally, typically during late summer and mid-winter for Peters River, when precipitation and runoff are naturally reduced. During these periods, physical habitat and overall ecological capacity are reduced. Key characteristics include reduced wetted area, shallower depths, elevated water temperatures, and lower dissolved oxygen levels (Dowling & Wiley, 1986). These conditions already challenge fish populations, particularly juveniles and cold-water species like salmonids. Since habitat availability and water quality are constrained during low flow, additional reductions from water withdrawal can disproportionately affect ecological function (Rolls et al., 2012).

The hydrological assessment for Peters Pond and Peters River evaluates ecological flow needs in the context of the 7Q10 statistical low-flow frequency metric. This metric is defined as the lowest stream flow for seven consecutive days that would be expected to occur once in a 10-year period. The 7Q10 is used for a wide variety of applications including the protection of regulated water quality from wastewater discharges or water taking, habitat protection during drought conditions, and minimum flow needed to maintain aquatic ecosystems (NSECC, 2016; Pyrcce, 2004). The 7Q10 is a standard low-flow metric considered for water use license applications from Newfoundland and Labrador.

Overall, the conservative hydrological model predicts that Peters Pond has sufficient water available to accommodate the proposed Project withdrawal, with few instances where mitigation in the form of recirculation of treated water is required to meet ecological flow requirements.

Impacts to fish and fish habitat within Peters Pond are expected to be negligible, as water levels within Peters Pond are expected to remain relatively stable during operational withdrawal. Average monthly water levels within Peters Pond were predicted to experience an average decrease of 0.7 cm, up to a maximum decrease of 3 cm during the driest year within the hydrological record (Table 7.3; Appendix H.3).

Changes to average monthly pond outflows are presented in Table 7.7.4, which range in decreases from 1.28% to 9.87%. The greatest change in average outflows of the Pond correspond to the winter (January – March) and summer (July and August) months. Changes in flow of less than 10% are not expected to result in any measurable impacts to fish or fish habitat (DFO, 2013).

Table 7.7.4: Average Monthly Values with and Without the Proposed Withdrawal

Month	Pond Outflows (m ³ /s)		
	Without Project Withdrawal	With Project Withdrawal	% Change
Jan	1.80	1.68	-6.71
Feb	1.14	1.02	-9.87
Mar	1.65	1.53	-6.84
Apr	7.13	7.04	-1.28
May	4.04	3.95	-2.20
Jun	1.71	1.65	-3.98
Jul	1.20	1.12	-6.89
Aug	1.44	1.37	-4.72
Sep	2.95	2.85	-3.48
Oct	3.69	3.60	-2.29
Nov	4.43	4.33	-2.40
Dec	3.56	3.46	-2.76

Based on the evaluation of water availability, it was determined that average monthly withdrawals will be a small proportion of the total available flow from Peters Pond, even under dry conditions. For all months, average monthly withdrawal at Peters Pond would be less than the 5th percentile natural water availability (or in other words, less than natural low flows that are exceeded 95% of the time). August represents the most restrictive month, corresponding to the lowest 5th percentile flow. During this month, the proposed withdrawal is approximately 28.6% of the 5th percentile flow and 5.3% of the 50th percentile flow. The analysis shows that withdrawals remain a fraction of natural low-flow availability, suggesting that fish habitat would be maintained but could experience incremental reductions in depth, wetted area, and connectivity based on higher daily water demands. As a result, low-flow protection was further evaluated using daily and a rolling 7-day average low-flow threshold (Appendix H.3).

To ensure environmental flows are maintained downstream in Peters River, recirculation of treated water from the Industrial Plant will be introduced to Peters Pond. The expected frequency and duration of these events based are summarized in Appendix H.3. Over the modelled period, recirculation of treated water from the Industrial Plant was required during low flow periods in July, August, September, and October. For the entire model simulation period (2000-2025), a total of seven events required recirculation. During the driest year on record (2001), water recirculation was required in the summer for a duration of 22 days. During the wettest year on record (2016), no water recirculation was required throughout the entire year. It is expected that some recirculation will be required during Project operations to ensure minimum instream flow requirements in Peters River are maintained. During operations, recirculation will be implemented as needed to ensure continuous outflow from Peters Pond into Peters Rivers to maintain habitat functions and connectivity throughout the watercourse.

As part of the Groundwater and Surface Water Monitoring Management Plan, water level monitoring thresholds and adaptive water management strategies will be established to ensure

the protection of ecological flows downstream in Peters River (Appendix Q.10). Monitoring will continue on the outflow of Peters Pond to further understanding of the system's hydrological regime and inform necessary measures for the protection of fish and fish habitat.

Water Discharge – WC15-104

Wastewater from the Industrial Facility will be discharged to WC15-104, located north of the facility (Drawing 7.6-4, Appendix A). The watercourse is considered to provide habitat for locally confirmed species (Atlantic salmon, brook trout, American eel, and stickleback). The results of the hydrologic evaluation of the stream (Appendix H.4) have been used to support the effects assessment of discharge on fish and fish habitat. Methods and results are fully described in the Appendix H.4. The assessment methods, findings, and effects on surface water are summarized in Section 7.6.

From a water quantity perspective, the additional flow volume (3.1 m³/s) discharged from the facility to WC15-104 is not expected to result in adverse effects on fish or fish habitat. As the channel is not well confined and frequently overtops its banks, increases in discharge have a limited influence on instream velocities before water spreads into the floodplain. Small, predicted velocity changes - up to 0.05 m/s (Appendix H.4) - are an order of magnitude lower than naturally occurring peak-flow conditions. As a result, the added flow is not anticipated to affect fish passage, bank stability, or cause physical alteration of fish habitat beyond the range of natural variability.

It is noted that the percent changes in flow presented in Appendix H.4 appear extreme, particularly during low- and average-flow periods. However, this is because in these cases predicted increases are calculated relative to an almost negligible existing discharge (e.g., approximately 0.0001 m³/s). In practical terms, the absolute change represents a shift from near-zero flow to a small, low-magnitude discharge of approximately 0.06 m³/s. Resulting flows remain well within the range of naturally occurring conditions for the watercourse and are not expected to alter existing fish habitat provisions within the stream. Conversely, the introduction of a modest, steady discharge during naturally low-flow periods may help maintain wetted channel conditions and reduce the occurrence of isolated microhabitats that can develop under natural extreme low flows. This may be particularly beneficial to brook trout, which are considered sensitive to hydrological instability (Raleigh, 1982). As such, while the percent change appears large due to the very small baseline flow, the actual magnitude of the increase is limited and is not anticipated to adversely affect fish habitat; instead, it may help sustain more stable and usable habitat during periods when natural flows are most restrictive.

To mitigate potential impacts to fish and fish habitat, discharge will be released in such a way as to prevent impacts to fish/fish habitat, including the collection, treatment, and monitoring of discharge quality through water management infrastructure (Section 7.1, controlled to avoid erosion/scour at the release point, and sited to avoid sensitive habitats (e.g., salmonid spawning). As part of future permitting, real-time monitoring will be conducted on WC15-104 to further understanding of the system's hydrological regime and inform necessary measures for the protection of fish and fish habitat.

Changes in Water Quality

As noted in Section 7.6 the primary sources of potential water quality issues within the IPA are expected to stem from wastewater discharge from the facility, which includes that which may be recirculated to Peters Pond; quarry activities, specifically stockpiling and blasting; general earthworks associated with road construction and upgrades, pipeline construction, and site preparation; and malfunctions and accidents. Potential effects to surface water are therefore primarily expected to occur during the construction phase; however, wastewater discharge and recirculation during operations can also pose a risk to fish and fish habitat depending on the composition and temperature of the effluent.

Temperature

Water temperature affects the metabolic rates and biological activity of aquatic organisms, thus influencing the use of habitat by aquatic biota. There are no CCME guidelines related to temperature and aquatic biota. Temperature preferences of fish vary between species, as well as with size, age and season. For example, salmonids like trout and salmon are cold-water fish species, meaning they require cold water to live and reproduce (Kanno & Beazley, 2004).

Throughout the construction phase, watercourse alterations required for the Project have the potential to alter instream temperatures through reduced shading (from removal of riparian vegetation) and impoundment or slowing of water velocities due to poorly designed crossing structures. To mitigate these potential effects, vegetation removal will be restricted to immediate work areas, and all crossings will be designed to maintain the natural hydraulic function of the watercourse.

During operations, some process water is expected to be warmer than ambient stream temperatures, particularly during periods when baseline temperatures are seasonally low. The assessment completed by Fracflow (Appendix H.4 and summarized in Section 7.6) was used to assess the potential effects of reject-water temperature on fish and fish habitat. For the purposes of this assessment, the reject-water temperature was assumed to be a constant 25 °C. This is considered a conservative estimate as thermally elevated process water would be expected to mix with other water sources in the stormwater/effluent pond prior to release.

Fish species vary widely in their thermal preferences. To assess potential effects of temperature changes on local fish communities, the assumed discharge temperature of 25 °C has been compared with species-specific thermal limits reported in scientific literature. The optimal temperature range for brook trout growth and survival is 11-16°C, but they can tolerate temperatures up to 20°C (Raleigh, 1982). The incipient lethal temperature for adult Atlantic salmon is approximately 25°C (DFO, 2012). However, prolonged exposure to temperatures above 20°C can be detrimental (DFO, 2012). American eel have a broader temperature range and can tolerate temperatures from 4 to 25 °C (U.S. Fish & Wildlife Service, 2020). Threespine stickleback have an optimal growth temperature of 16 to 18 °C (Hasnain, 2012), but can tolerate temperatures up to 29°C (Lefébure et al., 2011). Based on these thresholds, a reject-water temperature of 25 °C is at or above the upper thermal limit for salmonids but

remains within the tolerable range for American eel and threespine stickleback.

Estimated temperatures from mixing the flow of reject water with seasonal flows are provided in Appendix H.4. Note that calculated temperature increases are presented only at the point of mixing and do not infer the spatial extent of thermal warming. In addition, observations presented by this analysis are based on inferred data. Based on the assessment, predicted changes in temperature are more pronounced during low- to average-flow periods, as modelled flow can be up to an order of magnitude smaller than the constant flow of reject water. As such, the temperature of reject water is anticipated to remain, in some cases, undiluted at the point of discharge (to a maximum temperature of 25 °C).

Seasonally, the greatest temperature increases at the point of discharge are expected to occur in winter, when ambient stream temperatures are lowest and thermal contrast is highest. During this period, localized warming may alter overwintering behaviour. In summer, although the relative temperature contrast is smaller, the potential biological effects may be more significant, as salmonids are already near their upper thermal tolerance and stream flows are typically reduced. Under these conditions, even modest warming can increase physiological stress and trigger avoidance behaviour. During spring and fall, when key salmonid life-history events such as migration and spawning occur, elevated temperatures at the point of discharge may influence movement patterns or affect the development and survival of early life stages. However, the overall capacity of the discharge creek to support fish is inherently limited due to its narrow channel, shallow depth, and seasonally constrained flows and ice cover, which collectively restrict the extent and duration of suitable fish habitat. As noted above, increasing flows within the discharge creek during seasonal low-flow periods may benefit fish and fish habitat provided that potential thermal impacts are addressed.

As described in Section 7.1, process water will be directed to the stormwater/effluent pond, where it will be mixed with other water sources, including internal contact water, and held prior to controlled release. This mixing and retention period is expected to moderate water temperatures of the discharge. As part of the Surface Water Monitoring Plan, water quality monitoring thresholds and adaptive water management strategies will be established to ensure the protection of fish and fish habitat within the discharge creek. Prior to development, real-time monitoring of the discharge creek will be carried out to characterize its hydrology, water quality, and temperature regimes. This information will be used to refine the hydrologic model and identify any additional mitigation measures that may be required.

Erosion and Sedimentation

The mobilization of sediment within aquatic environments can affect habitat suitability for fish (Tilman et al., 1997). Sedimentation can reduce biological productivity, which affects food availability, egg development, and at high concentrations, fish survival (DFO, 2000). Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, routine road and vegetation maintenance, daily traffic, and site reclamation. However, the highest potential for these effects is related to the construction and upgrading of access and haul roads, quarry development, and stockpiling of material. The

alteration or removal of riparian vegetation can also result in bank instability and channel erosion.

In addition to the large-scale erosion and sedimentation reduction measures to be outlined in site-specific erosion and sediment controls plans, it is expected that localized control measures will be implemented whenever earth works occur. Specific sediment control measures certain Project components will be designed as part of future permitting processes. For example, the quarry will include space for an acceptable settling pond system(s) to remove suspended solids from site runoff (DFO, 2022). Appropriate vegetative buffers will also be employed, wherever possible, to mitigate the potential effects of sedimentation on fish habitat (DFO, 2022). Potential effects of blasting on sedimentation of fish habitat will be minimized through the use of site-specific blast designs that incorporate BMPs for fish and fish habitat (DFO, 2022; Wright & Hopky, 1998).

During operations, reject water from the Industrial Facility is expected to contain elevated TSS compared to the receiving environment. Elevated TSS can affect freshwater fish through a range of behavioural, physiological, and habitat-level mechanisms. Fine sediments in the water column can affect respiratory issues, reduce feeding efficiency by impairing visibility and decreasing general food production, destroy spawning areas, and smother eggs (DFO, 2023a). The severity of effects depends on both concentration and duration of exposure, with early life stages generally being the most sensitive. Salmonids like Atlantic salmon and brook trout are generally more sensitive to changes in TSS levels, requiring cool and clear flowing rivers for feeding and reproduction, whereas American eel, by contrast, naturally occupies more turbid, soft-bottomed habitats and is therefore more tolerant of elevated sediment conditions.

Rather than prescribing a single TSS limit, the CCME FWAL guidelines for TSS focus on increases above natural background conditions, recognizing that fish are adapted to the sediment regimes of their native watersheds (CCME, 2025).

Through the hydrologic modeling study prepared by Fracflow (Appendix H.4), the impact of reject water on the discharge creek's TSS levels prior to mitigation was evaluated under seasonal low flow, average flow, and high flow conditions at three points along the stream (at the point of discharge north of the facility, and two additional points downstream). Upon mixing with reject water, average seasonal TSS values within the discharge creek at the planned point of discharge (just north of the facility) ranges from 4.2-21.2 mg/L. The maximum predicted TSS at this point occurs during seasonal low flows (5th percentile) at 33.4 mg/L. These values trend slightly down if simulated reject water is mixed further downstream. Overall, these concentrations are low enough to avoid impacts on local fish populations, though behavioral responses such as avoidance or reduced feeding may occur during low-flow periods (CH2M Hill & U.S. EPA, 2000; Newcombe & Jensen, 1996).

Within the IPA, erosion and sediment controls will be incorporated into water management infrastructure (see Section 7.1 for a detailed description of water management infrastructure and treatment systems). Once treated, wastewater effluent will be joined with internal contact

water within the stormwater/effluent settling pond. At this stage, water will be treated for TSS (if required), and monitored, prior to a controlled release into the receiving stream.

Release of Deleterious Substances

Accidental releases of deleterious substances, including ammonia, petroleum hydrocarbons and other contaminants, present a risk to fish and fish habitat during all Project phases. If released, these substances can rapidly migrate into nearby watercourses, where they may degrade water quality and impair habitat functions essential for fish survival. Blasting activities required for site leveling, foundation preparation, or quarrying can also affect aquatic conditions by increasing turbidity and introducing nitrogen-based explosive residues (when incomplete detonation occurs), both of which can adversely affect fish and their habitat.

When released to water, even in small quantities of ammonia can be harmful to fish and other aquatic species (ECCC, 2024b). Ammonia toxicity to fish is driven by the bioavailable unionized form (NH_3), which can easily cross gill membranes (Levit, 2010). Once inside the fish, ammonia can interfere with essential physiological processes, leading to acute neurological effects or chronic impairment. If fish cannot effectively excrete ammonia when ambient concentrations are high, this can lead to internal accumulation that can become toxic and lethal. Environmental conditions that increase NH_3 levels, such as warm, high pH, or low flow waters, can greatly heighten the risk of ammonia toxicity on fish (Edwards et al., 2024; Levit, 2010).

These risks will be mitigated through strict spill-prevention and containment measures, including proper storage and handling of fuels and hazardous materials, use of secondary containment, and implementation of spill-response plans.

For the underground liquid ammonia pipeline, the Project's design basis is to prevent releases through layered (defense-in-depth) controls that combine containment, monitoring, automatic isolation, and conservative routing. The pipeline will be buried to protect it from weather, UV exposure, and accidental contact, and to reduce the risk of impact damage; it will be installed with engineered bedding/backfill, specified depth of cover, and clear right-of-way/marker controls at crossings and access points. The pipeline will be double-walled (pipe-in-pipe) so that the product is contained by an inner carrier pipe and a secondary outer pipe that provides containment in the unlikely event of a primary leak. Where implemented, the annulus (space between pipes) will be fitted with leak detection and monitoring (e.g., pressure/vacuum monitoring, hydrocarbon/ammonia sensors, or periodic sampling ports), allowing early identification of a loss of containment before any discharge to soil or groundwater. The pipeline will be integrated into the facility control system (SCADA/DCS) with continuous monitoring of pressure, flow, and temperature and automated alarming for abnormal conditions (e.g., sudden pressure drop, flow imbalance).

To limit the potential volume released and to isolate the system quickly, the pipeline will include strategically located sectionalizing block valves and ESD valves, including isolation at the Industrial Facility and at the marine terminal, with additional intermediate valves where warranted by risk assessment and routing. These valves are expected to be capable of remote

actuation and, where appropriate, automatic closure on defined triggers such as confirmed leak detection, rapid pressure decay, emergency stop activation, or loss of power/control signal (with fail-safe design as applicable). Check valves and overpressure protection will be included where required to prevent reverse flow and manage thermal/operational pressure scenarios. Routing and burial methodology will prioritize use of existing or previously disturbed corridors where feasible and will seek to minimize crossings of watercourses, wetlands, and sensitive receptors; where crossings are unavoidable, the Project will use site-specific engineering and construction controls (e.g., appropriate setbacks, isolation valves on either side of major crossings, and trenchless installation such as HDD if required).

Blasting impacts will be reduced by adhering to setback distances, minimizing blast charge weights, remove blasting equipment and products from blast area, and timing blasting activities to avoid sensitive fish periods.

Change in Fish Health and Survival

Construction activities which result in the removal of watercourses (i.e., grubbing and grading of the PF) or require the use of industrial equipment in watercourses (i.e., road crossing installation and upgrades) can result in the direct loss of fish. Impacts to fish can be mitigated through widely accepted best management practices and standards for working in and near water, including but not limited to timing in-water works within appropriate fish timing windows, isolating in-water work areas and performing fish rescues prior to equipment mobilization and habitat disturbance (DFO, 2019). Furthermore, water withdrawal activities can result in fish injury or mortality through impingement or entrainment from intake structures. These effects can be mitigated by siting the intake location in deeper water and away from sensitive habitats, employing properly sized end-of-pipe fish protection screens, and routine screen cleaning and inspections.

Blasting during the construction phase may result in sensory disturbance to fish, impacting fish behaviour, spawning grounds, and migration patterns. The detonation of explosives near watercourses can produce post-detonation shock waves which involves a rise to a high peak pressure and then a subsequent fall to below ambient hydrostatic pressure. This pressure deficit can cause impacts in fish (Wright & Hopky, 1998).

Overpressure in excess of 100 kilopascals (kPa) can result in adverse effects to fish including damage to the swim bladder in finfish, and potential rupture and hemorrhage to the kidney, liver, spleen, and sinus venous. It is also possible that fish eggs and larvae can be damaged (Wright & Hopky, 1998). The degree of damage is related to the type of explosive, the size and pattern of the charges, and the distance to the watercourse; depth of water within the watercourse; and species, size, and life stage of the fish. Sublethal effects have also been observed, including changes in fish behaviour as a result of noise produced during blasting (Wright & Hopky, 1998). Explosive charge weights will be restricted based on setbacks to fish habitat to achieve the 100 kPa guideline criteria outlined in Wright and Hopky (1998).

7.7.8 Mitigation

Avoidance of impacts to fish and fish habitat is the highest priority in the mitigation sequence. Throughout the iterative process of developing the current Project infrastructure layout, avoidance of effects to fish and fish habitat was attained through several key design considerations. Initial identification and characterization of potential water resources through modelling within the IPA helped inform an optimized site layout and reduce potential impacts to fish and fish habitat. Further micro-siting of Project infrastructure will be completed during the permitting phase and supported by field-verification and characterization of all fish habitat expected to be directly or indirectly impacted by Project activities.

Where avoidance of impacts to fish and fish habitat are not possible, mitigation measures must be employed to further reduce impacts to fish and fish habitat. Standards and best practices for working in and near water are well understood and will be followed (DFO, 2019). Best management practices for the protection of freshwater fish habitat in Newfoundland and Labrador will also be incorporated in mitigation measures (DFO, 2022). Mitigation measures that will be included in the design of the Project are detailed below.

Change in Habitat Quantity

- Complete culvert installations and upgrades (where applicable) in accordance with the Environmental Guidelines for Watercourse Crossings (NL WRMD, 2017).
- Complete further micro-siting of infrastructure during the detailed design and permitting phase to with the intent to avoid impacts to surface water features.
- Ensure fish passage is considered in the design and construction of ditching around the Industrial facility.
- Identify fish habitat features and ensure they are clearly marked.
- Minimize the number of stream crossings required through detailed designs of haul and access roads.
- Using existing roads, trails, and cutlines whenever possible.
- Micro-site crossings away from sensitive fish habitat (i.e., salmonid spawning sites).
- Prioritize structures that maintain the natural watercourse bottom and hydraulic conditions (e.g., bridges, bottomless arch culverts).
- Limit riparian vegetation removal to the immediate work area.
- Restore stream banks and riparian vegetation to their natural state (when possible).
- Educate Project personnel on the sensitivity of fish and fish habitats.

Change in Habitat Quality

- Integrate water management systems including diversion and collection ditches, roadside drainage channels, and stormwater retention ponds.
- Complete additional water balance assessments if/when indirect impacts to flow are anticipated to nearby watercourses from quarry development (to be determined in consultation with DFO).
- Maintain drainage patterns via grading and hydraulic connectivity structures.
- Adhere to the buffers outlined in the Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador for quarries, roads, camps, fuel

- storage, and grubbing, whenever possible (DFO, 2022).
- Treat wastewater discharge prior to release to ensure it meets applicable regulatory requirements.
 - Draft and implement a Surface Water Management Plan to support drainage and ensure water quality conforms to applicable regulations and guidelines.
 - Utilize rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life.
 - Develop site-specific erosion and sedimentation control plans during the detailed design phase. Properly install, inspect, and repair erosion and sediment controls.
 - Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed. Require that all equipment, including mobile, are equipped with spill kits and appropriate spill mitigation materials.
 - Require that workers are fully trained in spill response.
 - Ensure operators remain with equipment during refueling.
 - Plan any construction activities that may impact stream banks and substrate to align with low-flow periods, when possible.
 - Revegetate along the watercourse edge and above the ordinary high-water mark to facilitate bank stabilization, where applicable.
 - Locate stockpiles a minimum of 30 m from any surface water feature and stabilize to reduce the likelihood of erosion and sedimentation.
 - Collect or direct runoff containing suspended materials into settling ponds, diversion ditches, or well vegetated areas.
 - Integrate outlet protection features on settling ponds to dissipate flow velocities and decrease erosion at the outflow.

Change in Fish Health and Survival

- Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.
- Ensure explosive materials storage meets government regulations including required separation distances as regulated by the Explosives Regulatory Division of Natural Resources Canada (NRCAN).
- Avoid instream work whenever possible. When required, ensure effective worksite isolation and work in the dry season.
- Complete fish rescues in habitats to be directly impacted.
- Time in-water work, when possible, as per DFO Timing Windows for Newfoundland and Labrador (DFO, 2019).

General

- Adhere to all Approval conditions outlined in all regulatory approvals, including but not limited to, provincial watercourse alteration permits and *Fisheries Act* permits.
- Complete site kick-off meetings with relevant staff/contractors to educate and confirm

policies related to working in and around fish habitat, and that all Approval conditions for in-stream works are clearly communicated and adhered to.

7.7.9 Monitoring

All watercourses will be field verified as part of the permitting process, and fish habitat in all watercourses that are expected to be altered will be assessed and characterized, and the impacts will be quantified. As the watercourse model is verified, Project infrastructure will be microsituated to avoid impacts to fish and fish habitat to the extent possible. Any expected alterations to surface water resources will be permitted in accordance with the *Water Resources Act* through NLECCC.

Fish habitat that will be directly affected by construction of the Industrial Facility will be authorized under the *Fisheries Act*, including the development of appropriate habitat compensation through fisheries offsetting. Additional areas of potential fish habitat impact may also require authorization, pending further field verification and confirmation of final infrastructure locations. Based on current information and modelling predictions, potential effects of water withdrawal and wastewater discharge can be effectively mitigated such that a HADD of fish habitat is not expected.

A Groundwater and Surface Water Monitoring Management Plan will be implemented to ensure wastewater quality meets regulatory requirements and temperature thresholds for the protection of aquatic life prior to discharge into the receiving environment. This plan will also include locations for water quantity monitoring to update modelling predictions and track real-time changes in Peters Pond/River and WC15-104 and will outline thresholds and adaptive management strategies to ensure the protection of fish and fish habitat. A preliminary table of contents for the Groundwater and Surface Water Monitoring Management Plan has been included as Appendix Q.10. An Erosion and Sediment Control Plan will also be developed, and the preliminary table of contents is included as Appendix Q.9. These will be living documents and evolve with the Project and be updated as needed.

7.7.10 Conclusion

After mitigations, predicted residual effects on fish and fish habitat are characterized in Table 7.7.5.

Table 7.7.5: Fish and Fish Habitat Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Change in fish habitat quantity	Avoidance of fish habitat through infrastructure placement	A	M	IPA	LT	O	PR	Not significant
	Appropriately designed and installed road and pipeline crossings/upgrades							
	Permitting through <i>Fisheries Act</i> authorization and associated offsetting requirements							
Change in fish habitat quality	Erosion and sediment control	A	L	LSA	LT	I	PR	Not significant
	Riparian buffers							
	Spill preparedness							
	Water management							
	Surface Water Monitoring							
Change in fish health and survival	Erosion and sediment control	A	L	LSA	MT	O	PR	Not significant
	Surface Water Monitoring							
	Spill preparedness							
	Blast management							

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: LSA – Local Study Area, RSA – Regional Study Area, IPA – Industrial Project Area Duration: ST – Short Term, MT – Medium Term, LT – Long Term Frequency: O – Once, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

7.8 Flora & Vegetation Communities

7.8.1 Overview

A desktop review and field studies were undertaken to understand the diversity and distribution of land cover types, flora species, and wetlands present in the IPA (described in detail in the Baseline Vegetation and Wetlands Report in Appendix I.1). The objective of the assessment was to collect the information required to assess the potential impacts of the Project on vegetation and wetlands. The assessment was completed using the following approach:

- Complete a desktop review to characterize the land cover types, wetlands, and flora species known to occur within and near the broader PA.
- Informed by the desktop review, undertake targeted field surveys to document the floral diversity of the IPA, with a focus on flora SAR and SOCC.
- Use the information from the desktop review and field surveys to update the Project design to minimize interactions with rare flora species, their supporting habitat, and wetlands.

This section provides details about the potential effects of the Industrial Project Component on vegetation and wetlands. Information about the effects of the Wind and Transmission, and Solar Project Components is provided in Section 6.9 and 8.8, respectively.

7.8.2 Regulatory Context

The Project has potential to interact with lands, flora species, and their associated habitats that may be protected under federal and/or provincial legislation and regulatory guidelines. Legislation relating to vegetation and wetlands includes:

Federal Legislation

- SARA (Canada, 2002b)

Provincial Legislation

- *NL ESA* (Newfoundland and Labrador, 2001)
- *Lands Act* (Newfoundland and Labrador, 1991)
- *Water Resources Act* (Newfoundland and Labrador, 2002c)

7.8.3 Desktop Assessment Methodology

Desktop assessment methodology for flora and vegetation communities for the IPA followed the same methodology outlined in Section 6.9. The technical methods used to develop the ELCs are provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

7.8.4 Desktop Assessment Results

7.8.4.1 *Vegetation*

The IPA is in North Central Subregion of the Central Newfoundland Ecoregion (Drawing 3.1-2, Appendix A). This ecoregion is heavily forested, with an abundance of rivers, streams, ponds,

and bogs. Forests have a high component of black spruce (*Picea mariana*) and fires are relatively frequent. Stands of trembling aspen (*Populus tremuloides*) frequently regenerate after fires (S. J. Meades, 1990a).

Ecological Land Classification

The LiDAR-ELC developed for the Project provides a detailed overview of the land cover types present in the PA (Drawing 7.8-1, Appendix A). Within the IPA, bogs are the dominant land cover type (16% of the IPA), and shrub cover is extensive (the shrub, wet herbaceous/shrub, and wet shrub cover types make up a combined 39% of the IPA). The complete extent of modelled land cover types in each component PA is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

Old-Growth/Late-Successional Forests

A total of 133 ha of old-growth/late-successional forest was identified, primarily in the northeastern section of the IPA (Drawing 7.8-2, Appendix A). This represents 11% of the total IPA.

7.8.4.2 Flora Species

The ACCDC data reports prepared for the Project (ACCDC, 2023, 2026a) contained occurrence records representing 59 unique species of vascular plants. Of these, the natural population of red pine is a SAR (NL ESA Threatened, S2), and 25 species are SOCC (Appendix I.1). No non-vascular plant or lichen SAR or SOCC were identified in the reports.

Red Pine Potential Habitat Mapping

Area of potential red pine habitat was identified in the eastern extent of the IPA associated with the presence of glaciofluvial deposits (Drawing 7.8-2, Appendix A).

No forest stands identified in the FRI as containing red pine are in the IPA.

Rare Lichen Potential Habitat Mapping

Area of potential habitat for blue felt lichen was identified in the eastern portion of the IPA and boreal felt lichen was identified in the northern portion of the IPA (Drawing 7.8-2, Appendix A).

Potential Rare Flora Habitat

Areas of potential habitat for rare flora were identified, primarily in the northern portion of the IPA (Drawing 7.8-2, Appendix A).

7.8.4.3 Wetlands

Based on the two models used to estimate wetland area (LiDAR-ELC and CNWI), wetlands are estimated to be between 36% and 47% of the total IPA (Drawing 7.8-3, Appendix A). Bogs were the most common wetland type identified in the IPA. The complete extent of mapped wetland areas in each component PA is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

7.8.5 Field Methodology

7.8.5.1 *Vegetation*

Vascular and Non-Vascular Plants

Surveys for vascular plants were completed in the IPA in July 2025. Areas expected to have suitable habitat for flora SAR and SOCC, including red pine, were prioritized. Further information about the timing and methods used for vascular and non-vascular plant surveys are provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

Rare Lichens

Targeted lichen surveys were completed in April and May 2025 (Drawing 7.8-4, Appendix A) in areas of suitable habitat for lichen SAR and SOCC. Further details about the approach used for rare lichen surveys are provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

7.8.5.2 *Wetlands*

Information about the presence of wetlands in the IPA was recorded incidentally during biophysical surveys.

7.8.6 Field Results

7.8.6.1 *Vegetation*

The landscape of the IPA consists of a mixture of upland and wetland areas. Wetlands and wet areas are extensive in the IPA. Forests are a mixture of young, regenerating and mature forest stands.

Vascular and Non-Vascular Flora

A total of 128 species of vascular flora were identified during field surveys in the PA (Appendix I.1). Of these, one flora SAR, red pine (NL ESA Threatened, S2), and one flora SOCC, shinleaf (*Pyrola elliptica*, S2S3) were observed in the IPA (Table 7.8.1; Drawing 7.8-4, Appendix A).

Table 7.8.1: Field-Observed Flora SAR and SOCC in the IPA

Scientific Name	Common Name	COSEWIC	SARA	NL ESA	S-Rank	Number of Occurrences
<i>Pinus resinosa</i>	Red Pine	--	--	Threatened	S2	5+ ⁽¹⁾
<i>Pyrola elliptica</i>	Shinleaf	--	--	--	S2S3	1

⁽¹⁾ Occurrences of red pine were not individually recorded due to their relative abundance.

A total of 17 non-native vascular plants, four of which are considered invasive in Canada, were observed during field surveys (Appendix I.1). There were also 31 bryophyte species that were recorded (Appendix I.1), none of which are SAR or SOCC.

Rare Lichens

No lichen SAR or SOCC were observed in the IPA during non-targeted flora surveys.

7.8.6.2 Wetlands

Wetlands are a dominant feature in the IPA (Drawing 7.8-3, Appendix A). As predicted in the wetland models, bogs were commonly observed during field assessments. A large wetland complex, referred to as “Wetland Mosaic A” in Section 7.6, is located in the area planned for the Industrial Facility.

7.8.7 Effects Assessment

Project activities, primarily those that involve earth moving and vegetation removal have the potential to impact vegetation cover, rare flora and their supporting habitat, and wetlands (Table 7.8.2). Potential impacts could include direct or indirect impacts to flora SAR, SOCC, and their supporting habitat, and alterations to wetland area and function.

Table 7.8.2: Potential Project-Vegetation and Wetland Interactions – Industrial Project

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	-
Clearing and Grubbing	X
Construction of Temporary Works	-
Access Road Upgrading and Construction	X
Water Pipeline Construction	X
Facility Civil Works	-
Transportations of Facility Components	-
Equipment Installation	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance (33 years)	
Facility Operations and Maintenance	-
Site Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

7.8.7.1 Assessment Boundaries

Administrative Boundary

No administrative boundaries are identified for the effects assessment on vegetation and wetlands.

Technical Boundary

The primary technical boundary relating to the assessment of vegetation and wetlands is the inability to exhaustively survey all portions of the IPA. During field surveys, efforts were made to prioritize survey areas of suitable habitat for rare flora; however, it is possible that additional flora species, and additional occurrences of reported flora species are present on the landscape. Additional technical limitations of the assessment relate to the availability and accuracy of the land cover classifications and potential habitat mapping completed for the Project. LiDAR data used for the ELC is limited to the PA (99% coverage), and the accuracy of mapping is influenced by a variety of factors, including the accuracy of layers used as inputs. Finally, although wetland areas were incidentally recorded during field assessments, the assessment of impacts relating to wetlands relies primarily on modelled data.

Spatial Boundary

The Industrial Project will be constructed on 1,157 ha of land east of the BWPA. This area also encompasses the SPA. Within the IPA, a 214 ha PF has been identified for the placement of the Industrial Facility and associated infrastructure.

The LSA for vegetation and wetlands is the IPA plus a 1 km buffer (Drawing 7.8-5, Appendix A). This area encompasses the maximum expected extent of the direct and indirect impacts to vegetation and wetlands. The RSA is not applicable.

Temporal Boundary

The temporal boundaries indicate when vegetation and wetlands may be impacted by the Project. Impacts will occur throughout the site preparation and construction, operations, and decommissioning phases, with most impacts to vegetation and wetlands occurring during site preparation and construction.

7.8.7.2 Assessment Criteria

The VC-specific definition for magnitude is as follows:

- Negligible: No loss of sensitive vegetation types or wetlands; no loss of terrestrial flora SAR or SOCC individuals; no alteration to habitat known to support terrestrial flora SAR or SOCC expected.
- Low: Small loss of sensitive vegetation types or wetlands; no terrestrial flora SAR or SOCC individuals lost; small loss of or effects on habitat supporting terrestrial flora SAR or SOCC.
- Moderate: Moderate loss of sensitive vegetation types or wetlands; small loss of or effects on terrestrial flora SAR or SOCC individuals (and associated habitat) that do not

- have legislated protection status, but their populations remain largely intact.
- High: High loss of sensitive vegetation communities or wetlands; high loss of or effects on the habitat that supports terrestrial flora SAR or SOCC that do have legislated protection status.

7.8.7.3 Effects

Potential environmental effects and associated pathways of the Industrial Project Component in relation to vegetation and wetlands are grouped into four major categories:

- Loss and Alteration of Vegetation Cover
- Landscape Fragmentation and Edge Effects
- Loss of Rare Flora
- Impacts to Wetland Area and Function

Project-related effects can influence vegetation and wetlands directly and indirectly. A direct effect is defined by interactions that have no intermediate process (e.g., loss of an individual plant or lichen, loss of a tree that supports a rare lichen) and indirect effects are interactions that have intermediate processes such as landscape fragmentation and edge effects.

Loss and Alteration of Vegetation Cover

Losses and alterations to vegetated land cover will occur during the site preparation and construction phase of the Project because of activities requiring vegetation clearing and ground disturbance. Site preparation activities for the Industrial Project Component will include vegetation clearing, grubbing, and grading within the IPA to accommodate the construction of Project Infrastructure.

Within the IPA, Project Infrastructure will be constructed within 214 ha PF (18% of the IPA). The PF represents the area where direct disturbance will occur and represents the maximum anticipated extent of vegetation clearing for the Industrial Project Component. The infrastructure and areas of disturbance associated with the Industrial Project Components are presented in Table 7.8.3.

Table 7.8.3: Area Associated with Project Infrastructure – Industrial Facility

Infrastructure	Total Area (ha)
Roads (Newly Constructed)	8
Roads (Upgraded)	1
Transmission Line	14
Substation	11
Quarry	8
Accommodations	8
Industrial Facility Infrastructure	157
Haul Road	7
Totals	214
Total as Percent of IPA	18%

Areas within the PF associated with the buildings (e.g., warehousing, administration buildings, accommodations), substation, quarry, and roads will likely experience a long-term loss of vegetated land cover as construction in these areas will require access to the subsurface and/or land conversion to build infrastructure. In contrast, components such as the transmission ROW and aboveground water pipelines will primarily require vegetation clearing, such that alterations but not an overall loss of vegetated area can be expected.

During the operations phase of the Project, quarterly vegetation management inspections will be completed within the IPA. Vegetation control (e.g., manual brush removal, herbicide application) beneath overhead transmission systems to reduce the risk of infrastructure damage and fire. Decommissioning will entail replacement of salvaged topsoil, re-establishment of natural drainage patterns, and re-seeding or re-planting with appropriate vegetation species consistent with reclamation objectives at the time of decommissioning.

Land cover modelling and field surveys completed for the Project indicate that the IPA is dominated by bogs and shrub land cover types. To quantify the impacts of the Project on vegetation cover within the IPA, the amount of each land cover type present within the PF was determined and compared to the total amount available within the IPA (Table 7.8.4). The land cover types with the greatest overlap with the PF are bogs (46 ha) and wet shrub (33 ha). These cover types are abundant in the IPA and will remain available following construction. Wet softwood forest cover is expected to have the highest proportional impact (27%).

Table 7.8.4: Land Cover Types within the PF – Industrial Project

Land Cover Type	Area in PF (ha)	Total Available in the IPA (ha)	% Impacted
Road	1	12	5
Barren	2	22	8
Bog	46	182	25
Hardwood Forest	4	42	10

Land Cover Type	Area in PF (ha)	Total Available in the IPA (ha)	% Impacted
Herbaceous/Shrub Barren	17	91	18
Raised Wet Area	17	90	18
Shrub	28	163	17
Softwood Forest	10	85	12
Water	2	11	15
Wet Hardwood Forest	7	35	20
Wet Herbaceous/Shrub	18	145	12
Wet Mixedwood	3	35	8
Wet Shrub	33	142	24
Wet Softwood Forest	23	85	27
Total	211	1,140	18

Note: LiDAR data are unavailable for small sections of the IPA

Old-growth/late-successional forest stands were identified in the desktop review as having ecological value and potential to serve as habitat for several species of flora and fauna. Impacts to old-growth/late-successional forest due to the Industrial Project are expected to be low. Of the 133 ha of old-growth/late-successional forest in the IPA, 37 ha intersect with the PF (28%). Impacts to old-growth/late-successional forest due to the Industrial Project Component will primarily occur in the northern portion of the IPA with stands in the central and eastern portions largely avoided.

Landscape Fragmentation and Edge Effects

Vegetation clearing for infrastructure placement has the potential to fragment areas of intact vegetation cover and create new areas of edge habitat. Landscape fragmentation and edge effects can have a variety of impacts on flora and fauna, including changes in the composition, diversity, and reproductive output of flora species (Brisson et al., 2010; Hulting et al., 2025). Due to the compact siting of Project Infrastructure and prior disturbance in the IPA, the overall extent of landscape fragmentation is expected to be low. For example, silvicultural data provided to Strum by NL FAL indicates that much of the southern extent of the IPA has been harvested within the past 20 years, such that many forested areas are in a state of regeneration.

Of the infrastructure associated with the Industrial Project, the construction of the transmission line ROW, freshwater pipeline to Peters Pond, and access/heavy haul roads have the greatest potential to create new edge habitat. Vegetation within the edge may experience effects associated with altered environmental conditions, dust deposition, and the introduction and spread of invasive species. For example, the creation of edge habitat has been shown to induce changes in environmental conditions such as light availability, moisture levels, and temperature (Braithwaite & Mallik, 2012; Hamberg et al., 2009), while also increasing the vulnerability of forest edges to natural disturbances, such as windthrow. Lichens and non-

vascular plants are especially sensitive to edge effects and changes in air quality due to being unable to regulate and maintain their water content (Boudreault et al., 2008; Nash, 2008).

Dust deposition may impact flora near the PF when fugitive dust is generated by traffic on unpaved roads, crushing material, and blasting. Dust from unpaved roads has been found to change the pH of lichen substrates (i.e., the tree bark they are attached to) and impact individual health and species richness (Degtjarenko, 2016). Vascular plants may be impacted by dust through reductions in photosynthesis and leaf diffusion (Thompson et al., 1984). The effects of dust on flora may depend on the duration of exposure; one study found that lichens along a gravel road were unaffected within two years, but significant changes to the communities were observed after 10 years (Farmer, 1993). It is expected that impacts to vegetation relating to dust deposition will be greatest during the site preparation and construction phase (short-term duration) in the area near the PF. Site traffic will be greatly reduced during the operational and maintenance phase of the Project.

Finally, the creation of edge habitat is also associated with the introduction and spread of invasive species. Terrestrial flora, particularly rare native flora, may be at risk due to threats from invasive species (BCMECCS, 2018). Non-native species, often introduced to a landscape accidentally by humans, can become invasive when they cause harm to the environment, economy, or human health through rapid reproduction and out-competing of native species (Rutledge et al., 2024). Industrial projects can lead to the introduction of invasive species in two main ways:

- Revegetation of cleared land with non-native seed mixes.
- Increased access to remote areas with equipment carrying seeds, spores, or other reproductive materials from non-native species.

The construction of new roads and subsequent increase in vehicle traffic associated with operation and maintenance can lead to the introduction or spread of non-native species, some of which are invasive. Within the broader PA, there were 17 non-native vascular plant species observed, of which four are considered invasive (Plant list, Appendix I.1). Given that non-native and invasive species are already known to be present, mitigation strategies to minimize the risk are provided.

Loss of Rare Flora

Activities requiring ground disturbance and vegetation clearing during the site preparation and construction phase have the potential to directly impact occurrences of flora SAR and SOCC. The PF associated with the Industrial Project Component currently overlaps with occurrences of red pine, a flora SAR (Drawing 7.8-4, Appendix A).

Red Pine (NL ESA Threatened, S2S3)

Occurrences of red pine were observed in one general area associated with the freshwater pipeline to Peters Pond. One incidental observation of red pine was recorded during initial field assessments for the Project in 2024 adjacent to an existing forest access road, and further

observations of red pine were made scattered along the southern perimeter of the PF along this existing forest road. During field surveys, it was not possible to determine the origin of red pine trees with absolute certainty (the natural red pine population, but not silvicultural plantings, are protected under NL ESA). Data provided to Strum by NL FAL-Forest Ecosystem Management Division indicates that the occurrences fall within areas that have been harvested within the past 20 years. This indicates that the trees are currently growing in managed as opposed to “natural” landscapes where naturally occurring stands may be expected to occur. Additional occurrences of red pine were also observed in the BWPA (described further in Section 6.9).

To avoid impacts to red pine, engagement with NL FAL will be undertaken to confirm whether the trees observed are part of Newfoundland’s natural red pine population that is protected under NL ESA. If the trees are determined to be of part of the natural population, additional engagement with NL FAL will be undertaken to develop a strategy to avoid direct losses of red pine, as practicable. As a shade-intolerant pioneer species adapted to disturbance (USDA, n.d.-b, 1990), indirect impacts to red pine habitat due to the Project are expected to be low.

Potential Sensitive Flora Habitat

Potential habitat mapping for rare flora species was therefore completed to estimate the impacts of the Project on habitat with elevated potential to host rare flora species (referred to as “potential sensitive flora habitat”). This mapping exercise used several of the inputs used in the desktop review to prioritize surveys for rare flora (Drawing 7.8-6, Appendix A). The selection of mapped inputs was similarly informed by known associations between rare flora and specific landscape features. The following features were included in mapping:

- Mature forest (61+ year age classes determined from FRI Data) located along drainage features.
- Alluvial floodplains, as determined using LiDAR by simulating a 3 m water rise on water features.
- Areas with volcanic substrate identified detailed bedrock geology layers (NLGS, 2013).

Feature layers were combined to identify areas where multiple features coincide, and the overall area of potential sensitive flora habitat was determined. Although the mapping exercise was not validated using field observations, it is based on established associations between rare flora and landscape features and is expected to serve as a reasonable approximation of areas where suitable habitat is likely to occur.

A total of 94 ha of potential sensitive flora habitat, associated with fragmented areas of mature forest along drainage/floodplains, was identified in the IPA (8% of the IPA). Of this, 17 ha is within the PF (18%). The overall loss of potential rare flora habitat associated with the Industrial Project Component is therefore expected to be low to moderate.

Impacts to Wetland Area and Function

Wetlands are abundant in the IPA as identified by modelling and confirmed through field surveys (Drawing 7.8-7, Appendix A). Project activities that involve vegetation removal and ground disturbance have potential to impact wetlands through a direct loss of wetland area as well as impacts to wetland function.

Effects to wetlands include both direct loss and changes in wetland functionality and can occur throughout the life of the Project. Effects might be direct (e.g., habitat loss through infilling) or indirect (e.g., changes to functionality due to hydrologic shifts). Effect-specific active management, mitigation, and long-term monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

The impacts of the Industrial Project Component on Groundwater Hydrogeology, Surface Water Hydrology, and Fish and Fish Habitat (VCs with linkages to wetlands) are described in Sections 7.5 to 7.7.

Loss of Wetland Area

A direct loss of wetland area will occur during the site preparation and construction phase through infilling or excavating for Project Infrastructure. Wetland loss has the potential to fragment wildlife corridors, potentially isolating species and lowering species richness. It can also disrupt vital habitat characteristics that support vulnerable species. Further, the removal or infilling of wetland habitat can impact the hydroperiod of neighbouring wet areas, resulting in farther reaching impacts on habitat quality (Mitsch & Gosselink, 2000). Note that the locations of wetlands have been incorporated into the siting of the Industrial Facility.

The wetland areas identified in the LiDAR-ELC were used to estimate the maximum direct loss of wetlands associated with the Project. It is expected wetlands identified using this model incorporate an undetermined amount of “wet areas” that are not true wetlands, such that the areas reported are a conservative estimate of the total impact area. A total of 147 ha of wetland area was identified within the PF, which represents 27% of the amount within the IPA (Table 7.8.5).

Table 7.8.5: Estimated Impact to Wetlands within the IPA – LiDAR-ELC

Wetland Type	Area in PF (ha)	Total Available in IPA (ha)	% Impacted
Bog	46	183	25
Raised Wet Area	17	90	18
Wet Hardwood Forest	7	35	20
Wet Herbaceous/Shrub	18	151	12
Wet Mixedwood	3	36	8
Wet Shrub	33	143	23
Wet Softwood Forest	23	85	27
Total	147	723	27

Direct impacts to wetlands associated with the Industrial Project Component include the partial loss (approximately 5.4 ha) of a large wetland, Wetland Mosaic A, to accommodate the construction of the Industrial Facility. The remaining portion of this wetland, which extends beyond the IPA, could experience changes in wetland function associated with this impact, as described in the following section.

Change in Wetland Function

Wetlands play a variety of functional roles in boreal landscapes, which differ based on wetland type. Changes to wetland functionality may be caused through direct loss of wetland area, as discussed above, or through other Project activities such as subsidence or heave/uplift or remaining portions of partially altered wetland and wetland drawdown effects, along with dust deposition, sediment or invasive species movement into the wetland. Any of these activities can shift the wetlands' ecological, chemical, and hydrological profiles. Changes to wetland function are therefore possible during all Project phases. As visible in aerial imagery, many wetlands within the IPA have previously been disturbed by human activities, including ATV use.

The temporal and spatial extent of indirect effects such as effects on hydrology, erosion and sedimentation, invasive species, and compaction can be far reaching, but are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes. Indirect impacts are mitigated by maintaining a vegetated buffer between Project activities and unaltered wetlands.

Hydrological Effects

The hydrology of a wetland is one of the most important aspects of its overall structure and function. Project infrastructure within or near a wetland can result in changes in the timing and quantity of flow, potentially impacting species composition, water treatment capabilities, and nutrient export (Mitsch & Gosselink, 2000). Further, disruption to the hydrology of one area may hinder the hydrological connectivity to other areas, thus resulting in impacts being felt in neighbouring wet areas beyond the PF and IPA.

Partial alteration of wetland habitats (particularly Wetland Mosaic A) may result in subsidence or uplift in remaining wetland habitat. Wetland alteration must therefore be completed to ensure continuity of elevation in the adjacent wetland habitat, so that wetland soils remain submerged but not inundated, thereby protecting the vegetation community within the wetland as well.

Alterations to surface water flows will be required to accommodate the construction of the Industrial Facility. A diversion ditch will be constructed surrounding the facility footprint to convey flow from watercourse 15-104 and 15-159 around the facility. As these watercourses are outflows from the wetland and their flow will be maintained, wetland hydrology is not anticipated to be altered by the localized diversion of flow.

Alterations to surface water features have potential to impact the hydrology of surrounding wetlands (e.g., due to water drawdown and drying). Water withdrawal from Peters Pond to

support the production of hydrogen and ammonia is not expected to impact adjacent lacustrine wetlands due to maintaining of the outlet elevation of the lake. As part of the Groundwater and Surface Water Monitoring Mitigation Plan (Appendix Q.10), water level monitoring thresholds and adaptive water management strategies will be established to ensure the protection of downstream flows in Peters River, which will help to support the existing hydrological regimes of surrounding wetlands.

Measures to mitigate the impacts of the Project on surface water and groundwater resources, which hold relevance for wetlands, are described in Sections 7.5 and 7.6.

Erosion and Sedimentation

Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, daily traffic, routine road and transmission line ROW maintenance. The accumulation of sediment within wetland environments can cause shifts in ecological integrity, including the plant species composition and subsequent nutrient retention potential, hydrological storage capabilities, and habitat suitability for vulnerable species (Tilman et al., 1997). Additionally, the use of road salt for winter maintenance may result in indirect adverse effects on microbial and vegetative wetland communities, including detrimental salinity levels and increased soil erosion due to salt-damaged vegetation (Jones et al., 2017). During winter, access roads in the LSA will be maintained by plowing, sanding, and/or salting will be used as required for safe driving.

Invasive Species

The colonization of invasive species can result in detrimental impacts on wetland environments, including alterations to evapotranspiration rates, infilling from reduced decomposition rates, and ultimately a reduction in the complexity of the wetland and its subsequent species richness (Zedler & Kercher, 2004). The creation of roadways can act as a vector for invasive species, with the potential for seed dispersal increasing with both vehicular and animal traffic. Further, because many invasive species thrive in disturbed soils, routine maintenance of roadways can provide ideal conditions for their establishment (Trombulak & Frissell, 2000). Due to the existing presence of invasive species in the broader PA, mitigations will be applied to reduce the further introduction or spread of invasive species.

Compaction

Compaction can hinder both the vegetative and hydrological structure of a wetland, with a loss of pore space restricting root growth and groundwater infiltration (Duiker, 2004). This impacts the absorption of moisture and nutrients, thus impacting the ecological integrity of the wetland and the ecosystem services it provides. Further, compaction can decrease percolation rates, resulting in prolonged periods of saturation, and increasing the potential for flooding (Duiker, 2004). Following established BMPs for construction in wetlands and avoiding unnecessary travel through wetlands will reduce the overall extent of wetland compaction.

Summary of Wetland Impacts

Changes in wetland function associated with the Project were qualitatively assessed by

identifying the dominant wetland types present within the IPA. As the wetlands identified by the LiDAR-ELC do not follow an established wetland classification system, such as the Canadian Wetland Classification System (NWWG, 1997), the extent of wetlands identified by the CNWI (ECCC, 2024a) were reviewed. The total area of each wetland type within the PF was determined for the IPA to identify the relative impacts to primary wetland types (Table 7.8.6).

Table 7.8.6: Estimated Impact to Wetlands within the IPA – CNWI

Wetland Type	Area in PF (ha)	Amount Available in IPA (ha)	% Impacted
Bog	55	292	19
Fen	19	65	29
Swamp	15	41	37
Marsh	2	24	8
Total	91	422	21

Bogs typically have a high water table and receive most of their water from precipitation, resulting in nutrient-poor, acidic environments (NWWG, 1997). This acidity is further compounded due to the release of organic acids that result from the decomposition of *Sphagnum spp.* Bogs have an important role in carbon storage (due to the accumulation of peat), water storage, and habitat for wildlife species (DUC, n.d.). Bogs are the most common wetland type in the IPA and PF.

Fens typically exhibit more open water than bogs, often with a connection to a watercourse or abutting a lakeshore. They may also receive hydrology from neighbouring uplands. Ultimately, this inundation of water from outside sources facilitates a transfer of nutrients that allow fens to support a wider variety of flora and fauna than bogs (NSNR, 2018). Fens store large amounts of carbon, and are generally more biologically diverse than bogs due to being supplied by various sources of water (DUC, 2013a). Fens will be moderately impacted relative to the other wetland types assessed

The Canadian Wetland Classification System (NWWG, 1997) defines a swamp as a wetland characterized by the dominance of woody vegetation in which the water table is typically at or near the surface or inundates the soil for a significant portion of the growing season. Swamps are often associated with poorly drained or saturated soils, and they provide important habitat for various plant and animal species adapted to wet conditions. Swamps offer nutrient rich soils for a variety of flora species and offer a high diversity of habitat for wildlife species (DUC, 2013c). Proportionally, swamp wetlands will experience the greatest impacts of the four wetland types.

Marshes often display more persistent surface water areas that tend to shrink as the growing season progresses. The hydrology of marshes can be influenced by various external sources, including precipitation, surface runoff, surface water connections, and groundwater. This diversity of hydrological sources typically fosters a nutrient-rich environment which, when paired with the lack of canopy cover, often facilitates the vigorous growth of herbaceous vegetation (NSNR, 2018). In many cases, this vigorous growth can lead to the full engulfment of any open water areas, resulting in meadow-like marshes that may be partially or fully

inundated. Marshes are the least common but most biologically diverse type of wetland in boreal environments (DUC, 2013b). A low overall amount of marsh wetland is expected to be impacted by the Industrial Project Component (approximately 2 ha).

7.8.8 Mitigation

To address the abovementioned effects to vegetation and wetlands, the following mitigation measures will be implemented:

Loss and Alteration of Vegetated Land Cover

- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Conduct vegetation management activities (through application of herbicides and manual brush cutting) in accordance with the Pesticide Control Regulations under the NL EPA.

Landscape Fragmentation and Edge Effects

- Use approved dust suppressant to control road dust and minimize airborne emissions, where required.
- Establish and implement speed limits to minimize dust and potential collisions.
- Use quarried, crushed materials for road construction to reduce the introduction of invasive vascular plant species.
- Clean and inspect equipment to prevent the introduction of non-native species.
- Revegetate cleared areas with native species, to the extent possible.

Loss of Rare Flora

- Prioritize the avoidance of flora SAR and maximize avoidance of flora SOCC during the detail design stage.
- Pre-construction surveys of identified potential sensitive flora habitat within the PF to be conducted to inform detailed design.
- Maintain undisturbed buffers around flora SAR and SOCC to the extent possible to minimize impacts to supporting habitat, where possible.
- Consult with NL FAL to confirm the origin of red pine trees in the BWPA.
 - If red pine trees in the PF are determined to be naturally occurring individuals protected under NL ESA, avoidance of individuals will be maximized through careful micro-siting of Project Infrastructure, and undisturbed buffers maintained where possible.

Loss of Wetlands and Change in Wetland Function

- Avoid unnecessary travel through wetlands, where possible.
- Maintain a minimum 30 m vegetated buffer surrounding watercourses, where possible.
- Where undisturbed buffers cannot be maintained an application for a permit to Alter a Body of Water will be made in accordance with the *Water Resources Act*.
- Design wetland crossings and alterations to avoid permanent diversion, restriction or blockage of natural flow, such that hydrologic function of wetlands will be maintained.
- Direct run-off from construction activities away from wetlands.

- Construct diversion ditching around facility where appropriate to convey flow and prevent flooding.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Limit the area of exposed soil and the length of time soil is exposed, where possible, without mitigation (e.g., mulching, seeding, rock cover).

7.8.9 Monitoring

No monitoring programs specific to vegetation and wetlands are recommended.

7.8.10 Conclusion

A desktop review and field studies were undertaken to characterize the range of vegetation and wetlands present within the IPA. This information was incorporated into the Project design, and mitigation measures have been developed to further reduce impacts to the vegetation and wetlands due to the Project. Vegetation and wetlands may be impacted through the following:

- Loss and Alteration of Vegetation Cover
- Landscape Fragmentation and Edge Effects
- Loss of Rare Flora
- Direct Loss of Wetland Area and Function

Modelling and geospatial analyses were used to assess the impacts of the Project on vegetated land cover. The PF of the Industrial Project Component consists of 214 ha of land, and vegetation clearing will have the highest impact on bogs and shrub dominated areas. Due to the disturbed nature of the IPA, extent of new landscape fragmentation and edge habitat associated with the Project is expected to be low.

One flora SAR, red pine, was observed in the PF of the IPA. Further engagement with NL FAL is required to determine if the red pine trees observed are part of the natural red pine population protected under NL ESA. Desktop mapping for the assessment indicates that while some sensitive areas such as old-growth/late-successional forest and potential rare flora habitat will be impacted by the Project, the amount lost will be low to moderate relative to amount available in the PA.

Impacts to wetlands associated with direct loss of wetland area and changes in function were assessed using modelled data about the extent and type of wetlands in the IPA. Approximately 146 ha of wetland area is within the PF and may be directly impacted by the Project (27% of the amount in the IPA).

Following the application of mitigations, the residual effects of the Industrial Project Component on vegetation and wetlands are not expected to be significant (Table 7.8.7).

Table 7.8.7: Vegetation and Wetlands Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Loss and Alteration of Vegetation Cover	Maximize use of pre-existing roads and disturbed areas	A	L	LSA	LT	SE	PR	Not Significant
	Restore cleared areas where possible							
Landscape Fragmentation and Edge Effects	Minimize dust production and spread	A	L	LSA	LT	SE	PR	Not Significant
	Inspect and clean work vehicles to limit spread of non-native and invasive species							
Loss of Rare Flora	Prioritize avoidance of flora SAR and maximize avoidance of flora SOCC during detail design	A	L	LSA	ST	SE	IR	Not Significant
	Maintain undisturbed buffers around flora SAR and SOCC to the extent possible							
	Consult with NL FAL if a flora SAR is incidentally observed (e.g., during site preparation)							

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Impacts to Wetland Area and Function	Avoid unnecessary travel and disturbance in wetlands	A	L	LSA	LT	SE	PR	Not Significant
	Maintain vegetated buffers on wetlands where possible							
	Implement an Erosion and Sediment Control Plan							
	Design wetland crossings to avoid permanent diversion/blockage of flora							
	Design wetland crossings to avoid permanent diversion/blockage of flow							
LEGEND (Refer to Section 5.0 for Definitions)								
Nature of Effect: A – Adverse, P – Positive								
Magnitude: N – Negligible, L – Low, M – Moderate, H – High								
Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area								
Duration: ST – Short Term, MT – Medium Term, LT – Long Term								
Frequency: SE – Single Event, I – Intermittent, C – Continuous								
Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

7.9 Terrestrial Fauna

7.9.1 Overview

Fauna was selected as a VC because fauna species and their habitat will be impacted, directly and indirectly, by Project activities proposed within the IPA. The objective of this assessment is to collect the information required to assess the potential impacts of the Project within the IPA, with a focus on rare species. The assessment was completed using the following approach:

- Gain an understanding of the potential terrestrial fauna and fauna habitat types present within and near the IPA using desktop resources.
- Identify fauna SAR and SOCC with elevated potential to occur in the IPA.
- Undertake surveys for different taxa of terrestrial fauna to document the species present within the IPA, particularly SAR and SOCC.
- Use the information collected through field studies to update the Project design to avoid or minimize interactions between Project infrastructure components and terrestrial fauna and their supporting habitat, particularly SAR and SOCC.
- Apply mitigation, construction, and operational management practices to minimize effects to terrestrial fauna.

The fauna assessment specifically includes the assessment of the project related effects of the Industrial Project Component on caribou (*Rangifer tarandus*), moose (*Alces alces*), muskrat (*Ondatra zibethicus obscurus*), American marten (*Martes americana atrata*), bat species (*Myotis* spp.), and at-risk insects.

7.9.2 Regulatory Context

Several laws and regulations provide protection for fauna and their habitats in Newfoundland and Labrador. Legislation that may direct resource development and conservation of fauna include:

Federal Legislation

- *Species At Risk Act* (Canada, 2002b)
- *Migratory Birds Convention Act* (Canada, 1994)
 - Designates Migratory Bird Sanctuaries
- *Canada National Marine Conservation Areas Act* (Canada, 2002a)
 - Designates National Marine Conservation Areas
- *Canada Wildlife Act* (Canada, 2000)
 - Designates National Wildlife Areas
- *Canada National Parks Act* (Canada, 2022)

Provincial Legislation

- *Wildlife Act* (Newfoundland and Labrador, 1990f)
 - Designates wildlife reserves.
- *Water Resources Act* (Newfoundland and Labrador, 2002c)
- *Endangered Species Act* (Newfoundland and Labrador, 2001)

- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)
- *Wilderness and Ecological Reserves Act* (Newfoundland and Labrador, 1990g)
- *Lands Act* (Newfoundland and Labrador, 1991)

7.9.3 Desktop Assessment Methods

The baseline desktop methodologies for terrestrial fauna within the IPA followed the same methodology outlined in Section 6.10. Full descriptions of baseline conditions can be found in the Fauna baseline report (Appendix J.1).

7.9.4 Desktop Assessment Results

The ACCDC Data Report (2026) included one observation of a terrestrial mammal SAR and no observation of terrestrial mammal SOCC terrestrial mammal (excluding birds) within 5 km of the PA, as presented in Table 7.9.1.

Table 7.9.1: ACCDC Terrestrial Fauna SAR within 5 km of the Project Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	NL ESA Status	S-Rank
American Marten (Island of Newfoundland Population)	<i>Martes americana atrata</i>	Special Concern	Threatened	Vulnerable	S3

7.9.4.1 Caribou

The IPA overlaps the occupied territory of the Hodges Hill caribou herd which travels a portion of Central Newfoundland approximately between Exploits River and Notre Dame Bay. The Mount Peyton herd occupies territory southwest of the PA (S. Mahoney, 2000). The Hodges Hill herd is composed of 436 individuals as of a 2008 estimate (NLECCC, 2008). It is determined to be an isolated pocket of animals thought of as individuals from separate herds that eventually amalgamated into a larger group. The IPA does not intersect with any caribou management areas, with the closest area, Mount Peyton CMA 68, located 8 km southwest (NL FAL, 2024).

Habitat modeling for caribou indicates that approximately 867 ha of suitable habitat is present within the IPA (Drawing 6.13-2, Appendix A). In total, the IPA is 1,157 ha in area, therefore, this predicted suitable habitat comprises 75% of the IPA.

7.9.4.2 Moose

The IPA lies within MMA 15 Twin Lakes. Habitat modeling for moose indicated that approximately 662 ha of suitable habitat is present within the IPA (Drawing 6.10-1, Appendix A), comprising 57% of the IPA.

7.9.4.3 Muskrat

Habitat modeling indicated that approximately 57 ha of suitable habitat is present within the IPA for muskrat (Drawing 6.10-2, Appendix A). This comprises less than 5% of the IPA.

7.9.4.4 American Marten

The occurrence of American marten included in the ACCDC data report (ACCDC, 2026a) was reported 1,220 m from the IPA. A review of the Recovery Plan for American marten in Newfoundland, indicates that the PA does not overlap with any identified critical habitat areas (Newfoundland and Labrador, 2010).

Habitat modeling indicates that approximately 209 ha of high potential and 93 ha of low potential habitat is present within the IPA (Drawing 6.10-3, Appendix A). Combined, the high and low potentially suitable habitat comprises 26% of the IPA.

7.9.4.5 Bats

The ACCDC Data Report (ACCDC, 2026a) completed for this Project did not indicate any records of bats within 5 km of the Project center. The Recovery Strategy for Little Brown Myotis, Northern Myotis, and Tri-colored Bat does not indicate the presence of any critical habitat for *Myotis* species within the PA (ECCC, 2015c).

Habitat modeling indicated that approximately 182 ha of suitable habitat for foraging, hibernating and roosting is present within the IPA (Table 7.9.2), comprising 16% of the IPA (Drawing 6.12-1, Appendix A). Predicted bat habitat was divided into foraging and roosting, with roosting being further broken down into containing or not containing trembling aspen.

Table 7.9.2: Predicted Bat Habitat within the IPA

Project Areas	Suitable Foraging Habitat (ha)	Suitable Hibernation Habitat (ha)	Suitable Roosting Habitat (ha)	
			Does Not Contain Trembling Aspen	Contains Trembling Aspen
IPA	1	65	77	39

7.9.4.6 Invertebrates

No insect SAR or SOCC were identified in the ACCDC data report within the IPA (2026a).

7.9.5 Field Assessment Methodology

7.9.5.1 Species at Risk & Species of Conservation Concern

Direct observations of terrestrial fauna or signs thereof within the IPA were recorded and photographed, when feasible, during targeted fauna surveys and other non-target biophysical field surveys, with particular emphasis on terrestrial fauna SAR and SOCC. Incidental observations were recorded in addition to dedicated wildlife surveys as they provide the broad temporal and spatial coverage of the IPA. Signs included features such as dens, nests, scat, tracks, and evidence of foraging.

7.9.5.2 Wildlife Trail Cameras

One wildlife trail camera was deployed 300 m west of the IPA from December 2022- January 2023 and January 2024 to February 2025 in the IPA (Drawing 6.10-5, Appendix A). Survey methodologies were developed in consultation with NL FAL - Wildlife Division as per the EIS

Guidelines (NLECCC, 2025).

7.9.5.3 Caribou and Moose Cameras

No camera grids were placed within the IPA as the stratified random approach to grid placement allows habitat within these areas to be representatively sampled elsewhere.

7.9.5.4 American Marten

No hair snag stations were placed within the IPA due to its relatively small size as compared to the broader PA. Opportunistic surveys were completed for American marten throughout the suite of biophysical surveys. Any observations were identified and recorded by biologists experienced in recognition of wildlife tracks, scat, and browse.

7.9.5.5 Bats

Monitoring conducted within the IPA consisted of passive acoustic monitoring during the 2024 active bat season (6.12-2, Appendix A). Recorder locations were chosen following protocols outlined by the North American Bat (NA Bat) Monitoring Program (Loeb et al., 2022). Acoustic monitoring was conducted using Song Meter Mini Bat 2 Li-Ion detectors from Wildlife Acoustics, operating with firmware version 4.3. The detectors were programed to monitor from 30 minutes before sunset to 30 minutes after sunrise to correspond with nightly bat activity. Three detectors were deployed within the IPA (Table 7.9.3). Passive acoustic monitoring was conducted for 242 consecutive days within the IPA between the dates of April 13 and December 11, 2024, encompassing the spring, summer, and fall active bat seasons; however, the detectors experienced some interruptions in data collection during this period resulting in some missed dates.

Table 7.9.3: Monitoring Periods for Detectors in the IPA

Detector ID	Detector Location	Habitat Description	Monitoring Duration (2024)
BAT-01	49.104868, -55.418265	Softwood stand between a harvested area and a large bog.	April 13 to December 3
BAT-06	49.095810, -55.430282	Regenerating clearcut with a few hardwood snags near a lake.	April 13 to December 3
BAT-09	49.119637, -55.380987	Forest edge alongside a bog containing standing water.	April 13 to December 3

7.9.5.6 Invertebrates

Targeted surveys for SAR invertebrate species were not completed. Any incidental observations of SAR or SOCC insects during other field surveys were documented.

7.9.6 Field Assessment Results

7.9.6.1 Species at Risk & Species of Conservation Concern

Within the broader PA, 13 species were identified during field assessments either by sighting individuals or signs thereof, including both targeted surveys and incidental observations

conducted within the PA (Table 7.9.4). Twelve observations of moose were made at the trail camera closest to the IPA.

Table 7.9.4: Fauna Species Observed within the Project Area

Scientific Name	Common Name	COSEWIC Status ⁽¹⁾	SARA Status ⁽¹⁾	NL ESA ⁽²⁾	S-Rank ⁽³⁾
<i>Alces alces</i>	Moose	-	-	-	SNA
<i>Canis latrans</i>	Eastern Coyote	-	-	-	SU
<i>Castor canadensis</i>	American Beaver	-	-	-	S5
<i>Lepus americanus</i>	Snowshoe Hare	-	-	-	SNA
<i>Lutra canadensis</i>	Northern River Otter	-	-	-	S5
<i>Lynx canadensis</i>	Canada Lynx	-	-	-	S3S4
<i>Microtus pennsylvanicus</i>	Meadow Vole	-	-	-	S3S4
<i>Mustela vison</i>	American Mink	-	-	-	SNA
<i>Rangifer tarandus</i>	Caribou	Special Concern	Special Concern	-	S3S4
<i>Rattus norvegicus</i>	Rat	-	-	-	SNA
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	-	-	-	SNA
<i>Vulpes vulpes</i>	Red Fox	-	-	-	S5
<i>Ursus americanus</i>	Black Bear	-	-	-	S4

Source: ⁽¹⁾ECCC (2025b); ⁽²⁾Newfoundland and Labrador (2002); ⁽³⁾ACCDC (2026b)

Although most of the above species were not observed within the IPA, it is likely that they could be found in and around the IPA, given the similar habitat availability.

7.9.6.2 Wildlife Trail Cameras

Ten individuals were recorded on the one trail camera in the IPA, including eight moose and two caribou.

7.9.6.3 American Marten

No American marten were recorded incidentally within the IPA during any biophysical surveys.

7.9.6.4 Bats

There were three monitors deployed in the IPA, which recorded a total of 1,256 bat passes. This resulted in an average of 419 bat passes across the IPA. All bat passes were identified as *Myotis* species.

Most of the recordings (96%) were detected by monitor BAT-09. This monitor was deployed adjacent to an NL Hydro transmission line over a wetland. This monitor recorded the most bat passes of any other detector in the PA, accounting for 41% of all bat pass detections throughout the monitoring period. BAT-09 was deployed in feeding habitat identified through modelling. BAT-01 was located on a knoll near a small regenerating forest red pine (*Pinus resinosa*) grove and a large bog, and BAT-06 was in a previously clearcut regenerating spruce forest.

Observed bat activity was highest during June and mostly concentrated at BAT-09, with substantially fewer detections in all other months. This could be related to timing of offspring births and subsequent dispersal (Slough et al., 2023). Overnight bat activity was observed to peak between 23:00 and 00:00, with most activity being recorded between 22:00 and 04:00.

7.9.6.5 Invertebrates

No SAR invertebrate species were observed during field surveys.

7.9.7 Effects Assessment

7.9.7.1 Project-Terrestrial Fauna Interactions

The works, undertakings, and activities associated with the construction, operation, and decommissioning of the Project can impact fauna and fauna habitat through multiple direct and indirect pathways.

Project activities, primarily those that involve earth moving, road construction, or vegetation removal, have the potential to impact fauna and fauna habitat (Table 7.9.5). These potential impacts could include the loss of habitat and habitat fragmentation, injury or mortality, and sensory disturbance.

Table 7.9.5: Potential Project-Fauna Interactions – Industrial Facility

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	
Clearing and Grubbing	X
Construction of Temporary Works	X
Access Road Upgrading and Construction	X
Water Pipeline Construction	X
Facility Civil Works	X
Transportations of Facility Components	X
Equipment Installation	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance (33 years)	
Facility Operations and Maintenance	X
Site Management	
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

7.9.7.2 Assessment Boundaries

Administrative Boundary

No administrative boundaries are identified for the effects assessment on terrestrial fauna.

Technical Boundary

Prediction of habitat availability within the IPA was limited by the accuracy of GIS models developed to support this effects assessment. Several models were designed to understand the potential impacts of the Project on the landscape and to fauna. This includes the detailed ELC model developed using aerial imagery, airborne LiDAR data and land cover data for the IPA. This ELC model was used as the basis of all other additional habitat models developed for the effects assessment, and as a result cannot predict the potential habitat outside of the IPA. This reduces the ability of this assessment to compare available habitat within the IPA to the surrounding regions.

Additionally, technical boundaries include constraints associated with the available provincial data including the accuracy of the NL FAL - Land Cover Database (NL FAL, 2025b), thus impacting predictions of potential habitat for fauna.

Spatial Boundary

The spatial boundary for determining residual effects to terrestrial fauna is the LSA, which includes a 2 km buffer around the IPA. The LSA boundary was defined considering the maximum expected extent of direct and indirect impacts to terrestrial fauna. The IPA is used to describe specific interactions and impacts to specific habitats and species (Drawing 7.9-1, Appendix A). An RSA is not applicable for this effects assessment.

Temporal Boundary

Temporal boundaries associated with terrestrial fauna include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

7.9.7.3 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for terrestrial fauna. The fauna definition for magnitude is as follows:

- Negligible: No loss of fauna habitat or impact to fauna through sensory disturbance or injury/mortality.
- Low: Small loss of habitat supporting fauna and low impacts to fauna through sensory disturbance or injury/mortality.
- Moderate: Moderate loss of fauna habitat and/or moderate impacts to fauna through sensory disturbance or injury/mortality, but these impacts will only be experienced by individuals rather than entire populations.
- High: High loss of fauna habitat or high impact to fauna through sensory disturbance or injury/mortality that would impact fauna on a population scale.

7.9.7.4 Effects

Potential environmental effects and associated pathways of the Industrial Project Component in relation to fauna are grouped into three major categories:

- Habitat Loss and Fragmentation
- Injury or Mortality
- Sensory Disturbance

Project related effects can influence fauna directly and indirectly. A direct effect is defined by interactions that have no intermediates (e.g., mortality by vehicle collision) or direct loss of habitat and indirect effects are interactions that have intermediate steps such as edge effects, sensory disturbance, or changes in fauna behaviour associated with road development.

Mammals - General

Habitat Alteration and Fragmentation

The Project will result in direct and indirect impacts to habitat used by fauna within the IPA. Most effects to fauna are expected to occur during the construction phase of the Project, through vegetation removal and grubbing, the creation of new access roads and other infrastructure. Based on the proposed layout, the Project Footprint will include clearing for infrastructure placement, which will alter or reduce the overall availability of terrestrial fauna habitat. Infrastructure will disturb 214 ha (18% of the IPA); land cover types within this are presented in Section 7.8 – Flora and Vegetation Communities.

The majority of the IPA consists of shrubland, bog and wet herbaceous/shrub land cover types, all of which will see impacts from the PF. Historical disturbance is evident within the IPA, primarily composed of forestry activity. Habitat and vegetation communities are described further within the Baseline Vegetation and Wetlands Report, refer to Appendix I.1.

Wildlife species that currently use the habitat within the IPA may naturally avoid the area during construction and return once it is complete (Buckmaster et al., 1999). Much of the IPA is already subject to existing disturbances due to being surrounded by highway, which has contributed to current levels of habitat fragmentation and the prevalence of edge habitats, including barren and shrubland areas. Additionally, the land cover present within the IPA is not unique or rare in the local, regional or provincial context. It is anticipated that fauna will be able to move to alternative suitable habitat located within the LSA when habitat is lost (Buckmaster et al., 1999).

Much of the IPA has been subject to prior disturbance, with existing forest access roads and an extensive network of ATV trails present. Silvicultural data provided by NL FAL indicates that the majority of the PF has been harvested within the last 20 years. The usage of existing roads for the Project, and limited road network required to support the Industrial Facility components will minimize the creation of new edge habitat. Due to the disturbed nature of the IPA, the

amount of new landscape fragmentation due to the Project is expected to be low.

Although presence of species may change, similar available habitats are present within the LSA. The overall magnitude of impact to wildlife from habitat loss and fragmentation is predicted to be moderate and temporary in nature.

Mortality and Injury

Mortality and injury of fauna species could result from Project activities, particularly due to the increase in traffic during construction and operation of the Project. Increased traffic within the LSA could potentially increase the risk of wildlife and vehicle collisions.

The Project phases with the highest levels of road traffic, and therefore the highest risk of wildlife vehicle collisions, are the construction and decommissioning phases of the Project. During operation, trucks and other equipment will be accessing and working at the site but at a much lower frequency, lessening the potential interaction with wildlife.

Sensory Disturbance

Sensory disturbances such as noise and light pollution may deter fauna from using habitat in the IPA and surrounding areas. Reproduction and survival strategies of terrestrial mammals may be directly or indirectly impacted by sensory disturbances caused by Project activities. Many species have sensitive windows for breeding and birthing, and any small disruption to these activities may reduce reproductive success in the population.

Project-related noise may impact habitat use, patterns of activity, stress levels, immune response, risk of predation, communication, antipredator behaviours, and hearing damage (Lovich & Ennen, 2013). All phases of the project are expected to generate noise that may result in sensory disturbance to wildlife. Noise generated from construction, operation and decommissioning of the Project will likely result in the localized wildlife avoidance of the IPA. The construction phase of the project is expected to be the phase with the highest sensory disturbance to wildlife. The temporary development of a quarry for the provision of material for road construction and concrete mix will only occur during the construction phase of the project and will generate noise that will likely result in the localized wildlife avoidance of the IPA. Additional activities such as land clearing and infrastructure construction will result in noise during the construction phase of the Project.

A literature review conducted by Shannon et al. (2016) found that an increase in stress and decrease in reproductive success in terrestrial mammals has the potential to occur at noise levels ranging from 52 to 68 dBA. According to Suter (2002); bulldozers, graders, and excavators generate noise of the following ranges 91-107 dBA, 88-91 dBA, and 70-108 dBA, respectively. Blasting is expected to exceed these ranges. The levels of noise during all phases of the Project are likely to exceed the levels cited by Shannon et al. (2016) for indirect impacts to wildlife. However, mitigation measures such as a berm around the facility could be used to reduce the overall effects of noise.

Light is another source of sensory disturbance that can impact fauna by potentially causing disorientation, or attraction and avoidance behaviour (Longcore & Rich, 2004). In turn, these behavioural changes can affect the success of foraging, reproduction, and communication of wildlife (Longcore & Rich, 2004). The Project will employ mitigation measures to reduce overall light pollution and minimize the indirect effects to fauna.

Sensory disturbance (noise and light) to fauna is expected to occur, however, how a species may respond to this disturbance is often species specific. An overall negative effect to wildlife by the Project is expected to occur as species approach the IPA. This sensory disturbance could result in behavioural changes and changes in wildlife movement. Due to the proportion of the habitats proposed to be impacted by the Project and habitat availability in the surrounding LSA, available suitable habitat for many species is present. Wildlife corridors will still exist and movement of species from north, south and west remains possible.

Species Specific Effects

Caribou, moose, muskrat, American marten, bats and at-risk insects were chosen for more detail in their assessment of project impacts. Assessment of the following species was completed within the IPA, as data were too coarse and unavailable beyond this boundary to support modeling efforts.

Caribou

There are a variety of factors that influence caribou health and abundance in Newfoundland. The effect of loss, degradation and fragmentation of habitat may vary by ecotype, herd or aggregation of caribou (COSEWIC, 2014). Habitat loss and fragmentation have been identified as a threat to caribou in Newfoundland, as they require large contiguous landscapes to meet lifecycle requirements (Newfoundland, 2015).

The Project will impact habitat availability and quality for caribou. Changes in habitat include the loss or alteration of habitat, both indirectly and directly. Loss of habitat within the IPA will primarily occur through the clearing and grubbing of land to be used for infrastructure. The habitat model identified a total of 867 ha of suitable habitat for caribou within the IPA. Within the PF, an estimated 176 ha of habitat is expected to be disturbed, representing 20% of suitable caribou habitat (Table 7.9.6). Caribou were noted at wildlife trail camera 39, 300 m outside the IPA, only one individual was observed once. Given the low abundance of caribou within the IPA, caribou and project interactions are expected to be minimal.

Table 7.9.6: Direct Impacts to Predicted Caribou Habitat within the IPA

Available Predicted Caribou Habitat (ha)	Loss of Predicted Habitat from Project Footprint (ha)	Percentage of Loss
867	176	20%

Sensory disturbances from heavy machinery and equipment can disrupt normal behaviours such as foraging, breeding, rearing, and resting. These disturbances are most likely to have an impact on caribou presence within the IPA during the construction phase and could have an

exacerbated impact on females rearing calves (Chubbs et al., 1993).

Moose

Changes to habitat availability and quality as a result of the Project's activities are likely to affect moose behaviours by reducing areas for thermoregulation, overwintering, mating, and protection for calves (NSNR, 2021). As moose rely on large, connected habitats to meet their seasonal and life-stage requirements, habitat loss and fragmentation can compel individuals to expand their home ranges in search of suitable habitat. The PF will result in the loss of 131 ha (20%) of suitable habitat for moose within the IPA (Table 7.9.7).

Table 7.9.7: Direct Impacts to Predicted Moose Habitat within the IPA

Available Predicted Moose Habitat (ha)	Loss of Predicted Habitat from Project Footprint (ha)	Percentage of Loss
661	131	20%

Sensory disturbance from Project activities has the potential to impact moose at various life stages. Construction activities during the fall could potentially affect the rutting behaviour of moose. Twelve moose were observed at the trail camera closest to the IPA.

Given the wide availability of suitable habitat for moose in Newfoundland and maintenance of 80% of suitable habitat within the IPA, paired with low activity of moose documented within the IPA, the Industrial Facility is predicted to have a low impact to moose.

Muskrats

Muskrats are a semi-aquatic rodent that use wetlands, rivers, and riparian habitats. Muskrat are native to the island of Newfoundland and represent a unique genetic population, that differ from those found off of the island (Rigby & Threlfall, 1982). Muskrat populations have been suppressed by the introduction of mink, however, in recent years, muskrat populations have been making a recovery (NL FAL, n.d.). Muskrat are an important furbearer species and trapping is permitted island-wide (NL FAL, 2025b).

A muskrat habitat suitability model was developed for the Project, using parameters outlined in the Provincial muskrat survey protocol (NL FAL, 2019; details available in Appendix J.1). The muskrat habitat model identified a total of 57 ha (5% of the IPA) of predicted habitat within the IPA. Of this area, 16 ha are expected to be impacted by the PF (28% of the suitable habitat) (Table 7.9.8). However, no muskrat were observed within the IPA during field studies.

Table 7.9.8: Direct Impacts to Predicted Muskrat Habitat within the IPA

Habitat Ranking	Available Predicted Muskrat Habitat (ha)	Loss of Predicted Habitat (ha): IPA	Percentage of Loss
Highly Suitable Habitat	0	0	0%
Moderately Suitable Habitat (High)	0	0	0%

Habitat Ranking	Available Predicted Muskrat Habitat (ha)	Loss of Predicted Habitat (ha): IPA	Percentage of Loss
Moderately Suitable Habitat (Low)	< 1	0	0%
Suitable Habitat	56	16	28%
Total	57	16	28%

The Project Footprint will alter 16 ha of muskrat predicted habitat within the IPA. Not all alterations will be permanent, and avoidance of sensitive areas will be prioritized. If alterations are required, EVREC commits to maintaining 30 m vegetated buffers on wetlands and watercourses, when possible. Loss of habitat for muskrats is expected to be low. Overall effects of habitat loss or fragmentation on muskrats will be reduced through mitigation measures.

American Marten

No American marten were identified within the IPA, however the habitat model identified 302 ha of suitable habitat (26% of the IPA); this includes both high and low potential suitable habitat. Areas with greater habitat connectivity are considered high potential and are more favourable for the species. The Project is predicted to directly affect 98 ha of suitable marten habitat, comprising 32% of the available suitable habitat within the IPA (Table 7.9.9).

Table 7.9.9: Direct Impacts to Predicted American Marten Habitat within the IPA

High Potential American Marten Habitat (ha)	Low Potential American marten Habitat (ha)	Loss of Predicted High Potential Habitat from Project Footprint (ha)	Loss of Predicted Low Potential Habitat from Project Footprint (ha)	Percentage of Loss for High/Low Potential Habitat
93	209	28	70	30%/33%

The PF will result in the loss of 28 ha of high potential and 70 ha of low potential American marten habitat within the IPA, which represents 30% and 33% of loss (Table 7.9.9).

While the Project will result in habitat disturbance in the IPA, the effects are expected to be low, given the relatively small size of existing predicted habitat suitability and the fact that no American marten were observed during biophysical surveys. The IPA is mostly composed of shrub cover and wetlands, which lack the forest cover required for marten, making it poor habitat. The IPA sits adjacent to a highway, and it is expected that martens are not dispersing beyond this anthropogenic barrier.

Potential American marten mortality from vehicle collisions is also a potential concern. Although the risk of road mortality generally increases with population density (COSEWIC, 2022), the low likelihood of American marten in the IPA suggests that this risk remains low in the context of the Project. However, the development may lead to increased access to previously remote areas, raising the potential for illegal trapping or other forms of human-

induced mortality (COSEWIC, 2022). The risk of vehicle collisions for marten is expected to be low.

Bats

Vegetation clearing required for construction can result in the removal of bat habitat or disruption to corridors between important habitat features, such as foraging habitat and roosting habitat (Reusch et al., 2022; Segers & Broders, 2014). This could impede movement, foraging, flight activity, and habitat use (ECCC, 2015c). Harvesting and the creation of cleared areas can also reduce landscape-level habitat quality as well as result in increased predation risk as bats travel across open areas (Slough et al., 2023).

Bats may also be impacted by two flare stacks that will be constructed within the IPA. Flare stacks present risks to bats due to their intermittent flame. Flares may concentrate insects (Eisenbeis & Hänel, 2009) and draw foraging bats in, where they may be impacted by flying into the flare flame. There is a possible risk of mortality from flares within the IPA.

The land area within and around the IPA is visually similar based on aerial imagery in terms of road density, water bodies, wetlands, and forested areas. It can be assumed that potential bat habitat is also present within the LSA.

Bat monitor BAT-09 detected a total of 1,256 bat passes and falls within or near proposed IPA infrastructure. It may be that this detector captured bats moving past on their way to a roost, it is unknown if the roost is located within the PF. To avoid bat habitat loss, infrastructure will be strategically sited away from mature forests, wetlands, and waterbodies (Reusch et al., 2022) to the extent possible.

Noise and light will be generated during all phases of the Project and can impact bats. This is especially pertinent to the high number of bats observed within the IPA.

Overall, the expected impacts to bats are low for changes in habitat, mortality and sensory disturbance. The likelihood of bat habitat presence outside of the IPA and the avoidance of bat habitat within the IPA both indicate that bat habitat is not likely to be highly impacted by the Project.

Invertebrates

The four SAR invertebrate species found in Newfoundland are outlined in the Solar Project component section. Invertebrates may experience habitat loss as discussed in the Wind and Transmission Project Component Section and the Solar Project Component Section. No additional effects are expected.

7.9.8 Mitigation

To address the abovementioned effects to terrestrial fauna, the following mitigation measures will be implemented:

Habitat fragmentation

- Maintain avoidance of potential bat habitat (i.e., mature forests, riparian areas, and wetlands) to the greatest extent possible.
- Minimize clearing, by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Revegetate cleared areas with native species, to the best extent possible.
- Maintain a minimum 30 m vegetated buffer surrounding watercourses, where possible.

Injury or Mortality

- Inform all Project-related staff working on the site of dangers to wildlife and create awareness around wildlife hotspots on the site.
- Establish and implement speed limits to minimize dust and potential collisions.
- Install motion activated lights on-site infrastructure to reduce insect attraction and subsequent attraction by bats.
- Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.

Sensory Disturbance

- Maintain all equipment and machinery on site so that a level of good working condition is kept, reducing noise and vibration emissions.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Use noise controls (e.g., mufflers) on machinery and equipment to limit disturbance, when applicable.
- Limit unnecessary lighting as much as possible, especially at night.

7.9.9 Monitoring

Monitoring and management plans will be developed to assess the accuracy of the predicted environmental effects and effectiveness of the mitigation measures. The management and monitoring plans are subject to modifications after consultation with NL FAL - Wildlife Division. The following plans will be developed as part of the Project's commitment to monitoring and mitigation of adverse effects to fauna:

- Wildlife Response Plan – The primary goal is to provide strategies in reducing human-wildlife interactions, promote safety of both wildlife and site personnel and best management practices for vegetation management including invasive species management. This plan will also address reporting and response protocols for terrestrial fauna mortalities. This plan will occur during the duration of the construction, operation and reclamation phase of the Project. The Wildlife Response Plan is included

- in the Emergency Response Plan (Appendix Q.2)
- Waste Management Plan will be developed to reduce attraction of animals (Appendix Q.12).

7.9.10 Conclusion

After mitigations, predicted residual effects on fauna and fauna habitat are characterized in Table 7.9.9.

Table 7.9.9: Fauna Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Habitat Alteration and Fragmentation	Avoid sensitive habitat by adjusting infrastructure locations where practicable. Minimize disturbance by using existing roads or previously altered areas. Promote natural regeneration. Prevent the spread of invasive species	A	M	LSA	LT	SE	PR	Not significant
Injury or Mortality	Educate on-site staff about wildlife. Target clearing outside of sensitive timing windows. Prevent environmental contamination.	A	L	LSA	LT	I	R	Not significant
Sensory Disturbance	Reduce noise, vibration and light disturbance. Minimize wildlife disturbance.	A	L	LSA	LT	I	R	Not significant

LEGEND (Refer to Section 5.0 for Definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term MT – Medium Term, LT – Long Term

Frequency: SE – Single Event, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

7.10 Avifauna

7.10.1 Overview

This section covers effects on the avifauna VC based on the Industrial Facility component of the Project. Impacts such as habitat loss/fragmentation, mortality risk, and sensory disturbance will be assessed.

7.10.2 Regulatory Context

The Project has potential to interact with avifauna species that are protected under federal and provincial legislation. Legislation that may direct resource development and conservation of avifauna species and their habitats include:

Federal Legislation

- *Species At Risk Act* (Canada, 2002b)
- *Migratory Birds Convention Act* (Canada, 1994)
- *Canada Wildlife Act* (Canada, 2000)
- *Canadian Environmental Protection Act* (Canada, 1999)

Provincial Legislation

- *Endangered Species Act* (Newfoundland and Labrador, 2001)
- *Wild Life Act* (Newfoundland and Labrador, 1990f)
- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)

7.10.3 Desktop Assessment Methodology

The baseline desktop methodologies for avifauna within the IPA followed the same methodology outlined in Section 6.11.

7.10.4 Desktop Assessment Results

Avian SAR identified during desktop review include evening grosbeak (*Coccothraustes vespertinus*), grey-cheeked thrush (*Catharus minimus minimus*), olive-sided flycatcher (*Contopus Cooperi*), red crossbill (*Loxia curvirostra percna*), and rusty blackbird (*Euphagus carolinus*).

Key findings from the desktop review within the avian baseline (Appendix M.1) include:

- ACCDC: identified 10 avian SOCC and three avian SAR within a 5 km radius of the PA. The SAR identified were Newfoundland grey-cheeked thrush (*Catharus minimus minimus*), olive-sided flycatcher, and rusty blackbird.
- eBird: olive-sided flycatcher was identified within or near the IPA.

The avian baseline report (Appendix M.1) can be referred to for detailed desktop results, with more information and details on the findings listed above.

7.10.5 Field Assessment Methodology

Breeding bird surveys were conducted within or near the IPA during the 2024 season (Drawing 6.11-1, Appendix A), which aligned with CWS and EIS guidelines (NLECCC, 2025). The avian field baseline report (Appendix M.1) can be referred to for detailed methodology and survey locations for each survey type.

7.10.6 Field Assessment Results

In total, 40 individuals representing 20 species were observed within the IPA. There were no avian SAR or SOCC observed within or near the IPA during field surveys.

Survey locations and results are summarized by survey type in Table 7.10.1 below. The avian baseline report (Appendix M.1) can be referred to for full detailed field results.

Table 7.10.1: Summary of Solar and Industrial Facility Component Results

Section	Summary
Desktop Review	
ACCDC Results	One SAR species was identified to potentially occur in the IPA: olive-sided flycatcher.
eBird Results	One SOCC was identified in the proximity of the PA: great blue heron (<i>Ardea Herodias</i> , S2B, SUM).
Field Surveys	
Breeding Bird Surveys	Two point counts were surveyed at each site identifying 40 birds representing 20 different species. No SAR or SOCC were observed.

7.10.7 Effects Assessment

Project activities, primarily those that involve earth moving or vegetation removal, or interactions with avifauna in the airspace have the potential to impact avifauna (Table 7.10.2). These activities could result in habitat removal, edge effects, reductions in food availability, and direct avifauna-infrastructure interactions. Other Project related activities, including during construction and operation, may increase risk of mortality and injury, as well as impact avifauna behaviours, such as sensory disturbances resulting from increased traffic, light, and noise.

Table 7.10.2: Potential Project-Avifauna Interactions – Industrial Facility

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works	X
Access Road Upgrading and Construction	X
Water Pipeline Construction	X
Facility Civil Works	X

Project Phase	Potential for Interaction
Transportations of Facility Components	X
Equipment Installation	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance (33 years)	
Facility Operations and Maintenance	X
Site Management	
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

7.10.7.1 Assessment Boundaries

Administrative Boundary

This VC has no identified administrative boundaries.

Technical Boundary

Prediction of habitat availability within the IPA was limited by the accuracy of GIS models developed to support this effects assessment. Several models were designed to understand the potential impacts of the Project on the landscape and to avifauna. This includes an Ecological Land Classification (ELC) model that was developed using aerial imagery, airborne LiDAR data, and land cover data for the IPA. The ELC model was used as the basis of all other additional habitat models developed for the effects assessment, and as a result cannot predict the potential habitat outside of the IPA within the LSA. This reduces the ability of this assessment to compare available habitat within the IPA to the surrounding LSA.

In addition, technical boundaries include constraints associated with the available provincial data including the accuracy of the NL FAL - Land cover layer, thus impacting predictions of potential habitat for avifauna.

Spatial Boundary

For the purposes of this assessment, the IPA and an LSA will be assessed together for avifauna, which includes the IPA and the airspace that is directly surrounding the infrastructure, as well as a 2 km buffer (Drawing 7.10-1). The LSA was selected based on the maximum expected indirect effects, the size of the IPA compared to the WPA, and is consistent with the other terrestrial effects sections.

Temporal Boundary

Temporal boundaries include the time periods of each Project phase: Site Preparation and Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Rehabilitation (2 years).

7.10.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for avifauna. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable loss of sensitive avifauna habitat and no impacts to birds (i.e., no sensory disturbance to birds or loss/injury of individuals) are expected.
- Low: Low loss of sensitive avifauna habitat and/or direct impacts to birds are expected to be low.
- Moderate: Moderate loss of sensitive avifauna habitat and/or moderate impacts to birds on an individual level rather than population level.
- High: High loss of sensitive avifauna habitat and/or high impact to birds (i.e., loss of individuals at a scale which may cause population level impacts).

7.10.7.3 Effects

Potential environmental effects and associated pathways of the Industrial Project Component in relation to avifauna are grouped into three major categories:

- Direct Loss of Suitable Habitats
- Alteration of Suitable Habitats Through Landscape Fragmentation and Edge Effects
- Loss of Rare avifauna

Project related effects can influence avifauna directly and indirectly. A direct effect is defined by interactions that have no intermediate process (e.g., loss of an individual bird, loss of suitable habitat that supports an avian SAR) and indirect effects are interactions that have intermediate processes such as landscape fragmentation and edge effects.

Avian SAR Potential Habitat Modelling – Methodology

Potential avian SAR habitat modelling was completed to calculate the impact to potential habitat for the five avian SAR that were identified through desktop review and observed during field assessments and/or acoustic monitoring. The avian SAR included for the potential habitat modelling included evening grosbeak, Newfoundland grey-cheeked thrush, olive-sided flycatcher, red crossbill, and rusty blackbird.

The potential habitat modelling is based on habitat descriptions within federal and provincial government recovery strategies and management plans. It is also important to note that potential habitat modelling may include overestimation based on limits and constraints regarding GIS data and aerial imagery, which will be described in further detail in the methods below (e.g., outdated data, lack of data).

Evening grosbeak: The FRI dataset was used where the species matched trembling aspen for nesting habitat. Softwood forest classification from the ELC was included as well to capture spruce-fir woodland. The ECCC management plan for evening grosbeak was used as a habitat reference for evening grosbeak (ECCC, 2022a).

Grey-cheeked thrush: To account for boreal forest, inland or coastal in shrubby areas, the ELC Shrub class was used which captures some shrubby understory or thickets and regenerating clear-cuts with shrub regrowth. This class is also limited to 3 m height. Softwood Forest classification from the ELC was included as well. The COSEWIC assessment and status report was used as a habitat reference for grey-cheeked thrush (Environment and Climate Change Canada, 2024).

Olive-sided flycatcher: Mainly associated with wet areas, wetlands, and vegetation supported by such ecosystems. All ELC classes that represent a high-water table, supporting a high abundance of aerial insects, respective vegetation was included (e.g., Bog and Raised Wet Area). To account for open to semi-open areas within forested regions, the Barren and Herbaceous/Shrub Barren ELC classes were included. This captured recent clearcut areas as well. The ECCC recovery strategy was used as a habitat reference for olive-sided flycatcher (COSEWIC, 2016).

Red crossbill: A mature softwood forest layer was created to include all softwood species such as spruce, fir, and pine that produce cone crops. The Softwood ELC class was clipped to a “mature” layer created from the FRI data by filtering based on an Age Code of 4 -7 (e.g., ages 60 - 121 +). The ECCC recovery strategy (ECCC, 2009) and action plan (Canada, 2011) were both used as a habitat reference for red crossbill.

Rusty blackbird: Softwood Forest data was isolated from the ELC. To acquire fir and all spruce near water bodies or wetlands, hydrological modelling was used to predict wet areas. This was crossed with the softwood forest. This captures wet areas containing softwood and would also include potential softwood dominated treed swamps. The ECCC management plan for rusty blackbird was used as a habitat reference for rusty blackbird (ECCC, 2015b).

To further understand how different habitat criteria are influencing overall habitat for the SAR species (listed above) in the IPA, the occurrence of specific habitat criteria and connectivity relationships between all relevant habitat criteria was examined (e.g., forest cover and ELC).

The analysis is based on point density calculations, which involve generating a series of regularly spaced points across the IPA in each input layer. At each point, the density of suitable habitat in the surrounding area of 50 m is calculated. This allowed for the identification of patterns of habitat availability and how areas with more criteria being met are clustered, which in turn helps infer the strength of connectivity between habitat patches. Different criteria and their density are assumed to limit habitat suitability (Schroeder, 1983).

To ensure consistency and to reduce variability introduced by irregularities in the ELC data such as classification artifacts or inconsistencies, a fixed sampling interval of 10 m was used. This helps smooth out spatial noise and avoid over-interpreting fine-scale inconsistencies in the ELC dataset.

In short, the fixed interval approach provides a cleaner, more consistent representation of

habitat connectivity by avoiding distortions caused by small-scale noise or overly detailed classifications in the source data.

The range of densities produced are reclassified to a scale of 0 – 100 based on equal intervals for a habitat suitability index. A reclassified map showing only a few classes may be more honest about its actual informative content (Hirzel et al., 2006). Following literature review (Muhammed et al., 2022), habitat is considered excellent if the classification is above 0.8 for most land cover types used in the analysis. Thresholds of 0.6 to 0.8 were adopted to show connectivity and “fair” habitat and greater than 0.8 for “suitable” habitat.

Potential avian SAR habitat modelling results will be referred to throughout the effects assessment.

Habitat Loss

The LSA supports various life stages for migratory birds due to the wide range of habitats present (e.g., various wetland types, watercourses, forested areas, and open habitat (e.g., barren, shrubland, bog), as confirmed through desktop review and baseline field observations. The majority of the IPA consists of barren, shrubland, and wetland (i.e., bog) habitats based on the habitat and land cover modelling completed in the vegetation and wetlands baseline reporting. Refer to Appendix I.1 for habitat/land cover areas in hectares.

Coastal habitats are found on the eastern side of the IPA (Drawing 7.10-1). The coastline of Newfoundland is known as a fly-way during migration and it is evident that birds use the various habitats found along the coastline as well as inland for various needs (i.e., foraging, migratory stop-overs).

There is historical disturbance within the IPA from human exploration (e.g., natural resources) and forestry activity, which includes cleared areas in various stages of regeneration.

The IPA is 1157 ha and the total PF for the Industrial Facility component is 214 ha (Drawing 7.10-1, Appendix A), equating to 18% of the IPA. Based on the ELC vegetation communities as previously described, the highest impact based on the PF within the IPA will be to shrub habitat (i.e., 28 ha, equating to 13%) and bog habitat (i.e., 46 ha, equating to 22%). Refer to the Vegetation and Wetlands baseline reporting (Appendix I.1) for further details.

Clear-cutting, grubbing, and industrial development can result in substantial habitat loss for forest and wetland-dependent avian species (e.g., olive-sided flycatcher and rusty blackbird, modelled habitat will be provided in the next section), as well as to disrupt individuals and their migratory and breeding behaviours. A total of 146 ha of wetland area was identified within the IPA, which represents 27% of the amount within the LSA (Section 7.8).

Impacts to Avian SAR Modelled Habitat

Potential avian SAR habitat present within the IPA and impacted by the PF are shown in Table 7.10.3. The percent of impacted potential habitat per species from highest to lowest is as

follows: rusty blackbird (Drawing 7.10-2, Appendix A), olive-sided flycatcher (Drawing 7.10-3, Appendix A), grey-cheeked thrush (Drawing 7.10-4, Appendix A), red crossbill (7.10-5, Appendix A), and evening grosbeak (Drawing 7.10-6, Appendix A). The majority of the IPA represents bog, barren, and open water wetland and pond-type habitat, which may have equated to the higher percentages for rusty blackbird and olive-sided flycatcher since both species frequent wetland and edge habitat. Grey-cheeked thrush also had a higher percentage, likely due to the presence of tall shrubby habitat.

Table 7.10.3: Avian SAR Potential Habitat – IPA and PF

Avian SAR	IPA (ha)			IPA PF (ha)			% Total Habitat Impacted
	Suitable Habitat	Fair Habitat	Total	Suitable Habitat	Fair Habitat	Total	
Grey-cheeked Thrush	22	108	130	4	24	28	22%
Red Crossbill	7	11	18	0.01	0.5	0.5	3%
Evening Grosbeak	7	20	27	0	0.2	0.2	1%
Olive-sided Flycatcher	58	154	212	7	41	48	22%
Rusty Blackbird	6	47	53	2	20	22	42%

*IPA = 1157 ha, PF = 228 ha.

The proposed PF within the IPA will impact a variety of avian SAR habitat due to the presence of wetlands, particularly the open water pond and wetland habitat for rusty blackbird.

Although a decrease in suitable habitat for these SAR is anticipated from the PF, avian SAR potential habitat modelling results indicate that there is likely sufficient suitable habitat surrounding the PF to maintain habitat functionality and use within the larger PA and LSA. If alternative suitable habitats are unoccupied, the affected species may choose those alternate habitat areas in lieu of the cleared area. However, this may increase competition for territory, nesting areas, and foraging for the affected species in the LSA (Chen & Wang, 2024). In addition to increased competition, habitat loss could alter migration patterns via reduction of stopover areas and negatively affect food availability and abundance (Chen & Wang, 2024).

Habitat Alteration

The continuity of intact habitats will be affected through construction of the Project. Habitat fragmentation is used to describe this disruption and is assessed herein through evaluation of changes land cover and associated edge effects.

The Industrial Facility will create open spaces and edges within the forested environment, which may benefit certain bird species that favour edge or transitional habitats. These changes could potentially create favorable microhabitats, particularly for generalist bird species or those that readily adapt to disturbed environments. The construction of the Industrial Facility and new roads may create additional suitable breeding habitat for common nighthawks (COSEWIC, 2018), although nightjars are not common in the northern parts of Newfoundland.

Undisturbed avian habitats present within the LSA are not unique and are extensively present within the surrounding LSA. It is expected that any birds using habitat that will be disturbed by Project activities will move to similar habitats within and adjacent to the PF and IPA area. This supports the conclusion that loss of habitat will not be significant, although habitat types will differ from baseline conditions until the site is restored based on reclamation plans for the IPA.

Edge Effect

Edge effect refers to the changes in environmental conditions and biodiversity that occur along the boundary between two different habitats. These changes can affect bird abundance, species composition, and nesting success (e.g., nest predation and parasitism). For example, edges may alter physical conditions like light, temperature (e.g., higher wind and sun exposure), and wind, which in turn influences vegetation structure and food availability, potentially impacting bird communities (Andrén, 1994).

To model edge effect, a 100 m buffer was applied to the PF (Drawing 7.10-7, Appendix A). The 100 m buffer was chosen as a minimum zone of influence based on literature on the impacts of forestry on bird communities in adjacent forest (Brazner et al., 2024), recognizing that edge effect is quite variable from one species to the next, even in terms of nature of adverse effect (i.e., positive vs. negative).

Although new edge effect will be created by the Project, the LSA has historic disturbance due to forestry, which includes existing roads. It is expected that birds that will be disturbed by Project activities will move to similar habitats within and adjacent to the PF and LSA while birds that are adaptable to edge habitat may not be impacted as much. Overall, undisturbed avian habitats within the IPA are not unique and are extensively present within the surrounding landscape of the LSA. Although there will be habitat loss as a result of the Project, habitat functionality across the LSA is expected to remain intact.

Habitat loss and subsequent fragmentation within the IPA is anticipated to be moderate due to the high level of disturbed habitat existing within the PF area (i.e., historical forestry activity). Most of the IPA already represents edge habitat based on the presence of shrub, barren, bog, and open water wetland habitats. As part of mitigation measures associated with habitat loss, a site reclamation plan will be developed in consultation with NLECCC and NL FAL, which will limit the effects of fragmentation upon Project decommissioning.

Avifauna-Project Infrastructure Interactions – Injury and Mortality Risk

Bird injuries and mortalities are a primary concern when considering the interactions of avifauna with the Project, including potential interactions with infrastructure (i.e., the flare, hot pipes, and buildings), construction equipment, vehicles, as well as potential for fuel and gas leaks and exposure to toxic or hazardous materials/chemicals (i.e., gas and liquids in pipelines and storage tanks).

Indirect mortality, injury, or sublethal effects may result from avian interactions with stormwater

and wastewater ponds if poorly managed or if mitigation measures are not in place (Beck et al., 2015; Wren et al., 1997). Birds can mistake wastewater and stormwater ponds as their natural habitat (Meeker, 2023), particularly waterfowl and shorebirds. If these ponds are not properly managed, birds may subsequently expose themselves to contaminants (e.g., metals, petroleum products; Beck et al., 2015; Wren et al., 1997). Furthermore, such ponds may create an environment which increases invertebrate abundance and may attract avifauna to forage. Birds selecting to nest in poorly managed man-made ponds are at greatest risk of exposing eggs and young to contaminants (Thongcharoen et al., 2018). Although poorly managed stormwater and wastewater ponds present a risk to avifauna; proper management and mitigation measures (e.g., bird deterrents) should reduce this risk (Riley et al., 2012).

Direct and indirect mortality could result from short or long-term exposure to varying levels of contaminants from accidental spills and leaks from industrial equipment during the construction phase or from the facility during operations. Accidents could include equipment fuel or lubricant leaks and oil and gas spills. Risks from these situations can be reduced with the implementation of well-established environmental standards and mitigation measures for construction projects and equipment, as well as a spill response plan.

There is potential that Project infrastructure may attract certain species for nesting. Barn swallows often construct nests in anthropogenic structures such as buildings and under bridges, and bank swallows may nest along soil stockpiles with steep slopes. Generalist bird species such as doves, crows, and ravens may nest on structures and equipment not being used. The changes in the overall landscape and habitat can result in changes in wildlife patterns and increased risk in mortality.

An increase in road traffic associated with the Industrial Facility will potentially increase the chances of mortality to avifauna species that use roadways, especially grouse species and similar species, as they are known to use roadways for travel and nesting (Madden & Perkins, 2017; Whitaker et al., 2010). Construction and increased road traffic particularly pose a risk to nests and unfledged nestlings. Considering the pre-existing traffic load in the LSA, along with road traffic mitigations (e.g., speed limits and signage) during Project operations, road traffic is expected to have a negligible or low effect on avifauna in the IPA.

Avifauna may also be impacted by three flare stacks that will be constructed within the IPA (two at the facility and one at the jetty). Interactions with the flare stacks are a primary concern due to the flame and super-heated gas emissions that are intermittently released. This is particularly a concern when the flare stacks will be active at night during the spring and fall migration seasons, as well as during periods of high winds and/or low ceiling cover which forces birds to fly at lower altitudes. The flame and emissions will be released from the top, which could pose a lethal risk to birds if they fly too close to the flare stack. The two flare stacks in the facility PF are approximately 50 m tall and one is located at the port along the coast (i.e., flare stack locations are shown in Drawing 7.1-1, Appendix A).

Flare stacks are known to cause avian mortality and injury (Avery, 1979; ECCC, 2015a; W. P.

Erickson et al., 2005; Riley et al., 2012). Birds can be impacted by directly flying into the stack or the flare and associated exhaust can cause injuries or mortalities. The main concern would be if birds perch or fly close to the flare stack (Keeping Company with Kestrels, Inc. & EDM International, Inc., 2013).

Exhaust emissions, rather than collisions or flame incineration, were thought to be the primary cause of death of 3,000 migratory birds at an oil industry site in Alberta (Bjorge, 1987). Observed edema and pulmonary congestions in the birds' suggested emissions as the probable cause of injury and mortality. The incident occurred during cloud cover, fog, rain, and cold temperatures. Another avian mortality event occurred at the Canaport LNG facility in Saint John New Brunswick on September 13 and 14, 2013 from a flare stack which was burning natural gas. More than 7,500 fatalities were attributed to direct and indirect impacts from the burning gas emitting from the flare stack. Deaths of 26 species of migratory birds were recorded including Canada warblers (ECCC, 2015a). A custom fitted spike collar may deter birds from perching on the stack (Keeping Company with Kestrels, Inc. & EDM International, Inc., 2013). In addition, removing suitable perching areas – such as trees and poles – within a 120 m radius, and avoiding placing the stack between perching areas, may reduce the impacts of collisions and emission impacts. Adding lighting such as strobe lights on the stacks that blink briefly could reduce avian mortality from collisions with the stacks (Avery, 1979).

During a study on the behaviour of night migrating birds during gas flaring in Alaska, the general flight behaviour of birds differed during flaring and non-flaring periods. Higher percentages of birds exhibited directional (or straight line) flight behaviour during non-flaring periods. In comparison, higher percentages of birds exhibited erratic and circling flight behaviours during the gas flaring periods (Day et al., 2015). This erratic and circling behaviour is consistent with the attraction and disorienting behaviour relating to light disturbance as described in sections above.

Sensory Disturbance

Construction and operational activities for the Project, including lighting, noise, and increased traffic, have the potential to disturb bird species within the IPA and LSA. Sensory disturbance may occur during all Project phases. Temporary sensory disturbance is expected during construction, and limited disturbance is expected through operations (i.e., consistent and sporadic noise and lighting generated by traffic and facility operations).

Noise

Increased vehicle traffic along access roads and construction sites adds another disturbance factor. The movement of vehicles could lead to short-term displacement of birds, particularly ground-nesting or low-flying species within proximity to access routes. Traffic disturbance can be particularly stressful for species with established territories within the area, potentially prompting them to abandon nests or avoid otherwise suitable habitat. These disturbances may also cause localized changes in bird distribution and behaviour during the active phases of the Project.

Noise from heavy machinery and equipment can disrupt normal behaviours such as foraging, breeding, and resting, especially for sensitive species documented during breeding bird surveys. The sounds associated with construction, while temporary, may lead some birds to avoid areas near active construction zones, possibly altering their habitat use patterns during critical breeding or migration periods (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon, Crooks, et al., 2016). A literature review conducted by Shannon et al. (2016) found that birds have the potential to exhibit changes in song characteristics, reproduction, abundance, stress levels, and species richness at levels greater than 45 dBA. Sensory disturbance from noise levels associated with construction activities during the avian breeding season could result in abandonment of nests. If adjacent suitable habitat is not available, birds that have been displaced are not likely to nest until habitat becomes available which may result in a higher non-breeding population.

Effects to avifauna regarding noise, with the mitigations described Section 7.10.8, are expected to be low in magnitude.

Light

Lighting used during construction and operations may cause disorientation, attraction, and avoidance (Longcore & Rich, 2004). Attraction and disorientation may lead to interactions with infrastructure or waterbird strandings on land. Research has demonstrated that birds attracted to or congregating around lights often become disorientated and lose their sense of direction, ultimately disrupting migration (Adams et al., 2021). As described in the previous section, this may be a concern due to coastal proximity.

Light sources for the Industrial Facility will be inland lighting used during construction, particularly if activities extend into early morning or late evening hours, could also impact birds within the vicinity. Artificial lighting may disorient nocturnally active birds, increasing the likelihood of attracting them closer to construction areas. For species sensitive to light, especially migratory and nocturnal species, this could temporarily alter natural behaviours or increase the risk of collisions with equipment or structures (Longcore & Rich, 2004). Disoriented migratory birds are prone to circling light sources, which increases the potential for death by exhaustion or predation when forced to land in high-risk areas (Poot et al., 2008). In turn, these behavioural changes can affect the success of foraging, reproduction, and communication and can disrupt habitat connectivity through anthropogenic development (Bliss-Ketchum et al., 2016; Longcore & Rich, 2004).

Upon completion of construction and throughout the lifespan of the Project, the lighting on-site will be minimized, and mitigation measures will be applied to limit the effects of lighting on birds (i.e., motion-activated lighting, shielding, intermittent lighting/LEDs, etc.). Based on this, effects to avifauna regarding light are expected to be low in magnitude.

7.10.8 Mitigation

Mitigation and monitoring measures will be considered to minimize the effects on avifauna, including adhering to the *MBCA*, *SARA*, and the *Newfoundland Wildlife Act*.

Adaptive management of potential effects will be addressed through the development and implementation of an Avifauna Management Plan, which will include mitigation and monitoring for avian species. Other plans will also be created, which also fall under avifauna mitigation and monitoring measures: Wildlife Emergency Response Plan, Waste Management Plan, and Hazardous Materials Response and Training Plan.

Mitigations to reduce effects on avifauna include:

Habitat Loss and Fragmentation

- Adhere to ECCC guidelines on clearing windows for nesting migratory birds, where possible. Due to seasonal variability regarding conditions, if vegetation and tree clearing activities during the nesting/breeding season cannot be avoided, nests observed will be marked and avoided by appropriate buffers
 - Regulatory bodies will be contacted to receive advice on construction buffers for any nesting or confirmed breeding activity that must be avoided during the nesting season.
 - When vegetation and tree clearing activities take place during the non-nesting season, crew must be aware of nests protected year-round under the 2022 update to the Migratory Bird Regulations (under the *MBCA*).
- Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities during construction and operation phases.
- Limiting and managing exposed sedimentation banks, if applicable, to reduce the attraction of burrow-nesters such as bank swallows (e.g., maintain at least a 70 degree-slope), as per Environment and Climate Change Canada (ECCC) best management practices and recommendations.
- Develop a site reclamation plan in accordance with engineering standards and in consultation with NLECCC and NL FAL.

Sensory Disturbance

- Establish and implement speed limits to minimize dust and potential collisions.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Use noise controls (e.g., mufflers) on machinery and equipment to limit disturbance.
- Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Incorporate a lighting plan for construction-related activities into the EPP.
- Limit unnecessary lighting as much as possible, especially at night.
- Follow Transport Canada requirements for navigational hazard markings and lighting

on transmission lines, including the installation of strobe or intermittent/flashing lighting.

Mortality and Injury Risk

- Monitor for bird injuries and fatalities frequently within the IPA. ECCC-CWS will be notified within the event of the mortality or. Under the MBR, a scientific permit is required to possess or handle any stranded, injured, or dead migratory bird. Any birds found injured that may require transport to on-land facilities must also be reported. Record will be kept of such incidents.

Mitigations, specific to the Industrial Facility, to reduce effects on avifauna include:

- Obstruction lighting marking the flare stacks will use lights with short flash durations and the ability to emit no light during the “off-phase” of the flash (i.e., LED lights), with the minimum number of flashes per minute and the briefest flash duration allowable, as recommended by CWS.
- Equip the flare stacks with a custom-fitted spike collar to deter birds from perching on the stacks.
- Eliminate suitable perching areas within a 120 m radius of the flare stacks.
- Where feasible, tinted or frosted glass windows will be used in buildings to reduce bird mortality from collisions.
- Perform routine checks for bird injuries and fatalities especially when the flare stacks are in operation during nights in peak spring and fall migration periods (i.e., April to May, and mid-August to October).

7.10.9 Monitoring

A site-specific post-construction Avifauna Management Plan will be developed in consultation with government regulators and all other relevant parties. The management plan will inform monitoring activities that will take place to ensure continued protection of avifauna within the IPA. The Avifauna Management Plan will be created in consultation with NL FAL and CWS which will include mitigation measures, monitoring, and adaptive management frameworks for minimizing impacts to avifauna (Appendix Q.1). The legislation and guidelines described in the regulatory context section, as well as the EIS guidelines (NLECCC, 2025), will be referenced in the development of this management plan.

Adaptive management options will be considered if continuous incidents occur and/or a concerning number of avian injuries or deaths are observed.

7.10.10 Conclusion

While effects to avifauna species differ, the effects considered to be of concern include habitat loss, sensory disruption, and potential avifauna-infrastructure interactions. Based on this assessment and through the implementation of proposed mitigation and monitoring activities, effects to avifauna are expected to be of low magnitude, as loss of habitat may occur, the habitat loss is reversible and overall impact to bird populations and behaviours is expected to be low.

Taking the above characterizations into consideration for the Project, the residual effects are considered not significant (Table 7.10.4).

Table 7.10.4: Avifauna Residual Effects – Industrial Facility

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Habitat Loss and Fragmentation / Edge Effect	Limit habitat disturbance and minimize Project Footprint during detailed design where possible Restoration and reclamation plans	A May be some positive effect for species that forage in disturbed habitats (e.g., raptors and aerial insectivores)	M VC interaction causes direct loss of habitat and creates an edge effect for birds	IPA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	SE	R	Not Significant
Mortality and Injury Risk	Mitigation and monitoring measures surrounding infrastructure operation (e.g., flare stack deterrents), Project traffic, and nesting season	A	L VC interaction has potential to cause mortality and injury due to collisions with Project infrastructure and interactions with workers and traffic	IPA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	I May vary based on seasonal differences (e.g., breeding vs migration), as well as Project phase	R	Not Significant

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Sensory Disturbance	Mitigation and monitoring measures surrounding noise and light	A	L VC interaction has potential to cause sensory disturbance to birds, which may impact behaviour and distribution, as well as increased risk for collisions with Project infrastructure	LSA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	C	R	Not Significant
LEGEND (Refer to Section 5.0 for Definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

8.0 SOLAR PROJECT EFFECTS ASSESSMENT

8.1 Project Description

8.1.1 Geographic Location

8.1.1.1 *Siting Locations*

The Solar Project will be constructed on 242 ha of land south of the Industrial Facility and west of Peters Pond (Drawing 8.1-1, Appendix A). Access to the Solar Project will be via a proposed main access point off Hwy 350 that is shared with other Project components, and proceeding approximately 1.2 km along an existing, unpaved road to the Solar Project Area (SPA). A 5 m setback from the boundaries of the SPA and a 30 m setback from the access road have been applied to define the usable areas for PV installation.

A PF was established within the SPA which included the area of direct physical disturbance. The Solar Project footprint includes sufficient area for transportation and electrical connections, laydown areas, and facilities area (control building, warehouse and/or parts storage etc.). Additional elements, such as drainage, may need to be added during the detailed design phase. EVREC has applied for additional Crown land parcels to support the Solar Project.

8.1.2 Physical Components

8.1.2.1 *Solar Array*

EVREC is planning the installation of a 150 MW solar array and a collector substation, collectively, the Solar Project (Drawing 8.1-1, Appendix A). The Solar Project will be used to support the critical operating loads of and charge batteries at the Industrial Facility. By providing an alternative means of power production to supplement low wind production periods, the Solar Project will reduce the total battery storage facility size required and will provide sustainable power for critical electrical loads at the Industrial Facility.

The Solar Project will consist of a 150 MW (DC), fixed-tilt PV array with n-type TOPCon modules, and is based on the use of modern, utility-scale PV modules in the ~650 W class. On this basis, a 150 MW installation would require approximately 230,000 modules. Should commercially available module power ratings increase prior to procurement, the total number of modules required may be reduced accordingly.

Arrays will be mounted on racking system tables using two modules in portrait (2P) with a south facing zero degree azimuth and 20 degree tilt from horizontal, with each table supporting approximately 60 modules in this configuration (illustrative assumption). This results in an estimated ~4,000 racking system tables distributed across the SPA. Modules will be electrically connected in series, with DC strings routed to the end of each array block and collected at the corresponding central inverter station. Final table dimensions, module counts per table, and overall quantities will be confirmed during detailed engineering once the final module selection and electrical design are established.

The Solar Project is currently designed with 34 PV array blocks, each served by a dedicated central inverter station. The final number of central inverter stations may change subject to the availability of higher-capacity central inverter stations at the time of construction. The central inverter stations will be skid-mounted and containerized in 40 ft enclosures, typically located at the edge of each PV block to minimize DC cable lengths and to facilitate maintenance access via internal service roads. Each central inverter station will include:

- (i) Central inverter units
- (ii) DC input cabinets/combiner interfaces
- (iii) AC switchgear and isolation equipment
- (iv) Protection devices and surge protection devices
- (v) Communications and SCADA interface equipment
- (vi) A dedicated 34.5 kV medium-voltage (MV) transformer

Central inverter stations will be installed on engineered foundations, typically concrete pads over compacted granular bases, with adequate lateral clearances and appropriate height to ensure safe operation, maintenance, and equipment replacement (e.g., clearances are appropriate for access to the equipment and allows for safe working at height during switching operations).

8.1.2.2 Electrical Collection System

Interconnecting DC cables (strings) between PV modules will be routed above ground along the racking system beneath the modules, meeting at string combiner boxes. DC cabling connecting the combiner boxes to central inverter stations will be installed either:

- Mounted on array racking systems where practical
- Buried in trenches approximately 1.0–1.25 m deep, within PVC conduits

Medium-voltage (34.5 kV) cables will connect the central inverter stations to the Solar Project collection substation, and will be buried in approximately 1.0 m to 1.25 m-deep trenches, and protected by PVC conduit. The routing is intended to be via trenching adjacent to internal access tracks, and appropriate spacing has been allowed for within the design to accommodate the number of circuits required for the electrical characteristics of the design. Detailed design of the trenching and routing will be refined during the detailed design phase.

8.1.2.3 Collection Substation and Auxiliary Facilities

The Solar Project collection substation will be located in the northeastern edge of the SPA. This area will accommodate:

- The enclosed MV collection substation (conservatively approximately 20 m × 5 m)
- A control, monitoring, and office building
- A dedicated storage building/warehouse

The total footprint of this facilities area is expected to be approximately 1 ha. All buildings will

be prefabricated structures installed on concrete pads with compacted granular foundations. HV and LV areas are expected to be segregated by design within the prefabricated structure.

8.1.2.4 Project Substation Connection to Industrial Facility

An overhead MV line will be installed above ground on wooden/metal poles to connect the Solar Project to the main Project substation located in the Industrial Park. This approximately 3 km run will comprise three parallel MV feeders, north-northeast from the northernmost point of the Solar Project, generally following the western side of the indicated main access roads with appropriate setbacks. Final routing is to be refined during detailed design. Key design parameters include:

- Pole spacing of approximately 60 m
- Lateral spacing of approximately 10 m between each feeder
- An overall required ROW of approximately 40 m

The SPA will have a perimeter road and maintenance pathways, and a chain link security fence along the perimeter of the site. Segregation of HV areas through enclosed infrastructure and additional fencing will provide extra safety precautions and allow for access management.

8.1.3 Project Development

Solar Project development will take place in four phases, pre-construction, construction, operations and maintenance, and decommissioning (Table 8.1.1). Each phase is discussed in greater detail below.

Table 8.1.1: Activities by Solar Project Component and Phase

Component	Details
Pre-Construction (Post EA Approval)	
General	• Pre-Disturbance Site Assessment (PDSA) • Geotechnical • Final facility design • Development and building permits • Regulatory permitting as required • Notification of residents/landowners of construction commencement • Construction equipment delivery
Construction	
Site Preparation and Civil Works	• Stripping and clearing of soils as necessary and limited to placement of equipment such as inverter/transformation stations, switchgear, and step-up transformers • Construction of access roads • Construction of storage yards • Construction of temporary workspace • Construction of perimeter fence • Installation of erosion and sediment control structures • Installation of piling for solar panel racking systems

Component	Details
	- Engineered concrete foundations for central inverter stations, MV power transformers, and associated switch gear as necessary - Reclamation of surplus soils - Grading of site where required
PV Arrays	- Solar panel and racking system delivery - Installation of solar racking systems to installed piles - Installation of solar panels on racking systems
DC Collection and Central Inverter Stations	- Delivery of DC equipment and prefabricated structures - Connection of multiple modules in series via DC strings - Installation of prefabricated central inverter stations on engineered foundations - Connection of DC strings to Central Inverter Stations
Underground MV Collection Systems	- Delivery and handling of MV electrical components - Trenching for underground MV electrical collector system - Installation of underground MV collector lines
Solar Project Collection Substation and Control Facilities	- Delivery of equipment - Installation of equipment foundations and station electrical ground grid - Installation of equipment support structures - Installation of metering equipment, switch gear, protection and control systems, control building, conduits, wiring, and terminations - System commissioning and testing
Overhead MV Feeder System	- Installation of utility poles - Stringing of conductors - Installation of electrical hardware and protective devices - Connection to Solar Project substation and Project main substation
Operations and Maintenance	
Operations and Remote Monitoring	24/7 monitoring via SCADA operated by trained personnel - Real-time oversight of all electrical production and transmissions systems - Alarm-based system triggered by a variety of anomalous conditions
Environmental Monitoring	Post-construction mortality monitoring
Routine Maintenance, Inspections, and Component Replacement	- Solar panel maintenance - Equipment repair and testing - Control House maintenance
Ongoing Road, Access, and Vegetation Management	- Road maintenance - Vegetation control among arrays and under overhead transmission systems - Re-seeding of temporarily disturbed soils
Decommissioning	
Solar Project Decommissioning	- De-energizing facility - Disassembly and removal of Solar Project components

Component	Details
	- Abandonment of underground components if removal would cause greater damage than leaving in place - Recycling of components where feasible
Site Rehabilitation and Post-Decommissioning Monitoring	- Removal of perimeter fence and other fencing - Re-contouring of soil - Reclamation of surface soils - Re-seeding or re-planting - Reclamation monitoring

Following the completion of pre-construction studies, surveys, and design, Project development, operation, and decommissioning will take place according to the timeline presented in Table 8.1.2. The work involved within each phase is discussed in greater detail in Sections 8.1.3.1 to 8.1.3.3.

Table 8.1.2: Solar Project Timeline

Phase	Stages	Timeline
Construction	- Site preparation and civil works - PV array installation - DC collection strings and central inverter station installation - Underground MV collection system installation - Solar Project collection substation construction - Overhead MV feeder lines to main Project substation	April 2028 to March 2029 (11 months)
Operation	- Operations and remote monitoring - Routine maintenance, inspections, and component replacement - Ongoing road, access, and vegetation management	March 2029 to 2062 (33 years)
Decommissioning	- Solar Project decommissioning - Site rehabilitation and post-decommissioning monitoring	2062 to 2063 (12 months)

8.1.3.1 Construction

Site Preparation and Civil Works

Site preparation activities will include selective tree removal, vegetation clearing (grubbing), grading, and potential infilling within the defined SPA to accommodate PV array installation, and all associated infrastructure. Clearing will be limited to the minimum area required for safe construction and long-term Project operation.

All vegetation within the SPA that could cast shade on PV arrays will be removed during site preparation. Clearing activities will be conducted in accordance with applicable environmental permits and will incorporate erosion and sediment control measures to protect adjacent lands and downstream receptors.

Potential watercourses were identified through modelling within the SPA and field verified

where there was the potential for overlap between streams and the PF. No model-predicted watercourses were found to overlap with the PF.

Grading and infilling will be limited to localized leveling required for racking system installation, inverter foundations, access roads, and drainage management. Final grades will be designed to maintain natural drainage patterns and minimize erosion potential. Water management systems will be designed to mimic natural surface water patterns, with settling ponds proposed for both the northern and southern extents of the SPA.

A network of internal access roads and maintenance pathways, approximately 3 m wide, will be constructed to provide access to PV arrays, central inverter stations, and other electrical infrastructure. Roads will typically consist of compacted subgrade with gravel surfacing and may incorporate geotextile layers for stability.

Temporary construction laydown areas and parking areas will be established within the SPA during construction and decommissioned following completion. A chain-link security fence will be installed around the perimeter of the solar facility to restrict unauthorized access.

PV Array Installation

Following site preparation, Solar Project construction will involve installation of vertical posts to support fixed-tilt racking systems for the PV modules. Foundation systems will be selected based on site-specific geotechnical conditions and may include driven steel piles, helical piles, or concrete foundations where required.

Driven-pile foundations are the preferred method where soil conditions permit, as they minimize excavation, reduce concrete use, and limit soil disturbance. Piles will be installed using global navigation satellite system-guided equipment to ensure accurate placement and to limit disturbance. Embedment depths will be determined through geotechnical investigations to account for frost depth, wind and snow loading, soil bearing capacity, and saturated conditions.

Where shallow bedrock, cobbles, or refusal conditions are encountered, alternative foundation solutions such as pre-drilling, helical piles, or cast-in-place concrete foundations may be used. These methods will be applied selectively to maintain structural integrity while minimizing additional disturbance.

Racking systems will be assembled from corrosion-protected structural members and configured in a 2P arrangement at approximately 20 degrees tilt from horizontal, south facing zero degree azimuth. Ground clearance and row spacing will be designed to reduce snow accumulation impacts, limit inter-row shading, and facilitate vegetation management and maintenance access.

PV modules will be mechanically mounted to the racking systems using engineered fastening hardware consistent with manufacturer specifications. Modules will be electrically bonded to the racking system structure to maintain a continuous grounding system across the PV field.

DC Collection Strings and Central Inverter Station Installation

Modules will be connected electrically in series to form DC strings. Cabling will be routed beneath the modules and along racking system members using cable management systems to minimize the likelihood of mechanical damage and wildlife interactions. Strings will be collected at field-mounted combiner boxes that house fusing, surge protection, and monitoring equipment.

DC cabling will be installed connecting combiner boxes to central inverter stations either above ground on racking system structures or underground in trenches, depending on routing requirements and site constraints.

Central inverter stations will be installed within prefabricated, weather-resistant enclosures mounted on engineered foundations. Each central inverter station will convert DC power to AC and step up voltage to medium voltage (approximately 34.5 kV) via an integrated transformer.

Central inverter stations will include electrical protection systems, isolation devices, grounding, and communications equipment. Locations will be selected to minimize DC cable lengths and reduce land disturbance while maintaining safe access via internal maintenance roads.

Underground MV Collection System

Medium-voltage cables connecting central inverter stations to the Solar Project substation will be installed underground. Cables will typically be installed in trenches approximately 1.0 to 1.25 m deep, within protective conduits.

Trenching activities will be conducted systematically, with segregation of topsoil and subsoil where practicable to support post-construction restoration. Bedding materials may be used to protect cable jackets, while warning tape and markers will be installed to identify buried infrastructure.

At crossings of environmentally sensitive features such as wetlands, construction will minimize disturbance where practicable. Disturbed areas, where practicable, will be stabilized and re-vegetated following installation.

Solar Project Collection Substation and Control Facilities

The Solar Project collection substation will be located at the northeastern edge of the SPA (Drawing 8.1-1, Appendix A). The substation footprint will include electrical equipment, a control and monitoring building, and a storage building, occupying approximately 1 ha.

Substation construction will include site grading, installation of an engineered gravel surface, construction of equipment foundations and establishment of a grounding grid. If the substation is enclosed, a prefabricated building will be installed on a concrete foundation, while if the substation is outdoors, it will require the erection of a substation perimeter security fence. Buildings will be prefabricated and installed on concrete foundations.

Overhead MV Feeder Lines to Main Project Substation

Electrical power will be transmitted from the Solar Project collection substation to the main Project substation at the Industrial Facility via three parallel, MV, overhead feeder lines running a distance of approximately 3 km.

Construction will involve installation of utility poles, conductor stringing, and installation of electrical hardware and protective devices. For assessment purposes, average pole spacing of approximately 60 m is assumed, with localized adjustments based on terrain and environmental constraints. The overall right-of-way width is anticipated to be approximately 40 m.

Where feasible, alignment will be selected to avoid sensitive environmental features. Temporary access and disturbed areas, where practicable, will be reclaimed following construction.

8.1.3.2 Operations and Maintenance

Operations and Remote Monitoring

The Solar Project will be operated and monitored 24 hours per day through a centralized control and maintenance building using plant control software and SCADA systems. Trained operations personnel will remotely monitor system performance, alarms, and security systems, including automated callouts for abnormal operating conditions.

Continuous remote monitoring will provide real-time oversight of PV array blocks, central inverter stations, MV feeders, and the Solar Project substation. Alarm conditions monitored will include inverter trips, underperforming strings or maximum power point trackers (MPPTs), abnormal temperatures, ground faults, communications failures, feeder or substation events, and security breaches. Remote diagnostics will be used as the first response to identify affected equipment and determine whether on-site dispatch is required. Dispatch priorities will be based on safety considerations, environmental risk (e.g., oil-containing equipment), and energy production impacts.

Routine Maintenance, Inspections, and Component Replacement

Maintenance and inspections will be conducted in accordance with manufacturer recommendations and condition-based monitoring results. Routine activities will include inspection, servicing, testing, and minor component replacement to ensure safe and reliable operation over the Project life. Routine field inspections are anticipated to align to the original equipment manufacturer requirements and include:

- Weekly to bi-weekly inspections during snow-free periods to assess access roads, fencing, gates, signage, drainage features, and visible damage, with inspections potentially less frequent during snow periods, accounting for health and safety and accessibility, whilst still maintaining minimum requirements of original equipment manufacturers and legal obligations;

- Monthly inspections of central inverter stations, MV transformers, and visible cable and conduit entry points;
- Quarterly vegetation management inspections, with corrective mowing or brush control as required to maintain access and reduce fire risk; and
- Semi-annual to annual electrical inspections, including infrared thermography of selected electrical terminations and verification of grounding continuity at representative locations.

Preventative maintenance activities are expected to include inverter air-filter changes, HVAC inspections, electrical connection torque verification, transformer oil sampling and analysis, and functional testing of protection and communication systems. Mechanical maintenance requirements for racking systems are expected to be limited and will focus on identifying loose hardware, corrosion, frost heave effects, or pile movement, typically through annual inspections and post-storm assessments.

Panel cleaning will be conducted on an as-needed basis. Natural precipitation and snow shedding typical of the regional climate are expected to provide natural cleaning to limit soiling; however, manual cleaning may be undertaken if monitoring data indicates sustained performance losses attributable to soiling. Some maintenance activities may require short-term use of cranes or specialized equipment (e.g., replacement of inverter components or transformers). These activities will be planned to minimize physical disturbance, use existing internal roadways where possible, and follow established safety and environmental protection procedures.

The Solar Project is designed for a minimum operational life of approximately 30 years. PV modules are expected to remain in service for the majority of the Project's overall life with gradual performance degradation over time. Central inverter equipment is expected to have a shorter refurbishment or replacement cycle, typically on the order of 10–15 years. MV transformers and substation equipment generally have longer service lives, subject to a suitable preventative maintenance program in line with original equipment manufacturer guidance to support ongoing condition-based maintenance (i.e., collecting suitable data on the condition of the assets in an ongoing basis to guide maintenance requirements pre-fault).

Replacement activities will be planned to isolate only the affected inverter block or feeder section, allowing the remainder of the Solar Project to continue operating. Lockout/tagout procedures and electrical safety protocols will be strictly applied during all maintenance and replacement activities.

Ongoing Road, Access, and Vegetation Management

Internal access roads and maintenance pathways will be maintained to allow safe access for routine inspections, maintenance, and emergency response. Road maintenance may include grading, the addition of gravel, and localized repairs where required.

During winter operations, snow clearing will be minimized and generally be limited to frequently

travelled access routes necessary for safe operations. Plowing, sanding, and/or salting will be undertaken only where required. Alternatively, access to infrequently travelled areas will be preferentially achieved using low-impact all-terrain vehicles not requiring snow clearing (i.e., snowmobiles or off-highway vehicles) to reduce disturbance.

Low-growing natural vegetation will be allowed to establish in non-road areas, with vegetation management conducted selectively to maintain access, prevent shading, and reduce fire risk. A Vegetation Management Plan will guide timing and methods of vegetation control based on site-specific conditions and operational needs.

8.1.3.3 Decommissioning and Rehabilitation

An Asset Retirement Obligation Plan has been developed for the Project and will be finalized prior to decommissioning (Appendix Q.7). The plan addresses the full lifecycle of Project components, including environmental, social, and land-use considerations, and incorporates design measures intended to facilitate eventual dismantling and site rehabilitation.

Solar Project Decommissioning

Decommissioning will begin with a controlled shutdown and electrical isolation of the PV field, inverter blocks, and collection substation. This will include opening and locking out MV feeders and collector circuits, and application of lockout/tagout procedures to verify de-energized conditions and ensure worker safety.

Aboveground infrastructure removal will generally proceed in a staged manner and may include:

1. Removal of PV modules from racking systems for transport to reuse or recycling facilities.
2. Removal of DC wiring, combiner equipment, and central inverter station components.
3. Removal of MV transformers and switchgears, including managing insulating fluids in accordance with applicable environmental regulations.
4. Dismantling and removal of collection substation equipment and control systems.
5. Removal of overhead MV feeder lines, poles, and associated hardware.

Materials will be segregated where practicable to maximize recycling and recovery. PV modules, steel and aluminum racking system components, copper conductors, and substation metals will be directed to appropriate recycling or recovery streams, subject to available end-of-life markets at the time of decommissioning.

Below-ground infrastructure will be removed where practicable and environmentally preferable. In some cases, underground conduits or cables may be abandoned in place if removal would cause disproportionate environmental disturbance. Such decisions will be made in accordance with regulatory requirements and site-specific conditions at the time of decommissioning, and in accordance with the associated decommissioning plan.

Site Rehabilitation and Post-Decommissioning Monitoring

Rehabilitation will include removal of perimeter fencing (unless otherwise required by landowner or lease agreements), soil decompaction where necessary, replacement of salvaged topsoil, re-establishment of natural drainage patterns, and re-seeding or re-planting with appropriate vegetation species consistent with reclamation objectives.

Post-decommissioning monitoring will be conducted to confirm vegetation establishment, erosion control effectiveness, and stability of restored drainage features. The anticipated duration of decommissioning and rehabilitation activities is approximately three years, recognizing that actual timing will depend on salvage logistics, recycling options, seasonal constraints, and regulatory requirements in effect at the end of the project life.

8.2 Air Quality

8.2.1 Overview

The assessment of the atmospheric environment will incorporate weather and climate, as well as ambient air quality considerations. Weather and climate baseline conditions have been obtained from regionally available meteorological data. Ambient air quality baseline conditions have been collected from a local ambient air quality monitoring station in Grand Falls-Windsor.

8.2.2 Regulatory Context

Relevant legislation includes:

- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)
- Air Pollution Control Regulations (Newfoundland and Labrador, 2022b)
 - Air Quality Standards
 - Air Quality Standards for Air Zone Management

Relevant standards include:

- Canadian Ambient Air Quality Standards (CAAQS) (CCME, n.d.-b)

8.2.3 Desktop Assessment Methodology

The assessment was completed through a review of the following resources:

- ECCC Canadian Climate Data (ECCC, 2026)
- NL Ambient Air Quality Data (provided by NLECCC)

8.2.4 Desktop Assessment Results

8.2.4.1 *Weather and Climate*

Local temperature and precipitation data were obtained from the Gander International Airport, meteorological station (Climate ID 8401703) located approximately 64 km southeast of the Solar Project. Data obtained was analyzed to generate seasonal climate parameters for

temperature and precipitation (Table 8.2.1) (ECCC, 2026).

This analysis considered data collected over the three-year period from 2022 to 2024. Although there are closer climate stations to the SPA, the data obtained from the Gander International Airport meteorological station provided the most complete dataset for assessment (io consulting, 2026a).

Table 8.2.1: Climate Data from the Gander International Airport Meteorological Stations (2022-2024)

Time Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (°C)													
Daily Avg.	-4.9	-6.1	-2.0	2.1	6.7	13.2	19.7	18.3	13.9	8.7	1.7	-1.2	5.8
Daily Max.	-0.9	-2.1	1.3	6.0	11.9	18.5	25.0	23.2	18.2	12.8	4.5	1.7	10.0
Daily Min.	-8.9	-10.0	-5.3	-1.8	1.5	7.8	14.2	13.3	9.4	4.5	-1.2	-4.1	1.6
Extreme Max.	10.7	9.9	12.2	15.8	23.4	33.3	32.2	31.4	27.9	22.2	18.4	14.7	21.0
Extreme Min.	-19.2	-21.5	-15.5	-9.0	-2.2	-1.0	8.3	6.5	2.0	-2.2	-10.9	-12.8	-6.5
Precipitation (mm)													
Precipitation	55.8	64.1	51.8	39.1	70.8	89.3	60.0	71.7	73.7	76.4	154.8	69.4	876.8

(ECCC, 2026)

Between 2022 and 2024, the mean annual temperature was 5.8°C, with a mean daily maximum of 10.0°C and a mean daily minimum of 1.6°C. January and February were the coldest months (mean daily average of -4.9°C and -6.1°C, respectively), while the warmest months were July and August (mean daily average of 19.7°C and 18.3°C, respectively). The mean annual precipitation was 876.8 mm, with June and November having the highest precipitation (89.3 mm and 154.8 mm, respectively) (ECCC, 2026).

Wind speed and direction data were also obtained from the Gander International Airport meteorological station (Table 8.2.2) for the three-year period from 2022 to 2024.

Table 8.2.2: Wind Data from the Gander International Airport Meteorological Stations (2022-2024)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Hourly Speed (km/h)	110	100	113	94	84	80	73	77	99	73	101	100
Most Frequent Direction	SW	NW	NW	NE	NE	SW	SW	SW	NW	SW	NW	SW

(ECCC, 2026)

The maximum hourly wind speeds recorded at the Gander International Airport meteorological station ranged from 73 km/h in July and October to 113 km/h in March. The most prevalent wind direction observed is from the southwest. Wind directions will vary; and the direction during calm wind flows is not recorded at the meteorological station (ECCC, 2026).

A windrose plot of the annual wind speed and direction at Gander International Airport from

2022 to 2024 was generated by io consulting (2026a) (Figure 8.2.1). Calm to moderate wind speeds (0 m/s to 10.80 m/s) were predominant in the southwest (Appendix D.1).

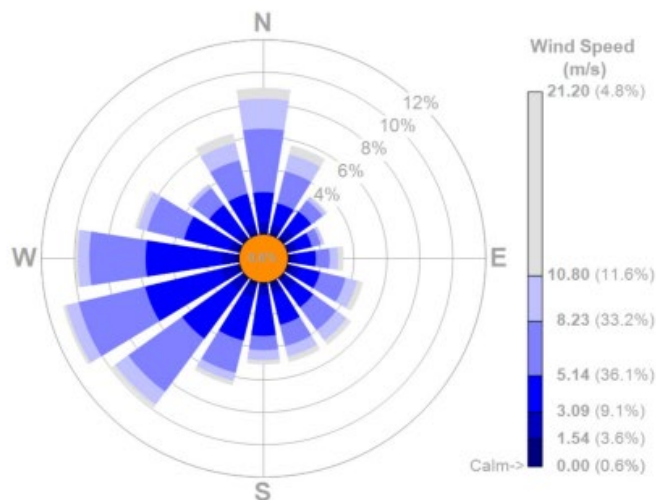


Figure 8.2.3: Windrose Plot – Annual Wind Speed and Direction 2022 to 2024 (Appendix D.1).

8.2.4.2 Air Quality

The Government of NL has legislated the Air Pollution Control Regulations (Newfoundland and Labrador, 2022b), under the *Environmental Protection Act* (Newfoundland and Labrador, 2002a). The air quality standards published (Schedule A, Table I) in the NLAPCR set the maximum permissible ground-level concentration limits. In addition, the NLAPCR also sets air quality standards for air zone management (Schedule A, Table II), which provide air quality limits for larger airshed management. These are similar to those targets set out by the CCME for the CAAQS (Table 8.2.3).

Table 8.2.3: Summary of Regulations Pertaining to Ambient Air Quality in NL

Contaminant ⁽¹⁾	Averaging Period	Regulatory Threshold			Unit
		NLAPCR (Schedule A, Table I)	NLAPCR (Schedule A, Table II)	CAAQS	
Ammonia	24-hour	144	-	-	ppb
CO	1-hour	30,582	-	-	ppb
	8-hour	13,107	-	-	ppb
H ₂ S	1-hour	11	-	-	ppb
	24-hour	4	-	-	ppb
NO ₂	1-hour	213	42	42	ppb
	24-hour	106	-	-	ppb
	Annual	53	12	12	ppb
PM _{2.5}	24-hour	25	25	27 ⁽²⁾	µg/m ³
	Annual	8.8	8.8	8.8 ⁽²⁾	µg/m ³
PM ₁₀	24-hour	50	-	-	µg/m ³

Contaminant ⁽¹⁾	Averaging Period	Regulatory Threshold			Unit
		NLAPCR (Schedule A, Table I)	NLAPCR (Schedule A, Table II)	CAAQS	
Particulate matter (total)	24-hour	120	-	-	µg/m ³
	Annual	60	-	-	µg/m ³
SO ₂	1-hour	344	65	65	ppb
	3-hour	229	-	-	ppb
	24-hour	115	-	-	ppb
	Annual	23	4.0	4.0	ppb

Air Pollution Control Regulations, 2022, N.L.R. 11/22

⁽¹⁾ The summary shows only the most relevant contaminants, as applicable to the Project.

⁽²⁾ Values are shown as the 2020 numerical value.

NL monitors air quality at seven AAQMSs throughout the province (NLECCC, 2024a).

Measured parameters vary by location and may include the following:

- PM_{2.5} – Particulate Matter less than or equal to 2.5 microns
- PM₁₀ – Particulate Matter less than or equal to 10 microns
- O₃ – Ozone
- NO – Nitric Oxide
- NO₂ – Nitrogen Dioxide
- NO_x – Oxides of Nitrogen
- CO – Carbon Monoxide
- SO₂ – Sulfur Dioxide
- VOC – Volatile Organic Compounds

The NO₂, O₃, and PM_{2.5} values from five of the seven AAQMSs are used to calculate a score on the AQHI. The AQHI is a scale from 1 to 10+, whereby scores represent the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+) (Meteorological Service of Canada, 2026).

The closest AAQMS to the Solar Project with available data is the Grand Falls-Windsor station, 35 km southwest of the SPA. The baseline maximum ambient air quality conditions observed at the Grand Falls-Windsor AAQMS from 2022 to 2024 were compared to the current NLAPCR Schedule A, Table I, as these air quality standards are the maximum permissible ground-level concentration limits (Table 8.2.4).

Table 8.2.4: Maximum Ambient Air Quality Conditions Observed at Grand Falls-Windsor (2022 to 2024)

Parameter	Averaging Period	NO ppb	NO ₂ ppb	NO _x ppb	O ₃ ppb	SO ₂ ppb	CO ppm ⁽¹⁾	PM _{2.5} µg/m ³	PM ₁₀ µg/m ³	TSP ⁽²⁾ µg/m ³	H ₂ S ppb	NH ₄ ppb
Grand Falls- Windsor AAQMS	1-hour	60.6	23.2	81.8	53.7	2.0	0.8	154.7	1189.7	-	-	-
	3-hour	40.4	22.9	57.8	52.5	2.0	0.7	130.0	541.2	-	-	-
	8-hour	25.2	22.9	35.9	51.5	1.9	0.6	84.4	303.8	-	-	-
	24-hour	9.9	5.9	14.6	50.7	1.7	0.3	45.4	185.4	-	-	-
	Annual	0.9	1.9	2.7	29.3	0.6	0.1	5.2	15.7	-	-	-
NLAPCR (Schedule A, Table 1)	1-hour	-	213	-	-	344	30.58	-	-	-	11	-
	3-hour	-	-	-	-	229	-	-	-	-	-	-
	8-hour	-	-	-	-	-	13.11	-	-	-	-	-
	24-hours	-	106	-	-	115	-	25	50	120	4	144
	Annual	-	53	-	-	23	-	8.8	-	60	-	-
Fraction of NLAPCR (Schedule A, Table 1)	1-hour	-	10.9%	-	-	0.6%	2.7%	-	-	-	-	-
	3-hour	-	-	-	-	0.9%	-	-	-	-	-	-
	8-hour	-	-	-	-	-	4.2%	-	-	-	-	-
	24-hours	-	5.5%	-	-	1.5%	-	181.5%	370.9%	-	-	-
	Annual	-	3.5%	-	-	2.8%	-	59.1%	-	-	-	-

Data provided by NLECCC

Values calculated as maximum values from rolling arithmetic averages of hourly data.

Shaded values denote exceedances of NLAPCR.

⁽¹⁾ Parts per million

⁽²⁾ Total suspended particulates, otherwise known as total particulate matter.

Per Table 8.2.4, existing air quality conditions (i.e., ambient air quality conditions at Grand Falls-Windsor; 2022 to 2024) indicate that most of the measured contaminants are well below their respective NLAPCR Schedule A, Table 1 limits. However, the maximum 24-hour concentrations of PM_{2.5} and PM₁₀ exceeded the NLAPCR 0.5% and 2.4% of the time, respectively based on the existing air quality data provided by NLECCC and compiled by Strum. The single maximal values observed were 45.4 µg/m³ (PM_{2.5}) and 185.4 µg/m³ (PM₁₀) during a rolling 24-hour period (Table 8.2.4).

8.2.5 Effect Assessment

The Solar Project activities will interact with the atmospheric environment through fugitive dust and exhaust emissions from light- and heavy-duty equipment, and quarrying (Table 8.2.5), primarily during the construction phase. There are no air emissions associated with the operation of the Solar Project. Furthermore, the generation of solar power offsets power that could otherwise be generated from emission-producing fossil fuels.

Table 8.2.5: Potential Project-Air Quality Interactions – Solar Project

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Clearing and Grubbing	X
Access Roads, Electrical Lines, Laydown Yards, Site Preparation	X
PV Array Installation	-
DC Collection Strings and Central Inverter Station Installation	X
Underground MV Collection System Installation	X
Solar Project Collection Substation Installation	X
Overhead MV Feeder Lines to Project Substation Installation	X
Solar Project Commissioning	-
Operations and Maintenance (33 years)	
Operations and Remote Monitoring	-
Routine Maintenance, Inspections, and Component Replacement	X
Ongoing Road, Access, and Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Decommissioning	X
Site Rehabilitation and Post-Decommissioning Monitoring	X

8.2.5.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries include air emission regulations, as described in the regulatory context section above, which informs the development of construction and operational air emission assessment.

Technical Boundary

The determination of air quality impacts was completed based on a qualitative assessment of anticipated construction and operational impacts.

Spatial Boundary

The LSA for the atmospheric environment is the SPA (Drawing 7.2-1, Appendix A). The RSA for atmospheric is the Newfoundland Air Zone.

Temporal Boundary

Temporal boundaries would include the timelines of each Solar Project phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

8.2.5.2 Assessment Criteria

The assessment criteria provided in Section 5.0 apply to the atmospheric environment. The VC-specific definition for magnitude is as follows:

- Low: Air quality is expected to remain less than or equal to the maximum permissible ground-level concentrations as defined by the NLAPCR.
- High: Air quality is expected to exceed the maximum permissible ground-level concentrations as defined by the NLAPCR.

8.2.5.3 Effects

Fugitive dust emissions consist of PM and may be generated from open-air activities (e.g., moving earth/disturbing soil, wind erosion, and increased traffic). Fugitive dust emissions are composed mainly of soil minerals, but can also contain salt, pollen, spores, and tire particles. PM is measured as TSP and is defined as the mass of airborne particles having a diameter of less than 100 µm (though measured concentrations are typically dominated by particles <45 µm). There are two forms of PM that pose the greatest concern for human health: PM with a diameter of 10 µm or less (PM₁₀) and PM with a diameter of 2.5 µm or less (PM_{2.5}).

Depending on its composition, concentration, and proximity to a human receptor, fugitive dust can affect lung and heart functions when it enters the atmosphere. Particulate matter has been linked to premature death (due to lung and/or heart disease), non-fatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms such as irritation of the airways, coughing, or difficulty breathing. People with underlying lung and heart disease, children, and the elderly are the most susceptible to particulate pollution exposure (US EPA, 2024b).

Fugitive dust may also affect visibility and cause environmental damage. Fine particles are the leading cause of reduced visibility in many cities, national parks, and wilderness areas. In addition, fugitive dust particles can be carried over long distances (via wind), deposited in other locations, and within surface water features. Some of the potential effects of particulate deposition may include the following (US EPA, 2024b):

- Increasing lake and stream acidity
- Altering coastal water and large river basin nutrient balance
- Depleting soil nutrients
- A variety of effects on flora (described further in Section 6.9)
- Affecting ecosystem diversity
- Contributing to acid rain effects
- Soiling of solar panels

Anticipated sources of fugitive dust emissions from the Solar Project will be primarily associated with the Solar Project's construction and may include the following activities:

- Soil disturbance during site preparation (i.e., clearing/grubbing, grading, etc.)
- Wind erosion from soil or rock stockpiles during grading
- Trenching for electrical collection system conduits
- Installing poles for the substation connection to Industrial Facility

The closest receptor is approximately 2,129 m from the Solar Project. The distance particles can travel is influenced by factors such as the height at which they are released, their deposition velocity, wind speed, and the degree of atmospheric turbulence. For instance, theoretical calculations indicate that at an average wind speed of 4.4 m/s, particles larger than 100 µm typically settle within 10 m of their emission point (Holsen et al., 2011). The LSA is presently well vegetated, which is anticipated help reduce the travel distance of fugitive dust emissions from the SPA (US EPA, 2014). Fugitive dust was not modelled for but expected to increase during construction. Impacts during the construction phase are considered short-term, intermittent, and within the LSA.

In addition to fugitive dust, construction may increase combustion residuals and/or exhaust tailpipe emissions, primarily PM, NO_x, SO₂, and CO from vehicles (i.e., travel by personnel, transport/delivery activities) and heavy equipment. Increased vehicle exhaust emissions were not modelled but are not anticipated to impact nearby receptors.

8.2.6 Mitigation

Measures to minimize and mitigate the creation and emission of pollutants, including fugitive dust and exhaust emissions, will be implemented for the Solar Project (particularly for the construction phase). General mitigation measures for fugitive (dust) emissions include:

- Minimize the footprint of disturbance to the extent practicable.
- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust and airborne particles, where practicable.
- Compact and/or ridge disturbed soil, where practicable, to prevent dust formation.
- Dust control measures to be implemented during dry periods (i.e., drought) when winds are high, where practical
- Wet aggregate, soil stockpiles or trench mounds with water to control dust, as required.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Limit use of approved dust suppressant to control road dust and minimize airborne emissions, where required.
- Establish and implement speed limits to minimize dust and potential collisions.
- Tie down, cover, and/or store loose site materials and/or products prior to inclement weather and wind events to prevent materials from becoming airborne.
- Wash down vehicles and equipment with water to remove accumulated mud/dirt on undercarriages, tracks, wheel wells, etc.
- Require that Solar Project personnel adhere to all safety protocols and wear appropriate PPE as an identification of a member of the project

General mitigation measures for exhaust emissions include:

- Require that equipment meets all applicable provincial and air quality regulations and emissions standards.
- Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.
- Remove malfunctioning equipment and/or equipment generating excess amounts of smoke, odour, or noise from service until an assessment and necessary repairs can be completed.
- Remove construction equipment with improperly functioning emissions control systems from service.
- Restrict the idling of equipment where feasible.

8.2.7 Monitoring

No monitoring is recommended.

8.2.8 Conclusion

The predicted residual effects of the Solar Project on the atmosphere and ambient air quality (after mitigation) are characterized in Table 8.2.6.

Table 8.2.6: Air Quality Residual Effects – Solar Project

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Fugitive Emissions Increased level of airborne particulate	Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust. Apply water as a dust suppressant as required.	A	L VC interaction causes direct increase of fugitive emissions	LSA	ST Effects are expected throughout construction and decommissioning	I Effects may occur during the Project's construction and decommissioning phases, but only intermittently.	R	Not significant
Exhaust Emissions Increased level of combustion related emissions	Maintain equipment and limit idling of where feasible.	A	L VC interaction causes a direct increase of exhaust emissions	LSA	ST Effects are expected throughout construction and decommissioning	I Effects may occur during the Project's construction and decommissioning phases, but only intermittently.	R	Not significant

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term MT – Medium Term, LT – Long Term

Frequency: SE – Single Event, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

8.3 Greenhouse Gases

8.3.1 Overview

Climate change refers to long-term, detectable changes in weather patterns and conditions, often including alterations to temperature and precipitation regimes. Climate change typically involves changes in average conditions and variability. GHGs from anthropogenic sources are the main contributors to climate change. Since GHGs disrupt natural heat transfer processes within the Earth's atmosphere, a build-up of these gases has enhanced the natural greenhouse effect. These human-induced enhancements are especially of concern since ongoing GHG emissions have the potential to warm the planet to levels that have yet to be experienced (ECCC, 2019d).

The effects of the Solar Project on climate change are described in terms of GHG emissions from solar energy produced by the Solar Project.

The impacts of climate change on the Solar Project are assessed separately under Section 13.0.

8.3.2 Regulatory Context

The climate change assessment considered the following Acts and Regulations:

- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)
- *Management of Greenhouse Gas Act* (Newfoundland and Labrador, 2016)
- Management of Greenhouse Gas Regulations (Newfoundland and Labrador, 2018a)
 - *Canadian Environmental Protection Act* (Canada, 1999)
 - Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations (Canada, 2010)
 - Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations (Canada, 2013)
 - Ozone-depleting Substances and Halocarbon Alternatives Regulations (Canada, 2016)

8.3.3 Desktop Assessment Methodology

The objectives of this assessment include the following:

- Establish Project-related GHG sources.
- Quantify baseline and Project-generated GHG emissions.
- Mitigate and minimize GHG generation from Project-related activities.

Sources of GHG emissions were identified through a review of Solar Project phases, components, and equipment.

Project-generated GHGs were quantified in accordance with the specifications described in the International Standard ISO 14064 (2019) and the NLECCC Guidance Document for Reporting

Greenhouse Gas Emissions for Large Industry in Newfoundland and Labrador (2017).

All emissions, unless otherwise stated, are reported in tonnes of carbon dioxide equivalents (tCO₂e).

8.3.3.1 Sources of GHG Emissions

The main GHGs of concern include:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Halocarbons
- Water vapour

GHGs may be natural or anthropogenic in origin, except halocarbons, which are human-made (ECCC, 2019a). The following subsections describe the GHGs and their contributors (sources) as anticipated during each Solar Project phase. Given that decommissioning will occur in the future, potentially under improved technologies that could reduce GHG emissions, its emissions inventory remains uncertain. To ensure a conservative assessment, emissions during the construction phase are used as a proxy for decommissioning.

Methane

Primary sources of anthropogenic CH₄ include landfills, sewage, and the incomplete combustion of fossil fuels with insufficient oxygen (ECCC, 2019a). The Solar Project's construction phase requires different heavy- and light-duty equipment, contributing to CH₄ emissions. Overall, the production of CH₄ in association with this Solar Project is anticipated to be minimal in relation to other sources of GHGs.

Nitrous Oxides

The primary sources of anthropogenic N₂O are related to the use of nitrogen-based synthetic fertilizers and manure. These sources have added significant amounts of reactive nitrogen to Earth's ecosystems. Other contributors include the release of N₂O into the atmosphere during the combustion of fossil fuels and biomass (e.g., trees or wood-based fuels) and from some industrial sources (ECCC, 2019a).

The Project's construction phase requires heavy- and light-duty equipment, which can contribute to N₂O emissions. Land restoration activities (i.e., fertilizers) following construction will also contribute to N₂O emissions. Overall, the production of N₂O in association with this Project is anticipated to be minimal, in relation to other sources of GHGs.

Halocarbons

Halocarbons are a group of synthetic chemicals containing a halogen group (e.g., fluorine, chlorine, and bromine) and carbon (ECCC, 2019a). They are typically used in refrigerants, fire-extinguishing agents, and solvents (ECCC, 2013b). There are various industrial sources, but

the main contributor is aluminum production (US EPA, 2024a).

During the construction phase, the primary source of halocarbon emissions would likely be accidental releases or leaks (losses) associated with coolants in air conditioning units found in vehicles, portable construction buildings (i.e., trailers), and equipment. Fire-extinguishing agents (containing halocarbons) may also be used in the event of an emergency which requires a fire-fighting response. Overall, halocarbon release is anticipated to be minimal and not considered further.

Water Vapour

Water vapour is the most important naturally occurring GHG. Human activities do not directly influence the amount of water vapour in the atmosphere, as it is a function of the atmosphere's temperature. The atmosphere can hold approximately 7% more water vapour for every additional degree Celsius in air temperature. When the air becomes saturated with water vapour, the water vapour condenses and falls as rain or snow, leading to climate change effects (i.e., variations in weather patterns).

As climate-warming gases (i.e., CO₂, CH₄, N₂O) increase in the atmosphere, the rising temperatures increase water evaporation from the Earth's surface and raise atmospheric water vapour concentrations. This increased water vapour, in turn, amplifies the warming from the initial GHGs, causing the cycle to repeat and temperatures to keep rising (ECCC, 2019a).

Project activities contributing to GHG emissions are not expected to affect water vapour concentrations in the atmosphere; therefore, this is not considered further.

Carbon Dioxide Equivalent (CO₂e)

The primary sources of anthropogenic CO₂ are burning carbon-containing fossil fuels (i.e., coal, oil, and natural gas) and deforestation/land clearing.

Site preparation and construction for the Solar Project will include several activities that are likely to produce CO₂, including, but not limited to:

- Use of heavy equipment (excavators, dozers, cranes, etc.).
- Use of light-duty vehicles and equipment (pick-up trucks, generators, etc.).
- Land clearing, including the decay of cut foliage (which slowly releases CO₂).

8.3.4 Desktop Assessment Results

8.3.4.1 *Quantification of the GHG Baseline Conditions*

The GHG baseline refers to sources, sinks (removing), and reservoirs (storing) occurring in the Project's absence and is used to compare pre- and post-Project conditions. The baseline demonstrates the quantity of CO₂e emitted from current electricity production methods for the same electrical generating capacity as the Project.

The Project consists of up to 150 MW of renewable energy. Based on the solar array design

capacity and an anticipated net capacity factor of 12% (provided by EVREC), the Solar Project will be capable of producing approximately **157,680,000 kWh/year**. The Solar Project's lifespan is estimated at a minimum of 33 years.

Quantifying GHGs in terms of tCO₂e requires using current electricity-generating practices. In 2021, electricity generated in Newfoundland was produced from the following fuel sources (CER, 2026):

- Hydropower (97%)
- Petroleum (2%)
- Natural Gas (0.6%)
- Wind (0.4%)

In 2022, the GHG intensity of the NL electricity grid was 17 grams of CO₂e/kWh (gCO₂e/kWh). Once operational, the Solar Project will not directly generate any GHG emissions (i.e., from energy generation), except for maintenance activities, which are considered negligible. The baseline emissions for the Solar Project are the emissions that would otherwise have been generated by conventional NL electrical generation for the same energy output of the Solar Project, **157,680,000 kWh/year**. Therefore, the baseline GHG emissions for the Solar Project are **2,680.56 tCO₂e/year** (Appendix E.3).

GHG Emissions Quantification – Construction Phase

Access Roads and Laydown Areas

The construction of internal access roads and maintenance pathways will be constructed to provide access to solar arrays, central inverter stations, and other electrical infrastructure. This will require removing vegetation and overburden, creating fugitive dust and GHG emissions. Laydown areas are intended to temporarily store equipment. Construction activities and equipment used to develop laydown areas may generate fugitive dust and GHG emissions.

However, fugitive dust and GHG contributions from these activities, which are temporary and short-term, represent a small incremental addition to the overall Project emissions; therefore, they were not quantified. Section 8.2 (Atmosphere and Air Quality) discusses fugitive dust and air emissions as they relate to the Project.

Solar Production

The Solar Project will require solar modules to be manufactured and delivered to the SPA. The United States National Renewable Energy Laboratory (NREL) completed an LCA on utility-scale PV solar arrays in the United States. The LCA covered the production components, including transformers, cables, and modules. The LCA assumed a construction scenario in the United States; however, the manufacturing and production of the solar arrays in the LCA assessment are anticipated to be similar to those of the Solar Project.

The LCA determined that the production of the solar arrays accounted for **31.4 gCO₂e/kWh**

(Smith et al., 2024). Based on the anticipated net production capacity of the Solar Project, the construction emissions for the solar modules and associated infrastructure are anticipated to be **163,388.02 tCO₂e** over the life of the Solar Project. Although there are uncertainties regarding the assumptions used for the LCA and their applicability to this Solar Project, this assessment considered only the more conservative LCA model, using low irradiances and high energy inputs, and therefore is anticipated to be a reasonable estimate of GHG emissions. The LCA transportation and construction related emissions were not used, instead a site-specific emissions inventory was created.

The suppliers of the solar arrays and associated supplies have not yet been determined. However, EVREC will use Tier 1 global suppliers for its solar modules, inverters, transformers, cables, and mounting systems, including Trina Solar and Jinko. Therefore, this assessment conservatively assumed that these panels (and associated equipment) would be procured from a Chinese manufacturer collocated with the Wind Project components. The quantification of the GHG emissions required the following inputs:

- The distances from the manufacturer to the SPA.
- The vehicle size and fuel type used to transport the solar components.
- The weight of freight materials.

For quantification purposes, the assessment assumed the following:

- Manufacturing Location: Dafeng District, Yancheng, Jiangsu Province, China
- Nearest Shipping Port: Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China
- Nearest NL Shipping Port: Port of Botwood, NL, CA

Solar projects are typically made up of three principal components:

- Solar Modules
- Racking Tables
- Central Inverter Station (including transformer)

The solar arrays are assumed to be manufactured at a manufacturing facility in Dafeng District, Yancheng, Jiangsu Province, China, for this assessment. The materials will travel to the Dafeng port in Dafeng District, Yancheng, Jiangsu Province, China, by heavy diesel hauler (transport), where they will be shipped via diesel cargo vessel to the Port of Botwood.

Table 8.3.1 summarizes the transportation distances from the manufacturer to the Solar Project.

Table 8.3.1: Solar Transportation Distances

Originating Destination	Final Destination	Distance (km)
Manufacturing Facility Dafeng District, Yancheng, Jiangsu Province, China	Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China	63 (Land)
Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China	Port of Botwood, NL	23,300 (Marine)
Port of Botwood, Newfoundland	SPA	8 (Land)

To determine the travel distance for the Solar Project, the following assumptions were made:

- 500 solar modules will be containerized and individually transported via a single diesel heavy hauler.
- 4 racking systems will be transported via a single diesel heavy hauler.
- Each inverter system (34) will be containerized and individually transported via a single diesel heavy hauler.
- Solar modules (230,000) will be transported via a single diesel cargo vessel (marine).
- Racking tables (4,000) will be transported via a single diesel cargo vessel (marine).
- All central inverter stations (34) will be transported via a single diesel cargo vessel (marine).

Based on the land distance from the manufacturer to the SPA, the total land transportation distance (not including marine transportation) is approximately **106,074 km**. The total marine transportation distance from China to the Botwood Port, NL, for the solar components is approximately **93,200 km**. The distances travelled consider travel from the manufacturer to the SPA only; an equivalent return distance is not considered, as the hauling companies would have commitments with other clients, and those GHG emissions would not be attributable to the Solar Project.

GHG emission factors for the different components of solar transportation are provided in Table 8.3.2.

Table 8.3.2: Solar Transportation Emission Factors

Component	Emission Factor (tCO ₂ e/tonne·km)
Heavy Duty Truck (Diesel) with Freight	1.35x10 ⁻⁴
Marine Cargo and Container Vessel (Diesel) with Freight	1.51x10 ⁻⁵

Emission Factors: (Squared Consultants Inc, 2025)

Given the land transportation distances required to deliver the solar components to the SPA and the emission factors (Table 8.3.2), the CO₂e emissions from land transportation of the solar components are expected to be approximately 345,827.76 tCO₂e. In addition, the marine transportation distances required to deliver the wind turbines from China to Canada will contribute 33,986.78 tCO₂e.

Detailed CO₂e calculations are provided in Table 2A (Appendix E.3).

Construction Equipment

The Solar Project will employ mobile equipment during construction.

EVREC provided a list of equipment anticipated to be used for the Solar Project construction, including the number of required pieces of equipment, anticipated hours of operation and anticipated fuel consumption. This equipment includes:

- Excavators
- Loaders
- Dozers
- Haul Trucks
- Harvesting Equipment
- Graders

While the construction phase of the Solar Project will last approximately one year and may operate 24 hours per day, seven days per week, it is not anticipated to operate continuously. Therefore, for the GHG emission calculations of the mobile equipment, it was assumed they would operate 21 hours per day, six days per week, during the construction period. It was further assumed that the construction period would occur over 1 year. Finally, EVREC provided the associated mobile equipment combined with the Industrial Facility. Therefore, Strum assumed half of the equipment would be used for the construction of the Solar Project, and the other half would be used for the construction of the Industrial Facility. As a result, the 50% reduction was applied to the Solar Project mobile equipment list to account for GHG emissions and fuel consumption.

GHG emission factors for the combustion of diesel are provided in Table 8.3.3.

Table 8.3.3: Equipment List Emission Factors

Parameter	Emission Factor
Diesel Fuel	2.66 (kgCO ₂ e/L)

Emission Factors: (NLECCC, 2017)

Given the proposed equipment usage for the construction of the Solar Project, and the emission factors, CO₂e are expected to be approximately **14,432.27 tCO₂e**.

Detailed CO₂e calculations are provided in Table 2B (Appendix E.3).

For the construction phase of the Solar Project, the anticipated GHG emissions and fuel consumption are summarized in Table 8.3.4 for each consumption type (i.e., on-site mobile equipment, marine transportation).

Table 8.3.4: Construction Phase – Estimated Fuel Consumption

Consumption Type	Fuel Type	Emission Factor (tCO ₂ e/L)	Total GHG Emissions (tCO ₂ e)	Annualized GHG Emissions (tCO ₂ e)	Fuel Consumption (L)	Annualized Fuel Consumption (L)
On-site Mobile Equipment	Diesel	2.66E-03	14,432.27	4,810.76	5,418,469.24	1,806,156.41
Off-site Mobile Equipment	Diesel	2.66E-03	345,827.76	115,275.92	129,837,985.30	43,279,328.43
Off-Site Marine Cargo and Container Vessel	Marine Diesel	2.89E-03	33,986.78	11,328.93	11,760,130.80	3,920,043.60

Note: Concrete trucks and heavy haulers are assumed to require diesel fuel.
Emission Factors: (BCMOE, 2014; NLECCC, 2017)

Note that Table 8.3.4 includes only those emissions provided through the combustion of fuels. A detailed GHG inventory is provided in Table 2A (Appendix E.3), which lists GHG emissions associated with the production and transport of concrete and solar components.

Operations Phase

Following the construction phase, the Solar Project will be operational, and GHG emissions reduction will begin. Based on the Solar Project's design capacity, it will produce approximately **157,680,000 kWh/year**. Therefore, the renewable energy produced will offset power generation from fossil fuels and from more intensive generation methods described under baseline conditions (Section 8.2.2.4).

According to Smith et al. (2024), maintenance activities are the primary contributors of GHGs during the operations phase. The maintenance typically includes replacing approximately 10% of inverter components every 10 years and 0.05% of panels annually. The calculated emission intensity of this operation and maintenance is 0.5 gCO₂e/kWh. Therefore, the GHG emissions associated with the operation and maintenance are **2,601.72 tCO₂e** (Appendix E.3).

8.3.4.2 Effects Assessment

Table 8.3.5: Potential Project-GHG Interactions – Solar Project

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Clearing and Grubbing	X
Access Roads, Electrical Lines, Laydown Yards, Settling Ponds, Site Preparation	X
PV Array Installation	X
DC Collection Strings and Central Inverter Station Installation	X

Project Phase	Potential for Interaction
Underground MV Collection System Installation	X
Solar Project Collection Substation Installation	X
Overhead MV Feeder Lines to Project Substation Installation	X
Solar Project Commissioning	X
Operations and Maintenance (33 years)	
Operations and Remote Monitoring	X
Routine Maintenance, Inspections, and Component Replacement	X
Ongoing Road, Access, and Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Decommissioning	X
Site Rehabilitation and Post-Decommissioning Monitoring	X

8.3.4.3 Assessment Boundaries

Administrative Boundary

Administrative boundaries include GHG reporting considerations, as described in the regulatory context section above and in regulatory guidance documentation (NLECCC, 2017), which informs the development of construction and operational GHG assessments.

Technical Boundary

The determination of climate change impacts was completed based on estimated construction impacts (e.g., shipments and materials) and the current NL energy grid. Where detailed construction methodologies are not yet determined, reasonable estimates for construction materials, suppliers, and transportation distances were used.

Spatial Boundary

The LAA for GHG emissions is the province of NL. The RAA for GHG emissions is the global environment.

Temporal Boundary

Temporal boundaries would include the timelines of each Project phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

8.3.4.4 Assessment Criteria

The MGGA stipulates that facilities with annual emissions exceeding 15,000 tCO₂e must report their emissions annually. The MGGA also provides a GHG reduction target for industrial facilities that emit 25,000 tonnes or more of GHG emissions per year. The 15,000 tCO₂e benchmark has been compared with the NL GHG emissions of 8,600,000 tCO₂e (in 2022), representing approximately 0.2% of total grid emissions (CER, 2026). This comparison is used to assess the magnitude of Project-related GHG emissions.

The VC-specific definition for magnitude is as follows:

- Negligible: GHG emissions are expected to change by $\leq 0.2\%$ annually of the 2022 NL GHG Emissions.
- Low: GHG emissions are expected to change by $> 0.2\%$ and $\leq 2\%$ annually of the 2022 NL GHG Emissions.
- Moderate: GHG emissions are expected to change by $> 2\%$ and $\leq 20\%$ annually of 2022 NL GHG Emissions.
- High: GHG emissions are expected to change by $> 20\%$ annually of the 2022 NL GHG Emissions.

8.3.4.5 Effects

The Solar Project is expected to have a low to moderate effect on the GHG environment (Table 8.3.6).

Table 8.3.6: Project GHG Emission Summary

Component	Emissions (tCO ₂ e)
Baseline	
NL Electricity Generation GHG Intensity	2,680.56
Total	2,680.56
Construction Phase	
Solar Manufacturing	163,388.02
Solar Component Transportation	379,814.54
Construction Works	14,432.27
Total	557,635.82
Operations Phase	
Electricity Generated from Wind	0
Wind Turbine Maintenance	2,601.72*
Total	2,601.72

The values in this table may differ from those presented in Appendix E.4 due to rounding errors; however, these errors are negligible and do not change their representation.

*Project lifespan emissions (single event)

As mentioned, the current GHG emissions for the quantity of electricity required by the Solar Project, using the NL electrical generation emission intensity, amount to **2,680.56 tCO₂e**.

The Solar Project's construction phase will generate the greatest GHG emissions from the manufacturing and transportation of solar components and the operation of required mobile equipment. The total GHG emissions from the construction phase are **557,635.82 tCO₂e**. The annual construction-related GHG emissions will account for approximately 6.5% of NL emissions, meaning that the construction phase of the Solar Project will generate a moderate magnitude of emissions.

The operations phase will generate GHGs from the Solar Project maintenance (i.e., part replacements) as a one-time (Project lifespan) occurrence of **2,601.72 tCO₂e**.

Following Solar Project commissioning, the annual GHG emission reduction is expected to be **2,680.56 tCO₂e**. A one-time **2,601.72 tCO₂e** (GHG emissions from solar maintenance) may be subtracted from any annual reduction; however, the annual reduction rate will be applied for the Solar Project's lifespan (33 years). The GHG emission reduction over the Solar Project's lifespan (33 years) is up to **77,815.08 tCO₂e**.

The assumptions considered in this assessment are an estimate of GHG emissions; the estimate may be lower if solar component suppliers are located closer to the SPA and manufacturing materials are lower than assumed.

8.3.5 Mitigation

Mitigation measures to reduce the Solar Project's contributions to GHG emissions, reducing the overall impact on climate change, include:

- Incorporate the shortest construction/transport routes where possible to minimize the use of fossil fuels during construction.
- Recover and recycle construction and demolition waste, where possible.
- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations.
- Require equipment to meet all applicable provincial and air quality regulations and emissions standards.
- Require that engine and exhaust systems are maintained according to the manufacturer's specifications and applicable maintenance schedule.
- Remove malfunctioning equipment or equipment generating excess amounts of smoke, odour, or noise from service until an assessment and necessary repairs can be completed.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Require preventative maintenance and inspections (e.g., leak testing) of equipment containing coolant (i.e., air conditioning units).
- Train Project personnel (as appropriate) in the proper disposal of halocarbon-containing materials.
- Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements.
- Require that trucks removing waste from or bringing materials to the SPA are filled to the maximum allowable capacity where practical (dependent on the truck size and load weight) to reduce transportation requirements and limit the number of trips.
- Implement an anti-idling policy to limit GHG emissions from vehicles and equipment and limit the use of fossil fuels, where feasible.

8.3.6 Monitoring

No monitoring programs are proposed.

8.3.7 Conclusion

The predicted residual effects of the Solar Project on Climate Change (after mitigation) are characterized in Table 8.3.7.

Table 8.3.7: GHGs Residual Effects – Solar Project

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Construction Burning of fossil fuels	Use of locally sourced materials, where possible, to reduce CO ₂ , CH ₄ , and NO _x emissions associated with transport.	A	M VC interaction causes direct combustion of fossil fuels and indirect emissions from the supply chain.	LSA	ST Effects are expected throughout the construction and decommissioning phases.	C	PR	Not significant
Operation Reduction in GHG emissions	N/A	P	N VC interaction directly reduces GHG emissions.	RSA	MT Effects are expected throughout the operational phase.	C	PR	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

8.4 Noise

8.4.1 Overview

The assessment of sound/noise considered both construction and operational-generated noise from the SPA. During construction, heavy equipment, machinery, and light vehicles will emit sound to the surrounding environment from activities associated with the development of roads, rectifiers, and transformers, along with the subsequent assembly of solar modules. To quantify potential impacts, sound levels of equipment anticipated to be used for the Project's construction were used to calculate sound levels at set distances from the SPA, considering nearby receptors. Sound generated during decommissioning activities will be similar to construction, based on the same process/activities (except for dismantling the infrastructure). Therefore, for this assessment, when describing construction sound/noise and Project interactions, it will act as a proxy for the decommissioning phase of the Project.

During the operational phase of the Solar Project, the rectifiers and transformers will emit sound to the surrounding environment from electrical equipment operation and the magnetic interaction with the structure's internal core (magnetostriction sound). To quantify the potential effects of solar-generated noise on nearby receptors, detailed sound modelling was completed.

8.4.2 Regulatory Context

Changes to the acoustic environment during construction and operational activities could result in annoyance and interference with communication, sleep, or working efficiency.

Table 8.4.1: Summary of Sound/Noise Level Regulations and Guidelines

Regulated/Considered By	Regulation/Guidance	Sound Level (dBA)	Criterion/Note
For Residential Receptors			
Health Canada	Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada, 2023)*	45	Sleep Disturbance: Indoor sound levels should not exceed 30 dBA (45 dBA outdoor noise) for continuous noise events to reduce impacts on sleep.
		45	Short Term Construction: Outdoor sound levels should not exceed 45 dBA for continuous noise events to reduce impacts on sleep.
		47	Mitigating Short-Term Construction Noise Exposure: Outdoor noise should not exceed 47 dBA L_{dn} for quiet suburban or rural receptors.**

Regulated/Considered By	Regulation/Guidance	Sound Level (dBA)	Criterion/Note
For Occupational Safety			
Newfoundland and Labrador Occupational Health and Safety.	Occupational Health and Safety Regulations, 2012 N.L.R. 5/12, ACGIH TLVs	85	8-hour maximum, 40-hour work week, without hearing protection.

* Health Canada (2023) provides an estimated outdoor-to-indoor transmission loss of 15 dBA for noise.

** Quiet rural and suburban receptors as defined in Health Canada (2017) and based on population density.

There are no municipal or provincial regulations related to operational Solar Project noise in NL. However, Health Canada (2023) has developed considerations and guidance for noise related to Environmental Assessments (Table 8.4.1).

8.4.3 Baseline Ambient Sound

A baseline sound assessment was conducted in 2024, within the IPA near the SPA, and the maximum modal 1-hour value was 32 dBA. This is less than the Health Canada (2023) estimated L_{dn} value for a quiet rural area (≤ 45 dBA), which can be used to characterize the SPA based on its sparse population density.

Sounds associated with the area include recreational and local traffic, along roads, which increases ambient sound levels from cars, trucks, and other vehicles. Furthermore, there are several commercial quarry permits near the SPA. These suggest that active quarrying is already underway at least periodically within the area surrounding the SPA. Lastly, in addition to anthropogenic sources, there are also natural sources of sounds originating from wildlife, wind, water, and vegetation.

The baseline sound assessment was conducted to determine baseline sound levels for use in possible post-construction sound and noise assessments.

8.4.4 Effects Assessment

Table 8.4.2: Potential Project-Sound/Noise Interactions – Solar Project

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Control measures	X
Tree Clearing and Grubbing	X
Excavating Grading and Compacting Soils for Construction	X
Access road upgrades and construction	X
Laydown yard and Solar Works construction, including piling for solar panel racking, concrete pads for inverter stations and transformers	X

Project Phase	Potential for Interaction
Solar Panel and Racking Delivery and installation	X
Collection System, Control House and Substation Construction	X
Transmission System Installation and Commissioning	X
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	-
Environmental Monitoring	-
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

8.4.4.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries include Health Canada (2023) considerations, as described in the regulatory context section above, which are used for the development of construction and operational noise assessments.

Technical Boundary

Technical constraints for assessing sound/noise effects include a lack of detailed construction equipment and sound power levels for the operational equipment (e.g., transformers) for the SPA. Additionally, baseline ambient noise data is limited and constrains the noise modelling of the SPA.

Spatial Boundary

The LSA for sound includes the maximum modelled extent for operational noise (Appendix F.3) (Drawing 8.4-1, Appendix A). The RSA is not applicable for sound/noise.

Temporal Boundary

Temporal boundaries would include the timelines of each Solar Project phase: Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Reclamation (2 years).

8.4.4.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to sound/noise. The VC-specific definition for magnitude is as follows:

Construction Sound

- Negligible: sound levels from Project activities are expected to always be indiscernible at receptor locations.
- Low: sound levels from Project activities are discernible and may exceed 47 dBA L_{dn} but are expected to be ≤ 45 dBA at receptor locations during evening and overnight hours (19:00 to 07:00).

- High: sound levels from Project activities are expected to exceed 45 dBA at receptor locations during evening and overnight hours (19:00 to 07:00).

Operational Sound

- Negligible: sound levels from Project activities are expected to always be indiscernible at receptor locations.
- Low: measurable sound levels predicted at receptor location(s), but results are below Health Canada (2023) guidance (45 dBA).
- High: sound levels predicted to exceed Health Canada (2024) guidance at receptor locations (45 dBA).

8.4.4.3 Modelling Methodology

Construction Sound

The assessment of construction sound/noise was completed through construction noise modelling conducted by io consulting in 2025 (Appendix F.2), which was developed based on the preliminary front-end engineering design (pre-FEED) of the SPA provided by EVREC (io consulting, 2025a). The io consulting report was completed with the following objectives:

- Establish the construction sound/noise levels produced by the SPA.
- Identify nearby receptors that may be exposed to construction sound produced by the Project.
- Determine if applicable guidance is met.
- Mitigate impacts experienced by nearby receptors, if required.

Operational Sound

To understand the Project-related impacts on noise emissions from the operational Solar Project, io consulting conducted a noise modelling assessment (Appendix F.3) based on the pre-FEED of the SPA provided by EVREC (io consulting, 2025a). The io consulting report was completed with the following objectives:

- Identify key contributors to environmental noise emissions.
- Identify and assess comprehensive sound levels at the exterior of identified receptors.
- Include low-frequency sound/noise within the overall EIS assessment
- Propose mitigation of Project-generated sound on nearby receptors, if required.

Noise Modelling

The sound assessments (Construction and Operational) were completed using the iNoise software package, which incorporates the standards set out in ISO 9613-1 and ISO 9613-2.

The models followed ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method and calculations, and were based on the following input information:

- Locations of solar components or equipment.
- Octave band sound power level data.
 - Estimated for construction equipment.
 - Provided by EVREC for the candidate equipment of rectifiers.
 - Estimated for transformers.
- UTM coordinates for receptors.
- Topographic data for the surrounding area.

The meteorological conditions used to model sound emission were determined based on the Solar Project BOD and discussions with EVREC and other subcontractors to assess a worst-case sound propagation scenario. These include a minimum air temperature of 5°C and a maximum relative humidity of 70%. A ground factor of 0.5 was applied to the model, representing a mix of hard and soft groundcover (i.e., vegetative growth [soft surface] and water [hard surface]).

Note, sound levels and impacts from blasting activities have not been included in this assessment as blasting is not required for the SPA.

8.4.4.4 Modelling Results

Construction Sound

During construction activities, sound will predominantly be generated through the operation of construction equipment and heavy machinery such as dozers, excavators, dump trucks, and hauling trucks.

An estimated list of construction equipment for the SPA was prepared by io consulting (Appendix F.2) and used to calculate the total noise generated during the construction phase of the Solar Project (io consulting, 2025a). The construction sound was then modelled as an area source across the SPA to account for equipment movement within the area. The model produced by io consulting assumed that at any given time, only half of the construction equipment would be operating, reducing the total estimated sound power level (Table 8.4.3).

Table 8.4.3: Estimated Construction Equipment Sound Power Levels – Solar Project

Parameter	dBA	Octave Band Centre Frequency (Hz) (dB)							
		63	125	250	500	1,000	2,000	4,000	8,000
Total sound power level for all construction equipment	119	125	124	117	115	113	111	107	101
Correction (50% equipment in use)	-3	-3	-3	-3	-3	-3	-3	-3	-3
Corrected Sound Power Level	116	122	121	114	112	110	108	104	98

Source: io consulting Report (Appendix F.2)

The nearest residential receptor to any Solar Project infrastructure is located approximately 2.1 km to the East of the SPA along Pumphouse Road (IRID 37). The predicted noise level at

this receptor is 24 dB $L_{Aeq(1hr)}$ during the construction of the SPA (io consulting, 2025a) (Drawing 8.4-2, Appendix A).

These predicted levels are below any of the Health Canada (2023) Guidelines (Table 8.4.1) at all receptors. Therefore, construction activities are not anticipated to cause regulatory exceedances or sleep disturbances at any nearby receptors. Furthermore, it is below the measured baseline sound levels of 32 dBA (Strum Consulting, 2025). Therefore, it is anticipated that the construction of the SPA would not be discernible from other surrounding noises.

Operational Sound

During the operation of the SPA, sound will predominantly be generated through the operation of rectifiers and transformers and the associated hum of these electrical components. The io consulting operational noise model assumed the operation of the Solar Project in conjunction with the Industrial Facility. However, the Solar Project produces far lower sound power levels than the associated Industrial Facility (io consulting, 2025b). Furthermore, the mapping of the modelled output (iso-lines) demonstrates that noise emitted from the SPA is rapidly reduced to levels below any guidance (Drawing 7.4-4, Appendix A).

It is anticipated that the noise emissions from the operation of the Solar Project alone will not cause any exceedances of the Health Canada Guidelines (2023) (Table 8.4.1) at nearby receptors.

8.4.4.5 Effects Summary

During construction of the SPA, decibel levels above 45 dBA at residential receptors can disrupt sleep during nighttime hours. Sounds produced during construction are not anticipated to exceed these thresholds at any residential receptors. Furthermore, because baseline sound levels are much higher than expected construction noise levels, it is likely that construction noise would not be discernible at the nearest receptors.

Modelled operational sound at receptor locations was completed in conjunction with the Industrial Facility. However, when considering the Solar Project alone, it emits much less noise than the Industrial Facility. It is therefore anticipated that the Solar Project would not, unto itself, exceed the 45 dBA guidelines (Health Canada, 2023).

8.4.5 Mitigation

No mitigations are proposed currently for the construction or operation of the SPA.

The modelling completed by io consulting relied on a series of technical assumptions (estimated sound power levels for construction and operational equipment). If the underlying assumptions outlined in the report (Appendix F.2 and F.3) are found to differ significantly from those established through subsequent engineering design of the Solar Project, additional mitigations may be warranted.

8.4.6 Monitoring

No monitoring programs are recommended at this time.

8.4.7 Conclusion

After mitigations, predicted residual effects on sound/noise are characterized in Table 8.4.4.

Table 8.4.4: Sound Noise Residual Effects – Solar Project

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Construction Sound/Noise Impacts to residential receptors	N/A	A	N	LSA	ST	I	R	Not significant
Operational Sound/Noise Impacts to residential receptors	N/A	A	N	LSA	MT	C	R	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term, MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

8.5 Solar Glare

8.5.1 Overview

Solar glint and glare are defined as reflections of the sun's rays by a reflective surface. Glare is a continuous source of bright light that is experienced by stationary or slowly moving receptors. Glint is a momentary flash of bright light and is experienced by moving receptors such as automobiles and aircraft (Ho et al., 2011). Threats to aviation safety are often the greatest concern where glint and glare from solar projects are concerned and some jurisdictions have established guidelines that require impact assessments as part of a solar project's development and approvals processes (FAA, 2021). Solar reflections may also be a hazard to human health if reflections are sufficiently intense to cause retinal damage, interfere with safe navigation of roadways, or may be a nuisance to nearby residents. Therefore, requirements to conduct glint and glare assessments are common where renewable energy projects are proposed (Cilliers et al., 2024; VELWP, 2019). The Project includes placement of solar panels that can potentially produce glare that affects nearby receptors.

8.5.2 Regulatory Context

There are currently no regulations limiting exposure to solar glare within Canada, including either intensity or duration of effects. The province of Alberta has established the most comprehensive framework for managing solar glare, detailed in the Alberta Utilities Commission (AUC) Rule 007 (AUC, 2025). The rule requires identification and assessment of solar glare at receptors within 800 m of the boundary of a rural solar project, and aerodromes within 4,000 m. While similar rules or regulations do not exist in Newfoundland and Labrador, AUC rule 007 will be applied in this context as a guideline.

8.5.3 Desktop Modelling Methods

A desktop modelling exercise was conducted to understand the potential intensity and duration of glare from the Project on nearby receptors year-round. The assessment was completed through modelling to achieve the following objectives:

- Identify receptors that may potentially experience solar glare from the Project's operation.
- Quantify the expected duration of solar glare for receptors over a calendar year and during the modelled worst day.
- Assess if applicable guidelines are expected to be met.

Strum used WindPRO's Glare module (EMD International, n.d.-a) to complete an assessment of glare from the Project. The Glare module can model reflectivity of PV panels and other structures, such as glass facades. The model outputs provide information about the timing, duration, and intensity of reflections from PV panels and 3D objects visible from specified receptors.

For the purposes of this assessment, a conservative approach was used and receptors within 3,000 m of the SPA were assessed for solar glare. This greatly exceeds the 800 m requirement

in AUC Rule 007 (AUC, 2024) and was selected both as a conservative measure and because no receptors were found within 800 m. As an additional conservative measure, no distinction was made between habitable dwellings and barns, sheds, or outbuildings. A total of 15 buildings were located and modelled as receptors within 3,000 m of the Project (Drawing 8.5-1, Appendix A). Most of these receptors are private residences that appear to be occupied year-round (SRID1-15). A point 1.5 m off the ground was used for building receptors to simulate an average first floor window.

In addition to buildings, seven points were distributed across the nearest aerodrome (SGMA1-7) to determine effects on the airfield approximately 5,000 m from the SPA. This also exceeds the AUC Rule 007 guidelines requiring assessment of glint and glare at aerodromes within 4,000 m of a proposed development, an allowance made out of an abundance of caution. This aerodrome, the Exploits Valley (Botwood) Airport, is a civil airfield with no scheduled services, the gates to which have been observed to be periodically locked. Official records from 2020 note that the runway is in poor repair and the facility has limited winter maintenance (NAV Canada, 2020).

Five intersections along Highway 350 were selected for assessment where automobiles would potentially point directly at the Project while travelling along the highway, or during a turn on or off the highway. At each of these intersections, four points were modelled at different heights to evaluate the effect at cab heights of common vehicles in addition to the effect at ground level (SGM1-5). Per Alberta's *Assessment Requirements for Solar Developments Near Provincial Highways* (Alberta Transportation, 2021), the heights above ground and corresponding feature modelled were:

- 0.0 m – ground level baseline
- 1.1 m – average passenger vehicle
- 1.8 m – large SUVs or trucks
- 2.3 m – semi tractor-trailers

An assessment was also conducted to look for nearby solar power installations that could potentially interact with the Project or produce cumulative effects and none were identified.

WindPRO requires several solar panel technical parameters as input values that are used to model the interaction between incoming sunlight and solar panels and the resulting reflected glare. These values were selected from information provided by EVREC (Table 8.5.1). WindPRO also allows for the introduction of 3D objects and vegetation which would allow for a more realistic simulation of solar glare effects. These parameters were not used, and glare is considered in model outputs to be unmitigated by physical obstructions such as vegetation or topography. This conservative approach therefore models the worst-case scenario.

Table 8.5.1: WindPRO Glare Module Model Inputs

Attribute	Value
Module Surface	Smooth glass with anti-reflective coating
Axis Tracking	Single
Orientation	180°
Height Above Ground (m)	0.65
Tilt Angle	20.1°
Row Spacing (m)	4.65

For daily sunlight values, clouds and other weather conditions that may reduce total sunlight hours were not considered. Constant direct normal irradiance values of 1,000 W/m² were used as a conservative assumption in modelling, assuming no reduction in incoming solar radiation from weather conditions. The daily values of sun position, track, and sunlight duration as they vary throughout the year are automatically determined by the WindPRO Glare module based on the geographic position of the Project.

8.5.4 Desktop Modelling Results

The WindPRO Glare module results are presented in Table 8.5.2, sorted by distance to nearest edge of the SPA. Receptors are labelled in Drawing 8.5-1 (Appendix A). Highway intersection receptors are labeled as “SGM” with the intersection number and a letter corresponding to the height position of the point. “G” is on the ground, “A” is at 1.1 m from the ground, “B” at 1.8 m, and “C” at 2.3 m. The total hours of glare per year and minutes of glare on the worst day of the year are presented, as well as the day of the year and time of day when the longest duration of glare is received by each affected receptor.

Table 8.5.2 Glare Model Results by Receptor

Receptor #	Receptor	Distance to Nearest Project Edge (m)	Total Glare Hours / Year	Peak Glare Minutes / Day	Day and Timing of Max Glare
SGMA1	Airstrip	4982	0	--	--
SGMA2	Airstrip	4969	0	--	--
SGMA3	Airstrip	5136	0	--	--
SGMA4	Airstrip	5303	0	--	--
SGMA5	Airstrip	5524	0	--	--
SGMA6	Airstrip	5784	0	--	--
SGMA7	Airstrip	6149	0	--	--
SRID1	Building	2833	0	0	--
SRID2	Building	2687	0	--	--
SRID3	Building	2539	0	0	--
SRID4	Building	2547	0	0	--
SRID5	Building	2008	226.9	105	21 Apr 17:50-19:36

Receptor #	Receptor	Distance to Nearest Project Edge (m)	Total Glare Hours / Year	Peak Glare Minutes / Day	Day and Timing of Max Glare
SRID6	Building	2331	117.7	98	31 Aug 17:45-19:24
SRID7	Building	2347	106.7	94	11 Apr 17:48-19:22
SRID8	Building	2996	108.3	94	14 Apr 17:49-19:24
SRID9	Building	2957	116	96	28 Aug 17:50-19:26
SRID10	Building	2721	37.1	47	11 Mar 17:48-18:35
SRID11	Building	2758	30.5	43	11 Mar 17:51-18:35
SRID12	Building	2761	35.1	45	12 Mar 17:51-18:37
SRID13	Building	2914	22	35	5 Mar 16:50-17:26
SRID14	Building	2804	12	25	17 Oct 17:20-17:44
SRID15	Building	2613	16.6	29	27 Feb 16:49-17:16
SGM1A	Highway 1A	2175	101	85	7 Sep 17:44-19:09
SGM1B	Highway 1B	2175	101	84	5 Apr 17:49-19:13
SGM1C	Highway 1C	2175	101	85	6 Apr 17:49-19:14
SGM1G	Highway 1G	2175	101	85	6 Apr 17:49-19:14
SGM2A	Highway 2A	1755	239.7	106	23 Apr 17:53-19:39
SGM2B	Highway 2B	1755	239.7	108	21 Aug 17:56-19:44
SGM2C	Highway 2C	1755	239.7	106	21 Aug 17:58-19:44
SGM2G	Highway 2G	1755	239.7	105	21 Aug 17:58-19:44
SGM3A	Highway 3A	1591	0	--	--
SGM3B	Highway 3B	1591	0	--	--
SGM3C	Highway 3C	1591	0	--	--
SGM3G	Highway 3G	1591	0	--	--

Receptor #	Receptor	Distance to Nearest Project Edge (m)	Total Glare Hours / Year	Peak Glare Minutes / Day	Day and Timing of Max Glare
SGM4A	Highway 4A	3172	0	--	--
SGM4B	Highway 4B	3172	0	--	--
SGM4C	Highway 4C	3172	0	--	--
SGM4G	Highway 4G	3172	0	--	--
SGM5A	Highway 5A	2878	0	--	--
SGM5B	Highway 5B	2878	0	--	--
SGM5C	Highway 5C	2878	0	--	--
SGM5G	Highway 5G	2878	0	--	--

Generally, with one exception (SRID3), receptors located south of the SPA (Drawing 8.5-1, Appendix A) are not expected to receive glare based on modelling due to the relative position of the sun, solar panels, and the reflections that will result. This includes the nearby aerodrome, a cluster of buildings south of Peters Pond, and two highway intersections. Modelled receptors to the east of the SPA are modelled to receive glare from the Project. There are no modelled receptors to the north or west within the established buffers. In total, 11 building receptors and two highway intersections will receive varying levels of solar glare (Table 8.5.2). No receptors were found within the 800 m assessment buffer established per AUC Rule 007 for receptors requiring glare assessment (AUC, 2024).

8.5.5 Effects Assessment

Project activities related to Solar Project operations have the potential to create solar glare and modelling predicts that this glare may affect nearby receptors (Table 8.5.3). This effect is limited to periods when solar panels are installed and primarily during operations and maintenance (Table 8.5.3).

Table 8.5.3: Potential Project-Solar Glare Interactions – Solar Project

Project Phase	Potential for Interaction
Site Preparation and Construction (2 years)	
Clearing and Grubbing	
Access Roads, Electrical Lines, Laydown Yards, Settling Ponds, Site Preparation	
PV Array Installation	X
DC Collection Strings and Central Inverter Station Installation	
Underground MV Collection System Installation	
Solar Project Collection Substation Installation	
Overhead MV Feeder Lines to Project Substation Installation	
Solar Project Commissioning	X
Operations and Maintenance (30 years)	
Operations and Remote Monitoring	X
Routine Maintenance, Inspections, and Component Replacement	
Ongoing Road, Access, and Vegetation Management	

Project Phase	Potential for Interaction
Decommissioning and Rehabilitation (3 years)	
Decommissioning	X
Site Rehabilitation and Post-Decommissioning Monitoring	

In the absence of the Project, no natural features will produce solar glare of the type and magnitude expected in WindPRO Glare module model outputs (Section 8.5.4 Results). All reflective surfaces have the potential to produce solar glare that affects receptors, and it is possible that in time, glass or other reflective surfaces from other developments such as buildings may produce glare that affects receptors. It is, however, unlikely that the scale of residential development in this area would produce a similar magnitude of effect as the Project.

To understand the intensity of the glare predicted by WindPRO Glare module outputs, model results were studied in the context of literature on the likelihood of negative impacts to human health due to glare. This assessment of potential effects on human health informs the nature and necessity of mitigation recommendations.

The possibility for reflected light to affect human health is due to the potential for light of sufficient intensity to cause retinal damage over short exposures. The WindPRO Glare results were analyzed in terms the potential for effects on human health based on the methodology outlined in Ho et al. (2011). This approach determines the risk to eyesight using the intensity of glare, measured as retinal irradiance, and the relative size of the project, calculated as the subtended source angle. Results are graphed and categorized as either green, yellow, or red based on potential effects on vision (Figure 8.5.1).

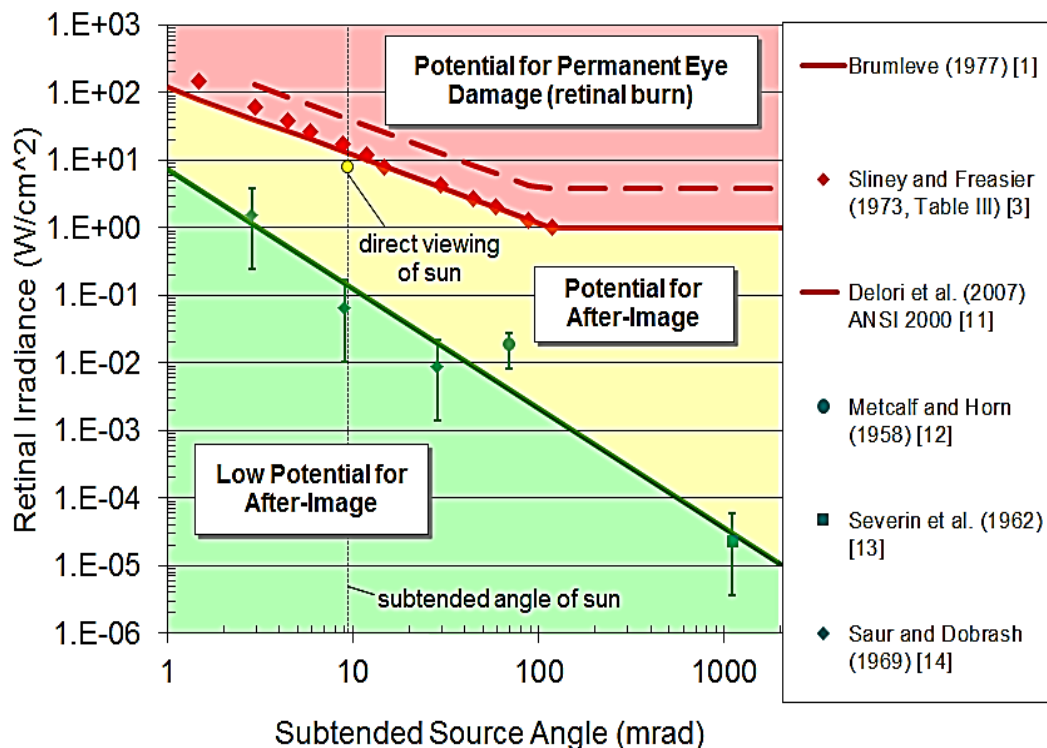


Figure 8.5.1. The Potential for Adverse Effects on Vision. Source: Ho et al. (2011).

Sources in the green zone have a low potential for an after image, which is experienced as a lingering spot in an observer's vision, similar to seeing a camera flash in a dim room. Sources in the yellow zone have the potential for temporary after-image but are not likely to cause permanent damage over short exposures. Sources in the red zone can cause either an after-image or permanent eye damage to unprotected eyes. This classification only applies to short exposures of harsh light as humans will respond to harsh light by averting their gaze to mitigate long-term exposure.

Analysis was only conducted of receptors for which the WindPRO Glare model determined there would be solar glare received at any point of the year. Assumptions such as always clear skies, made due to a lack of or exclusion of data from consideration, result in this analysis producing conservative results that likely overestimate the magnitude of effect. Determination of the subtended angle used the widest part of the Project to determine its width from any viewing angle and assumed that all panels will reflect light to the receptor. In fact, from many viewpoints the Project will appear narrower, and only the small portion of panels that perfectly align between the sun and observer will reflect glare to a single point receptor. This causes an overestimation of the Project's size from many viewpoints and the overall amount of light reflected to a receptor.

8.5.5.1 Assessment Boundaries

Administrative Boundary

There are presently no regulations in Newfoundland and Labrador pertaining to the production of glare from solar projects. Additionally, there are no guidelines for best practice in this jurisdiction, so guidelines from Alberta (Alberta Transportation, 2021; AUC, 2024) informed the development of the modelling approach and interpretation of results.

Technical Boundary

Modelling conducted with the WindPRO Glare module (EMD International, n.d.-a) used a variety of data sources such as solar project technical specifications, Project location, the locations of receptors, and topographical information. A variety of data constraints lead to model results being conservative estimates of glare that receptors are likely to experience. Therefore, model results are likely to overestimate the duration of glare experienced at receptors or evaluate the effect on receptors that may not be inhabited. Data not available or not used in this modelling includes realistic weather conditions, obstructive vegetation, and habitation status of receptors.

Spatial Boundary

The following spatial boundaries were used to evaluate the Project effects and interactions (Drawing 8.5-2, Appendix A).

- The Solar Project itself is located within the SPA.
- An 800 m buffer of the SPA was used to understand the Project's effects in relation to Alberta guidelines.
- LSA, as defined by a 3,000 m buffer applied to the Solar Project plus additional area to encompass an aerodrome. Residential receptors within 3,000 m are investigated for potential effects due to the Project's solar glare. An aerodrome located approximately 5,000 m from the Project was examined for potential effects due to the increased sensitivity to glint and glare at aerodromes, despite being beyond the 4,000 m cutoff for projects in Alberta.

Temporal Boundary

The temporal boundaries for the solar glare effects assessment include the construction, operation, and decommissioning phase of the Project. Whereas solar glare effects are limited to periods when panels are installed, only a portion of the construction and decommissioning phases are applicable.

The production of solar glare was modelled year-round to understand the changing effect of the sun's path through the daytime sky.

8.5.5.2 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for solar glare. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable solar glare predicted at receptor location(s).
- Low: Measurable solar glare predicted at receptor locations, but intensity is below the threshold to cause human health concerns.
- High: Solar glare is likely to be a risk to human health at receptor locations.

8.5.5.3 Results

The 11 buildings and two highway intersections that the WindPRO Glare module predicted would receive solar glare were assessed for the intensity of glare received (Table 8.5.4). The intensity of light (quantified as irradiance) was relatively low for all modelled receptors, with a range of 2.4E-^3 to 3.8E-^3 W/cm². The subtended angle of the glare was relatively high at receptors, ranging from 488 to 716 mrad (approximately 28 to 41 degrees) of an observer's field of view. Examined in the context of the chart from Ho et al. (2011), all receptors are in the yellow zone (Figure 8.5.1).

Table 8.5.4: Quantitative Results of Solar Glare Effects Assessment

Receptor #	Receptor	Incidence (°)	Irradiance (W/cm ²)	Subtended Angle (mrad)	Glare classification
9	Building	86.6	2.5E-03	532	Yellow
10	Building	80.3	3.8E-03	589	Yellow
11	Building	80.3	3.8E-03	494	Yellow
12	Building	80.3	3.8E-03	488	Yellow
13	Building	80.7	3.8E-03	586	Yellow
14	Building	80.3	3.8E-03	655	Yellow
16	Building	85.8	2.9E-03	492	Yellow
23	Building	85.0	3.2E-03	521	Yellow
24	Building	85.3	3.1E-03	515	Yellow
25	Building	85.1	3.1E-03	515	Yellow
26	Building	86.9	2.4E-03	504	Yellow
19	Highway 1G	81.1	3.8E-03	618	Yellow
28	Highway 1A	81.1	3.8E-03	618	Yellow
29	Highway 1B	81.1	3.8E-03	618	Yellow
30	Highway 1C	81.0	3.8E-03	618	Yellow
20	Highway 2G	80.3	3.8E-03	716	Yellow
31	Highway 2A	80.3	3.8E-03	716	Yellow

Receptor #	Receptor	Incidence (°)	Irradiance (W/cm ²)	Subtended Angle (mrad)	Glare classification
32	Highway 2B	80.3	3.8E-03	716	Yellow
33	Highway 2C	80.3	3.8E-03	716	Yellow

8.5.5.4 Effects

Solar glare characterized as yellow glare per the methods established by Ho et al. (2011) is expected at 11 buildings and two highway intersections assessed as receptors. Yellow glare may produce a temporary after-image after short exposures but is classified as not posing a risk to human health due to permanent effects on vision. It is notable that at the modelled irradiance intensities (2.4E^{-3} to 3.8E^{-3} W/cm²), a red-classified glare that presents a risk of long-term or permanent vision damage is not possible for a project at any size. Therefore, glare from the Solar Project may affect receptors that have a view of the Solar Project and that align along the reflective path, but the Solar Project will not cause uncomfortable or damaging reflections and will only affect certain receptors during certain times of day only on some days of the year. Glare from the Solar Project may be visible from additional receptors beyond the 3,000 m buffer used for residential receptors in this assessment, however both the intensity and apparent size of the project will diminish with increasing distance. Whereas modelled effects are not a concern to human health within the 3,000 m buffer, receptors beyond this buffer will also not be subject to levels of glare that present a risk to human health.

Conservative assumptions were made in modelling that will mean the actual intensity and duration of glint and glare produced by the Solar Project will be less than what is predicted in modelling. One key assumption is the quantity and layout of panels. For simplicity in modelling, the widest part of the SPA was assumed to represent the width of the project when viewed from any angle, leading to an overestimate of the subtended angle of glare at receptors. Additionally, the entire SPA was assumed to be populated with panels, which leads to a further overestimate of the subtended angle.

Another conservative assumption in modelling is the timing and duration of the glint and glare effect. The sun's rays will only be reflected to an individual receptor at certain times of the year, and a bright reflection only produced when no clouds or fog are impeding clear sightlines. An additional conservative parameter used in modelling was the buffer applied for receptor selection. Both residential receptors and the aerodrome were examined beyond what Alberta guidelines describe, looking 3,000 m and 5,000 m respectively versus the guidelines' 800 m and 4,000 m. While this does not affect the results at individually assessed receptors, it extends the analysis to receptors that would not otherwise be assessed. The nearest residential receptor was 2,008 m from the panel arrays, the nearest highway receptor point was 1,591 m away, and the aerodrome receptor is 4,969 m away at its nearest point. All of these receptors are well beyond the guidelines of how far to search for potential risks due to glint and glare.

Affecting how glare is received at receptors, another conservative assumption in modelling is the lack of vegetative screening. Canopy height models of the vicinity of affected receptors demonstrates tall canopies that may offer a degree of screening. Trees are effective at screening both buildings and outdoor spaces from solar radiation, making these spaces more comfortable for human habitation and enjoyment (Berry et al., 2013; Takebayashi et al., 2017). Most literature studying vegetative shading, however, is examining shading from direct solar rays, and not reflected rays from sources such as solar arrays. While the vicinity of the Solar Project is known to be well-forested, less is known about these canopies' vertical structure and therefore the ability to screen for light rays travelling nearly horizontal paths. Therefore, vegetative screening has been omitted from consideration, but it will play a role in mitigation beyond modelled values.

8.5.6 Mitigation

EVREC will develop a "good neighbour program", which will record and respond to concerns related to solar glare and outline a process to investigate complaints. During all phases of the Project, including operations, contact information from EVREC's point of contact will be made available and displayed publicly should the public have any questions, inquiries, or complaints. EVREC representative will respond to each communication accordingly. Mitigation to resolve complaints, if deemed necessary, will be completed on a case-by-case basis in consultation with the affected landowner and may include the provision of screening.

8.5.7 Monitoring

No monitoring programs are recommended.

8.5.8 Conclusion

Residual effects of solar glare are characterized as follows:

- Low magnitude as glare affecting receptors that are expected to receive glare from the Project is not expected to be a risk to human health.
- Within the LSA. As with the glint and glare experienced within the LSA, reflected light experienced beyond the LSA is not of a sufficient intensity to cause a risk to human health, and is therefore not classified as an effect.
- Medium duration as the residual effects will extend through the operational and maintenance phase.
- Of intermittent frequency as solar glare only occurs when the sun, solar panels, and receptor are aligned and weather conditions are clear and sunny.
- Reversible as the effect will terminate at the end of the Project lifespan.

As a result, the residual effects are considered not significant (Table 8.5.5).

Table 8.5.5: Solar Glare Residual Effects – Solar Project

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Solar Glare Impacts to residential and transportation-related receptors	Provide screening, potentially through vegetation, in response to complaints.	A	L Glare is produced but below the threshold that would cause concern for human vision health.	LSA	MT Effects are expected with late during construction and throughout operations and partially at the early stages of decommissioning.	Intermittent Intermittent depending on time of year and weather	R Reversible with removal of solar panels	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

8.6 Surface Water

8.6.1 Overview

The objective of the surface water assessment is to inform the Project's design and collect the information necessary to assess potential impacts to surface water and fish habitat (assessed separately in Section 8.7) resulting from the Project within the SPA. This was accomplished using the following approach:

- Identify and characterize potential water resources and use within the SPA using desktop resources and predictive methods.
- Use the information collected to inform Project design (e.g., avoid/minimize impacts to surface water).
- Complete field verification and assessments on surface water features anticipated to be directly or indirectly impacted within the SPA.
- Use the information collected to inform mitigation and monitoring programs.

8.6.2 Regulatory Context

Surface water is protected under the following provincial legislation and regulatory guidelines:

- *Water Resources Act* (Newfoundland and Labrador, 2002c)

Although the *Water Resources Act* defines a body of water as “surface or subterranean”, this section focuses on surface water features. Potential effects to wetlands as are discussed in Section 8.8.

8.6.3 Desktop Assessment Methods

A desktop study was conducted to identify all potential permanent and intermittent water resources that intersect or are located within 5 km of the SPA. Potential surface water features were identified using the following sources:

- Provincial Land Cover (NLFAL, 2025h)
- Federal CanVec watercourse and waterbody shapefiles (NRCan, 2023)
- Provincial digital elevation model (NRCan, 2024a)
- Newfoundland and Labrador Land Use Atlas (Newfoundland and Labrador, 2025d)
- Newfoundland and Labrador Angler's Guide (DFO, 2025d)
- Water Resources Portal (NLECCC, 2022)

Modelled watercourses were classified and characterized to support the development of field surveys. Protected water supply areas in the vicinity of the Project were also identified. Desktop review methods, including surface water flow modelling, are discussed in more detail in the Baseline Aquatic Environment Report (Appendix H.2).

8.6.4 Desktop Assessment Results

8.6.4.1 *Watershed*

The desktop review identified two local watersheds within the SPA (Drawing 8.6-1, Appendix A). Local watershed 4 intersects the southeast portion of the SPA and contains Peters Pond and Peters River. Water within this watershed drains southeast, and then northeast, into Peters Arm. Local watershed 15 intersects the northwest portion of the SPA and drains northwest, and then northeast, into Northern Arm.

No protected water supplies occur within the SPA. The protected water supplies closest to the SPA are Northern Arm Lake, Mill Lake, Muddy Pond, and Indian Cove Pond, which are located approximately 12.72 km west, 12.21 km southeast, 6.93 km north, and 6.55 km north of the SPA, respectively (NLECCC, 2022).

No scheduled salmon rivers intersect the SPA. The nearest scheduled salmon river is Peters River, which is located 680 m south and southeast of the SPA. Flowers Pond is located 714 m east of the SPA. Another mapped, unnamed watercourse (mainstem of local watershed 15), is located 49 m to the northwest of the SPA (Drawing 8.6-1, Appendix A).

A detailed analysis of watersheds, protected water supplies, and CanVec waterbody and watercourse databases is provided in the Baseline Aquatic Environment Report (Appendix H.2).

8.6.4.2 *Surface Water Classification*

Based on the predictive desktop review, ten potential first-order streams were identified that intersect the SPA (Drawing 8.6-1, Appendix A). All predicted streams within the SPA were checked in the field, and none were found to be present.

8.6.5 Field Assessment Methods

Field verification for predicted watercourses was completed throughout the SPA PF, and none were identified. As such, no additional assessments were completed.

8.6.6 Field Assessment Results

Table 8.6.1 summarizes the results within the SPA.

Table 8.6.1: Summary of Results within the SPA

Survey	Summary
Desktop Review	
Surface Water Classification	Across two watersheds. Ten potential first-order streams predicted through desktop methods.
Surface Water Characterization	
Watercourse Crossing	No Class N watercourses were assessed.
Assessment	No Class S1 watercourses were assessed.

Survey	Summary
	No Class S2 watercourses were assessed.
Detailed Habitat	No watercourses were identified within the SPA PF. One small, isolated waterbody identified outside of the PF.

The SPA PF was surveyed for watercourses and none were identified. One small, isolated waterbody (0.16 ha) was identified within the SPA, but outside of the PF (Drawing 8.6-3, Appendix A).

Baseline conditions are further discussed in the Baseline Aquatic Environment Report (Appendix H.2).

8.6.7 Effects Assessment

Solar Project activities, primarily those that involve earth moving, vegetation removal, and road construction have the potential to impact surface water (Table 8.6.2). These potential impacts could include changes to surface water quantity and quality.

Table 8.6.2: Potential Project- Surface Water Interactions – Solar Project

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Clearing and Grubbing	X
Access Roads, Electrical Lines, Laydown Yards, Settling Ponds, Site Preparation	X
PV Array Installation	-
DC Collection Strings and Central Inverter Station Installation	-
Underground MV Collection System Installation	-
Solar Project Collection Substation Installation	-
Overhead MV Feeder Lines to Project Substation Installation	-
Solar Project Commissioning	-
Operations and Maintenance (33 years)	
Operations and Remote Monitoring	-
Routine Maintenance, Inspections, and Component Replacement	-
Ongoing Road, Access, and Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Decommissioning	X
Site Rehabilitation and Post-Decommissioning Monitoring	X

8.6.7.1 *Assessment Boundaries*

Administrative Boundary

Administrative boundaries for surface water in the SPA include the *Water Resources Act* and CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME, n.d.-a; Newfoundland and Labrador, 2002c). The surface water effects assessment is undertaken in accordance with the specific requirements prescribed for the Aquatic Environment in the

Environmental Impact Statement Guidelines for the Botwood and Area EVREC Green Energy Project (NLECCC, 2025).

Technical Boundary

No technical boundaries are applicable to the assessment of effects to surface water within the SPA.

Spatial Boundary

The LSA for surface water is the SPA and segments of mapped watercourses and waterbodies within proximity of the SPA (Peters Pond and River, unnamed watercourse, Flowers Pond) including 500 m downstream river extensions. The RSA for surface water includes all modelled local watersheds that intersect the SPA (Drawing 8.6-2, Appendix A).

Temporal Boundary

The temporal boundaries for the surface water effects assessment include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

8.6.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to surface water. The VC-specific definition for magnitude is as follows:

- Negligible: Less than 1% change in flow from baseline. No measurable change to in water quality parameters relative to baseline (CCME, n.d.-a).
- Low: 1-10% change in flow from baseline. A measurable change in water quality parameters but within natural variation as compared to baseline (CCME, n.d.-a).
- Moderate: 10-25% change in flow from baseline. A measurable change in water quality parameters above baseline but within acceptable limits (CCME, n.d.-a).
- High: >25% change in flow from baseline. A measurable change in water quality parameters that elevates parameters above applicable guidelines (CCME, n.d.-a).

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

8.6.7.3 Effects

Solar Project infrastructure has been sited to avoid all watercourses and waterbodies; therefore, no direct effects to surface water resources are anticipated (Drawing 6.8-3, Appendix A).

Indirect effects such as changes in water quantity (e.g., alterations to hydrological inputs) and quality (e.g., sedimentation, water chemistry) can be farther reaching. These effects are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes, and the magnitude at which they are felt (DFO, 2022).

Changes in Surface Water Quantity

Changes to the amount of flow entering a water resource can alter channel morphology, increase flood potential, and disrupt habitat characteristics that support fish and other aquatic species (Section 8.7). Such effects often stem from changes in contributing drainage areas due to grading, vegetation removal, and soil compaction.

No surface water features were identified within the SPA PF. However, nearby surface water features (e.g., Peters River, unnamed watercourse, Flowers Pond) may experience changes in surface water quantity.

The SPA is located on the divide between two local watersheds, 4 and 15. Minimal grading is planned within the PF, and as such the natural drainage divide is largely expected to be maintained. Water management infrastructure will be designed to maintain natural flow within each respective watershed, where possible. This may require the installation of two settling ponds, one on each side of the watershed divide to collect on-site runoff. Water collected in the settling ponds would eventually be discharged into the surrounding environment. Detailed designs for the water management infrastructure will be prepared during the permitting phase. At that time, if more substantial site grading is required, a contributing drainage area assessment may be completed to evaluate any potential changes in surface water quantity affecting nearby water features. With minimal grading requirements and the implementation of on-site water management features, detectable hydrological alterations to nearby water resources are not anticipated.

Changes in Surface Water Quality

Changes in the quality of surface water can arise from alterations to the surrounding environment and can include an increase in water temperature from decreased shade, an increase in pollutants from machinery and infrastructure, and the mobilization of sediments (MTO, 2009). Given the dynamic nature of channeling water, effects upon water quality can quickly spread throughout different reaches of the respective watershed.

The mobilization of sediment within aquatic environments can cause shifts in ecological integrity, including changes to the plant species composition, the distribution of primary and secondary producers, and the habitat suitability for vulnerable species (Tilman et al., 1997). Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, routine road maintenance, and daily traffic. However, the highest potential for these effects is related to the construction and upgrading of access roads and installation the Solar Project and associated infrastructure. The alteration or removal of riparian vegetation can also result in bank instability and erosion.

Vegetated riparian buffers surrounding nearby surface water features will remain intact, as the PF of the SPA is set back at least 90 m from the nearest mapped (unnamed) watercourse. Potential indirect impacts to surface water quality will be further reduced through the implementation of standard BMPs such as erosion and sediment control measures and containment of hazardous substances. Regular water quality monitoring will ensure discharged

water meets CCME Guidelines for the Protection of Freshwater Aquatic Life (CCME, n.d.-a).

8.6.8 Mitigation

Avoidance of direct impacts to surface water features is the highest priority in the mitigation sequence. Throughout the iterative process of developing the current Project infrastructure layout, avoidance of direct effects to surface water was attained through several key design considerations. Initial desktop identification and characterization of surface water features within the SPA was completed using a watercourse model and a review of aerial and satellite imagery. The results of the desktop review helped inform an optimized site layout and reduce potential impacts to surface water.

Mitigation measures will be employed to further reduce potential indirect effects to surface water resources. The following mitigation measures will be included in the design of the Project:

Changes to Surface Water Quantity

- Integrate water management systems including diversion and collection ditches, roadside drainage channels, vegetated swales, and settling ponds.
- Develop a maintenance schedule for regular maintenance and inspection of Project water management infrastructure.

Changes in Surface Water Quality

- Maintain a minimum 30 m vegetated buffer surrounding watercourses, where possible.
- Integrate outlet protection features on retention ponds to dissipate flow velocities and decrease erosion at the outflow.
- Develop site-specific erosion and sedimentation control plans during the detailed design phase. Properly install, inspect, and repair erosion and sediment controls.
- Develop site-specific spill response and an emergency response plan to address potential impacts of spills, hazardous substances, and other emergencies on surface water resources.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Ensure operators remain with equipment during refueling.
- Require that workers are fully trained in spill response.

General

- Adhere to all Approval conditions outlined in all regulatory approvals.
- Complete site kick-off meetings with relevant staff/contractors to educate and confirm policies related to working near surface water resources, and that all Approval conditions are clearly communicated and adhered to.

8.6.9 Monitoring

A Groundwater and Surface Water Monitoring Management Plan will be implemented to ensure water discharged from site confirms to applicable regulations and guidelines. Should changes in water quantity be expected, the Groundwater and Surface Water Monitoring Management Plan may also include locations for flow monitoring to compare actual conditions with predicted streamflow changes. A table of contents for this plan has been included in Appendix Q.10 and this plan is considered a living document that will evolve and be updated with the Project as needed.

8.6.10 Conclusion

After mitigations, residual effects on surface water are characterized as follows in Table 8.6.3.

Table 8.6.3: Surface Water Residual Effects – Solar Project

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Changes to water quantity	Water management	A	L	LSA	MT	I	PR	Not significant
	Surface water monitoring							
Changes to water quality	Erosion and sediment control	A	L	LSA	MT	I	PR	Not significant
	Water management							
	Spill preparedness							
	Surface water monitoring							
LEGEND (Refer to Section 5.0 for definitions)								
Nature of Effect: A – Adverse, P – Positive								
Magnitude: N – Negligible, L – Low, M – Moderate, H – High								
Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area								
Duration: ST – Short Term, MT – Medium Term, LT – Long Term								
Frequency: O – Once, I – Intermittent, C – Continuous								
Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

8.7 Fish & Fish Habitat

8.7.1 Overview

The objective of the fish and fish habitat assessment is to inform the Project's design and collect the information necessary for the assessment of fish species and associated habitat within the SPA. This was accomplished using the following approach:

- Identify potential fish habitat (waterbodies, watercourses) within the SPA using desktop resources.
- Use the information collected to inform the Project design (e.g., avoid/minimize impacts to watercourses and waterbodies).
- Assess the quality of fish habitat within the SPA via field surveys.
- Inventory and assess abundance and diversity of fish within the SPA.
- Use the information collected to inform mitigation and monitoring programs.

8.7.2 Regulatory Context

The Project has potential to interact with fish and fish habitat that may be protected under federal and/or provincial legislation and regulatory guidelines. Legislation relating to fish and fish habitat includes:

Federal Legislation

- *Fisheries Act* (Canada, 1985)
- SARA (Canada, 2002b)

Provincial Legislation

- *NLESA* (Newfoundland and Labrador, 2001)
- *Water Resources Act* (Newfoundland and Labrador, 2002c)
- Newfoundland and Labrador Fishery Regulations (Newfoundland and Labrador, 2018b)

8.7.3 Desktop Assessment Methods

Desktop assessment methodology for the identification of surface water features (and potential fish habitat) is discussed in Section 8.6.

8.7.3.1 *Fish Community*

A desktop review to identify fish species that are potentially present within the SPA was completed using the following resources and databases:

- Aquatic Species at Risk Map (DFO, 2025b)
- Atlantic Canada Conservation Data Centre (ACCDC) Data Report (ACCDC, 2023)
- NL FAL GEOHub Aquaculture Licenses dataset (NL FAL, 2024)
- Water quality station profile for Peters River (Newfoundland and Labrador, n.d.)
- Scientific reports
- Consultation with local outfitters

8.7.4 Desktop Assessment Results

A review of the ESA list determined that the SPA includes habitat for two inland SAR:

- Banded killifish (ESA Vulnerable)
- American eel (ESA Vulnerable)

A review of data from a biomonitoring site at Peters River, which is located east of the SPA near Botwood, indicated that the following species may be found within the associated local watershed 4 (Newfoundland and Labrador, n.d.):

- Atlantic salmon – Northeast Newfoundland population (both sea run and ouananiche - land locked Atlantic salmon)
- Brook trout
- Arctic char
- Threespine stickleback
- Ninespine stickleback
- Rainbow smelt
- American eel
- Sea lamprey

The ACCDC database did not identify any fish species considered to be SOCC or SAR within 5 km of the SPA (ACCDC, 2026a).

Keefe et al. (2019) reported the first records of finescale dace (SNA) in four ponds within a first order tributary of Exploits River, which is located within 5 km south of the SPA.

The results of the desktop review are described in detail in the Aquatic Baseline Report (Appendix H.2).

8.7.5 Field Assessment Methods

Field verification for predicted watercourses was completed throughout the SPA PF, and none were identified. As such, no additional fish habitat assessments were completed. Methods are discussed in detail in the Aquatic Baseline Report (Appendix H.2).

8.7.6 Field Assessment Results

Table 8.7.1 summarizes the results of fish and fish habitat assessments within the SPA.

Table 8.7.1: Summary of Results within the SPA

Section	Summary
Fish Collection	
Trapping	No trapping was completed within this component due to the absence of fish habitat.
Electrofishing	No electrofishing completed within this component due to the absence of fish habitat.
Fish Habitat Characterization	

Section	Summary
Detailed Fish Habitat Assessment	Assessments within the SPA PF determined no fish habitat is present as no watercourses or contiguous water bodies were identified during field assessments.

No watercourses were identified within the SPA PF. One small, isolated waterbody (0.16 ha) was identified within the SPA, but outside of the PF. This waterbody is isolated and not contiguous with any fish-bearing system. Baseline conditions are further discussed in the Aquatic Baseline Report (Appendix H.2).

8.7.7 Effects Assessment

Solar Project activities, primarily those that involve earth moving, vegetation removal, and road construction have the potential to impact fish and fish habitat (Table 8.7.2). These potential impacts could include changes in fish habitat quality, quantity, and fish health and survival.

Table 8.7.2: Potential Project-Fish and Fish Habitat Interactions – Solar Project

Project Phase	Potential for Interaction
Site Preparation and Construction (three years)	
Clearing and Grubbing	X
Access Roads, Electrical Lines, Laydown Yards, Settling Ponds, Site Preparation	X
PV Array Installation	-
DC Collection Strings and Central Inverter Station Installation	-
Underground MV Collection System Installation	-
Solar Project Collection Substation Installation	-
Overhead MV Feeder Lines to Project Substation Installation	-
Solar Project Commissioning	-
Operations and Maintenance (33 years)	
Operations and Remote Monitoring	-
Routine Maintenance, Inspections, and Component Replacement	-
Ongoing Road, Access, and Vegetation Management	X
Decommissioning and Rehabilitation (two years)	
Decommissioning	X
Site Rehabilitation and Post-Decommissioning Monitoring	X

8.7.7.1 Assessment Boundaries

Administrative Boundary

Administrative boundaries for fish and fish habitat include the framework offered by the *Fisheries Act* (Canada, 1985) and supporting policy statements and management objectives from DFO. DFO interpretation of HADD of fish habitat supports the evaluation of this VC. The fish and fish habitat effects assessment is undertaken in accordance with the specific requirements prescribed for the Aquatic Environment in the Environmental Impact Statement Guidelines for the Botwood and Area EVREC Green Energy Project (NLECCC, 2025).

Technical Boundary

No technical boundaries are applicable to the assessment of effects to fish and fish habitat within the SPA.

Spatial Boundary

The LSA and RSA for fish and fish habitat are equivalent to the LSA and RSA for surface water (Drawing 8.6-2, Appendix A).

Temporal Boundary

Temporal boundaries associated with fish and fish habitat include the site preparation and construction (three years), operation and maintenance (33 years), and decommissioning and rehabilitation (two years) phases of the Project.

8.7.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for fish and fish habitat. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable change to fish habitat quantity (m²) or quality. No loss of fish.
- Low: A change in fish habitat quantity or quality or impacts to fish that are within natural variation.
- Moderate: A change in fish habitat quantity or quality, above the range of natural variation, which partially limits the ability of fish to use the habitat or carry out one or more life processes. Impacts to fish will only be experienced by individuals rather than entire populations and can be managed with routine measures.
- High: A change in fish habitat quantity or quality that limits the ability of fish to use the habitat to carry out one or more life processes. Impacts to fish will be experienced by entire populations and cannot be managed with routine measures.

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

8.7.7.3 Effects

Solar Project infrastructure has been sited to avoid all surface water resources; therefore, no direct loss of fish habitat or fish are expected (Drawing 8.6-2, Appendix A).

Indirect effects such as changes to water quantity and quality (refer to Section 8.6) can be interrelated, farther reaching, and may extend into the LSA. The identification of potential indirect Project interactions with fish and fish habitat have been guided by DFO's Pathways of Effects (DFO, 2024). These effects are often foreseeable, and research based BMPs can be implemented to mitigate the resulting outcomes, and the magnitude at which they are felt (DFO, 2022).

Change in Habitat Quantity

No direct impacts on fish habitat quantity (i.e., habitat loss) are expected as a result of Solar Project-related activities. However, alterations to the amount of water entering a watercourse can affect habitat viability, potentially leading to indirect reductions in available fish habitat in nearby systems (Peters River, unnamed watercourse north of the SPA).

The Pathways of Effects diagram developed by DFO outlines potential impacts to fish and fish habitat as a flow modification (DFO, 2024). Flow modification can influence fish habitat in several interconnected ways. When water levels or flow patterns are altered, the continuity of aquatic habitat can be disrupted, limiting or completely blocking fish passage between critical areas such as spawning, rearing, and feeding habitats. Reduced discharge can also shrink the extent of wetted area within a channel, decreasing the amount of physically available habitat. These pressures can collectively contribute to a measurable decline in habitat quantity, even in the absence of direct physical alteration of the channel.

As no substantial regrading of the land is expected, no measurable, localized changes in flow are anticipated to occur, and changes in habitat quantity are expected to be negligible. If the Project design changes and involves more substantial regrading, a contributing drainage area assessment may be considered during the permitting phase in consultation with DFO.

Change in Habitat Quality

Changes in fish habitat quality can occur through any mechanism that alters or disrupts the habitat's ability to support fish. Several Solar Project-related activities could affect nearby fish habitat quality during site preparation and earth works including the use of industrial equipment, vegetation clearing, excavation and grading, road construction, construction and installation of infrastructure, and water management. These activities can increase the potential for changes in stream flow, runoff, sedimentation, and the introduction of deleterious substances into fish habitat.

An increase in erosion due to removal of riparian vegetation, exposed soils, changing slopes, or drainage patterns could affect fish habitat quality by mobilizing sediments (Tilman et al., 1997). Sedimentation can reduce biological productivity, which affects food availability, egg development, and at high concentrations, fish survival (DFO, 2000). Removal of riparian vegetation may reduce shade, bank stability, and increase runoff, nutrient and energy inputs, in turn affecting the quality of fish habitat through changes in temperature, sediment concentrations, water chemistry, and food supply (Collison & Gromack, 2022). In addition, changes in stream flow from changes to catchment areas can result in lost habitat or habitat alterations that impact overall suitability for fish.

The Project has been designed to avoid these pathways to the extent practicable through siting of project infrastructure away from fish habitat. Additional mitigation measures will be used to reduce the potential for effects as outlined below. When working near water, interactions for fish and fish habitat are well known and documented, and DFO standards and codes of practice will be followed. With the application of best practices measures in accordance with

DFO's Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador (DFO, 2022) and the broader Measures to Protect Fish and Fish Habitat (DFO, 2025c), Solar Project-related effects on fish habitat quality are anticipated to be effectively mitigated. Furthermore, a Groundwater and Surface Water Monitoring Management Plan will be developed to ensure water quality and quantity mitigation measures are effective in their protection of fish habitat (table of contents included in Appendix Q.10).

Change in Fish Health and Survival

No direct loss of individual fish is expected as a result of Solar Project-related activities. However, sublethal effects to fish (i.e., injury and stress) can result from unmitigated changes in habitat quality, which can in turn impact long-term survival. For example, changes in fish habitat quality may affect predation rates, alter water temperature in exceedance of species-specific thermal tolerances, and impact reproductive success and availability of food sources (Zalewski et al., 2000). Project measures designed to preserve fish habitat quality are expected to effectively reduce potential impacts on fish health and survival.

8.7.8 Mitigation

Avoidance of direct impacts to fish and fish habitat is the highest priority in the mitigation sequence. Throughout the iterative process of developing the current Project infrastructure layout, avoidance of effects to fish and fish habitat was attained through several key design considerations. Initial identification and characterization of waterbodies and watercourses within the SPA helped inform an optimized site layout and reduce potential impacts to fish and fish habitat.

Mitigation measures will be employed to further reduce impacts to fish and fish habitat. Standards and best practices for working near water are well understood and will be followed (DFO, 2019). The following mitigation measures will be included in the design of the Project:

Change in Fish Habitat Quantity

- Integrate surface water management systems including diversion and collection ditches, roadside drainage channels, vegetated swales, and a settling pond, where required.
- Develop a maintenance schedule for regular maintenance and inspection of Project water management infrastructure.

Change in Fish Habitat Quality, and Fish Health and Survival

- Maintain a minimum 30 m vegetated, intact riparian buffer surrounding fish habitat.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff.
- Develop site-specific erosion and sedimentation control plans during the detailed design phase. Properly install, inspect, and repair erosion and sediment controls.
- Require that fuel storage areas, refueling and equipment lubrication are located a

minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.

- Avoid conducting any work in water, where possible.
- Ensure operators remain with equipment during refueling.
- Require that all equipment is equipped with spill kits and appropriate spill mitigation materials.
- Require that workers are fully trained in spill response.
- Require that surface run-off containing suspended materials or other harmful substances be minimized.
- Direct run-off from construction activities away from fish habitat.
- Ensure water discharge meets CCME FWAL guidelines (including temperature) prior to release.

8.7.9 Monitoring

A Groundwater and Surface Water Monitoring Management Plan will be implemented to ensure water discharged from site conforms to applicable regulations and guidelines. The Groundwater and Surface Water Monitoring Management Plan may also include locations for flow monitoring should catchment area analyses (to be considered at the permitting phase) indicate potential effects from flow modification. A table of contents for this plan has been included in Appendix Q.10 and this plan is considered a living document that will evolve and be updated with the Project as needed.

8.7.10 Conclusion

After mitigations, residual effects on fish and fish habitat are characterized in Table 8.7.3.

Table 8.7.3: Fish and Fish Habitat Residual Effects – Solar Project

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Change in fish habitat quantity	Avoidance of fish habitat through infrastructure placement	A	N	LSA	MT	I	PR	Not significant
Change in fish habitat quality	Erosion and sediment control	A	L	LSA	MT	I	PR	Not significant
	Spill preparedness							
	Water management							
	Surface Water Monitoring							
Change in fish health and survival	Erosion and sediment control	A	L	LSA	MT	I	PR	Not significant
	Surface Water Monitoring							
	Spill preparedness							
LEGEND (Refer to Section 5.0 for definitions)								
Nature of Effect: A – Adverse, P – Positive								
Magnitude: N – Negligible, L – Low, M – Moderate, H – High								
Geographic Extent: LSA – Local Study Area, RSA – Regional Study Area								
Duration: ST – Short Term, MT – Medium Term, LT – Long Term								
Frequency: O – Once, I - Intermittent, C – Continuous								
Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

8.8 Flora & Vegetation Communities

8.8.1 Overview

A desktop review and field studies were undertaken to understand the diversity and distribution of land cover types, flora species, and wetlands present in the SPA (described in detail in the Baseline Vegetation and Wetlands Report in Appendix I.1). The objective of the assessment was to collect the information required to assess the potential impacts of the Project on vegetation and wetlands. The assessment was completed using the following approach:

- Complete a desktop review to characterize the land cover types, wetlands, and flora species known to occur within and near the broader PA.
- Informed by the desktop review, undertake targeted field surveys to document the floral diversity of the SPA, with a focus on flora SAR and SOCC.
- Use the information from the desktop review and field surveys to update the Project design to minimize interactions with rare flora species, their supporting habitat, and wetlands.

This section provides details about the potential effects of the Solar Project Component on vegetation and wetlands. Information about the effects of the Wind and Transmission, and Industrial Project Components is provided in Section 6.9 and 7.8, respectively.

8.8.2 Regulatory Context

The Project has potential to interact with lands, flora species, and their associated habitats that may be protected under federal and/or provincial legislation and regulatory guidelines. Legislation relating to vegetation and wetlands includes:

Federal Legislation

- SARA (Canada, 2002b)

Provincial Legislation

- NL ESA (Newfoundland and Labrador, 2001)
- *Lands Act* (Newfoundland and Labrador, 1991)
- *Water Resources Act* (Newfoundland and Labrador, 2002c)

8.8.3 Desktop Assessment Methodology

Desktop assessment methodology for flora and vegetation communities for the SPA followed the same methodology outlined in Section 6.9. The technical methods used to develop the ELCs are provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

8.8.4 Desktop Assessment Results

8.8.4.1 *Vegetation*

The SPA is in North Central Subregion of the Central Newfoundland Ecoregion (Drawing 3.1-2, Appendix A). This ecoregion is heavily forested, with an abundance of rivers, streams, ponds,

and bogs. Forests have a high component of black spruce (*Picea mariana*) and fires are relatively frequent. Stands of trembling aspen (*Populus tremuloides*) frequently regenerate after fires (S. J. Meades, 1990a).

Ecological Land Classification

The LiDAR-ELC developed for the Project provides a detailed overview of the land cover types present in the PA (Drawing 7.8-1, Appendix A). Within the SPA, the herbaceous/shrub barren class is the dominant land cover type (31% of the SPA), with shrub cover the next most common (22%). Based on inspection of aerial imagery, much of the area classified as herbaceous/shrub barren appears to be associated with cleared and harvested areas. Bogs are relatively abundant within the SPA, consisting of 10% of the overall area. The complete extent of modelled land cover types in each component PA is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

Old-Growth/Late-Successional Forests

A total of 24 ha of old-growth/late-successional forest was identified, primarily in the northern section of the SPA (Drawing 7.8-2, Appendix A). This represents 10% of the total SPA.

8.8.4.2 Flora Species

The ACCDC data reports prepared for the Project (ACCDC, 2023, 2026a) contained occurrence records representing 59 unique species of vascular plants. Of these, the natural population of red pine is a SAR (NL ESA Threatened, S2), and 25 species are SOCC (Appendix I.1). No non-vascular plant or lichen SAR or SOCC were identified in the reports.

Red Pine Potential Habitat Mapping

No areas of potential red pine habitat were identified in the SPA, and no forest stands containing red pine were identified in the FRI.

Rare Lichen Potential Habitat Mapping

No areas of potential habitat for blue felt lichen or boreal felt lichen were identified in the SPA.

Potential Rare Flora Habitat

Areas of potential habitat for rare flora were identified, primarily in the southern portion of the SPA (Drawing 7.8-2, Appendix A).

8.8.4.3 Wetlands

Based on the two models used to estimate wetland area (LiDAR-ELC and CNWI), wetlands are estimated to be between 25% and 40% of the total SPA (Drawing 7.8-3, Appendix A). Bogs are by far the most abundant wetland type identified in the SPA. The complete extent of mapped wetland areas in each component PA is provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

8.8.5 Field Methodology

8.8.5.1 *Vegetation*

Vascular and Non-Vascular Plants

Surveys for vascular plants were completed in the SPA between June 2024 and July 2025. within appropriate seasonal windows by qualified professionals. A variety of approaches were used to obtain representative survey coverage of major land cover types, including point-based surveys and transects. Further details about the timing and methods used for vascular and non-vascular plant surveys are provided in the Baseline Vegetation and Wetlands Report (Appendix I.1).

Rare Lichens

Targeted surveys for rare lichens were not completed in the SPA due to a lack of suitable habitat identified both through potential habitat modelling and reconnaissance gathered during early Project surveys.

8.8.5.2 *Wetlands*

Information about the presence of wetlands in the SPA was recorded incidentally during biophysical surveys.

8.8.6 Field Results

8.8.6.1 *Vegetation*

Three forest types were classified within the SPA: kalmia-black spruce, black spruce fen, and a mixed wood forest type. The landscape consists of a mixture of upland and wetland areas. The upland forest has both young, regenerating forest stands as well as mature forests. Black spruce-dominated softwood stands make up the vast majority of forested area in the SPA, and secondary tree species include red maple (*Acer rubrum*) and tamarack (*Larix laricina*).

Vascular and Non-Vascular Flora

No vascular flora SAR and SOCC were observed in the SPA (Drawing 7.8-4, Appendix A).

A total of 17 non-native vascular plants, four of which are considered invasive in Canada, were observed during field surveys in the SPA (Flora List, Appendix I.1). There were also 31 bryophyte species that were recorded (Flora List, Appendix I.1), none of which are SAR or SOCC.

No lichen SAR and SOCC were observed in the SPA.

8.8.6.2 *Wetlands*

Wetlands were a dominant feature on the landscape. As predicted in the wetland models, bogs were commonly observed during field assessments. Representative photographs of wetlands

are included in a photograph log within the Baseline Vegetation and Wetlands Report (Appendix I.1).

8.8.7 Effects Assessment

Project activities, primarily those that involve earth moving and vegetation removal have the potential to impact vegetation cover, rare flora and their supporting habitat, and wetlands (Table 8.8.1). Potential impacts could include direct or indirect impacts to flora SAR, SOCC, and their supporting habitat, and alterations to wetland area and function.

Table 8.8.1 Potential Project-Vegetation and Wetland Interactions – Solar Project

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Clearing and Grubbing	X
Access Roads, Electrical Lines, Laydown Yards, Settling Ponds, Site Preparation	X
PV Array Installation	-
DC Collection Strings and Central Inverter Station Installation	-
Underground MV Collection System Installation	-
Solar Project Collection Substation Installation	-
Overhead MV Feeder Lines to Project Substation Installation	-
Solar Project Commissioning	-
Operations and Maintenance (33 years)	
Operations and Remote Monitoring	-
Routine Maintenance, Inspections, and Component Replacement	-
Ongoing Road, Access, and Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Decommissioning	X
Site Rehabilitation and Post-Decommissioning Monitoring	X

8.8.7.1 *Assessment Boundaries*

Administrative Boundary

No administrative boundaries are identified for the effects assessment on vegetation and wetlands.

Technical Boundary

The primary technical boundary relating to the assessment of vegetation and wetlands is the inability to exhaustively survey all portions of the SPA. Although efforts were made across two years of field data collection, it is possible that additional flora species, and additional occurrences of reported flora species are present on the landscape. Additional technical limitations of the assessment relate to the availability and accuracy of the land cover classifications and potential habitat mapping completed for the Project. LiDAR data used for

the ELC is limited to the PA (99% coverage), and the accuracy of mapping is influenced by a variety of factors, including the accuracy of layers used as inputs. Finally, although wetland areas were incidentally recorded during field assessments, the assessment of impacts relating to wetlands relies primarily on modelled data.

Spatial Boundary

The LSA for vegetation and wetlands is the SPA plus a 1 km buffer (Drawing 8.8-1, Appendix A). This area encompasses the maximum expected extent of the direct and indirect impacts to vegetation and wetlands. The RSA is not applicable.

Temporal Boundary

The temporal boundaries indicate when vegetation and wetlands may be impacted by the Project. Impacts will occur throughout the site preparation and construction, operations, and decommissioning phases, with the majority of impacts to vegetation and wetlands occurring during site preparation and construction.

8.8.7.2 Assessment Criteria

The VC-specific definition for magnitude is as follows:

- Negligible: No loss of sensitive vegetation types or wetlands; no loss of terrestrial flora SAR or SOCC individuals; no alteration to habitat known to support terrestrial flora SAR or SOCC expected.
- Low: Small loss of sensitive vegetation types or wetlands; no terrestrial flora SAR or SOCC individuals lost; small loss of or effects on habitat supporting terrestrial flora SAR or SOCC.
- Moderate: Moderate loss of sensitive vegetation types or wetlands; small loss of or effects on terrestrial flora SAR or SOCC individuals (and associated habitat) that do not have legislated protection status, but their populations remain largely intact.
- High: High loss of sensitive vegetation communities or wetlands; high loss of or effects on the habitat that supports terrestrial flora SAR or SOCC that do have legislated protection status.

8.8.7.3 Effects

Potential environmental effects and associated pathways of the Solar Project Component in relation to vegetation and wetlands are grouped into four major categories:

- Loss and Alteration of Vegetation Cover
- Landscape Fragmentation and Edge Effects
- Loss of Rare Flora
- Impacts to Wetland Area and Function

Project-related effects can influence vegetation and wetlands directly and indirectly. A direct effect is defined by interactions that have no intermediate process (e.g., loss of an individual plant or lichen, loss of a tree that supports a rare lichen) and indirect effects are interactions that have intermediate processes such as landscape fragmentation and edge effects.

Loss and Alteration of Vegetation Cover

Losses and alterations to vegetated land cover will occur during the site preparation and construction phase of the Project as a result of activities requiring vegetation clearing and ground disturbance. Site preparation activities for the Solar Project Component will include selective tree removal, vegetation clearing (grubbing), and grading within the SPA to accommodate the PV array and all associated infrastructure. All vegetation within the SPA that could cast shade on PV arrays will also be removed during site preparation.

Areas within the SPA associated with the substation, buildings, road, and the PV array will likely experience a long-term loss of vegetated land cover as construction will require removal and contouring of overburden and/or conversion of land to build infrastructure. In contrast, components such as the electrical collection system will primarily require clearing of tall vegetation within ROWs, such that alterations but not an overall loss of vegetated area can be expected. Much of the SPA already consists of barren/shrub cover (frequently associated with cleared and disturbed areas), which will limit the overall extent of new disturbance required for the Solar Project Component.

During the operations phase of the Project, quarterly vegetation management inspections will be completed within the SPA. Vegetation control (e.g., manual brush removal, herbicide application) among solar arrays will be completed to prevent shading, and beneath overhead transmission systems to reduce the risk of infrastructure damage and fire. Decommissioning will entail replacement of salvaged topsoil, re-establishment of natural drainage patterns, and re-seeding or re-planting with appropriate vegetation species consistent with reclamation objectives at the time of decommissioning.

Land cover modelling and field surveys completed for the Project indicate that the SPA is dominated by herbaceous/shrub barren and shrub cover, with abundant bogs and other wet areas. To quantify the impacts of the Solar Project Component on vegetation cover, the amount of each land cover type present within the PF was determined using the LiDAR-ELC and compared to the total amount available within the SPA (Table 8.8.2). Comparisons of land cover within the PF relative to the SPA are useful for contextualizing impacts; however, note that percentages are elevated in Table 8.8.2 due to the close boundary between the PF and SPA. This interpretation of percent impact rings true for other pathways of effect on flora presented herein.

The land cover types with the greatest overlap with the PF are herbaceous/shrub barren (58 ha) and shrub cover (34 ha), which collectively make up over half of the PF. The prioritization of previously disturbed areas is highlighted by the high proportion of available herbaceous/shrub barren used for the Project (78%) and usage of existing road area (100%).

Table 8.8.2: Land Cover Types within the PF – Solar Project

Land Cover Type	Area in PF (ha)	Total Available in the SPA (ha)	% Impacted
Road	2.6	2.6	100%
Barren	0.2	0.5	43%
Bog	10.7	25.5	42%
Hardwood Forest	0.8	2.5	35%
Herbaceous/Shrub Barren	57.6	74.2	78%
Raised Wet Area	4.5	7.9	57%
Shrub	33.6	53.4	63%
Softwood Forest	5.6	11.1	50%
Water	0.2	0.4	48%
Wet Hardwood Forest	0.7	1.3	50%
Wet Herbaceous/Shrub	19.9	31.9	63%
Wet Mixedwood	2.0	3.2	63%
Wet Shrub	13.4	21.8	62%
Wet Softwood Forest	2.5	5.9	42%
Total	154.4	242.1	64%

Old-growth/late-successional forest stands were identified in the desktop review as having ecological value and potential to serve as habitat for several species of flora and fauna. Impacts to old-growth/late-successional forest due to the Solar Project are expected to be low. Of the 24 ha of old-growth/late-successional forest in the SPA, 5 ha intersect with the PF, with most of the concentrated area in the northern portion of the SPA avoided by the Project.

Landscape Fragmentation and Edge Effects

Vegetation clearing for infrastructure placement has the potential to fragment areas of intact vegetation cover and create new areas of edge habitat. Landscape fragmentation and edge effects can have a variety of impacts on flora and fauna, including changes in the composition, diversity, and reproductive output of flora species (Brisson et al., 2010; Hulting et al., 2025).

Much of the SPA has been subject to prior disturbance, with existing forest access roads and an extensive network of ATV trails present. Silvicultural data provided to Strum by NL FAL indicates that the majority of the Solar PF has been harvested within the past 20 years. Due to the disturbed nature of the SPA, the amount of new landscape fragmentation due to the Project is expected to be low.

Of the infrastructure associated with the Solar Project, the construction of the 3 km MV electrical line and access road between the Solar Project and Industrial Facility have the greatest potential to create new edge habitat. Vegetation within the edge may experience effects associated with altered environmental conditions, dust deposition, and the introduction and spread of invasive species. For example, the creation of edge habitat has been shown to

induce changes in environmental conditions such as light availability, moisture levels, and temperature (Braithwaite & Mallik, 2012; Hamberg et al., 2009), while also increasing the vulnerability of forest edges to natural disturbances, such as windthrow. Lichens and non-vascular plants are especially sensitive to edge effects and changes in air quality due to being unable to regulate and maintain their water content (Boudreault et al., 2008; Nash, 2008).

Dust deposition may also impact flora near the PF when fugitive dust is generated by traffic on unpaved roads, crushing material, and blasting. Dust from unpaved roads has been found to change the pH of lichen substrates (i.e., the tree bark they are attached to) and impact individual health and species richness (Degtjarenko, 2016). Vascular plants may be impacted by dust through reductions in photosynthesis and leaf diffusion (Thompson et al., 1984). The effects of dust on flora may depend on the duration of exposure; one study found that lichens along a gravel road were unaffected within two years, but significant changes to the communities were observed after 10 years (Farmer, 1993). It is expected that impacts to vegetation relating to dust deposition will be greatest during the site preparation and construction phase (short-term duration) in areas within and near the PF. Site traffic will be greatly reduced during the operational and maintenance phase of the Project.

Finally, the creation of edge habitat is also associated with the introduction and spread of invasive species. Terrestrial flora, particularly rare native flora, may be at risk due to threats from invasive species (BCMECCS, 2018). Non-native species, often introduced to a landscape accidentally by humans, can become invasive when they cause harm to the environment, economy, or human health through rapid reproduction and out-competing of native species (Rutledge et al., 2024). Industrial projects can lead to the introduction of invasive species in two main ways:

- Revegetation of cleared land with non-native seed mixes.
- Increased access to remote areas with equipment carrying seeds, spores, or other reproductive materials from non-native species.

The construction of new roads and subsequent increase in vehicle traffic on associated with the operation and maintenance can lead to the introduction or spread of non-native species, some of which are invasive. Within the broader PA, there were 17 non-native vascular plant species observed, of which four are considered invasive (Appendix I.1). Given that non-native and invasive species are already known to be present, mitigation strategies to minimize the risk are provided.

Loss of Rare Flora

Activities requiring ground disturbance and vegetation clearing during the site preparation and construction phase have the potential to directly impact occurrences of flora SAR and SOCC. No flora SAR or SOCC were observed during field surveys, and no direct impacts to rare flora species due to the Solar Project are expected.

Potential Sensitive Flora Habitat

Potential habitat mapping for rare flora species was completed to estimate the impacts of the Project on habitat with elevated potential to host rare flora species (referred to as “potential sensitive flora habitat”). This mapping exercise used several of the inputs used in the desktop review to prioritize surveys for rare flora (Drawing 7.8-6, Appendix A). The selection of mapped inputs was similarly informed by known associations between rare flora and specific landscape features. The following features were included in mapping:

- Mature forest (61+ year age classes determined from FRI Data) located along drainage features.
- Alluvial floodplains, as determined using LiDAR by simulating a 3 m water rise on water features.
- Areas with volcanic substrate identified detailed bedrock geology layers (NLGS, 2013).

Feature layers were combined to identify areas where multiple features coincide, and the overall area of potential sensitive flora habitat was determined. Although the mapping exercise was not validated using field observations, it is based on established associations between rare flora and landscape features and is expected to serve as a reasonable approximation of areas where suitable habitat is likely to occur.

A total of 12 ha of potential sensitive flora habitat associated with fragmented areas of mature forest along drainage/floodplains was identified in the SPA (8% of the SPA). Of this, 3 ha are within the PF. The overall loss of potential sensitive flora habitat is therefore expected to be low.

Impacts to Wetland Area and Function

Wetlands are a common feature observed in the SPA as identified by modelling and confirmed through field surveys (Drawing 7.8-7, Appendix A). Project activities that involve vegetation removal and ground disturbance have potential to impact wetlands through a direct loss of wetland area as well as impacts to wetland function.

Effects to wetlands include both direct loss and changes in wetland functionality and can occur throughout the life of the Project. Effects might be direct (e.g., habitat loss through infilling) or indirect (e.g., changes to functionality due to hydrologic shifts). Effect-specific active management, mitigation, and long-term monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

The impacts of the Solar Project Component on Surface Water Hydrology, as well as Fish and Fish Habitat (VCs with linkages to wetlands) are described in Sections 8.6 and 8.7.

Loss of Wetland Area

A direct loss of wetland area will occur during the site preparation and construction phase through infilling or excavating for Project Infrastructure. Wetland loss has the potential to fragment wildlife corridors, potentially isolating species and lowering species richness. It can

also disrupt vital habitat characteristics that support vulnerable species. Further, the removal or infilling of wetland habitat can impact the hydroperiod of neighbouring wet areas, resulting in farther reaching impacts on habitat quality (Mitsch & Gosselink, 2000).

The wetland areas identified in the LiDAR-ELC were used to estimate the maximum direct loss of wetlands associated with the Project. It is expected wetlands identified using this model incorporate an undetermined amount of “wet areas” that are not true wetlands, such that the areas reported are a conservative estimate of the total impact area. A total of 53.7 ha of wetland area was identified within the PF, which represents 54% of the amount within the SPA (Table 8.8.3).

Table 8.8.3: Estimated Impact to Wetlands within the SPA – LiDAR-ELC

Wetland Type	Area in PF (ha)	Total Available in SPA (ha)	% Impacted
Bog	10.7	25.5	42%
Raised Wet Area	4.5	7.9	57%
Wet Hardwood Forest	0.7	1.3	54%
Wet Herbaceous/Shrub	19.9	31.9	63%
Wet Mixedwood	2.0	3.2	63%
Wet Shrub	13.4	21.8	62%
Wet Softwood Forest	2.5	5.9	42%
Total	53.7	97.5	54

Change in Wetland Function

Wetlands play a variety of functional roles in boreal landscapes, which differ based on wetland type. Changes to wetland functionality may be caused through direct loss of wetland area, as discussed above, or through other Project activities that release dust, sediment or invasive species into the wetland, thus shifting its ecological, chemical, and hydrological profiles. Changes to wetland function are therefore possible during all Project phases. As visible in aerial imagery, many wetlands within the SPA have previously been disturbed by human activities including ATV use.

The temporal and spatial extent of indirect effects such as effects on hydrology, erosion and sedimentation, invasive species, and compaction can be far reaching, but are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes. Indirect impacts are mitigated by maintaining a vegetated buffer between Project activities and unaltered wetlands.

Hydrological Effects

The hydrology of a wetland is one of the most important aspects of its overall structure and function. Project infrastructure within or near a wetland can result in changes in the timing and quantity of flow, potentially impacting species composition, water treatment capabilities, and nutrient export (Mitsch & Gosselink, 2000). Further, disruption to the hydrology of one area may hinder the hydrological connectivity to other areas, thus resulting in impacts being felt in

neighbouring wet areas, including those outside of the SPA.

Impacts to wetland hydrology may occur due to ground disturbance and infilling required for placement of infrastructure within the SPA. However, minimal grading is planned for the PF within the SPA, and natural drainage patterns are therefore expected to largely be maintained. The layout of the Solar Project Component has also been microsituated to avoid direct impacts to surface water features (watercourses and waterbodies), such that no impacts to wetland hydrology due to changes in surface water flows are expected.

Erosion and Sedimentation

Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, daily traffic, routine road and transmission line ROW maintenance. The accumulation of sediment within wetland environments can cause shifts in ecological integrity, including the plant species composition and subsequent nutrient retention potential, hydrological storage capabilities, and habitat suitability for vulnerable species (Tilman et al., 1997). Additionally, the use of road salt for winter maintenance may result in indirect adverse effects on microbial and vegetative wetland communities, including detrimental salinity levels and increased soil erosion due to salt-damaged vegetation (Jones et al., 2017). During winter, access roads in the SPA will be maintained by plowing, sanding, and/or salting will be used as required for safe driving.

Invasive Species

The colonization of invasive species can result in detrimental impacts on wetland environments, including alterations to evapotranspiration rates, infilling from reduced decomposition rates, and ultimately a reduction in the complexity of the wetland and its subsequent species richness (Zedler & Kercher, 2004). The creation of roadways can act as a vector for invasive species, with the potential for seed dispersal increasing with both vehicular and animal traffic. Further, because many invasive species thrive in disturbed soils, routine maintenance of roadways can provide ideal conditions for their establishment (Trombulak & Frissell, 2000). Due to the existing presence of invasive species in the broader PA, mitigations will be applied to reduce the further introduction or spread of invasive species.

Compaction

Compaction can hinder both the vegetative and hydrological structure of a wetland, with a loss of pore space restricting root growth and groundwater infiltration (Duiker, 2004). This impacts the absorption of moisture and nutrients, thus impacting the ecological integrity of the wetland and the ecosystem services it provides. Further, compaction can decrease percolation rates, resulting in prolonged periods of saturation, and increasing the potential for flooding (Duiker, 2004). Following established BMPs for construction in wetlands and avoiding unnecessary travel through wetlands will reduce the overall extent of wetland compaction.

Summary of Wetland Impacts

Changes in wetland function associated with the Project were qualitatively assessed by identifying the dominant wetland types present within the SPA. As the wetlands identified by the LiDAR-ELC do not follow an established wetland classification system, such as the

Canadian Wetland Classification System (NWWG, 1997), the extent of wetlands identified by the CNWI (ECCC, 2024a) were reviewed. The total areas of each wetland type within the PF were determined for the SPA to identify the relative impacts to primary wetlands types (Table 8.8.4).

Table 8.8.4: Estimated Impact to Wetlands within the SPA – CNWI

Wetland Type	Area in PF (ha)	Amount Available in SPA (ha)	% Impacted
Bog	28	52	54%
Fen	2	5	35%
Swamp	0.72	1	72%
Marsh	0.96	1	96%
Total	31.68	60	53

Bogs typically have a high water table and receive most of their water from precipitation, resulting in nutrient-poor, acidic environments (NWWG, 1997). This acidity is further compounded due to the release of organic acids that result from the decomposition of *Sphagnum spp.* Bogs have an important role in carbon storage (due to the accumulation of peat), water storage, and habitat for wildlife species (DUC, n.d.). Bogs are the most common wetland type in the SPA and PF.

Fens typically exhibit more open water than bogs, often with a connection to a watercourse or abutting a lakeshore. They may also receive hydrology from neighbouring uplands. Ultimately, this inundation of water from outside sources facilitates a transfer of nutrients that allow fens to support a wider variety of flora and fauna than bogs (NSNR, 2018). Fens store large amounts of carbon, and are generally more biologically diverse than bogs due to being supplied by various sources of water (DUC, 2013a). Fens will experience the lowest proportional impact of the four wetland types assessed.

The Canadian Wetland Classification System (NWWG, 1997) defines a swamp as a wetland characterized by the dominance of woody vegetation in which the water table is typically at or near the surface or inundates the soil for a significant portion of the growing season. Swamps are often associated with poorly drained or saturated soils, and they provide important habitat for various plant and animal species adapted to wet conditions. Swamps offer nutrient rich soils for a variety of flora species and offer a high diversity of habitat for wildlife species (DUC, 2013c). A low overall amount of swamp wetland is expected to be impacted by the Solar Project (approximately 1 ha).

Marshes often display more persistent surface water areas that tend to shrink as the growing season progresses. The hydrology of marshes can be influenced by various external sources, including precipitation, surface runoff, surface water connections, and groundwater. This diversity of hydrological sources typically fosters a nutrient-rich environment which, when paired with the lack of canopy cover, often facilitates the vigorous growth of herbaceous vegetation (NSNR, 2018). In many cases, this vigorous growth can lead to the full engulfment of any open water areas, resulting in meadow-like marshes that may be partially or fully inundated. Marshes are the least common but most biologically diverse type of wetland in

boreal environments (DUC, 2013b). A low overall amount of marsh wetland is expected to be impacted by the Solar Project (approximately 1 ha).

8.8.8 Mitigation

To address the abovementioned effects to vegetation and wetlands, the following mitigation measures will be implemented:

Loss and Alteration of Vegetated Land Cover

- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Conduct vegetation management activities (through application of herbicides and manual brush cutting) in accordance with the Pesticide Control Regulations under the NL EPA.

Landscape Fragmentation and Edge Effects

- Use approved dust suppressant to control road dust and minimize airborne emissions, where required.
- Establish and implement speed limits to minimize dust and potential collisions.
- Use quarried, crushed materials for road construction to reduce the introduction of invasive vascular plant species.
- Clean and inspect equipment to prevent the introduction of non-native species.
- Revegetate cleared areas with native species, to the extent possible.

Loss of Rare Flora

- Consult NL FAL-Wildlife Division if a flora SAR is incidentally observed in the SPA (e.g., during site preparation, construction).

Loss of Wetlands and Change in Wetland Function

- Avoid unnecessary travel through wetlands, where possible.
- Maintain a minimum 30 m vegetated buffer surrounding watercourses, where possible.
- Where undisturbed buffers cannot be maintained an application for a permit to Alter a Body of Water will be made in accordance with the *Water Resources Act*.
- Design wetland crossings to avoid permanent diversion, restriction or blockage of natural flow, such that hydrologic function of wetlands will be maintained.
- Direct run-off from construction activities away from wetlands.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation, where possible (e.g., mulching, seeding, rock cover).

8.8.9 Monitoring

No monitoring programs specific to vegetation and wetlands are recommended.

8.8.10 Conclusion

A desktop review and field studies were undertaken to characterize the range of vegetation and wetlands present within the SPA. This information was incorporated into the Project design, and mitigation measures have been developed to further reduce impacts to the vegetation and wetlands due to the Project. Vegetation and wetlands may be impacted through the following:

- Loss and Alteration of Vegetation Cover
- Landscape Fragmentation and Edge Effects
- Loss of Rare Flora
- Impacts to Wetland Area and Function

Modelling and geospatial analyses were used to assess the impacts of the Project on vegetated land cover. The PF of the Solar Project Component consists of 160 ha of land, and vegetation clearing will have the highest impacts to herbaceous/shrub barrens. Much of this land cover class consists of areas that have been disturbed by forest harvesting within the past 20 years. Due to the disturbed nature of the SPA, extent of new landscape fragmentation and edge habitat associated with the Project is expected to be low.

No flora SAR or SOCC were observed during surveys in the SPA. Desktop mapping for the assessment indicates that a relatively low amount of sensitive vegetation types such as old-growth/late-successional forest and potential rare flora habitat will be impacted by the Solar Project Component.

Impacts to wetlands associated with direct loss of wetland area and changes in function were assessed using modelled data about the extent and type of wetlands in the SPA. Approximately 52 ha of wetland area is within the PF and may be directly impacted by the Project.

Following the application of mitigations, the residual effects of the Solar Project Component on vegetation and wetlands are not expected to be significant (Table 8.8.5).

Table 8.8.5: Vegetation and Wetlands Residual Effects – Solar

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Loss and Alteration of Vegetation Cover	Maximize use of pre-existing roads and disturbed areas	A	L	PA	LT	SE	PR	Not Significant
	Restore cleared areas where possible							
Landscape Fragmentation and Edge Effects	Minimize dust production and spread	A	L	LSA	LT	SE	PR	Not Significant
	Inspect and clean work vehicles to limit spread of non-native and invasive species							
Loss of Rare Flora	Consult with NL FAL if a flora SAR is incidentally observed (e.g., during site preparation).	A	N	N/A	N/A	N/A	N/A	Not Significant
Impacts to Wetland Area and Function	Avoid unnecessary travel and disturbance in wetlands.	A	M	LSA	LT	SE	IR	Not Significant
	Maintain vegetated buffers on wetlands where possible.							
	Implement an Erosion and Sediment Control Plan.							
	Design wetland crossings to avoid permanent diversion/blockage of flow.							

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term, MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

8.9 Terrestrial Fauna

8.9.1 Overview

Fauna was selected as a valued component (VC) because fauna species and their habitat will be impacted, directly and indirectly, by Project activities proposed within the SPA. The objective of this assessment is to collect the information required to assess the potential impacts of the Project within the SPA, with a focus on rare species. The assessment was completed using the following approach:

- Gain an understanding of the potential terrestrial fauna and fauna habitat types present within and near the SPA using desktop resources.
- Identify fauna SAR and SOCC with elevated potential to occur in the SPA.
- Undertake surveys for different taxa of terrestrial fauna to document the species present within the SPA, particularly SAR and SOCC.
- Use the information collected through field studies to update the Project design to avoid or minimize interactions between Project infrastructure components and terrestrial fauna and their supporting habitat, particularly SAR and SOCC.
- Apply mitigation, construction, and operational management practices to minimize effects to terrestrial fauna.

The fauna assessment specifically includes the assessment of the project related effects of Solar Project Components on caribou (*Rangifer tarundus*), moose (*Alces alces*), muskrat (*Ondatra zibethicus obscurus*), and American marten (*Martes americana atrata*), bat species (*Myotis* spp.), and at-risk insects.

8.9.2 Regulatory Context

Several laws and regulations provide protection for fauna and their habitats in Newfoundland and Labrador. Legislation that may direct resource development and conservation of fauna include:

Federal Legislation

- *Species At Risk Act* (Canada, 2002b)
- *Migratory Birds Convention Act* (Canada, 1994)
 - Designates Migratory Bird Sanctuaries
- *Canada National Marine Conservation Areas Act* (Canada, 2002a)
 - Designates National Marine Conservation Areas
- *Canada Wildlife Act* (Canada, 2000)
 - Designates National Wildlife Areas
- *Canada National Parks Act* (Canada, 2022)

Provincial Legislation

- *Wildlife Act* (Newfoundland and Labrador, 1990f)
 - Designates wildlife reserves.
- *Water Resources Act* (Newfoundland and Labrador, 2002c)
- *Endangered Species Act* (Newfoundland and Labrador, 2001)
- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)

- *Wilderness and Ecological Reserves Act* (Newfoundland and Labrador, 1990g)
- *Lands Act* (Newfoundland and Labrador, 1991)

8.9.3 Desktop Assessment Methods

The baseline desktop methodologies for terrestrial fauna within the SPA followed the same methodology outlined in Section 6.10. Full descriptions of baseline conditions can be found in the Fauna baseline report (Appendix J.1).

8.9.4 Desktop Assessment Results

The ACCDC Data Report (2026) included one observation of a terrestrial mammal SAR and no observation of terrestrial mammal SOCC terrestrial mammal (excluding birds) within 5 km of the PA, as presented in Table 8.9.1.

Table 8.9.1: ACCDC Terrestrial Fauna SAR within 5km of the Project Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	NL ESA Status	S-Rank
American Marten (Island of Newfoundland Population)	<i>Martes americana atrata</i>	Special Concern	Threatened	Vulnerable	S3

8.9.4.1 Caribou

The SPA overlaps the occupied territory of the Hodges Hill caribou herd which travels a portion of Central Newfoundland approximately between Exploits River and Notre Dame Bay (Drawing 6.13-2, Appendix A). The Hodges Hill herd was composed of 436 individuals as of a 2008 estimate (NLECCC, 2008), an additional estimate in 2017 indicated that the herd contained 259 individuals (Randell, 2019). It is determined to be an isolated pocket of animals thought of as individuals from separate herds that eventually amalgamated into a larger group. The SPA does not intersect with any caribou management areas, with the closest area, Mount Peyton CMA 68, located 8 km southwest (NL FAL, 2024).

Habitat modeling for caribou indicates that approximately 167 ha of suitable habitat is present within the SPA (Drawing 6.13-2, Appendix A). In total, the SPA is 242 ha in area, therefore, this predicted suitable habitat comprises approximately 69% of the SPA.

8.9.4.2 Moose

The SPA lies within MMA 15 Twin Lakes. Habitat modeling for moose indicated that approximately 188 ha of suitable habitat is present within the SPA (Drawing 6.10-1, Appendix A), comprising approximately 78% of the SPA.

8.9.4.3 Muskrat

Habitat modeling indicated that no suitable habitat is present within the SPA for muskrat.

8.9.4.4 American Marten

The occurrence of American marten included in the ACCDC data report (ACCDC, 2026a) was reported 5,139 m from the SPA (Appendix J.1). A review of the Recovery Plan for American marten

in Newfoundland, indicates that the PA does not overlap with any identified critical habitat areas (Newfoundland and Labrador, 2010).

Habitat modeling indicates that approximately 54 ha of high potential and 12 ha of low potential habitat is present within the SPA (Table 8.9.2, below). Total American marten habitat comprises approximately 27% of the SPA (Drawing 6.10-3, Appendix A).

Table 8.9.2: Predicted American marten Habitat within the SPA

Project Component	High Potential American Marten Habitat (ha)	Low Potential American Marten Habitat (ha)	Total Available Habitat (ha)
SPA	12	54	66

8.9.4.5 Bats

The ACCDC Data Report (ACCDC, 2026a) completed for this Project did not indicate any records of bats within 5 km of the Project center. The Recovery Strategy for Little Brown Myotis, Northern Myotis, and Tri-colored Bat does not indicate the presence of any critical habitat for *Myotis* species within the PA (ECCC, 2015c).

Habitat modeling indicated that approximately 89 ha of suitable habitat for foraging and roosting is present within the SPA (Table 8.9.3). Predicted bat habitat was divided into foraging and roosting, with roosting being further broken down into containing or not containing trembling aspen. In total, 89 ha of suitable habitat for bats is present within the SPA, representing approximately 37% of the SPA (Drawing 6.12-1, Appendix A).

Table 8.9.3: Predicted Bat Habitat within the SPA

Project Area	Suitable Foraging Habitat (ha)	Suitable Hibernation Habitat (ha)	Suitable Roosting Habitat (ha)	
			Does Not Contain Trembling Aspen	Contains Trembling Aspen
SPA	83	0	6	0

8.9.4.6 Invertebrates

No insect SAR or SOCC were identified in the ACCDC data report (2026a).

8.9.5 Field Assessment Methodology

8.9.5.1 Species at Risk & Species of Conservation Concern

Direct observations of terrestrial fauna or signs thereof within the SPA were recorded and photographed, when feasible, during targeted fauna surveys and other non-target biophysical field surveys, with particular emphasis on terrestrial fauna SAR and SOCC. Incidental observations were recorded in addition to dedicated wildlife surveys as they provide the broad temporal and spatial coverage of the SPA. Signs included features such as dens, nests, scat, tracks, and evidence of foraging.

8.9.5.2 Wildlife Trail Cameras

One wildlife trail camera was deployed from December 2024 to January 2026 in the SPA (Drawing

6.10-4, Appendix A). Survey methodologies were developed in consultation with NL FAL - Wildlife Division as per the EIS Guidelines (NLECCC, 2025).

8.9.5.3 Caribou and Moose Cameras

No camera grids were placed within the SPA as the stratified random approach to grid placement allows habitat within these areas to be representatively sampled elsewhere.

8.9.5.4 American Marten Surveys

No hair snag stations were placed within the SPA due to its relatively small size as compared to the broader PA. Opportunistic surveys were completed for American marten throughout the suite of biophysical surveys. Any observations were identified and recorded by biologists experienced in recognition of wildlife tracks, scat, and browse.

8.9.5.5 Bats

Monitoring conducted within the SPA consisted of passive acoustic monitoring during the 2024 active bat season (Drawing 6.12-2, Appendix A). Recorder locations were chosen following protocols outlined by the North American Bat (NA Bat) Monitoring Program (Loeb et al., 2022). Acoustic monitoring was conducted using Song Meter Mini Bat 2 Li-Ion detectors from Wildlife Acoustics, operating with firmware version 4.3. The detectors were programed to monitor from 30 minutes before sunset to 30 minutes after sunrise to correspond with nightly bat activity. One detector was deployed within the SPA. Passive acoustic monitoring was conducted for 242 consecutive days within the SPA between the dates of April 13 and December 3, 2024, encompassing the spring, summer, and fall active bat seasons; however, the detector experienced some interruptions in data collection during this period resulting in some missed dates (Table 8.9.4).

Table 8.9.4: Monitoring Periods for Bat Detector within the SPA

Detector ID	Detector Location	Habitat Description	Monitoring Duration
BAT-07	49.114307, -55.424445	Treed bog adjacent to a large, regenerating clearcut.	April 13 to December 3, 2024

8.9.5.6 Invertebrates

Targeted surveys for invertebrate species were not completed. Any incidental observations of SAR or SOCC insects during other field surveys were documented.

8.9.6 Field Assessment Results

8.9.6.1 Species at Risk & Species of Conservation Concern

Within the broader PA, thirteen species were identified during field assessments either by sighting individuals or signs thereof, including both targeted surveys and incidental observations conducted (Table 8.9.5). Twelve observations of moose were made at the trail camera closest to the SPA.

Table 8.9.5: Fauna Species Observed within the Project Area

Scientific Name	Common Name	COSEWIC Status ⁽¹⁾	SARA Status ⁽¹⁾	NL ESA ⁽²⁾	S-Rank ⁽³⁾
<i>Alces alces</i>	Moose	-	-	-	SNA
<i>Canis latrans</i>	Eastern coyote	-	-	-	SU
<i>Castor canadensis</i>	American Beaver	-	-	-	S5
<i>Lepus americanus</i>	Snowshoe Hare	-	-	-	SNA
<i>Lutra canadensis</i>	Northern River Otter	-	-	-	S5
<i>Lynx canadensis</i>	Canada Lynx	-	-	-	S3S4
<i>Microtus pennsylvanicus</i>	Meadow Vole	-	-	-	S3S4
<i>Mustela vison</i>	American Mink	-	-	-	SNA
<i>Rangifer tarandus</i>	Caribou	Special Concern	Special Concern	-	S3S4
<i>Rattus norvegicus</i>	Rat	-	-	-	SNA
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	-	-	-	SNA
<i>Vulpes vulpes</i>	Red Fox	-	-	-	S5
<i>Ursus americanus</i>	Black Bear	-	-	-	S4

Source: ⁽¹⁾ECCC (2025b); ⁽²⁾Newfoundland and Labrador (2002); ⁽³⁾ACCDC (2026b)

Although most of the above species were not observed within the SPA, it is likely that they could be found in and around the SPA, given the similar habitat availability.

8.9.6.2 Wildlife Trail Cameras

Thirty-one individuals were recorded on the one trail camera within the SPA, of three distinct species: moose, caribou and red fox. Moose observations were the most recorded, with 29 observations. One caribou observation was recorded, and one red fox was recorded within the SPA.

8.9.6.3 American Marten Surveys

No American marten were recorded within the SPA during any biophysical surveys.

8.9.6.4 Bats

Three bat passes were detected within the SPA; each of these recordings were identified as *Myotis* species, with one occurring in mid-July and two occurring in early August. This is a very low level of activity in comparison to other detectors, indicating relatively low abundance in this area.

8.9.6.5 Invertebrates

No SAR invertebrate species were observed during field surveys.

8.9.7 Effects Assessment

8.9.7.1 Project-Terrestrial Fauna Interactions

The works, undertakings, and activities associated with the construction, operation, and decommissioning of the Project can impact fauna and fauna habitat through multiple direct and indirect pathways.

Project activities, primarily those that involve earth moving, road construction, or vegetation removal, have the potential to impact fauna and fauna habitat (Table 8.9.6). These potential impacts could include the loss of habitat and habitat fragmentation, injury or mortality, and sensory disturbance.

Table 8.9.6: Potential Project-Fauna Interactions – Solar Component

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Clearing and Grubbing	X
Access Roads, Electrical Lines, Laydown Yards, Settling Ponds, Site Preparation	X
PV Array Installation	X
DC Collection Strings and Central Inverter Station Installation	X
Underground MV Collection System Installation	X
Solar Project Collection Substation Installation	X
Overhead MV Feeder Lines to Project Substation Installation	X
Solar Project Commissioning	X
Operations and Maintenance (33 years)	
Operations and Remote Monitoring	
Routine Maintenance, Inspections, and Component Replacement	X
Ongoing Road, Access, and Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Decommissioning	X
Site Rehabilitation and Post-Decommissioning Monitoring	X

8.9.7.2 Assessment Boundaries

Administrative Boundary

No administrative boundaries are identified for the effects assessment on terrestrial fauna.

Technical Boundary

Prediction of habitat availability within the SPA was limited by the accuracy of GIS models developed to support this effects assessment. Several models were designed to understand the potential impacts of the Project on the landscape and to fauna. This includes the detailed ELC model developed using aerial imagery, airborne LiDAR data and land cover data for the SPA. This ELC model was used as the basis of all other additional habitat models developed for the effects assessment, and as a result cannot predict the potential habitat outside of the SPA. This reduces the ability of this assessment to compare available habitat within the SPA to the surrounding regions.

Additionally, technical boundaries include constraints associated with the available provincial data including the accuracy of the NL FAL - Land Cover Database (NL FAL, 2025b), thus impacting predictions of potential habitat for fauna.

Spatial Boundary

The spatial boundary for determining residual effects to terrestrial fauna is the LSA, which includes a

2 km buffer around the IPA (excluding ocean), as the SPA is located within the IPA. The LSA boundary was defined considering the maximum expected extent of direct and indirect impacts to terrestrial fauna. The SPA is used to describe specific interactions and impacts to specific habitats and species (Drawing 7.9-1, Appendix A). An RSA is not applicable for this effects assessment.

Temporal Boundary

Temporal boundaries associated with terrestrial fauna include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

8.9.7.3 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for terrestrial fauna. The fauna definition for magnitude is as follows:

- Negligible: No loss of fauna habitat or impact to fauna through sensory disturbance or injury/mortality.
- Low: Small loss of habitat supporting fauna and low impacts to fauna through sensory disturbance or injury/mortality.
- Moderate: Moderate loss of fauna habitat and/or moderate impacts to fauna through sensory disturbance or injury/mortality, but these impacts will only be experienced by individuals rather than entire populations.
- High: High loss of fauna habitat or high impact to fauna through sensory disturbance or injury/mortality that would impact fauna on a population scale.

8.9.7.4 Effects

Potential environmental effects and associated pathways of the Solar Project component in relation to fauna are grouped into three major categories:

- Habitat Loss and Fragmentation
- Injury or Mortality
- Sensory Disturbance

Project related effects can influence fauna directly and indirectly. A direct effect is defined by interactions that have no intermediates (e.g., mortality by vehicle collision) or direct loss of habitat and indirect effects are interactions that have intermediate steps such as edge effects, sensory disturbance, or changes in fauna behaviour associated with road development.

Mammals - General

Habitat Alteration and Fragmentation

The Project will impact habitat used by fauna within the SPA. Most effects to fauna are expected to occur during the construction phase of the Project, through vegetation removal and grubbing, the creation of new access roads and other infrastructure and installation of the array. Based on the proposed layout, the Project Footprint will include clearing for infrastructure placement, which will alter or reduce the overall availability of terrestrial fauna habitat. Infrastructure will disturb 154 ha; land cover types within this are outlined in Section 8.8 – Vegetation and Wetlands.

The majority of the SPA consists of shrubland and bog habitat, both land cover types will see impacts from the PF. Historical disturbance is evident within the SPA, primarily composed of forestry activity. Habitat and vegetation communities are described further within the Baseline Vegetation and Wetlands Report, refer to Appendix I.1. The Project will have a direct impact on the loss and alteration of fauna habitat within the SPA. Similar to the Wind and Transmission Project Component, Section 6.9, activities within the SPA may result in mortality if fauna are unable to relocate to other suitable habitats. However, given the similar land cover types within the LSA, it is expected that most fauna species will be able to move to alternative suitable areas. Additionally, fauna behaviour may change stemming from indirect Project impacts such as reduced refugia, changes in food sources, and reduced space for mating. Similar to the Wind and Transmission Project Component, changes in overall fauna populations are not anticipated by these pathways.

The Project will result in an increase of habitat fragmentation, by restricting movements and connectivity to additional habitats and decreasing habitat quality. Fence construction around the solar array may result in the obstruction of movement for fauna, possibly preventing terrestrial fauna from accessing the SPA. The fence is not expected to impact small mammals, birds or amphibian movement, as fencing gaps may be large enough for these species. Much of the SPA has been subject to prior disturbance, with existing forest access roads. Silvicultural data provided by NL FAL indicates that the majority of the PF has been harvested within the last 20 years. Due to the disturbed nature of the SPA and the relatively small size of the SPA, the amount of new landscape fragmentation due to the Project is expected to be low.

A study completed by Montag, Parker and Clarkson in 2016 found that solar infrastructure had greater diversity than control areas for invertebrates and bats. Butterflies and bumblebees were also found in greater abundance than control areas, possibly due to management of on-site vegetation through re-seeding (Montag, Parker, Clarkson, 2016). The clearing of open areas has the potential to create foraging habitat for *Myotis* species that prefer to forage in edge habitat (COSEWIC, 2013; Segers & Broders, 2014; Slough et al., 2023).

During the detailed design process, consideration will be made to minimize adverse impacts to sensitive habitats, such as mature forests, wetlands and watercourses, in order to maintain important ecological features for fauna. Although presence of species may change, similar available habitats are present within the LSA. The overall magnitude of impact to wildlife from habitat loss and fragmentation is predicted to be low and temporary in nature.

Injury or Mortality

Mortality or injury of fauna species could result from Project activities, particularly due to the increase in traffic during construction and operation of the Project. Increased traffic within the LSA, on roads leading into the SPA, could potentially increase the risk of wildlife and vehicle collisions.

The construction and decommissioning phases of the Project are the phases with the highest levels of road traffic, and therefore the highest risk of wildlife-vehicle collisions. During operation, trucks and other equipment will be accessing and working at the site but at a much lower frequency, lessening the potential interaction with wildlife. The construction of a perimeter fence will also lower

the risk of mortality by reducing overall access of the SPA by fauna.

Sensory Disturbance

Sensory disturbances such as noise, solar glare, and light pollution may deter fauna from using habitat in the surrounding areas. Reproduction and survival strategies of terrestrial mammals may be directly or indirectly impacted by sensory disturbances caused by Project activities. Many species have sensitive windows for breeding and birthing, and any small disruption to these activities may reduce reproductive success in the population.

Project-related noise may also impact habitat use, patterns of activity, stress levels, immune response, risk of predation, communication, antipredator behaviours, and hearing damage (Lovich & Ennen, 2013). The construction and decommissioning phase of the project is expected to be the phase with the highest sensory disturbance to wildlife. Noise generated from vegetation removal, trenching, and installation of solar panels will only occur during the construction phase of the project and will likely result in the localized wildlife avoidance of the SPA. These activities are temporary and will not persist beyond project construction. Noise impacts to fauna are expected to be low during the operation phase for the Project.

Light is another source of sensory disturbance that can impact fauna by potentially causing disorientation, or attraction and avoidance behaviour (Longcore & Rich, 2004). In turn, these behavioural changes can affect the success of foraging, reproduction, and communication of wildlife (Longcore & Rich, 2004). Solar glare, while often considered a human inconvenience, can significantly affect mammals, particularly those active during dawn and dusk. The intensity and angle of sunlight during these times can impair their ability to detect predators, find food, and navigate their environments (Chocky et al., 2021).

Sensory disturbance (through noise, solar glare, and light pollution) to fauna is expected to occur, however, how a species may respond to this disturbance is often species specific. An overall negative low-magnitude effect to wildlife by the Project is expected to occur as species approach the SPA. This sensory disturbance could result in behavioural changes and changes in wildlife movement. Due to the proportion of the habitats proposed to be impacted by the Project and habitat availability in the surrounding LSA, available suitable habitat for many species is present. Although movement of species may change, habitats required for their survival will remain present within the LSA. Wildlife corridors would still exist and movement of species from north, south, and west remains possible.

Species Specific Effects

Caribou, moose, muskrat, American marten, bats and at-risk insects were chosen for more detail in their assessment of project impacts. Assessment of the following species was completed within the SPA, as data was too coarse and unavailable beyond this boundary to support modeling efforts.

Caribou

There are a variety of factors that influence caribou health and abundance in Newfoundland. The effect of loss, degradation and fragmentation of habitat may vary by ecotype, herd or aggregation of caribou (COSEWIC, 2014). Habitat loss and fragmentation has been identified as a threat to caribou

in Newfoundland, as they require large contiguous landscapes to meet lifecycle requirements (Newfoundland, 2015).

The Project will impact habitat availability and quality for caribou. Changes in habitat include the loss or alteration of habitat, both indirectly and directly. Loss of habitat within the SPA will primarily occur through the clearing and grubbing of land to be used for infrastructure. The caribou habitat model identified a total of 167 ha of predicted suitable habitat for caribou within the SPA. Within the PF an estimated 85 ha (35%) of predicted habitat is expected to be disturbed (Table 8.9.7).

Table 8.9.7: Direct Impacts to Predicted Caribou Habitat within the SPA

Available Predicted Caribou Habitat (ha)	Loss of Predicted Habitat from Project Footprint (ha)	Percentage of Loss
167	85	35%

Despite the amount of predicted habitat within the SPA, limited signs of caribou were observed, indicating a possibly limited level of interaction between the Project and caribou populations at the outset. Where caribou were noted at wildlife trail camera 25, only one individual was observed once, so the area is not expected to be heavily used by caribou despite presence of suitable habitat.

The Project will reduce potential habitat available for caribou within the SPA and may also indirectly contribute to avoidance of the surrounding area during construction and operation phases. Changes in habitat have been shown to influence behavioural changes of caribou such as avoidance. Caribou have been documented to avoid anthropogenic disturbances such as forestry by an average of 9.2 km in Newfoundland (Schaefer & Mahoney, 2007). Mahoney and Schaefer (2002) earlier saw avoidance of a hydroelectric project in Newfoundland by up to 3 km, and Weir et al. (2007) recorded avoidance of up to 6 km from a gold mine – predominately in the pre-calving season. Avoidance behaviours from anthropogenic disturbances is related to increase risk of predation (COSEWIC, 2014).

Sensory disturbances from heavy machinery and equipment can disrupt normal behaviours such as foraging, breeding, rearing, and resting. These disturbances are most likely to have an impact on caribou presence within the SPA during the construction phase and could have an exacerbated impact on females rearing calves (Chubbs et al., 1993).

Moose

Moose were introduced to Newfoundland over 100 years ago and have rapidly grown in population size due to the lack of predators and abundant food sources (Parks Canada, 2025). Since their introduction, moose populations have fluctuated due to over-browsing and over-hunting, which lead the Newfoundland government to introduce a quota system for species management (NL FAL, 2022). Moose are an important cultural species on the island for subsistence hunting by Newfoundlanders and economic value from non-resident hunting (NL FAL, 2022). Moose are generally associated with mixed-wood and boreal forests and may be found in younger, recently disturbed forests (e.g., forest harvesting, fire, insect outbreaks (NL FAL, 2025a).

Changes to habitat availability and quality as a result of the Project's activities is likely to affect

moose behaviours by reducing areas for thermoregulation, overwintering, mating, and protection for calves (NSNR, 2021). As moose rely on large, connected habitats to meet their seasonal and life-stage requirements, habitat loss and fragmentation can compel individuals to expand their home ranges in search of suitable habitat. The PF will result in the loss of 122 ha of suitable habitat for moose within the SPA, which is 65% of the potential predicted habitat within the SPA (Table 8.9.8). Twelve moose were observed at the trail camera closest to the SPA.

Table 8.9.8: Direct Impacts to Predicted Moose Habitat within the SPA

Available Predicted Moose Habitat (ha)	Loss of Predicted Habitat from Project Footprint (ha)	Percentage of Loss
188	122	65%

Sensory disturbance from Project activities has the potential to impact moose at various life stages. Construction activities during the fall could potentially affect the rutting behaviour of moose. Most ungulates prefer riparian areas, typically with high shrub vegetation cover to give birth. As Project infrastructure will be sited away from riparian areas to the extent practicable, the noise associated with construction and assembly of arrays is not likely to affect the selection of calving areas.

Given the wide availability of suitable habitat for moose in Newfoundland and the relatively small footprint of the SPA relative to moose home ranges, it is likely that lost access to suitable habitat within the SPA will not have a substantial impact to moose.

Musk rats

Musk rats are a semi-aquatic rodent that use wetlands, rivers, and riparian habitats. Muskrat are native to the island of Newfoundland and represent a unique genetic population, that differ from those found off of the island (Rigby & Threlfall, 1982). Muskrat populations have been suppressed by the introduction of mink, however, in recent years, muskrat populations have been making a recovery (NL FAL, n.d.). Muskrat are an important furbearer species and trapping is permitted island-wide (NLFAL, 2025e).

A muskrat habitat suitability model was developed for the Project, using parameters outlined in the Provincial muskrat survey protocol (NL FAL, 2019; details available in Appendix J.1). The muskrat habitat model did not identify any predicted habitat that may support muskrat within the SPA. Muskrat were not observed within the SPA, but they are found throughout Newfoundland; they are not a SAR or SOCC. The Project is unlikely to impact this species.

American Marten

In total, 66 ha of high and low suitable habitat for American marten is present in the SPA; 23 ha of which will be impacted by Project infrastructure (35% impact; see Table 8.9.9). Areas with greater habitat connectivity are considered high potential and more favourable for the species. Given that 65% of suitable habitat is maintained within the SPA, and the habitat that is present doesn't appear to be heavily used by American marten, no substantial impact is expected. The SPA is mostly composed of shrub cover and wetlands, which lack the forest cover required for marten, making it poor habitat. The SPA sits adjacent to a highway, and it is expected that martens are not dispersing beyond this anthropogenic barrier.

Table 8.9.9: Direct Impacts to Predicted American Marten Habitat within the SPA

High Potential American marten Habitat (ha)	Low Potential American marten Habitat (ha)	Loss of Predicted High Potential Habitat from Project Footprint (ha)	Loss of Predicted Low Potential Habitat from Project Footprint (ha)	Percentage of Loss for High/Low Potential Habitat
12	54	9	14	74%/26%

Potential American marten mortality from vehicle collisions is also a potential concern. Although the risk of road mortality generally increases with population density (COSEWIC, 2022), the low likelihood of American marten in the SPA suggests that this risk remains low in the context of the Project. However, the development may lead to increased access to previously remote areas, raising the potential for illegal trapping or other forms of human-induced mortality (COSEWIC, 2022). The perimeter fence around the SPA will reduce the overall risk of vehicle collisions. The risk of vehicle collisions for marten is expected to be low.

Bats

Vegetation clearing required for construction can result in the removal of bat habitat or disruption to corridors between important habitat features, such as foraging and roosting habitat (Reusch et al., 2022; Segers & Broders, 2014). This could impede movement, foraging, flight activity, and habitat use (ECCC, 2015c). Harvesting and the creation of cleared areas can also reduce landscape-level habitat quality as well as result in increased predation risk as bats travel across open areas (Slough et al., 2023). Research shows that bats exhibit altered flight and foraging behaviours near solar arrays. A study by Barré et al. (2024) found that bats increased flight speed and reduced the probability of emitting acoustic signals when flying over solar arrays due to reduce insect abundance. However, as stated above, studies have shown that in some instances, solar infrastructure lead to greater diversity for bats as the cleared areas created new foraging habitat (COSEWIC, 2013; Montag, Parker, Clarkson, 2016; Segers & Broders, 2014; Slough et al., 2023).

The land area within and around the SPA are visually similar based on aerial imagery in terms of road density, water bodies, wetlands, and forested areas. It may be assumed that potential bat habitat is also present within the LSA, though the extent of habitat occurrence is unknown. According to ECCC (2015), no critical habitat (i.e., confirmed hibernacula) is located inside the SPA or within a 5 km buffer.

The likelihood of bat habitat presence outside of the SPA and the low level of recorded bat activity within the SPA both indicate that bat habitat is not likely to be highly impacted by the Project.

Noise and light will be generated during all phases of the Project and can impact bats within the SPA. Bat echolocation calls are in the ultrasonic range beyond the upper frequency limits of construction noise (CDT, 2016), meaning there is likely no echolocation masking effect from construction noise. Construction noise (e.g., heavy equipment,) could, however, affect bats roosting nearby, potentially causing roost abandonment and avoidance of the general area (Haarsma & de Hullu, 2012). Bats are well adapted morphologically, physiologically, and behaviourally to avoid acoustic trauma (CDT, 2016). As they are often exposed to the exceptionally loud sounds of their own echolocation signals (approximately 110 dB), they have evolved protective mechanisms to

prevent sensory overload and damage to the auditory system (CDT, 2016). These mechanisms include behavioural avoidance, changing the shape and orientation of the pinnae, closing the cartilaginous fold in the outer ear canal, the tympanic reflex, and resonance absorption (Wever & Vernon, 1961).

Sensory disturbance associated with lighting during the construction, operation, and decommissioning phases of the Project may also impact bat behaviour. During construction and decommissioning, lighting will be a temporary source of sensory disturbance. A study by Seewagen et al. (2023) found that, while white floodlights had no significant impact on migratory species including the eastern red bat and hoary bat, little brown bats were impacted within at least a 75 m radius and experienced a loss of foraging habitat.

Lastly, solar panels present a collision risk and may disrupt echolocation abilities for bats. Solar panels can act as acoustic mirrors and reflect away echoes from bats when approached at certain angles (Greif et al., 2017). The smooth flat surface of a solar panel can act as a sensory trap for bats, increasing collision risks and disrupt their ability to navigate or forage (Barré, et al., 2024). Subtle modifications may be made to panel angle, where feasible, to reduce the overall effect on bats.

Overall, the expected impacts to bats are low for changes in habitat, mortality and sensory disturbance. The likelihood of bat habitat presence outside of the SPA and the avoidance of bat habitat within the SPA both indicate that bat habitat is not likely to be highly impacted by the Project.

Invertebrates

There are four SAR invertebrate species found in Newfoundland. The gypsy cuckoo bumble bee (*Bombus bohemicus*), the Suckleys cuckoo bumble bee (*Bombus suckleyi*), the yellow-banded bumble bee (*Bombus terricola*) and the transverse lady beetle (*Coccinella transversoguttata*). The SAR listings for these species are outlined in Section 6.10.

Sensory disturbances from the Project will likely impact at-risk insects through light pollution. Research suggests that solar projects can attract insects through the polarized light they generate that mimics the reflection of water (Greif et al., 2017). This is recognized as an ecological trap and poses as a threat to aquatic insects (ECCC, 2020b). None of the Newfoundland SAR insects are considered aquatic insects and do not use aquatic features as their primary habitat.

Solar infrastructure can enhance habitat diversity, especially when vegetation in and around arrays can be managed through re-seeding (Montag, Parker, Clarkson, 2016).

Vegetation clearing and grading can, however, lead to the introduction of invasive species, with the potential for seed dispersal increasing with vehicular traffic during the construction phase. The introduction of invasive species reduces overall quality of foraging habitat. The gypsy cuckoo bumble bee and the Suckley's cuckoo bumble bee are both parasitic ground nesting bees. Vegetation clear and grading can lead to the destruction of potential nests (ECCC, 2022b).

8.9.8 Mitigation

To address the above-mentioned effects to terrestrial fauna, the following mitigation measures will be implemented:

Habitat Alteration and Fragmentation

- Minimize clearing by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.
- Site remediation activities shall be executed to promote natural vegetation by recovering and distributing overburden and organic material and decompacting soils where possible.
- Revegetate cleared areas with native species, to the best extent possible.

Injury or Mortality

- Install fencing surrounding the solar facility.
- Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.
- Install anti-reflective coating on panels to reduce reflection, if feasible.

Sensory Disturbance

- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Use noise controls (e.g., mufflers) on machinery and equipment, where applicable, to limit disturbance.
- Limit unnecessary lighting as much as possible, especially at night.

8.9.9 Monitoring

Monitoring plans outlined in the IPA (Section 7.9.9) are applicable in the SPA.

8.9.10 Conclusion

After mitigations, predicted residual effects on fauna and fauna habitat are characterized in Table 8.9.10.

Table 8.9.10: Fauna Residual Effects – Solar Project

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Habitat Alteration and Fragmentation	Minimize disturbance by using existing roads or previously altered areas to the extent possible. Promote natural regeneration. Prevent the spread of invasive species	A	L	LSA	LT	SE	PR	Not significant
Injury or Mortality	Educate on-site staff about wildlife. Prevent environmental contamination.	A	L	LSA	LT	I	R	Not significant
Sensory Disturbance	Reduce noise, vibration and light disturbance. Minimize wildlife disturbance.	A	L	LSA	LT	I	R	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

8.10 Avifauna

8.10.1 Overview

This section covers effects on the avifauna VC based on the solar component of the Project. Impacts such as habitat loss/fragmentation, mortality risk, and sensory disturbance will be assessed.

8.10.2 Regulatory Context

The Project has potential to interact with avifauna species that are protected under federal and provincial legislation. Legislation that may direct resource development and conservation of avifauna species and their habitats include:

Federal Legislation

- *Species At Risk Act* (Canada, 2002b)
- *Migratory Birds Convention Act* (Canada, 1994)
- *Canada Wildlife Act* (Canada, 2000)
- *Canadian Environmental Protection Act* (Canada, 1999)

Provincial Legislation

- *Endangered Species Act* (Newfoundland and Labrador, 2001)
- *Wild Life Act* (Newfoundland and Labrador, 1990f)
- *Environmental Protection Act* (Newfoundland and Labrador, 2002a)

8.10.3 Desktop Assessment Methodology

The baseline desktop methodologies for avifauna within the SPA followed the same methodology outlined in Section 6.11.

8.10.4 Desktop Assessment Results

Avian SAR identified during desktop review include evening grosbeak (*Coccothraustes vespertinus*), grey-cheeked thrush (*Catharus minimus minimus*), olive-sided flycatcher (*Contopus Cooperi*), red crossbill (*Loxia curvirostra percna*), and rusty blackbird (*Euphagus carolinus*).

Key findings from the desktop review within the avian baseline report (Appendix M.1) include:

- ACCDC: identified 10 avian SOCC and three avian SAR within a 5 km radius of the SPA. The SAR identified were Newfoundland grey-cheeked thrush (*Catharus minimus minimus*), olive-sided flycatcher, and rusty blackbird.
- eBird: olive-sided flycatcher was identified within or near the SPA.

The avian baseline report (Appendix M.1) can be referred to for detailed desktop results, with more information and details on the findings listed above.

8.10.5 Field Assessment Methodology

Breeding bird surveys were conducted within or near the SPA during the 2024 season (Drawing 6.11-1, Appendix A), which aligned with CWS and EIS guidelines (NLECCC, 2025).

The avian field baseline report (Appendix M.1) can be referred to for detailed methodology and survey locations for each survey type.

8.10.6 Field Assessment Results

Field assessments were combined for the SPA and IPA. Survey locations and results are summarized by survey type in Table 7.10.1. In total, 40 individuals representing 20 species were observed within the SPA and IPA. There were no avian SAR or SOCC observed within or near the SPA during field surveys.

The avian baseline report (Appendix M.1) can be referred to for full detailed field results.

8.10.7 Effects Assessment

Project activities, primarily those that involve earth moving or vegetation removal, or interactions with avifauna in the airspace have the potential to impact avifauna (Table 10.8.1). These activities could result in habitat removal, edge effects, reductions in food availability, and direct avifauna-infrastructure interactions. Other Project related activities, including during construction and operation, may increase risk of mortality and injury, as well as impact avifauna behaviours, such as sensory disturbances resulting from increased traffic, light, and noise.

Table 8.10.1: Potential Project-Avifauna Interactions – Solar

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Clearing and Grubbing	X
Access Roads, Electrical Lines, Laydown Yards, Settling Ponds, Site Preparation	X
PV Array Installation	X
DC Collection Strings and Central Inverter Station Installation	X
Underground MV Collection System Installation	X
Solar Project Collection Substation Installation	X
Overhead MV Feeder Lines to Project Substation Installation	X
Solar Project Commissioning	X
Operations and Maintenance (33 years)	
Operations and Remote Monitoring	X
Routine Maintenance, Inspections, and Component Replacement	X
Ongoing Road, Access, and Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Decommissioning	
Site Rehabilitation and Post-Decommissioning Monitoring	X

8.10.7.1 Assessment Boundaries

Administrative Boundary

This VC has no identified administrative boundaries.

Technical Boundary

Prediction of habitat availability within the SPA was limited by the accuracy of GIS models developed to support this effects assessment. Several models were designed to understand the potential impacts of the Project on the landscape and to avifauna. This includes an Ecological Land Classification (ELC) model that was developed using aerial imagery, airborne LiDAR data, and land cover data for the SPA. The ELC model was used as the basis of all other additional habitat models developed for the effects assessment, and as a result cannot predict the potential habitat outside of the SPA within the LSA. This reduces the ability of this assessment to compare available habitat within the SPA to the surrounding LSA.

In addition, technical boundaries include constraints associated with the available provincial data including the accuracy of the NLFAL - Land cover layer, thus impacting predictions of potential habitat for avifauna.

Spatial Boundary

For the purposes of this assessment, the SPA and an LSA will be assessed for avifauna, which includes the SPA and the airspace that is directly surrounding the infrastructure, as well as a 2 km buffer (Drawing 8.10-1, Appendix A). The LSA was selected based on the maximum expected indirect effects, the size of the SPA compared to the WPA, and is consistent with the other terrestrial effects sections. No RSA was established for this VC.

Temporal Boundary

Temporal boundaries include the time periods of each Project phase: Site Preparation and Construction (3 years), Operations and Maintenance (33 years), and Decommissioning and Rehabilitation (2 years).

8.10.7.2 Assessment Criteria

Assessment criteria provided in Section 5.0 apply for avifauna. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable loss of sensitive avifauna habitat and no impacts to birds (i.e., no sensory disturbance to birds or loss/injury of individuals) are expected.
- Low: Low loss of sensitive avifauna habitat and/or direct impacts to birds are expected to be low.
- Moderate: Moderate loss of sensitive avifauna habitat and/or moderate impacts to birds on an individual level rather than population level.
- High: High loss of sensitive avifauna habitat and/or high impact to birds (i.e., loss of individuals at a scale which may cause population level impacts).

8.10.7.3 Effects

Potential environmental effects and associated pathways of the Solar Project Component in relation to avifauna are grouped into three major categories:

- Direct Loss of Suitable Habitats
- Alteration of Suitable Habitats Through Landscape Fragmentation and Edge Effects
- Loss of Rare avifauna

Project related effects can influence avifauna directly and indirectly. A direct effect is defined by interactions that have no intermediate process (e.g., loss of an individual bird, loss of suitable habitat that supports an avian SAR) and indirect effects are interactions that have intermediate processes such as landscape fragmentation and edge effects.

Avian SAR Potential Habitat Modelling – Methodology

Potential avian SAR habitat modelling was completed to calculate the impact to potential habitat for the five avian SAR that were identified through desktop review and observed during field assessments and/or acoustic monitoring. The avian SAR included for the potential habitat modelling included evening grosbeak, Newfoundland grey-cheeked thrush, olive-sided flycatcher, red crossbill, and rusty blackbird. This methodology is outlined in Section 6.11.

Potential avian SAR habitat modelling results will be referred to throughout the effects assessment.

Habitat Loss

The LSA supports various life stages for migratory birds due to the wide range of habitats present, as confirmed through desktop review and baseline field observations. The majority of the SPA consists of shrubland and barren habitats based on the habitat and land cover modelling completed in the vegetation and wetlands baseline reporting. Refer to Appendix I.1 for habitat/land cover areas in hectares.

A variety of bird species use the SPA for migration and breeding purposes. The coastline of Newfoundland is known as a fly-way during migration and it is evident that birds use the various habitats found along the coastline as well as inland for various needs (i.e., foraging, migratory stop-overs).

There is historical disturbance within the SPA from human exploration and forestry activity, which includes cleared areas in various stages of regeneration. Although disturbed and cleared areas can be considered degraded habitat for interior species, species that use edge habitat and disturbed and regenerating landscapes can benefit, which will be described in the habitat fragmentation section.

The SPA is 242 ha and the total PF for the solar component is 160 ha (Drawing 8.10-1, Appendix A), equating to 66% of the SPA. Based on the ELC vegetation communities as

previously described, the highest impact based on the PF within the SPA will be to shrub habitat (i.e., 34 ha, equating to 21%) and herbaceous/shrub barren habitat (i.e., 58 ha, equating to 36%), which represent a variety of habitat for birds.

Clear-cutting, grubbing, and industrial development can result in substantial habitat loss for forest and wetland-dependent avian species (e.g., olive-sided flycatcher and rusty blackbird, modelled habitat will be provided in the next section), as well as disrupt individuals and their migratory and breeding behaviours. A total of 52 ha of wetland area was identified within the PF, which represents 54% of the amount within the LSA (Section 8.8).

Mitigation measures regarding habitat loss, specifically for vegetation clearing (e.g., nest monitoring) and disturbed areas, to limit effects to avifauna are presented below.

Impacts to Avian SAR Modelled Habitat

Potential avian SAR habitat present within the SPA and impacted by the PF, based on the methodology previously described, is shown in Table 8.10.2. The percent of impacted potential habitat per species from highest to lowest is as follows: olive-sided flycatcher (Drawing 7.10-3, Appendix A), grey-cheeked thrush (Drawing 7.10-4, Appendix A), rusty blackbird (Drawing 7.10-2, Appendix A), evening grosbeak (Drawing 7.10-6, Appendix A), and red crossbill (Drawing 7.10-5, Appendix A). The majority of the SPA represents bog and barren-type habitat, which may have equated to the higher percentages for rusty blackbird and olive-sided flycatcher since both species frequent wetland and edge habitat.

Table 8.10.2: Avian SAR Potential Habitat – SPA and PF

Avian SAR	Overall SPA (ha)			Footprint SPA (ha)			% Total Habitat Impacted
	Suitable Habitat	Fair Habitat	Total	Suitable Habitat	Fair Habitat	Total	
Grey-cheeked Thrush	11	35	46	6	24	30	66%
Red Crossbill	4	4	8	0.4	0.6	1	13%
Evening Grosbeak	4	5	9	1	3	4	43%
Olive-sided Flycatcher	15	65	80	10	46	55	70%
Rusty Blackbird	5	5	10	2	3	5	51%

*SPA = 242 ha, PF = 151 ha.

The PF within the SPA will impact a variety of avian SAR habitat due to the presence of wetlands (i.e., olive-sided flycatcher and rusty blackbird), edge habitat (i.e., foraging habitat for evening grosbeak), and tall shrubby habitat (i.e., grey-cheeked thrush). Although a decrease in suitable habitat for these SAR is anticipated from the PF, avian SAR potential habitat modelling results indicate that there is likely sufficient suitable habitat surrounding the PF to maintain habitat functionality and use within the larger PA and LSA. If alternative suitable habitats are unoccupied, the affected species may choose those alternate habitat areas in lieu of the cleared area. However, this may increase competition for territory, nesting areas, and foraging for the affected species in the LSA (Chen & Wang, 2024). In addition to increased competition,

habitat loss could alter migration patterns via reduction of stopover areas and negatively affect food availability and abundance (Chen & Wang, 2024).

Habitat Alteration

The continuity of intact habitats will be affected through construction of the Project. Habitat fragmentation is used to describe this disruption and is assessed herein through evaluation of changes land cover and associated edge effects.

The solar facility will create open spaces and edges within the forested environment, which may benefit certain bird species that favour edge or transitional habitats. These changes could potentially create favorable microhabitats within the ROW, particularly for generalist bird species or those that readily adapt to disturbed environments. The construction of the Solar Project and new roads may create additional suitable breeding habitat for common nighthawks (COSEWIC, 2018), although nightjars are not common in the northern parts of Newfoundland.

Undisturbed avian habitats present within the LSA are not unique and are extensively present within the surrounding landscape (specifically the interior of Newfoundland). It is expected that any birds using habitat that will be disturbed by Project activities will move to similar habitats within and adjacent to the PF and SPA area. This supports the conclusion that loss of habitat will not be significant, although habitat types will slightly differ from baseline conditions until the site is restored based on reclamation plans for the SPA.

Edge Effect

Edge effect refers to the changes in environmental conditions and biodiversity that occur along the boundary between two different habitats (e.g., clearcut and forested habitat). These changes, as described above in the habitat fragmentation section, can affect bird abundance, species composition, and nesting success (e.g., nest predation and parasitism). For example, edges may alter physical conditions like light, temperature (e.g., higher wind and sun exposure), and wind, which in turn influences vegetation structure and food availability, potentially impacting bird communities (Andr n, 1994).

To model edge effect, a 100 m buffer was applied to the PF (Drawing 7.10-7, Appendix A). The 100 m buffer was chosen as a minimum zone of influence based on literature on the impacts of forestry on bird communities in adjacent forest (Brazner et al., 2024), recognizing that edge effect is quite variable from one species to the next, even in terms of nature of adverse effect (i.e., positive vs. negative). Note that a constraint to this calculation is the potential for the inclusion of small areas of open habitats (e.g., lakes, open wetlands, clear-cuts).

Habitat loss and subsequent fragmentation within the SPA is anticipated to be moderate with the consideration of the mitigation measures presented below. As part of mitigation measures associated with habitat loss, a site reclamation plan will be developed in consultation with NLECCC and NLFAL, which will limit the effects of fragmentation upon Project decommissioning. Another consideration is that the majority of the SPA already represents edge habitat based on the presence of barren and shrubland habitats.

Avifauna-Project Interactions – Injury and Mortality Risk

Birds have the potential to interact with vehicles and infrastructure within the SPA during construction and operations.

An increase in road traffic during construction and Solar Project maintenance will increase the chances of mortality to avifauna species that use roadways, especially grouse species and similar species, as they are known to use roadways for travel and nesting (Madden & Perkins, 2017; Whitaker et al., 2010). Construction and increased road traffic particularly pose a risk to nests and unfledged nestlings. Outside of the construction phase, the Project will only require technicians to access the site to perform regular maintenance/equipment checks and occasional larger-scale repairs. The pre-existing traffic load in the LSA and minimal traffic associated with Project operation is expected to have a negligible or low effect on avifauna in the SPA.

There is also potential that Project infrastructure may attract certain species for nesting. Barn swallows often construct nests in anthropogenic structures such as buildings and under bridges. Generalist bird species such as doves, crows, and ravens may nest on structures and equipment not being used. The changes in the overall landscape and habitat can result in changes in wildlife patterns and increased risk in mortality.

Within the solar PF, there may be a potential risk of injury and mortality due to avian collisions with the solar panels. It is speculated by scientists that the reflective surfaces of solar panels, especially when viewed from above, may resemble the surface of water. Migratory birds, particularly waterfowl and shorebirds, may be drawn to these reflections and attempt to land or dive on the panels, mistaking them for bodies of water which is also known in literature and research studies as the “lake effect” theory (Diehl et al., 2024). Waterbirds, which require water to take off, are particularly at risk due to the potential for strandings and may be a concern due to coastal proximity. Animals in flight show evidence of descent but not reorientation toward solar facilities, consistent with attraction from a solar cue. This attraction can result in birds colliding with the solar panels or other structures as they attempt to land, potentially causing injury or death (Diehl et al., 2024).

Horvath et. al (2009) has described this phenomenon as a form of polarized light pollution, where the highly and horizontally polarized light reflected from artificial surfaces alters the naturally occurring patterns of polarized light that birds use for navigation and foraging (Diehl et al., 2024). This is a concern with regards to disorientation and attraction due to reflective light from solar panels. Although this is a working theory in the scientific community, the “lake effect” is not well understood or studied (Diehl et al., 2024).

Overall, based on literature and the implementation of mitigation measures, there is a low potential for mortality and injuries to birds from Project activities. The potential for injury and mortality is expected to be low and infrequent.

Sensory Disturbance

Construction and operational activities for the Project, including lighting, noise, and increased traffic, have the potential to disturb bird species within the SPA and LSA, with expectation for a reduction in sensory disturbance once construction is completed. Sensory disturbance may occur during all Project phases. Temporary sensory disturbance is expected during construction, and limited disturbance is expected through operations (i.e., consistent and sporadic noise and lighting generated by traffic and facility operations).

Noise

Noise from heavy machinery and equipment can disrupt normal behaviours such as foraging, breeding, and resting, especially for sensitive species documented during breeding bird surveys. The sounds associated with construction, while temporary, may lead some birds to avoid areas near active construction zones, possibly altering their habitat use patterns during critical breeding or migration periods (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon, Crooks, et al., 2016). This pathway of effect, including direct and indirect effects to behaviour, nesting/foraging success, disorientation, avoidance, and hearing loss, is discussed in detail within the wind and transmission component chapter and applies to the solar facility as well.

Effects to avifauna regarding noise, with the mitigations described below, are expected to be low in magnitude.

Light

Lighting used during construction and operations may cause disorientation, attraction, avoidance (Longcore & Rich, 2004). Attraction and disorientation may lead to interactions with infrastructure or waterbird strandings on land. Research has demonstrated that birds attracted to or congregating around lights often become disorientated and lose their sense of direction, ultimately disrupting migration (Adams et al., 2021). This may be a concern due to coastal proximity. Given the frequency of foggy conditions that encroach on the coastline, light intensity may be amplified, further enhancing the potential for disturbance.

Upon completion of construction and throughout the lifespan of the Project, the lighting on-site will be minimized, and mitigation measures will be applied to limit the effects of lighting on birds (i.e., motion-activated lighting, shielding, intermittent lighting/LEDs, etc.). Based on this, effects to avifauna regarding light are expected to be low in magnitude.

8.10.8 Mitigation

Mitigation and monitoring measures will be considered to minimize the effects on avifauna, including adhering to the *MBCA*, *SARA*, and the *Newfoundland Wildlife Act*.

Adaptive management of potential effects will be addressed through the development and implementation of an Avifauna Management Plan, which will include mitigation and monitoring for avian species.

Various plans will be created, which also fall under avifauna mitigation and monitoring

measures: Wildlife Emergency Response Plan, Avifauna Management Plan, Waste Management Plan, and Hazardous Materials Response and Training Plan.

Mitigations to reduce effects on avifauna include:

Habitat Loss and Fragmentation

- Adhere to ECCC guidelines on clearing windows for nesting migratory birds, where possible. Due to seasonal variability regarding conditions, if vegetation and tree clearing activities during the nesting/breeding season cannot be avoided, nests will be marked and avoided by appropriate buffers if encountered.
 - Regulatory bodies will be contacted to receive advice on construction buffers for any nesting or confirmed breeding activity that must be avoided during the nesting season.
 - When vegetation and tree clearing activities take place during the non-nesting season, crew must be aware of nests protected year-round under the 2022 update to the Migratory Bird Regulations (under the *MBCA*).
- Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities during construction and operation phases.

Sensory Disturbance

- Establish and implement speed limits to minimize dust and potential collisions.
- Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions, and increase fuel efficiency.
- Use noise controls (e.g., mufflers) on machinery and equipment, where applicable, to limit disturbance.
- Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Incorporate a lighting plan for construction-related activities into the EPP.
- Limit unnecessary lighting as much as possible, especially at night.

Mortality and Injury Risk

- Monitor for bird injuries and fatalities frequently within the SPA. ECCC-CWS will be notified in the event of the mortality or injury. Under the MBR, a scientific permit is required to possess or handle any stranded, injured, or dead migratory bird. Any birds found injured that may require transport to on-land facilities must also be reported. Record will be kept of such incidents.

8.10.9 Monitoring

A site-specific post-construction Avifauna Management Plan will be developed in consultation

with government regulators and all other relevant parties. The management plan will inform monitoring activities that will take place to ensure continued protection of avifauna within the SPA. The Avifauna Management Plan will be created in consultation with NLFAL and CWS which will include mitigation measures, monitoring, and adaptive management frameworks for minimizing impacts to avifauna (Appendix Q.1). The legislation and guidelines described in the regulatory context section, as well as the EIS guidelines (NLECCC, 2025), will be referenced in the development of this management plan.

Adaptive management options will be considered if continuous incidents occur and/or a concerning number of avian injuries or deaths are observed.

8.10.10 Conclusion

While effects to avifauna species differ, the potential effects considered to be of concern include habitat loss, potential sensory disruption, and potential avifauna-infrastructure interactions. Based on this assessment and through the implementation of proposed mitigation and monitoring activities, effects to avifauna are expected to be of low magnitude, as loss of habitat may occur, the habitat loss is reversible and overall impact to bird populations and behaviours is expected to be low.

Taking the above characterizations into consideration for the Project, the residual effects are considered not significant (Table 10.8.3).

Table 8.10.3: Avifauna Residual Effects – Solar

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Habitat Loss and Fragmentation/Edge Effect	Limit habitat disturbance and minimize Project Footprint during detailed design where possible Restoration and reclamation plans	A May be some positive effect for species that forage in disturbed habitats (e.g., raptors and aerial insectivores)	M VC interaction causes direct loss of habitat and creates an edge effect for birds	LSA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	SE	R	Not Significant
Mortality and Injury Risk	Mitigation and monitoring measures surrounding infrastructure operation, Project traffic, and nesting season	A	L VC interaction has potential to cause mortality and injury due to collisions with Project infrastructure and interactions with workers and traffic	LSA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	I May vary based on seasonal differences (e.g., breeding season vs migration season), as well as Project phase	R	Not Significant

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Sensory Disturbance	Mitigation and monitoring measures surrounding noise and light	A	L VC interaction has potential to cause sensory disturbance to birds, which may impact behaviour and distribution, as well as increased risk for collisions with Project infrastructure	LSA	LT Effects are expected to extend beyond operations into the decommissioning and rehabilitation phase	C	R	Not Significant

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term MT – Medium Term, LT – Long Term

Frequency: SE – Single Event, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

9.0 LAND & RESOURCE USE

9.1 Overview

A desktop review was undertaken to understand the variety and occurrence of land and resource use present in the PA. The objective of the assessment was to collect the information required to assess the potential impacts of the Project on land and resource use. The assessment was completed using the following approach:

- Complete a desktop review to characterize the land and resource known to occur within and near the broader PA
- Evaluate the potential interactions between the Project and identified land and resource uses
- Use the information collected from desktop studies to apply mitigation, construction, and operational management practices to minimize effects interactions to local stakeholders

9.2 Regulatory Context

Applicable provincial laws and regulations relating to the use of the lands and interaction with designated lands are included to demonstrate understanding of the potential Project interactions.

9.2.1 Federal

The Canadian *Fisheries Act* (1985) designates Salmon Fishing Areas (SFA) under the Atlantic Fisheries Regulations (1985).

9.2.2 Provincial

The *Urban and Rural Planning Act* (2000) provides regulations that support development permits that may interact with the Project, including any permits that overlap the jurisdictions of the Town of Botwood and the Town of Northern Arm. The *Act* also highlights the ability for a council to expropriate property, land, or interest in land in accordance with Part IV in order to carry out a plan or regulation as designated by the council. In the event where expropriation has occurred, the *Act* establishes the need for compensation to be paid to the owner of expropriated land. It is noted that there are several exceptions as indicated by the *Act* to the compensation to be paid.

The *Public Utilities Act* (1990d) and the *Electrical Power Control Act* (1994) provide regulations of electricity supply and use in the province. Adherence to this legislation is necessary for any consideration of grid connectivity or supply.

The *Petroleum and Natural Gas Act* (1990c), and *Forestry Act* provide restrictions associated with land tenure. These pieces of legislation quantify the permit requirements for petroleum and gas development and forestry operations in the province.

The management of land and resource use in the context of mining, mineral use and quarry

activities is provincially regulated in Newfoundland and Labrador. Legislation relevant to these resources includes:

- **Mineral Act** (Newfoundland and Labrador, 1990a)
Defines the rights of explorers and developers of mineral properties; the methodology to be used in obtaining such rights and the areas where government may regulate activity.
- **Mineral Holdings Impost Act** (Newfoundland and Labrador, 1990b)
Designed, by imposition of a tax, to encourage holders of mineral properties that do not come under the terms of the Mineral Act to either explore their lands or to surrender them so that they become subject to the Mineral Act.
- **Mining Act** (Newfoundland and Labrador, 1999a)
Regulates the development, operation and closure of mines in the province; outlines requirements for development, operational and rehabilitation and closure plans as well as milling licenses and financial assurance. This Act does not deal with Occupational Health and Safety matters.
- **Quarry Materials Act** (Newfoundland and Labrador, 1998)
Defines the rights of explorers and developers of quarry materials; the methods by which such rights may be required, royalties payable; and areas where government may regulate activity.
- **Undeveloped Minerals Act** (Newfoundland and Labrador, 1990e)
Enables government to arrange for the exploration of private mineral properties (generally ones which are not covered by the Mineral Act) that in its opinion have not been adequately explored. Properties affected by the Act have been identified by various orders.
- **Revenue Administration Act** (Newfoundland and Labrador, 2009)
Part VII of the Act defines the percentage of taxes to be paid to the Crown in respect to mining operations, and the terms under which these taxes are calculated.

The *Towns and Local Service District Act* (2023b) provides local service districts and municipalities with planning authority tools to manage land use resources within their boundaries. The *Urban and Rural Planning Act* provides additional plans, including protected roads.

The *Lands Act* (1991) indicates that any activities within the 15 m shoreline reserve of any water body must adhere to the regulations in Section 7 of the Act.

The *Municipalities Act* (1999b) provides regulations that support the administration of municipalities, including those of the Town of Botwood and the Northern Arm. These regulations include guidelines for purposes such as waste and sewage, heritage preservation, expropriation, and compensation and remuneration. Notably, the Act highlighted the municipal council's ability to impose regulations on the use of resources and the management of land designations.

The *Fisheries Act* (1995) indicates the definitions and regulations for fish businesses or enterprises in the province.

The *Forestry Act* (1990) provides regulations for the management, harvesting and protection of forests in the province.

Water Resources Act (2002) indicates the need for leasing and licensing water power and water for the purpose of generating water power and thermal power. The *Act* also designates the regulations on public water supply areas and the activities restricted and permitted in those areas.

Wilderness and Ecological Reserves Act (1990g) provides regulations and management on wilderness reserves, ecological reserves, and other protected areas within the Province.

Wild Life Act (1990) provides regulations and management on hunting licensing and guidelines, including the divisions of big and small game hunting seasons and zones. The *Act* also provides provisions for the role of outfitters and resources.

9.3 Desktop Assessment Methodology

A desktop review was completed using public mapping records to determine land use tenure and potential interactions in the PA. Sources used to determine land use in the PA are identified in Table 9.3.1. Additionally, engagement with local businesses and stakeholders provided further information relating to local land use.

Table 9.3.1: Data Sources Reviewed to Identify Interactions

Title	Source	Description
Federal Resources		
Anglers Guide	DFO (2026)	The Anglers Guide lists salmon fishing areas and the regulations around scheduled salmon rivers.
Provincial Resources		
Nature Conservancy of Canda (NCC) lands	NCC (2026)	The NCC is the only land trust organization in Newfoundland and Labrador and conserves 11 areas across the island.
Protected and Potential Public Water Supplies	NL Environment, Conservation, and Climate Change - Water Resources Management Division (NLECCC-WRMD, 2025)	Surface and groundwater supply areas in Newfoundland and Labrador.

Title	Source	Description
Provincial Protected Areas	NL Environment, Conservation and Climate Change – Natural Areas Division (NLECCC) and NL Tourism, Culture, Arts and Recreation – Parks Division (NLTCAR)(2024e)	There are currently seven types of provincial protected areas in Newfoundland and Labrador: Wilderness Reserves, Ecological Reserves, Provincial Parks, Wildlife Reserves, Wildlife Parks, and Special Management Areas.
Land Use Atlas	Newfoundland and Labrador (2025b)	Land use designations for areas across Newfoundland and Labrador.
Water Resources Portal	NLECCC – WRMD (2025)	Display water resources data such as drinking water quality data, public protected water supply areas, and other water quality data.
Geosciences Portal	Newfoundland and Labrador (2025a)	Display mineral licenses, quarry permits and geology information across Newfoundland and Labrador.
Fisheries and Aquaculture Licensed Fish Processors and Aquaculture Sites	Newfoundland and Labrador (2025b)	Display licensed fish processors and aquaculture sites.
2023 Visitor Exit Survey	Newfoundland and Labrador(2023c)	Highlights from the 2023 Newfoundland and Labrador exit survey from non-residents and tourists.
2025-2026 Hunting & Trapping Guide	Newfoundland and Labrador (2025e)	Guide on big and small game hunting and guidelines.
Municipal Resources		
Botwood MPA Municipal Plan	Newfoundland and Labrador (2025c)	The Town of Botwood municipal plan, which includes land use designation, future land use map, and development regulations.
Other Resources		
Indigenous Lands of Canada	Esri Canada (2025)	Legislative boundaries of Indian Reserves, Land Claim Settlement Lands (lands created under Comprehensive Land Claims Process that do not or will not have Indian Reserve status), and Indian Lands.
AllTrails	AllTrails (n.d.)	Resource on publicly available trails and lookouts within the province.

9.4 Desktop Assessment Results

The PA is located within the Exploits electoral district and stretched into the Grand Falls-Windsor – Buchans and Baie Verte – Green Bay electoral districts (Drawing 9.4-1, Appendix A). These districts form the basis of the Local Study Area (LSA), further described in Section 9.5.1.

Through review of the publicly available resources in Table 9.3.1, the following land use categories were identified in the PA:

- Land Use Zoning and Planning
- Industrial and Commercial
- Tourism and Recreation

These land use categories are further detailed in the following sections.

9.4.1 Land Use Zoning and Planning

Considerations for land use zoning and planning include municipal lands, the electrical grid, roads, protected public water supplies, protected areas, and control monuments.

9.4.1.1 *Municipal Lands*

The Project overlaps with the following municipal boundaries: Botwood, Peterview, Northern Arm, Point Leamington, Point of Bay and Leading Tickles. Although the PA overlaps with Botwood and Northern Arm Municipal Planning Areas (MPAs) (Drawing 9.4-2, Appendix A), only the Botwood MPA is directly affected by the placement of Project infrastructure. The WPA is primarily located outside the MPA, excepting a small corridor covering the transmission line and haul road from the IPA to the BWPA. The IPA and SPA are located within the Botwood MPA, including the Solar Project and Industrial Facility and associated infrastructure, as discussed in Sections 2.0, 7.1, and 8.1. The Solar Project infrastructure is located on uninhabited lands within the Botwood MPA.

The Industrial Facility will be served by two principal road networks: a site access road connecting the Industrial Facility to Botwood Highway, and a dedicated heavy haul road connecting the Port of Botwood to the Industrial Facility for delivery of oversized and heavy Project cargo. An underground ammonia pipeline within the heavy haul road right of way is also part of the IPA. The heavy haul road and ammonia pipeline are described further in Section 7.1. The routes for both are located in “industrial general” and “commercial-industrial” zones from the Industrial Facility to the Botwood Highway. This road will originate at the Industrial Facility, extend southeast, cross Route 350, and follow the existing railway alignment toward Valley Road, Water Street, and the Port of Botwood. The existing railway alignment is under the control and management of the town of Botwood from the Crown lands location just outside the Botwood MPA to the Port of Botwood, after which the Exploits Valley Port Corporation assumes control and management of the railway alignment. Both the heavy haul road and the ammonia pipeline continue along the railway alignment until the pipeline reaches the former Irving jetty and is loaded onto shipping vessels. The heavy haul road continues on the railway alignment until it reaches Port wharf infrastructure to be used for the offload of construction materials for this Project and future use for Port of Botwood activities. This portion of the heavy haul road will be constructed and managed by the Exploits Valley Port Corporation. The heavy haul road and pipeline portions from Pumphouse Rd to Parsleys Rd are located within “residential medium” and “open space, park & trail” designations. The heavy haul road along the railway alignment from Parsleys Rd. to the Port of Botwood, adjacent to Water St., are located in “industrial marine” designated lands. The heavy haul road and ammonia pipeline are the closest infrastructure to residents in the town of Botwood, with the

nearest location at 12 m on the south side of Water St. before the jetty (see Section 3.3 for further identification of these receptors).

The Botwood MPA (Drawing 9.4-3, Appendix A) consists of different zones designated for a variety of land uses (Newfoundland and Labrador, 2025c). The largest portion of the designated zones was assigned as “resource”, with permitted land uses purposes including agricultural, forestry, and conservation (Newfoundland and Labrador, 2025b). The majority of the remaining zones included “residential”, “commercial”, “open spaces”, and “industrial” (Newfoundland and Labrador, 2025b). A portion of the BWPA overlaps the “rural” land use designated zone, which is potentially considered as discretionary land use, while the remaining area is under Crown Lands.

While the majority of the WPA do not overlap with the “resource” zone, both the IPA and SPA are within this zone and are considered on a discretionary basis. No rezoning is required but amendments are required to the development regulations for the Botwood MPA as the development regulations currently do not identify the use as eligible for development in the “resource” use zone. The development regulations have been approved whereby the Solar Project is a conforming use within the resource zone.

Municipal plan amendments and an associated development regulations amendment are also required for the pipeline/haul road corridor associated with the IPA and SPA. In particular, the pipeline corridor on the eastern side of Botwood Highway (Route 350) will require rezoning from “commercial-industrial”, “commercial local”, and potentially “open space parks & trails” to “industrial general” based on final pipeline location (Drawing 9.4-3, Appendix A). The remaining “commercial-industrial” zones not included in the rezoning area will be converted to “open space parks & trails”. The application for the Municipal Plan modification has been submitted to the province and its release is projected for May 2026.

Five Service NL dump site buffers overlap with the PA, two within the BWPA, two in the LTWPA, and one in the IPA, with an additional buffer zone located within 1 km of the IPA (heavy haul road in the town of Botwood) (Drawing 9.4-2, Appendix A). The two dump site buffers in the LTWPA overlap infrastructure, while only one dump site buffer overlaps the BWPA infrastructure. The buffer overlap in the IPA is also not affected by project infrastructure. All the dump site buffers are labelled as potentially former dump sites (Newfoundland and Labrador, 2025b). All waste in Botwood is collected and delivered to the central waste management station in Norris Arm, while waste in Peterview and Phillips Head is collected at the Point Leamington waste transfer station and then delivered to the central waste management station in Norris Arm. Waste in Northern Arm, Point Leamington, and Leading Tickle is not collected by central NL waste management and handled separately by those municipalities. .

9.4.1.2 Electrical Grid

Communities in the PA receive electrical power from NF Power, which sources its electricity from NL Hydro's hydroelectric generating stations. In the PA, NL Hydro operates the Exploits

Generation System on behalf of the Provincial Government (NL Hydro, 2026b). A further description of the existing electrical infrastructure present within the region is outlined in Section 12 but generally, there is a transmission line that follows the Botwood Highway to supply electricity to the towns within the LSA. A substation is located in the Botwood MPA, located between the Industrial Facility in the IPA and the town of Botwood. The Project will require a grid connection to provide construction power to the Industrial Facility during early works, site preparation, and the main construction period. Within the context of the pre-construction support infrastructure, the grid connection is intended to supply reliable electrical construction power reducing the reliance on temporary diesel generation and improving the overall efficiency of site development. This power will support temporary offices and construction facilities, laydown and warehousing areas, lighting, pumps, construction tools and equipment, temporary utility systems, and electrical requirements associated with the staged buildout of the Industrial Facility. EVREC is evaluating a dedicated interconnection using the existing Botwood-area electrical system, which is supplied through the Stony Brook–Bishop Falls–Botwood 138 kV transmission system. Available information indicates that additional capacity may be achievable through upgrades to existing transformer equipment and/or installation of new transformer infrastructure associated with the selected point of interconnection. Final interconnection arrangements, available capacity, and utility requirements will be confirmed through ongoing discussions with Newfoundland Power and Newfoundland and Labrador Hydro, and through subsequent interconnection studies and detailed engineering and associated permitting. The utilities will lead permitting efforts for this interconnection.

The grid connection is expected to include several principal components. These may include;

- A point of interconnection at or near the Botwood Substation, or another utility-designated location;
- Transformer and switching infrastructure;
- An interconnection line or feeder extending from the point of interconnection to the Industrial Facility; and
- A terminal substation or switchyard area at the Industrial Facility to receive and distribute construction power to the site.

Depending on the final design, the interconnection may include new overhead line segments with associated structures, conductors, grounding systems, protection and control systems, communications infrastructure, and auxiliary electrical components.

9.4.1.3 Road Network

The primary road network used to access the Project include the Botwood Highway, which runs from the TCH off of Bishops Falls to Leading Tickles. Along the Botwood Highway, there are two areas of protected roads between Bishops Falls and the town of Botwood, but neither road is located within the PA (Drawing 9.4-4, Appendix A). The Botwood Highway is also listed as a Class II secondary road under the provincial Protected Road Zoning Regulations (1996) in the *Urban and Rural Planning Act* (2000). The route provided in Schedule B of the regulations

dictate only that portion of the Highway from the TCH at Bishop Falls junction to a point where the eastern boundary of the Town of Botwood crosses the road. However, the regulations indicate that there is currently no protected zoning plan in place for the Botwood Highway and is therefore subject to the municipality's development regulations or section 6 of the regulations for those roads that do not run through an MPA. There is a portion of road (approximately 5 km) that runs through the northwest section of the BWPA but is not expected to be impacted due to the required setbacks from highways (60-100 m depending on the development and access intersection). There is another portion of the Botwood Highway that will be adjacent to the 230 kV transmission line from Southern Lake, approximately 10 km from Point Leamington, running north for approximately 9 km to the edge (and into) the LTWPA. Within the LTWPA, the closest substation is 160 m from the Botwood Highway, quarry at 451 m, and turbine at 343 m. All infrastructure will be adjusted during final engineering to ensure regulatory road setbacks are met, including those setbacks indicated in Section 2.0 respecting turbine distances to roads.

A traffic impact study (Appendix P) was conducted on the traffic volume and existing roads proposed to be used by the Project, including the Botwood Highway, other existing roads within the PA, and a proposed heavy haul corridor connecting the IPA to the Port of Botwood (Water St.). The study mainly focused on transport of components to the PA and general construction and operations labour, as well as the proposed crossing of the heavy haul road on the Botwood Highway. The study demonstrated that traffic volume will be highest during the site preparation and construction phase, with the heavy haul road used as the primary route to transport construction, industrial equipment and turbine materials. The study assessed traffic conditions along the Botwood Highway in August 2025 and Water St. in March 2026. Daily existing traffic along the Botwood Highway totaled 3,777 vehicles, with daily traffic at 1,284 vehicles on Water St. There is a projection of approximately 5,830 crossings on the Botwood Highway associated with the transportation of the wind project components. Increased daily traffic during construction along the Botwood Highway and Water St. is expected at 4,184 and 1,402 vehicles, respectively. As well, increased daily traffic is expected to remain at the Botwood Highway for operational maintenance and shift changes, at 4,223 vehicles but no further impacts are anticipated for Water St. following the construction period. The study also concluded that no signal change was required for the Botwood Highway due to lack of pedestrian traffic at the site, but additional lighting is recommended at the proposed crossing, as well as regrading of Water St. to allow increased visibility of the heavy haul road.

Including the proposed road construction, as detailed in the traffic impact study, there will be a total of 552 km of road networks across the PA, including existing roads and trails and newly constructed roads. Detailed breakdown of the road network is further described in Sections 6.1, 7.1, and 8.1 but there is 317 km of new roads planned for the WPA, 4 km of new road (heavy haul road) for the IPA (2.2 km from the Industrial Facility to the jetty included in this EIS), and 9 km of new road around the SPA. There will be 222 km of existing roads to be used or upgraded in the WPA for the Project.

9.4.1.4 Public Water Supply Areas

Within the LSA, there are several protected public water supply areas (PPWSA) that are near the Project and may be impacted by Project activities (Drawing 9.4-5, Appendix A). Near the northeastern and northern boundaries of the BWPA are the Indian Cove Pond Water Supply Area and the Little Pond Water Supply Area respectively. The Dogberry Brook Water Supply Area and Muddy Hole Pond Water Supply Area are located to the southeastern side of Indian Cove Pond Water Supply Area, bordering the Northern Arm section of the BWPA. On the southern side of the BWPA, there is the Northern Arm Lake Water Supply Area. The Cook's Pond Water Supply Area directly borders the northwestern boundary of the LTWPA. The PA does not overlap with the identified PPWSAs excepting some potential Project roads in a few locations within BWPA (Little Pond, Indian Cove Pond, Northern Arm Lake) and LTWPA (Cook's Pond). However, all intake locations for these PPWSAs are located outside of any proposed infrastructure. The closest intake locations for a PPWSA are located approximately 2 km in the BWPA (turbine near Little Pond PPWSA) and approximately 200 m from LTWPA infrastructure (road and turbine). All identified water supply areas are considered protected, and no development is permitted in these watersheds without the Minister's approval as stated in the policy for land and water related developments in protected public water supply areas (NLECCC-WRMD, 1999). Both BWPA and LTWPA boundaries that border the water supply are outside of the required buffers of the PPWSAs' intake sources (30-150 m) as mentioned in NLECC – WRMD policy (1999).

9.4.1.5 Protected Areas

There are no provincial parks and natural areas that overlap the PA within the LSA, including existing and proposed protected areas (Drawing 9.4-6, Appendix A). Notre Dame Provincial Park is located approximately 22 km east of the IPA (Newfoundland and Labrador, 2025b). There is also the Crooked Bog Natural Area, approximately 27 km southwest of TLPA (Newfoundland and Labrador, 2025b). One marine protected area is located along the coast of Leading Ticks, which is adjacent to the LTWPA, (Newfoundland and Labrador, 2025b). The closest turbine within the LTWPA is located approximately 160 m from the marine protected area. Swan Island natural area is also located approximately 25 km northeast of the BWPA (Newfoundland and Labrador, 2025b).

While there are no sensitive wildlife areas directly interacting with the PA within the LSA, there are three wetland stewardship areas and one waterfowl area near Grand Falls-Windsor, nearly 25 km south of the PA. As these areas are outside the PA, there are no interactions expected.

9.4.1.6 Control Monuments

The NL Geodetic Network (2025f) displays geodetic control monuments across the province. Within the LSA, most control monuments are distributed along the coast, with various sites along the Botwood, Northern Arm, Peterview, Point Leamington, and Leading Ticks coastlines (NLFAL, 2025f). One monument site, monument #37020, is located within the BWPA directly east of New Bay Pond (Drawing 9.4-5, Appendix A). No sites were identified within the IPA or SPA.

9.4.2 Industrial and Commercial

Industrial and commercial land uses considered for the PA included mining and quarries, agriculture, forestry, and fisheries and aquaculture.

9.4.2.1 Mining and Quarries

There are nineteen quarry permits within the PA (Drawing 9.4-7, Appendix A). Ten intersect the BWPA, five intersect the IPA, two are located on the transmission line route to LTWPA, and two are within the LTWPA. There are small areas of overlap between quarries and the PF in BWPA, LTWPA and the IPA. All issued permits and permit applications are for commercial quarries.

There are 15 mapped mineral claims overlapping with the PA, with nine in the BWPA and three in the SLWPA, as well as one in LTWPA and two on the periphery of the IPA. Turbines, access roads, and transmission infrastructure are expected to interact with access to these mineral claim areas. No mineral licences were found to overlap the TLWPA or SPA.

There is one historical mine within the LSA, but not overlapping with the PA, the Point Leamington Project, located in Point Leamington near Botwood Highway. Initially developed in the 1970s, the project was proposed as an open-pit mine operation for the exploration of gold, copper, zinc, silver and lead mineralization (Visionary Mines Inc., 2025). The project's deposit was acquired by Callinex Mines Inc. in 2016, with the company recommending an exploration campaign in conjunction with metallurgical testing in 2025 (Visionary Mines Inc., 2025).

9.4.2.2 Agriculture

Within the LSA, there are three areas designated as “area of agricultural interest”, all outside the PA, with two locations approximately 5 km from TLWPA and one 2.5 km south of the IPA. In addition to the “areas of agricultural interest,” there is an area designated as “potential agriculture” overlapping the eastern half of the BWPA (Drawing 9.4-8, Appendix A). Notably, there are two smaller agricultural areas designated as a mink farm/fox farm and a Crown reserve area within 2 km of the BWPA but are located outside the PA boundary. There is a cranberry farm located 1 km southwest of the BWPA. No agricultural areas overlap with the IPA or SPA.

Agricultural development areas are managed by NL FAL, and no concerns have been identified for the Project throughout regulatory engagement for the EIS.

9.4.2.3 Forestry

Forestry activities occur for domestic and commercial woodcutting throughout the PA, which overlaps Forestry Management Districts 8, 9 and 10 (Drawing 9.4-9, Appendix A). The area has a long history of logging throughout the PA, primarily overlapping the WPA. The town of Botwood, which hosts part of the proposed heavy haul road, pipeline and jetty infrastructure, has a history of hosting a variety of commercial industries, including Irving Oil and the former Abitibi Consolidated Inc. Corner Brook Pulp & Paper (CBPP aka Kruger) also operates within much of TLWPA, while Domestic Harvest Areas occur throughout all Project areas except

SLWPA (Newfoundland and Labrador, 2025b). Domestic Harvest Areas are designated zones on Crown land where individuals can cut timber for personal use (firewood, etc.) with a valid permit and are managed by NL FAL.

9.4.2.4 Fisheries and Aquaculture

There are existing mussel and oyster culture farms in Green Bay and Notre Dame Bay that are east of the BWPA and IPA but located outside the PA. Communications provided by NL ECCC and NLFA during the EA review process recommends no development takes place within 500 m of the boundary of an existing bivalve site (Drawing 9.4-10, Appendix A). Leading Ticks Seafood Inc. is also located north of LTWPA near Mooring Cove, and a bivalve buffer area in Budgell's Harbour located southeast of the northern portion of the LTWPA (NLFAL, 2025b). These locations are located within the LSA but do not overlap the PA.

9.4.3 Tourism and Recreation

Tourism and Recreation land uses in the PA can include recreational harvesting, ATV/snowmobile use, outfitting, provincial tourism, and cabins.

9.4.3.1 Recreational Harvesting

Recreational activities for sustenance are a large component of NL culture and attraction, with activities including hunting and trapping, berry-picking, and fishing and angling. Some activities, including hunting and fishing, do require licenses to operate and conduct the activities as indicated by the *Fisheries Act*, the *Wild Life Act*, and the Migratory Birds Hunting Regulations.

Hunting and trapping is an essential component of Newfoundland and Labrador, both as a source of self-sufficiency and upholding traditional outdoor pursuits for physical and mental wellbeing (NLFAL, 2025e). Big game animals on the island of Newfoundland include caribou, black bear, and moose, with the hunting season and management differences between each species. Game populations, such as moose, are managed through population surveys, annual license allocation and harvest statistics (Newfoundland and Labrador, 2022a). Management areas overlapping the PA include the Moose Management Area (MMA) 15-Twin Lakes and the Black Bear Management Area (BBMA) 15-Twin Lakes (Drawing 9.4-11, Appendix A). Notably, the 15-Twin Lakes MMA indicated a hunting success rate of 58.33% with no proposed quota changes, suggesting that the population of moose within this MMA is still available for hunting/trapping within the appropriate hunting seasons (NLFAL, 2025c). Moose population management on the Island is driven by target densities, with management areas being categorized into one of three density targets. The 15-Twin Lakes MMA is identified as a Class II management area, meaning that it has a target density of 1.5 moose / km². Annual harvest of moose allows government to manage moose populations at sustainable levels, in an effort to optimize hunter success rates while mitigating the potential for effects associated with over population. A key factor in population management across these broad MMAs is hunter access, with parts of MMAs where hunter accessibility is limited often seeing densities that exceed management targets.

The Central Moose Reduction Zone is located south of the PA along the Trans-Canada Highway. This management area is a maximum of 6 km wide, excluding the traveled portion of the highway, and follows the highway between Grand Falls-Winsor to Gander (NL FAL, 2025b). No caribou management areas overlap with the LSA. Potential Project interaction with caribou is discussed in Section 6.13. Hunting for moose, bear, and caribou is expected to occur throughout the WPA, primarily the BWPA, SLWPA, and TLWPA, where there is more road accessibility.

For small game species, harvest is managed through general small game licences. Annual surveys of small game population on the Island are limited to sensitive areas or index surveys to model general population trends. While populations of some small game species, such as rock ptarmigan and willow ptarmigan, may be limited by harvest pressure in sensitive areas of the province, no management areas specific to ptarmigan are identified within the PA. Introduced small game species such as spruce grouse, ruffed grouse, and snowshoe hare are managed through season dates and bag limits, with harvest success and effort monitored annually through small game returns. The province has not publicly identified target populations or densities for any small game populations on the Island of Newfoundland. Migratory bird hunting may also occur within the LSA, with activities assumed to potentially occur within the PA where suitable habitat is present, such as along the coast near TLWPA.

The Island of Newfoundland is home to a variety of berries and edible plants, which the province actively encourages and embraces as an important source of food culture and recreational activity for subsistence. Within the WPA, there are approximately 66.6 ha of barren lands where berries such as blueberries and strawberries are most likely to be found. While no online records of active berry-picking and foraging attractions exist within the PA, it is assumed that the local community and visitors do partake in berry-picking and foraging in areas near and within the PA given the presence of various berries and produce farms throughout Botwood, Grand Falls-Windsor and other community centers within the LSA.

Aside from hunting/trapping and berry-picking, the Island of Newfoundland also actively participates in fishing and angling activities, both for recreational and sustenance purposes. Salmon fishing is permitted and regulated in individual salmon fishing areas (SFAs), with each area receiving different season dates, retention limits, and other regulations (DFO, 2025e). The PA is within SFA 4, in which only Exploits River and tributaries flow within the PA. No Project activity is expected to impact the fishing/angling opportunities for salmon within Exploits River and SFA 4. Trout is another species with specific angling zones, with no scheduled trout waters or special trout areas located within the LSA (DFO, 2025e).

9.4.3.2 ATV and Snowmobile Use

The PA contains a broad network of maintained and unmaintained ATV and snowmobile trails. Many of these trails have been documented within the PA (Drawing 9.4-12, Appendix A) and are identified as the “existing” road network. They primarily consist of historic resource roads developed within the region by the forestry industry, that have been maintained by local residents, primarily within the BWPA and SLWPA. There is little trail network within the TLWPA

and virtually no trails within the LTWPA or the Industrial Facility footprint of the IPA. The Frozen Ocean Trail is approximately 21 km long running east-west between South Twin Lake and New Bay Pond, and an Unnamed trail running north from New Bay Road, along the western and northern sides of New Bay Pond, connecting with NL-350 between Botwood and Northern Arm. The Frozen Ocean Trail runs through the middle of the eastern half of the BWPA (approximately 12 km) and then turns south on the western side of New Bay Pond for approximately 12 km, before exiting the PA. The Frozen Ocean Trail weaves in and out of the southwestern portion of the BWPA, intersecting a 3 km portion in the middle of the southern tip of the BWPA. The unnamed trail runs approximately 2 km through the IPA (within the southern half of the proposed Industrial Facility, likely starting from the existing transmission line right of way) and a portion of the BWPA where the 230 kv transmission line is routed from the Industrial Facility to the BWPA. The unnamed trail is listed as unmaintained by the snowmobile federation.

Additionally, the heavy haul road and the underground ammonia pipeline are located within the railway alignment, locally used by ATV and snowmobile riders, and named the Exploits Valley and Beothuk Trail (Trail) on google maps (Drawing 9.4-12, Appendix A). The Exploits Valley and Beothuk trail travels from south of Bishop Falls (approximately 10 km south of the SPA/IPA) northwards to the Port of Botwood. The Exploits Valley and Beothuk Trail along the Port from Parsley's Rd. to Fernwod Dr. offers recreational opportunity for ATV/snowmobile users as well as walking activity. This portion of the Trail is almost entirely within the proposed heavy haul road footprint to the Port of Botwood, as well as the underground ammonia pipeline to the jetty, and is under the management and control of the town of Botwood. EVREC is working with the town on development of these lands.

9.4.3.3 Outfitting

The outfitting industry has contributed economically and recreationally to the island of Newfoundland, with land use for outfitting abundant across rural and natural environment. Non-resident hunters and anglers are legally required to be accompanied by licensed guides, which come in the form of licensed outfitters. Within the LSA, there are three zones designated as outfitter buffers (Drawing 9.4-11, Appendix A). One of the outfitter buffers that overlaps with the BWPA is designated for Hideaway Lodge, which provides accommodation and moose and black bear hunting packages to residents and non-resident hunters looking to hunt in the area. A1 Hunts overlaps the TLWPA and provides accommodation and hunting experiences in the Twin Lakes and Marks Lake area. No outfitter buffers were identified overlapping the IPA or SPA.

9.4.3.4 Provincial Tourism

The communities of Botwood, Peterview, Point Leamington, Leading Ticks, Northern Arm, as well as other communities within the LSA and the Bay of Exploits, are home to a variety of primarily outdoor recreational activities. This includes kayaking, hiking, camping, biking, and other outdoor recreational activities. According to the provincial tourist exit survey (2023c), 41% of the survey respondents travelled to the province for vacation which encompassed activities such as visiting tourist attractions, natural sightseeing, and partaking in recreational

activities. Hiking, coastal sightseeing, and seabird and whale watching are among the top outdoor experiences highlighted by survey respondents, with experience local cuisine and exploring rural communities also making up large proportions of activities survey respondents experienced during their trips (Newfoundland and Labrador, 2023c). Tourism is also an integral part of the communities within the LSA, with organizations such as Adventure Newfoundland providing guided tours and recreational activities to the Bay of Exploits areas (Adventure NL, 2025). The Shawnadithit campground and RV park is located over 2 km from the SPA and is approximately located within proximity of proposed IPA infrastructure (400 m from proposed road and 900 m from accommodations camp).

While no publicly available hiking trails are present within the PA, there are trails within the LSA that may attract visitors to the area. Near the BWPA, there is the Killick Island trail in the northern end of the town of Botwood and the Pendragon trail in Northern Arm, both providing easy access to the areas' views of the Bay of Exploits (AllTrails, n.d.). There are two trails in Point Leamington, which are accessible by Botwood Highway and is north of the BWPA (AllTrails, n.d.). On the island of Leading Ticks north of the LTWPA, there are two trails and one lookout location that provide coastal views from the island (AllTrails, n.d.).

9.4.3.5 Cabins

There are numerous remote titled and remote untitled cabins throughout the WPA, primarily located in the BWPA, including the New Bay Cabins Owners Association in the designated cottage planning area on the west side of New Bay Pond (Drawing 9.4-13, Appendix A). The cabin owners access their site using the various resource roads throughout the PA, from the Botwood Highway. There are 320 remote-titled and 29 remote-untitled cabins in the WPA, with further details on cabins within each WPA discussed in Section 3.2.4.1. There were no cabins identified in the IPA or the SPA.

9.5 Effects Assessment

Project activities, primarily those that involve access road creation, quarry/accommodation development, and infrastructure installation have the potential to impact land and resource users (Table 9.5.1).

Table 9.5.1: Potential Project-Land Use Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Controls	X
Clearing and Grubbing	X
Construction of Temporary Works (Quarries/Borrow Pits, Concrete Production Batch Plants, Accommodation Camps)	X
Access Road Upgrading and Construction	X
PV Array Installation	X
Water Pipeline Construction	X
Facility Civil Works and Equipment Installation	X
Utility Connections	X
Laydown Area and Turbine Pad Construction	X
Collector and Transmission Line Construction	X
Transportation of Components	X
Turbine Assembly	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Vegetation Management	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

9.5.1 Assessment Boundaries

9.5.1.1 *Administrative Boundary*

Administrative boundaries for land and resource use include, the *Towns and Local Service District Act*, the *Urban and Rural Planning Act*, the *Lands Act*,

9.5.1.2 *Technical Boundary*

The assessment of the Project effects on land and resource use is constrained by the limited publicly available data and research on land and resource use within the LSA. While some information regarding mapped areas of use is available through the Provincial databases, little fine scale data is available to fully assess the potential for impact on recreational or commercial

activities.

9.5.1.3 Spatial Boundary

The LSA (Drawing 9.4-1, Appendix A) includes any provincial electoral district that overlaps with the PA (WPA, IPA, and SPA). This includes the Exploits electoral district, the Grand Falls-Windsor – Buchans electoral district, and the Baie Verte – Green Bay electoral districts ([Elections NL, 2025](#)). The RSA is Statistics Canada Census Division 6 and 8 as some components of land usage are applicable to the LSA but may have indirect effects to the RSA (i.e., tourism).

9.5.1.4 Temporal Boundary

Temporal boundaries associated with land and resource use include the site preparation and construction (3 years), operation and maintenance (33 years), and decommissioning and rehabilitation (2 years) phases of the Project.

9.5.2 Assessment Criteria

Assessment criteria provided in Section 5.0 also apply to Land and Resource Use. The VC-specific definition for magnitude is as follows:

- Negligible – no change in accessibility in the use of the land and resources.
- Low – small changes to land and resource use and/or minor limitations to access the land and resources.
- Moderate – moderate changes to land and resource use and moderate limitations to accessibility.
- High – high changes to land and resource use and widespread limitation to access the land and resource.

The approach to determine the significance of effects from the Project on VCs is described in Section 5.0.

9.5.3 Effects

Direct effects to land and resource use such as changes to land accessibility, changes to resource availability, impacts on visual landscape, impacts to tourism, recreational and cultural uses, and changes in traffic are likely to be most prominent during two phases of the Project: site preparation and construction and operation and maintenance. Specific pathways for each listed effect include loss of land access, increase accessibility, loss of resources or change in resource availability, changed visual landscape, adjustments in outfitting, tourism, recreational and cultural uses, and increased traffic. Effect-specific active management, mitigation, and monitoring are required to mitigate or otherwise manage the magnitude of these direct effects.

Indirect effects from Project interactions with land and resource use, such as impacts on tourism, recreational, and cultural uses, changes to the landscape, and changes to land value, are foreseeable but more complex to capture. These will rely on research not often based in the Newfoundland context to create a general basis of how the effects may occur.

Nonetheless, discussion on these indirect effects may provide precedents on how these effects may occur and can be mitigated or otherwise managed by adaptive management and communication.

9.5.3.1 Land Use Zoning and Planning

Municipal Lands

The majority of the PA falls within Crown Lands. A portion of the BWPA and the entirety of the IPA and SPA are within the Botwood MPA. Although no rezoning is required for the IPA and SPA, an amendment to the development regulations is required. An amendment has been drafted with the town of Botwood. The amendment will allow for the development of the Industrial Facility and Solar Project within the IPA/SPA, in accordance with regulations imposed by the town. The development plan amendment has been approved and filed with the province. The Project will comply with existing zoning requirements through consultation with the Botwood MPA and other provincial and municipal departments, with areas affected by Project activities be adjusted appropriately to proceed with construction permitting. The heavy haul road and ammonia pipeline will be located within a recreational trail (Exploits Valley and Beothuk Trail) used by ATV/snowmobile riders and local community hikers. These lands are included in the proposed development regulations amendment for the IPA and will likely be impacted, if not completely removed, within the Botwood MPA.

In addition to municipal lands zoning, provincial Crown lands are required to be applied for infrastructure located outside MPAs once development areas are finalized during detailed engineering. These lands will allow access to the turbines, as well as leased lands for occupation of infrastructure. The provincial government is continuing to evaluate and finalize a process for granting Crown lands for wind and hydrogen projects. However, it is EVREC's intent to apply for the Crown lands following detailed engineering and EA approval.

Flooding Risk

Section 7.6.7.3 speaks to modelled impacts of additional discharge into the natural creek that flows into Botwood Harbour. The additional plant discharge will not produce any measurable change in flooding risk to residences along Botwood Highway on the most westerly end of IRID51.

Electrical Grid

EVREC is evaluating a dedicated interconnection using the existing Botwood-area electrical system, which is supplied through the Stony Brook–Bishop Falls–Botwood 138 kV transmission system. Future grid connection is outside the scope of this EIS assessment and will be evaluated at the time of permitting with the regulatory agencies.

Road Network

Anticipated temporary closures during construction and decommissioning will impede recreational activities in the PA. However, it is estimated that recreationalists will benefit from the increased accessibility from upgraded road networks and may increase their access to suitable habitats for fishing, hunting and trapping, and other recreational activities. The IPA,

SPA, and some electrical infrastructure (substations) will be fenced to deter access during operations to these sites but general access throughout the WPA should remain open.

The access road and heavy haul road are intended to be delivered early to support mobilization and arrival of major equipment, and the grid interconnection will also be sequenced to make construction power available as early as practicable. Site preparation activities in those areas will therefore include clearing, grading, temporary drainage, engineered pads or working surfaces, and other enabling works needed to support subsequent construction activities and construction logistics. The use of a dedicated heavy haul road and a logistics approach may incorporate module and super-module design to expedite construction, reduce field work, improve quality, and mitigate execution risk. This means that certain large equipment packages, structural assemblies, or skid-mounted systems may be fabricated or pre-assembled off site and then delivered by marine vessel and transported to the Industrial Facility for installation using the heavy haul corridor and designated laydown and staging areas. Environmental protection and construction management measures will be implemented throughout the construction phase. These will include maintenance of the erosion and sediment control measures installed during site preparation, staged clearing and grading, controlled handling and storage of fuels and hazardous materials, dust suppression on exposed areas and unpaved roads, waste segregation and removal, temporary drainage management, and protection of adjacent watercourses, wetlands, and other sensitive features

The traffic study conducted on the Botwood Highway and other proposed road developments (Appendix P) anticipated increased traffic to be generated by the Project, with the majority of impacts within the town of Botwood during the construction period. There is a predicted daily traffic increase of 9% on Water St. during construction associated with transportation of construction materials. The change in predicted daily traffic on the Botwood Highway is expected to increase by 10.7% during construction and 11.8% during operations due to maintenance and shift changes. The use of the heavy haul road is expected to help minimize traffic impacts on the existing road network in the area. The proposed intersection of the heavy haul road and the Botwood Highway will be monitored during construction to review pavement deterioration, with traffic safety signage posted. A highway access permit will be required for the crossing on Botwood Highway. Oversized crossings will aim to occur outside peak traffic hours when possible. Water St. in the town of Botwood may require regrading once the heavy haul road is built.

The access road and heavy haul road will remain among the most important pieces of support infrastructure during operations because they provide routine access for inspections, corrective maintenance, emergency response, heavy-component replacement, and movement of materials and equipment between the Industrial Facility, the port, and other Project areas. Operational roads will require periodic grading, re-topping, pothole remediation, surface shaping, and regular drainage maintenance, with activities increasing during spring thaw, following major weather events, and ahead of heavy equipment mobilization. Access roads will also be maintained through snow clearing, grading, gravel placement, and vegetation management, and high-use roads will be plowed, sanded, and/or salted as required for safe

operation. Maintenance of the road system will include regular inspections; and winter road maintenance for the roads required to support routine and emergency operations. The heavy haul road, in particular, will be retained as a strategic corridor for movement of oversized equipment, specialized maintenance vehicles, and replacement components arriving through the Port of Botwood. For that reason, the operational maintenance program for the heavy haul road is expected to include periodic review of load-bearing capacity and surface condition.

Protected Public Water Supply Areas

No PPWSAs overlap the PA, therefore no effects to land use are anticipated.

Protected Areas

No protected areas overlap the PA, therefore no effects to land use are anticipated.

Control Monuments

Project activities and infrastructure will avoid impacting the control monument within the BWPA as required in Section 65(1) of the *Lands Act* (1991). Therefore, no impacts are anticipated.

9.5.3.2 Industrial and Commercial Resources

Direct and indirect effects are anticipated related to the accessibility and availability of mineral claims, quarry resources, agriculture, forestry, fisheries, and aquaculture. The Project will reduce the availability of potential resources (including minerals, forestry, and agriculture) in the PA. Vegetation clearing will result in loss of forested habitats, and habitat alterations will alter the abundance, distribution and composition of trees in the PA. Ground disturbance will result in the minor loss of available aggregate within the PF and disturbance to soil surface. Management of resources such as forestry and minerals are directly dependent on the ability of public and private individuals being able to access them. Increases in accessibility to remote areas may improve the potential for resource management and development, provided those resources are not removed by Project development.

Mining and Quarries

Mining and quarrying activities within the PA are anticipated to be affected both directly and indirectly. Direct loss of opportunity will occur in area where project infrastructure directly overlaps with existing mineral leases. Additional lost opportunity is anticipated to occur for mineral leases overlapping with the PA due to proximity of project infrastructure. Activities occurring during mining and quarrying such as blasting and bulk extraction may be incongruent with the structural stability of Project infrastructure and thus may result in limitations associated with potential mining and quarrying activity in close proximity to the PF. Tables 9.5.2 and 9.5.3 provide an overview of the total area of existing mineral claims and quarries within the PA and the anticipated overlap of the PF.

Table 9.5.2: Overview of Mineral Claims within the PA

Project Area	Mineral claims (ha) per Project Area	Mineral claims (ha) impacted by Project Footprint
BWPA	1,650	163
TLWPA	0	0
SLWPA	234	59
LTWPA	1	1
IPA	18	0
SPA	0	0
Project Area (total)	1,903	222

Fifteen active mineral claims, owned by eight claim holders and covering 1,903 ha of the PA. The BWPA, contains the largest number of claims (9 claims, owned by 3 different claim holders) totaling 1650 ha of overlap. Callinix Mines Inc. owns the majority of these active claims, primarily around and to the south of Lewis and Nanny Bag Lake. Of the 1,650 ha of overlap between the mineral claims and BWPA, 163 ha overlap with the PF. There are an additional 3 claims, owned by three different claim holders, in SLWPA. The claims in SLWPA overlap with the PA for 234 ha of which 59 ha intersect with the PF. In LTWPA, there is a single claim which overlaps with the PA, and which also overlaps with the PF (1ha). The claims which intersect the IPA are on the periphery, there is 18 ha of overlap with the IPA but no overlap between the claims and PF. Therefore, the anticipated loss to claim holders will be 222 ha of their claims, the majority of which is in BWPA. However, there is also potential benefit to claim holders from increased access to their claims through the development of new access routes.

Improved road access through SLWPA and TLWPA may afford prospectors and exploration companies reduced costs of exploration to areas adjacent to the wind project infrastructure. Currently, in remote areas within the WPA, prospecting and exploration activities may currently require the use of helicopters or the establishment of lengthy access trails. Access road construction may decrease the distance between areas of interest of exploration and nearest access point, reducing logistics costs or access trail construction costs.

Table 9.5.3: Overview of Quarries within the PA

Project Area	Quarry Permit (ha) per Project Area	Quarry Permit Area (ha) impacted by Project Footprint
BWPA	15	1.5
TLWPA	0	0
SLWPA	0	0
LTWPA	1	0.3
IPA	16	0.7
SPA	0	0
Project Area (total)	32	2.5

In the BWPA, a project road intersects two quarries located to the west of Highway 350, as well

as a quarry along the transmission route from the BWPA to the Industrial Facility (1.5 ha impacted in total). In LTWPA, the project road and transmission line leading to the LTWPA intersect two permitted quarries (0.3 ha impacted in total) which are located along the preexisting resource road. In the IPA, a project road intersects with a quarry to the south of the Industrial Facility (0.3 ha impacted). Overall, the project is anticipated to impact 6 permitted quarries covering a total of 2.5 hectares. EVREC will engage with local quarry operators to ensure that access to existing active quarries be maintained and avoid impacts to operation where feasible. Additionally, EVREC are working with industry to develop a Mineral Resource Industry Consultation Plan (Appendix Q.5) and a Quarry Resource Consultation Plan (Appendix Q.6) and will continue to engage with stakeholders through the detailed design process. These will be living documents and evolve and be updated as needed.

Agriculture

There are no published development plans for the potential agricultural areas in the BWPA. The mink farm in the BWPA was released from EA in 2004 with Botwood Fur Ranch Inc planning to construct a farm and expand within four years of operation. The mink farm currently covers a 2.4 ha site with an EA for the planned expansion withdrawn in 2017 by Eagle Ridge Farm Limited. There are no effects anticipated on the mink farm as it's located outside the PA. s. There is a cranberry farm located approximately 2 km south of the IPA. The cranberry farm was granted a water use licence (WUL 20-22523) in December 2020 with expiry in December 2025 for maximum annual water withdrawal of 120,000 cubic meters from unnamed bodies of water near Peters River. The withdrawal is located upstream and therefore, the Project is not expected to be impacted by the proposed water withdrawal from Peters Pond.

Forestry

Forestry activity is expected to be affected directly and indirectly by the Project. Construction activities related to tree and vegetation clearing will directly result in the reduction of available forest cover for domestic and commercial forestry activities and silviculture. Specifically related to domestic harvest, the anticipated loss of land within the Domestic Harvest Areas related to Project infrastructure, and the overall percentage loss relative to the PA are outlined in Table 9.5.4.

Table 9.5.4: Overview of Domestic Harvest Areas within the PA

Project Area	Domestic Harvest Area (ha) per Project Area	% of Project Area which is a Domestic Harvest Area	Domestic Harvest Area impacted by Project Footprint	% of the Domestic Harvest Area within the PA which is impacted by the Project Footprint
BWPA	14,146	68%	1409	10%
TLWPA	184	2%	34	18%
SLWPA	0	0%	0	0%
LTWPA	2092	87%	382	18%
IPA	641	55%	89	14%
SPA	169	70%	135	80%

Project Area (total)	17,232	48%	2049	12%

Within the PA, there is 17,232 ha of domestic harvest area which covers 48% of the total PA. Of that 17,232 ha, 2,049 ha (or 12%) overlaps with the PF. The majority of this domestic harvest area is located in the BWPA (14,146 ha) covering 68% of that WPA. Of that 14,146 ha in BWPA, only 10% (or 1,409 ha) intersects with the PF. The percentage of domestic harvest area within the other WPAs varies, with the majority of LTWPA being domestic harvest area (87% coverage) in contrast to TLWPA which has only 2% of its total area designated as a Domestic Harvest Area. SLWPA has no Domestic Harvest Area. While the percentage of each WPA designated as Domestic Harvest Area varies, the impact of the PF on the Domestic Harvest Area within each WPA remains relatively stable with 10% - 18% of the Domestic Harvest Area being impacted, due to a consistent footprint with evenly spaced project roads and turbines.

The IPA and SPA, similar LTWPA and BWPA, have a relatively high percentage of their area designated as Domestic Harvest Areas. The IPA is 55% domestic harvest area, and the SPA is 70% domestic harvest area. Also similar to the WPAs, 14% of the domestic harvest area within the IPA would be impacted by the PF. In contrast, due to the densification of the footprint within SPA, the percentage of the domestic harvest area impacted in the SPA increases to 80%, which while a large increase, the relatively small size of the area (SPA is 242 ha total, with 135 ha of domestic harvest area) results in it being only a small percentage of the overall anticipated impact to the domestic harvest area. While the loss of harvestable area is unavoidable in some areas, the Project will increase and simplify access to some of these Domestic Harvest Areas through the creation of new roads throughout the PA.

Cleared areas required only during the construction phase are anticipated to return to a forest state through succession over time, resulting in a return to availability for resource users. Increases in new roads and improvement on old roads and trails may also improve accessibility and availability of timber resources for resource users, as previously remote areas of timber may become more accessible for domestic harvest.

The TLWPA overlaps with timber limits for Corner Brook Pulp and Paper. Previous management plans for Management District 9 have identified potential commercial operation occurring within the TLWPA. EVREC will continue to engage with Corner Brook Pulp and Paper and NLFAL related to harvest activities in this area. EVREC is committed to the development of a Domestic and Commercial Wood Cutting Consultation Plan (Appendix Q.4) during the detailed design phase, and will continue to engage with stakeholders, both domestic and commercial throughout the development of the Project. This will be a living document and be updated as needed.

Fisheries and Aquaculture

Acoustic impacts to marine species generally refers to anthropogenic noises that generate sounds with frequencies and vibrations that overlap the auditory range of marine organisms (Richardson et al., 2013; Solé et al., 2023). These include intentional (i.e., navy sonar, seismic survey) and unintentional (i.e., pile-driving, shipping) sounds that can generate particle motions

traveling through the water or underwater substrate that impact the vibrations of the invertebrate body (Solé et al., 2023).

Increased sound disturbances from site preparation and construction may temporarily affected aquatic species populations in nearby aquaculture farms. Few studies were conducted on the impacts to shellfish population within aquaculture farms from airborne noise; however, a variety of studies were conducted on the impact of underwater noise pollution on invertebrates.

One study conducted a literature review of studies looking at the impacts of biotic and abiotic sounds on 50 species from seven taxonomic groups, including arthropods, crustaceans, and molluscs (Davies et al., 2024). The study found that anthropogenic noise (i.e., boat) and synthetic noise were demonstrated to negatively affect the physiological responses and behaviours of invertebrate species, such as a reduction of activity level, reduction of biomarkers of DNA health and genetic expression, and reduction in defense mechanism (Davies et al., 2024). As the study explored the impacts of different sound sources on marine invertebrates' physiology and behaviors across an amalgamation of various literatures, estimated noise levels that are detrimental to marine invertebrates were excluded from the discussion. Nonetheless, the study provides context on the potential effects of marine noise pollution on marine invertebrates, specifically to arthropods and molluscs in which the study found the greatest impacts from anthropogenic and synthetic noises.

A study by Solé et al. (2023) also conducted a literature review of marine noise exposure on invertebrates and found that species, such as blue mussel (*Mytilus edulis*), displayed stress behaviours after undergoing through underwater anthropogenic noise playbacks at high noise levels. For example, one of the selected studies found pile-driving playback noise level of 153 dB re 1µPa (approximately 127 dB in airborne sound) played for 50 minutes caused blue mussels to increase valve movement to compensate for noise-induced stress (Spiga et al., 2016). Another selected study had sequences of simulated sound from 200 to 350 Hz played through a speaker placed inside of the tank of tested blue mussels for a total of 95 minutes (25 minutes of silent ambient noise, followed by 65 to 66 minutes of simulated sound exposure, and 4 to 5 minutes of silence playback) (Hubert et al., 2022). Noise level bandwidths played during the test were 141.8 dB re 1µPa (115 dB) for the 200 Hz playback, 143.2 dB re 1µPa (117 dB) for the 350 Hz playback, and 102.8 dB re 1µPa (76.8 dB) for the ambient condition. The study found that the mussels partially closed their valves when initially introduced to the pulse rates, but some habituated to the tonne series of identical frequency at the second-last sound pulse. The study also found that the sound did not negatively affect phytoplankton, which was included in the tested enclosure to test for mussel's behavior, clearance rate or valve gape during the entire experiment.

Similarly, a study was conducted to study the acute behavioral and physiological responses of eastern oysters (*Crassostrea virginica*) to sound treatments mimicking human activity, including drilling, boating, and pile driving (Ledoux et al., 2023). Oysters were tested in a simulated laboratory environment, with ambient anthropogenic noise set to approximately 114.5 dB re 1µPa, which converts approximately to 88.5 dB in airborne sound. Results

demonstrate that oysters reacted to simulated pile driving sound, but not drilling or boating sound, and none of the sound treatments affected valve activity levels 12 hours after the administration of sounds. In the context of aquaculture farming, a study by Zhang and fellow researchers (2023) studied the effects of two soundscape systems on aquaculture species using underwater noise to observe the potential effects on largemouth bass. Ambient underwater noise level was 70.4 dB re 1µPa (44.4 dB), whereas the two soundscape systems were set to emit underwater noise from 107.7 to 115.1 dB re 1µPa (81.7 to 89.1 dB). The study found that fish populations benefitted when appropriate soundscape management strategies were implemented to reduce noise pollution on fish populations and aquaculture systems.

It is noted that studies on impacts of marine anthropogenic noise were conducted in or collected data from literatures conducted in simulated environment where sound sources were deployed at a distance close to the tested species in underwater environment (e.g., inside the tested tank, right next to tanks/burrows, 15 m away) (Hubert et al., 2022; Spiga et al., 2016; Staaterman et al., 2011). Therefore, conclusions of the negative impacts of anthropogenic noise on marine invertebrates are not applicable to understand the potential impacts from Project activities as these activities will occur above water and mostly away from the coast.

Most aquaculture farms identified within the LSA are located in Green Bay and Notre Dame Bay, with the closest farms (blue mussel) approximately 3 km north of the BWPA and 3 km east of the LTWPA (Drawing 9.4-10, Appendix A). No Project activities are expected to occur near the coast where these aquaculture farms are located. Considering the distances of Project and the simulated distances and noise levels seen in the above studies, noise levels generated by Project activities will likely be dispersed within the terrestrial environment until the noise reaches the aquaculture population.

The Project will engage with the aquaculture farms near LTWPA and BWPA on identifying potential noise impacts during site preparation and construction and the continued operation of the aquaculture farms during Project's lifespan.

Further information on noise levels generated by Project activities is discussed in Sections 6.4, 7.4 and 8.4.

9.5.3.3 Tourism and Recreation

It is difficult to determine with certainty how visitors and recreational providers will react to a wind and hydrogen/ammonia project development. Wind turbines are objects of fascination for many who might see them as an attraction or at worst neutral in their visiting or tourism decisions. Others, such as the outfitting industry, may find them intrusive in otherwise natural or rural spaces and be forced to choose other, less-developed areas for recreational opportunities if available. EVREC is working with the outfitters within the PA to time construction plans around important business periods (ex. Fall hunting, winter snowmobile, etc.) in an effort to provide as little disruption as possible to the outfitting operations. Additionally, EVREC is working with the outfitters to address potential impacts to their business during construction and initial operation of the facility.

There will likely be view points of the turbines from various receptor locations and transportation corridors. While it is not possible to predetermine recreationalists' response to the presence of or the aesthetic qualities of the Project, The Project can examine direct impacts on recreational opportunities and the experiences sought after and provided by locals and tourists alike.

Recreational Harvesting

Changes in accessibility to lands and resources caused by Project activities will occur. The placement of physical infrastructure will result in the direct loss of accessibility of land and resources. Additionally, Project activities will result in habitat alteration, affecting the availability of sustenance resources within the PA, particularly in the IPA and the SPA where facilities will be placed. However, increased road densities throughout the LSA, and within the WPA, have the potential to increase the accessibility of previously remote resources and potentially improve resource harvest success. Increasing accessibility can also lead to increased availability of some spatially limited resources, such as berries and timber, potentially benefitting the public. As discussed in Section 6.10.7.4, roads densities within the WPA are anticipated to increase by 86%.

Game Management

Increased accessibility to game populations through increased access roads or subsequent habitat loss is not anticipated to result in changes in populations that are inconsistent with provincial management targets. Further, for big game species such as moose and black bear, increased accessibility may improve the ability to manage populations in remote parts of the MMA as management is directly tied to hunter success and accessibility. Hunters will continue to have access to hunting throughout the WPA, with short term loss of accessibility during construction. There will be a loss of accessibility to hunt within the IPA and SPA due to the fencing and security of those sites.

Recreational Fishing

Populations of fish targeted by the recreational fishing community, such as salmon and trout, may be affected both directly and indirectly through increased access. Remote areas that are currently inaccessible to anglers may represent refugia or overwintering habitat juvenile populations. While habitat alterations and changes to surface water quality or quantity (Section 6.8) may result in direct loss of habitat, fishing pressure has been documented to influence population dynamics for local salmon and trout populations (Hard et al., 2008). However, increased accessibility within the WPA may also result in diffusion of fishing effort over a broader area, potentially improving areas currently experiencing heavy pressure. The re-routing of two streams in the IPA will remove fish habitat as they are routed into ditches around the IPA.

Regarding recreational fishing pressure and its impacts on fish abundance within the PA, increased access may impact previously remote populations however, it is unclear what effect this may have on the population of salmon and trout within the broader PA.

Creel surveys are designed to obtain feedback on fishing abundance within an area. Creel surveys were not completed for the EIS but can be incorporated into the Project Public Participation Plan (Appendix Q.3) if required by regulators. This data will be useful to advise on high access areas and seasons within the PA.

ATV and Snowmobile Use

Project construction may affect the areas within the WPA in which recreationalists operate, such as the use of existing trails, especially where they facilitate access to nearby waterbodies and forests suitable for big and small game hunting. These trails that provide access to fishing, hunting and trapping may be temporarily inaccessible for safety reasons. The PA will see the development of new and upgraded road networks across the WPA that may intersect with and require temporary closure of roads and trails used by hikers, ATVs, snowmobiles, and other recreationalists while work is underway. Only those resource roads that follow main infrastructure (230 kv transmission line, substations) will be maintained during operations.

Additionally, the portion of the snowmobile trails within the IPA will be lost with development of the Industrial Facility. EVREC has mapped the existing trail(s) within the PA and will be working with Trailnet on adjustments. The loss of the Exploits Valley and Beothuk Trail along the port of Botwood will also be lost for development of the heavy haul road and ammonia pipeline.

Outfitting

Project activities during site preparation and construction may affect the land and resource use of the outfitting industry through potential disruption to resource harvesting success from reduced resource accessibility. Specifically, trails, waterbodies, and forested habitats previously vital to the local outfitting industry may be altered or limited by construction and operational activities. Site preparation and construction may also result in changes to wildlife behaviors and abundance of targeted species, which can reduce the quality of outfitting experiences within the area. With the WPA overlapping the 15-Twin Lake moose and black bear hunting and trapping management area, it is expected that Project activities will affect the presence of these species, which will also lead to impacts to the operation of the outfitting industry.

The two outfitters in the PA operate out of the BWPA (Hideaway Lodge) and TLWPA (A1 Hunts). There is less existing disturbance in TLWPA and therefore, an increase in access roads and other infrastructure will affect A1 Hunts to a larger extent. An overview of the outfitter buffer area in the PF is provided in Table 9.5.5.

Table 9.5.5: Overview of Overlap between Project Footprint and Outfitter Buffer Areas

Outfitter	Area (ha) of Outfitter Buffer Impacted by Footprint	Percentage of Outfitter Buffer Impacted by Footprint
Hideaway Lodge	129	<1%
A1 Hunts	397	2%

Changes in economic activities, such as potential loss in revenue from reduced quality of providing services and potential relocation of services, are also considered as indirect effects from potential loss of land and resource uses to the outfitting industry. Sensory disturbances generated by the Project, such as noise, dust and visual, may contribute to the displacement of targeted species within the PA and reduce the appeal of outfitting experiencing in the area. There are no outfitters in the IPA or SPA.

Increased noise is expected short term during construction and intermittently, so the whole WPA will not be impacted at once. Operational noise from turbines and the IPA are not expected to have impacts on fauna (Section 6.10).

Increased road density may also affect the outfitting industry by expanding accessibility to previously isolated areas. Outfitters may see increased competition with recreational hunters and users who also benefit from increased accessibility. This may impact the enjoyment of guests, presence and size of target species, and generate further sensory disturbance beyond that of the Project related activities.

EVREC is working with the outfitters in the PA to understand and outline the impacts to the outfitters during construction and operation so they can retain their business opportunities.

Provincial Tourism

A variety of research has attempted to understand the connection between wind energy development and tourism outcomes, both in terms of tourism demand and tourist experience. Most research finds that the effect of wind turbines on both demand and experience is neutral to slightly negative. Work in Portugal found a generally net neutral outcome of onshore wind farms, in which some tourists and residents expressed slightly negative to positive outlooks (de Sousa & Kastenholz, 2015). The researchers examined the potential for wind projects to become areas of tourism interest, which they concluded requires more investigation though may be practical. Alternatively, tourists in Iceland expressed negative views towards turbines from one project in particular (Sæþórsdóttir & Ólafsdóttir, 2020). The authors of this study found that further development in the region would put 'nature-based tourism' and wind energy in competition for land use, highlighting that the conflict between tourism and wind development is dependent on the prevailing type of tourism practiced in an area. In Germany, researchers found a negative relationship between turbines and tourism demand and highlighted a strong difference between the effect of onshore inland and onshore, coastal turbines (Broekel & Alfken, 2015). These authors, however, point to the need for greater study to determine if these relationships hold when examined at a greater scale. Finally, research in the Czech Republic finds a generally neutral attitude towards wind turbines among regional visitors (Frantál & Kunc, 2011). The authors noted that interestingly, tourists had higher acceptance of turbines than residents.

From this literature scan, the potential effects of the Project on tourism demand and experience need to be understood in the context of the Project's features and the tourism demand in the

area. Despite the presence of trails within the PA, it is unlikely that these trails contributed to the overall tourism and recreational enjoyment of the LSA outside of local and outfitting usages. It is more likely that the region's tourists will seek structured recreational activities in more populated areas within the RSA, such as the town of Botwood, Bishop Falls, and Grand Falls-Windsor, and will only venture to areas within the PA through established recreation providers (i.e., outfitter). Associated businesses and infrastructures, such as hotels and cabin accommodations, restaurants, and tourist attractions are also located near these populated areas and along the Botwood Highway, which are outside of the WPA.

Increased jobs for the Project and goods/services requirements are expected to increase visitors to the town of Botwood. The view of the IPA and SPA may not be visible from the town, excepting the heavy haul road, which will be limited to the Port of Botwood infrastructure. Increased employment and demand for local services associated with the construction, and particularly, operation of the Industrial Facility may bring increased awareness to central NL and help boost tourism within the communities located in the LSA. Further discussion of impacts to the business and community infrastructure is located in Sections 11 and 12.

Cabins

People living and working in the vicinity of wind projects express a wide range of perspectives on the visual aesthetic and social acceptability of large turbines (Kirchhoff et al., 2022a). While regulations in Newfoundland do not require aesthetic impact assessments, assumptions on the potential effects of changing visual landscape can be inferred from literature views of studies on the visual impacts of wind projects.

A study in 2022 found that when presented with four images of different landscapes seen from a distance, of which one image included wind turbines within the landscape, respondents ranked the landscape without mast-like structures as most positive, followed secondly by the image with the wind turbines (Kirchhoff et al., 2022b). It was noted that both proponents and opponents to wind energy developments ranked the image with the wind turbine as landscape least impaired when compared to images with other mast-like structures, despite some negative associations brought forth by the opponents to wind developments. The authors linked the potential positive outlook on wind turbines being the possible reason behind the higher ranking compared to the remaining two images, suggesting that wind turbines are often associated with environmental problem solving and bear a higher positive association. While the study was conducted in Germany, the results are highly transferable across Western cultures due to visual perceptions of landscapes being interspersed with symbolic, political, ecological, and moral perceptions (Kirchhoff et al., 2022b).

A study conducted in western United States attempted to determine the minimum threshold of when wind development start to impair the visual landscape, with 377 observations of five wind turbine operations in Wyoming and Colorado made under various lighting and weather conditions (Sullivan et al., 2018). The study found that at the visibility limit where wind turbine development became the major focus of an unobstructed landscape, the conservative viewing distance was at 16 km. Considering that the facilities in this area were mostly situated in flat,

unobstructed terrains, the threshold distance for facilities with differing topography, vegetation or structural screening may be smaller.

People within the town of Botwood may experience temporary disruption during construction along the heavy haul road by the Port of Botwood, but the town has historically experienced large commercial industries, similar to the proposed Industrial Facility, using this area for pulp and paper and oil/gas shipping. The replacement of the Exploits Valley and Beothuk recreational trail with the heavy haul road will provide a temporary disruption in view during construction and will remain under the control and management of the Exploits Valley Port Corporation.

Land Value

Potential effects on property value are often a concern of neighboring residents due largely to anecdotal reports from appraisers of drastic declines in property values following the nearby installation of a wind energy facility (Gulden, 2011). Despite these concerns, many rigorous and statistically defensible studies have concluded that wind energy developments have had no significant direct or indirect effect on surrounding property values.

Prior to 2013, the most comprehensive study on the impact of wind farms on property values was completed by Hoen et al. (2009). This research analyzed data on nearly 7,500 sales of single-family homes situated within 16 km of 24 existing wind farms in the United States. Eight different hedonic pricing models failed to generate statistically significant evidence that property values for houses located within 16 km of wind farms are influenced by the developments. Subsequent research by the same researchers but employing additional analyses confirmed these results (Hoen et al., 2010).

A study by Hinman (2010) tracked property transactions in communities located close to a 240-turbine wind farm for an eight-year period that spanned pre-development and operation stages. Hinman found that before project approval, property values in the area decreased. This was attributed to a fear of the unknown effects that development would have, an effect known as anticipation stigma. However, once the development became operational, property values recovered. This recovery was attributed to a greater understanding of the operational effects of the development. Anticipation stigma, however, was not detected in a similar study in Colorado (Laposa & Mueller, 2010), in which it was concluded that the announcement of a large wind energy development did not significantly reduce the selling prices of homes surrounding the proposed development.

The primary limitation of previous research on the effects of wind energy facilities on surrounding home values has long been the relatively small sample sizes (data sets) of relevant home-sale data. The inability to account for the complexity of the various factors that affect property values has also been cited as a limitation of previous studies. Data had been limited for homes located within approximately 800 m of turbines, where impacts would be expected to be the largest but includes Hinman (2010) (sample size of 11) and Carter (2011) (sample size of 41). This is in part because setback requirements generally result in wind

facilities being sited in areas with relatively few dwellings, limiting the number of sales transactions available to be analyzed (Hoen et al., 2013). Although these smaller data sets are adequate to examine large impacts (e.g., over 10%), they are less likely to reveal small effects with any reasonable degree of statistical significance.

A study published in August 2013 by Berkeley National Laboratory was conducted to address these gaps in data and included the largest home-sale dataset to date (Hoen et al., 2013). Researchers collected data from 51,276 home sales spanning 27 counties in nine states, related to 67 different wind facilities. These homes were within 16 km of 67 different wind facilities, and 1,198 of the sales analyzed were within 1.6 km of a turbine, giving a much larger dataset than previous studies had collected. The data span the periods well before announcement of the wind facilities to well after their construction (Hoen et al., 2013).

Two types of models were employed during the Hoen et al. (2013) study to estimate property-value impacts: (1) an ordinary least squares model, which is standard for this type of study, and (2) a spatial-process model, which accounts for spatial variability. These models allowed the researchers to control for home values before the announcement of a wind facility (as well as the post-announcement, pre-construction period), the spatial dependence of unobserved factors affecting home values, and value changes over time. A series of robust models was also employed to add an additional level of confidence to the study results (Hoen et al., 2013).

Regardless of model specification, the results of Hoen et al.'s (2013) study revealed no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods. Therefore, the authors concluded that if effects do exist, the average impacts are relatively small (within the margin of error in the models) and/or sporadic (Hoen et al., 2013).

A study analyzing more than 7,000 home and farm sales from 2002 to 2010 in the Melancthon Township and 10 surrounding counties found that Ontario's first and largest wind farm (133 turbines) had "no statistically significant effect" on property values. Further, the study found a lack of significant effect is similar across both rural residential properties and agricultural properties (Vyn & McCullough, 2014).

A more recent review based on housing and property values within specific radii of wind farms and other energy infrastructure by Brinkley and Leach (2019) found that while most energy infrastructure has an impact on nearby land values, renewable energy projects (including wind farms) do not have statistically significant impacts. These findings are based on seven individual studies of varying scales that all consider the value of property relative to the proximity to wind power, whether a single turbine or more (Brinkley & Leach, 2019).

In 2019, researchers at the University of California, Davis conducted an analysis of property values research in the energy sector. Their analysis found that studies on wind turbines and property values overwhelmingly find that wind turbines do not negatively impact property values at any point during their installment (ACPA, 2023). Similarly, a study of onshore wind

energy projects in New England found that negative effects on property value were concentrated within 1 km of the project, were not significant beyond this threshold, and dissipated with time (Dong et al., 2023).

Research has consistently demonstrated that, in a variety of spatial settings and across a wide temporal scale, sale prices for homes near wind energy facilities are not significantly different from those attained for homes sited away from wind energy facilities.

While some studies found potential impacts from Industrial Facility proximity to residential areas, these impacts are often constrained by the spatial extent of a facility's presumed impact and the facility's size (de Vor & de Groot, 2009; Farber, 1998; Wang & Levinson, 2023). One study explored the factors affecting home values within proximity to industrial areas, including location, property characteristics, economy, and variable climate and environmental contamination (Razali et al., 2020). The study found that location was the primary factor affecting home value, with indicators such as zoning, topography, and environmental and governmental policies influencing whether effects were positive or negative. The study also found that physical characteristics of the industrial area, including the size and property design, affecting values of home. This is corroborated by findings of another study on industrial facilities across the United States, which found that industrial facilities producing toxic emissions saw higher decline in housing values within 0.5 miles (0.80 km) (Currie et al., 2015). One study, using a hedonic analysis on determinants of home values, found that industrial sites near urban areas can positively appreciate home values when accessibility and other functions supporting the Industrial Facility is available on site (i.e., public services, roadways, housing, open space) (Beekmans et al., 2014). Overall, these studies demonstrate that property values can fluctuate depending on implications of the Industrial Facility and various external factors may influence the values outside of the presence of the Industrial Facility.

The IPA has been carefully designed to align with existing land uses and minimize potential impacts on nearby properties. The Project has focused on locations appropriately zoned and set back from residential areas where possible. The closest residence to the Industrial Facility is IRID37, a house along Pumphouse Road which is 962 m from the Industrial Facility boundary. There is also a cluster of residences in the town of Botwood (IRID51), with the closest resident located 12 m from the heavy haul road (Section 3).

Modern design standards, environmental safeguards, compliance with environmental constraints, and mitigation measures – such as noise and visual buffers – will help ensure the facility operates safely and unobtrusively, as well as minimize impacts on nearby property values. Considering the presence of proposed mitigations for noise, emissions, dust, groundwater wells, and other factors that will be implemented during Project's phases, it is expected that the Project is unlikely to significantly influence residential housing values.

Due to the lack of empirical evidence regarding the impact of solar facilities on property value, the extent of the SPA's impact on adjacent land use and housing values remains inconclusive. One study looking at empirical research on solar project impacts on land value found that

results were mixed between positive, negative and no statistical effect, with the public perception of large-scale solar farms playing a role in influencing outlook on potential impact to land value (Cate, 2025). One study in Massachusetts found that property values depreciate 1.5 to 3.6% after the construction of a solar array, contributing the depreciation to the reduced enjoyment of the natural and rural landscape (Gaur & Lang, 2023). In contrast, a study looking at multiple solar sites across the United States found that large-scaled solar farms increased agricultural or vacant land values while simultaneously reducing residential property values at a lower rate (Hu et al., 2025). These studies point to the negative stigmas of solar farms as being the main contributor to the impacted land values rather than the actual operation or effects generated by the studied solar farm.

The SPA has been carefully selected to align with existing land uses and minimize potential impacts on nearby properties. The Project has focused on locations appropriately zoned and set back from residential areas where possible. No mitigations are currently proposed for the construction or operation of the SPA. Modelling predicted noise levels not to exceed Health Canada Guidelines (2023) and therefore no residual effects are evaluated (Section 8.4). Therefore, it is expected that the SPA is unlikely to significantly influence residential housing values.

9.6 Mitigations

The Project will be micro-sited to avoid and reduce impacts to key land and resource use wherever appropriate, including landmarks and designated lands protected under regulatory provisions. When avoidance of impacts to land and resource use is not possible, mitigation measures must be employed to further reduce impacts to land and resource use. The following mitigation measures will be included in the design of the Project during all phase

9.6.1 Land Use and Planning

- Obtained all required zoning permit within the Botwood MPA prior to development
- Avoid PPWSAs where possible and, if required, apply for a permit to develop in a PPWSAs. All Project activities will be conducted outside of the required buffer of the PPWSA intake source.
- Conservative setbacks from public infrastructure, transmission lines, roads, and residences will be incorporated into the Project design.
- Minimize transportation-related traffic in school zones and on school bus routes during school hours and bus pick-up and drop-off times.

9.6.2 Industrial and Commercial Resources

- Obtain all required quarry and forestry permits prior to any development.
- Ensure continued access to road networks for users leading to active quarries and forestry activities within the WPA.

9.6.3 Tourism and Recreation

Recreational Harvesting

- Conduct creel surveys to document fishing effort before construction.
- Use noise controls (e.g., mufflers) on machinery and equipment to limit disturbance.
- Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.
- During the detailed design phase, the location of WTGs and other infrastructure will be microsituated to avoid unnecessary impacts to wetlands, including locating crossings of large wetlands along edge or narrow portions of the wetland where possible.
- Restore cleared areas where possible to reduce permanent habitat loss, primarily through revegetation of road ROWs and other areas cleared temporarily for construction.

ATV and Snowmobile Use

- Using existing roads, trails, and cutlines whenever possible.
- Allow continued access throughout the PA, except fenced areas in the IPA, SPA, and substations in the WPA.
- Install signage illustrating and warning of potential hazards associated with ice throw and shedding around wind turbines, including on any recreational or logging trails, receptors, or roads within the danger zone of ice throw or shedding.

Outfitters

- Inform all Project-related staff working on the site of dangers to wildlife and create awareness around wildlife hotspots on the site.
- Install signage where specific wildlife concerns have been identified.
- Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.
- Store hazardous and non-hazardous waste in designated areas, in appropriate containers to reduce potential for spills and to avoid attracting wildlife.
- Complete visual surveys for wildlife (moose and caribou) prior to blasting.
- Project personnel will always yield right of way to wildlife.
- Fencing will be installed to exclude wildlife from higher risk areas such as substations, quarries and camp sites.

Tourism and Recreation

- Schedule transport of oversize loads outside of peak traffic hours.
- Apply limitations to areas posed as safety risks to the public, which includes fencing the substations.

- Incorporate a lighting plan for construction-related activities into the EPP.
- Hire locally/regionally as much as possible based on availability of labour with appropriate training and skills.
- Procure goods and services provincially as much as possible to the extent that they are available.

Cabins

- Ensure turbine locations have been sited outside of major populated areas and relocate turbines with high visual impact as appropriate.
- Avoid or reduce activities that have high ignition potential during periods of high drought conditions.
- Ensure job sites are equipped with fire extinguishers and other fire reduction equipment. Crews should be informed of the available equipment to use and are trained on appropriate drills in case of an emergency.
- Updated shadow flicker modelling will be done once detailed engineering is completed, with further on-site investigations performed if exceedances are noted through analysis or the complaint response protocol.
- The Project will develop a “good neighbour program” to register and respond to concerns, which will consider complaints and outline a process to investigate complaints.

9.7 Monitoring and Follow-Up

Monitoring will be implemented through various plans, located in Appendix Q:

- Project Public Participation Plan has been developed (Appendix Q.3). This plan will be used to gauge public feedback and promote project updates, as well as respond to potential areas of concern (ex. Traffic, safety, trail access, wildlife incidents, impacts to recreational users).
- Traffic Management Plan will be developed to showcase the management of vehicular traffic during transportation of oversized and overweight loads, including municipal requirements for transportation of these loads through municipal roadways and infrastructures (Recommendations from the Traffic Study in Appendix P.1 will form the basis of the Traffic Management Plan).
- Mineral Resource Industry and Quarry Resource Consultation Plans have been developed Appendix Q.5 and Q.6).
- Domestic and Commercial Wood Cutting Consultation Plan (Appendix Q.4) will be developed in accordance with continued communication with commercial operators in the Project Area.
- An Outfitter Environmental Effects Monitoring Plan (Appendix Q.8) has been drafted to monitor the effects of the Project on the outfitting industry in the area, including specific mitigative and adaptive measures that address potential concerns raised by the outfitters in the area.
- Plans that have been discussed in previous chapters, including the Groundwater and

Surface Water Monitoring Management Plan (Appendix Q.10) and Erosion and Sediment Control Plan (Q.9).

All monitoring plans are considered living documents and will continue to evolve and be updated throughout the life of the Project. The Project will ensure that project site safety is maintained throughout all Project phases. Continued engagement with local communities, outfitters, industry members, recreational users and Indigenous people will occur throughout the life of the Project.

Appropriate follow-up efforts will also be made to communicate with neighboring landowners, which may include a community liaison committee and public engagement forums. A Complaint Response Plan will also be available to allow direct communication from the public.

9.8 Conclusion

After mitigations, residual effects on land and resource use are characterized as follows:

Table 9.8.1: Land & Resource Use Residual Effects

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Changes to land accessibility	Obtained all required permits prior to development. Construct on existing infrastructures where possible. Provide continued access to active operations where possible.	A/P	M	LSA	LT	I	PR	Not Significant
Changes to resource availability	Engage with relevant stakeholders on the continued use and enjoyment of resources. Engage with relevant stakeholders on continued access. Minimize footprint to the extent possible.	A/P	M	LSA	LT	I	PR	Not Significant
Impacts to outfitting, recreational and cultural use	Engage with communities, recreational users, Indigenous, and relevant outfitters on the continued use and enjoyment of resources. Engage with relevant stakeholders on continued access.	A/P	M	LSA/RSA	LT	I	PR	Not Significant

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Impacts to the visual landscape	Engage with relevant stakeholders. Follow management plans (traffic, water, erosion control). Ensure zoning per approved development regulations. Consider ceasing operations during dry and windy conditions, where possible.	A	L	LSA	LT	C	PR	Not Significant
Changes to land value	Engage with relevant stakeholders.	A	N	LSA	LT	I	R	Not Significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

10.0 HERITAGE & CULTURAL RESOURCES

10.1 Overview

Heritage & Cultural Resources are valued by Indigenous people and the public and is included as a VC because they can provide information about past people, society, culture and interactions with other groups. This assessment includes the necessary information to assess potential impacts to Heritage & Cultural Resources resulting from the Project within the whole PA. This was accomplished using the following approach:

- Desktop Review of cultural resources within the PA, including a review of the Provincial Archaeology Office (PAO) database and literature review of publications.
- Identify model criteria to guide future desktop- and field-based Heritage Resource Impact Assessments (HRIAs). This guide initially identified potential for high, medium, and low resources within the PA until further field investigation could occur.
- Complete the field verification and assessments of some areas (HRIA) to be directly impacted within the PA (ex. Industrial and Solar Facility), as well as a sample of areas anticipated to be directly impacted within the WPA as part of an overview assessment.
- Use the information to inform mitigation and monitoring programs.

10.2 Regulatory Context

The Arts and Heritage Division of the NL Department of Tourism, Culture, Arts, and Recreation (NL TCAR) is responsible for supporting the preservation and management of arts and heritage across the province, including the operation of the PAO. The division is guided by the *Historic Resources Act* (Historic Resources Act, 1990) with a mandate to protect historical and paleontological resources. The PAO reviews the need for historic resource assessments through the review of land use referrals submitted by government agencies and the private sector, including the Environmental Assessment Division.

The *Historic Resources Act* defines the following:

“archaeological object means an object showing evidence of manufacture, alteration or use by humans that is found in or on land within the province and is of value for the information that it may give on prehistoric or historic human activity in the province and includes human remains.”

“historic resource means a work of nature or of humans that is primarily of value for its archaeological, prehistoric, historic, cultural, natural, scientific or aesthetic interest, including an archaeological, prehistoric, historic or natural site, structure or object.”

“palaeontological resource means a construct, structure or work of nature consisting of or being evidence of prehistoric multicellular organisms and palaeontological resources that are designated by regulation.”

Using the definitions above, archaeological, historic, and palaeontological resources were

identified and described throughout the PA to support the assessment of effects of those regulated resources which may require further provincial approvals. Generally, the PAO recommends avoidance of historic resources where possible and recommends further mitigation for registered archaeological resources.

10.3 Desktop Assessment Methodology

A desktop study was conducted to identify all potential heritage and cultural resources that may fall within the PA. Potential resources were identified using the following sources:

- PAO Archaeological Sites Database
- Literature and publication review of potential resources near Botwood, Leading Tickles, North and South Twin Lakes, and the western border of the Exploits River watershed (Drawing 3.1-5, Appendix A)
- Provincial Land Cover (NLFAL, 2025h)
- Federal CanVec watercourse and waterbody shapefiles (NRCan, 2023)
- Provincial digital elevation model (NRCan, 2024a)
- Newfoundland and Labrador Land Use Atlas (Newfoundland and Labrador, 2025d)

An archaeological potential model was developed to determine the potential of heritage and paleontological resources in proposed development areas and highlight locations of high potential heritage resources. The model used LiDAR mapping to help identify areas of high potential for archaeological resources due to its ability to see through vegetation and identify cultural features on the landscape, such as mounds or other linear features. Four criteria were used for ranking areas of high potential within the PA:

- Evidence of existing archaeological sites from the PAO database and literature review,
- Access to navigable waterways for transportation routes,
- Sympathetic topography (e.g., level, dry ground) for building wigwams and structures, and
- Potential cultural features identified during LiDAR surveys (e.g., mounds)

Those areas identified as being near waterways, having low slopes, and proximity to coastal inlets with freshwater inflow were ranked as having highest potential. The model will be continually refined through field surveys and as additional data becomes available.

The desktop literature review included PA components within the Exploits River watershed: BPWA, TLWPA, LTWPA, IPA, SPA. However, the model was developed prior to inclusion of SLWPA in the Project.

10.4 Desktop Assessment Results

The PAO Archaeological Sites Database listed over 200 archaeological sites within the watershed and surrounding Exploits Bay region, mostly along the coastline near Leading Tickles, and there were no paleontological resources recorded in the PA. Therefore, no further

assessment of paleontological resources was required. The area of Notre Dame Bay and the Exploits Valley have evidence of pre-contact Indigenous habitation dating back roughly 5,000 years, including the Maritime Archaic, Groswater and Dorset Pre-Inuit, Beothuk, and Cow Head Complex/Middle Woodland people. Mi'kmaq sites are known from about 300 years ago onward. Literature review identified historic use by the Beothuk and potential for archaeological resources around the north end of South Twin Lake. However, previous archaeological fieldwork was unsuccessful in locating the potential Beothuk camp in this location (McLean, 2024). European explorers, settlers, fishers and trappers began moving into the Exploits River Basin in the early eighteenth century, with late 19th/early 20th century logging camps and other infrastructure possible throughout the PA. The desktop review also identified two known archaeological resources within or within 50m of LTWPA.

Through predictive modelling, potential resource areas were identified with high/medium/low potential based on the criteria above (Drawings 10.4-1A-D, Appendix A). LiDAR data also identified anomalies that resembled historical archaeological features at Butler Cove, along the northern coast of the LTWPA. Generally, the SPA and IPA showed low potential. A Heritage Resource Impact Assessment (HRIA) was required to further investigate a sample of high potential areas in the PA. Also, given the inflexibility of proposed infrastructure, the IPA and SPA were chosen to be prioritized within the HRIA to support the EIS.

10.5 Field Assessment Methods

A HRIA for the IPA and SPA, and an overview assessment for the WPA were completed via HRIA Permit #25.06 throughout the SPA and the IPA, as well as a selection of high potential areas near LTWPA, northern South Twin Lakes (TLWPA), and southern BWPA (Drawings 10.5-1A-F Appendix A). In May 2025, a two-person crew (professional archaeologists) completed walking pedestrian transects and judgmental shovel test pitting over twenty (20) days. Proposed project footprints that overlapped with predictive model results were driven or walked and assessed for archaeological potential based on slope, drainage, proximity to water and other resources. Test pits were placed in areas of medium-high potential areas and excavated to sterile subsoil or bedrock, screened through 6 mm mesh, and backfilled to restore the area back to natural conditions. Test pits were recorded with GPS and identified as positive (resource found) or negative (no resources identified).

10.6 Field Assessment Results

Tables 10.6.1 summarizes the results within the WPA, SPA and IPA. The final report was provided to the PAO.

Table 10.6.1 Summary of Results within the WPA

Survey Area	Survey	Summary
HRIA		
Botwood	5 test pits	No historic resources were identified. Four ethnographic sites were recorded (sled parts, traps)
Twin Lakes	6 test pits	No historic resources were identified. One ethnographic site was recorded (old school bus).
Leading Tickles	5 test pits	• Previous archaeological site (DiAu-08), located 50 m outside LTWPA, could not be assessed due to "Keep Out" sign and blocked chain entry. • Previous archaeological site (DiAv-10), located along the proposed route for access road and transmission line from SLWPA to LTWPA, is a 20th century Mi'kmaq site reported in 2024, but archaeologists were unable to find it during this survey. • New archaeological site (DiAu-10) is an early 20th century Roman Catholic cemetery that was located within the LTWPA (150 m of a proposed access road to multiple turbines). The extent of the boundary of this site is unknown.
Seabrights Lake	0 test pits	No historic resources were visually identified. One ethnographic site was recorded (cabin).

The BWPA has heavy recreational use and logging resource roads, with no archaeological sites encountered during traverse throughout the site. Archaeological staff conducted three (3) test pits in the south end of BWPA near ethnographic evidence by a scheduled salmon river. No archaeological resources were identified.

The majority of proposed road upgrades and new construction roads surveyed in the Twin Lakes WPA were within existing resource roads. Six (6) test pits were conducted within the high potential area identified in the northeastern end of the TLWPA but no archaeological resources were identified.

Although the SLWPA was not assessed in the resource model, portions of the resource and proposed road upgrades/new construction were assessed during this HRIA with no archaeological sites encountered. Steep slopes and heavily disturbed logging areas are present throughout the site. Most of the existing roads are former logging roads in various states of regrowth.

Potential road construction (new access and existing road upgrades) was walked within the LTWPA, as well as further attempt to locate the two existing registered archaeological sites and one potential new archaeological site (high potential areas). Most of the road access appeared to be existing logging resource roads with low potential and no further work

recommended. There were five (5) test pits within the potential new archaeological site, three of which indicated positive findings of an archaeological resource.

The entire WPA was not field verified during May 2025 HRIA. Only those areas that have been visually assessed in the field and/or test pitted, should be considered assessed. The assessment is only valid for the footprint provided at the time of the 2025 HRIA. Due to the size of the footprint of the WPA, it is recommended that further desktop and field HRIA be completed once the footprint is further defined. Also, the ammonia pipeline was not considered in the 2025 HRIA as the routing and construction details were not available at the time of assessment.

The entire SPA footprint was surveyed for historic and cultural resources, and none were identified (Table 10.6.2). Four ethnographic sites were identified within the SPA but no further assessment is recommended.

Table 10.6.2 Summary of Results within the SPA

Survey	Summary
HRIA	
16 test pits	No historic resources identified. Four ethnographic sites recorded (hunting platform, 3 collapsed cabins).

The entire Industrial Facility plant site (and portion of heavy haul road to the port entrance) were surveyed for heritage and cultural resources, excepting the ammonia pipeline route (Table 10.6.3). No historic resources were identified.

Table 10.6.3 Summary of Results within the IPA

Survey Area	Survey	Summary
HRIA		
Industrial Facility Site	18 test pits	No historic resources identified. One ethnographic site (potential cabin in progress).
Heavy Haul Road to the Port Entrance	0 test pits	No historic resources were visually identified.
Ammonia Pipeline	0 test pits	Unassessed.

10.7 Effects Assessment

Activities that primarily involve earth moving and road construction have the potential to impact heritage and cultural resources (Table 10.7.1). These potential impacts could include accidental removal or destruction of historic resources. The primary focus of this assessment will be on the interactions and effects of the construction of the WPAs and associated infrastructure as the SPA and IPA have been surveyed with no further assessment required (no historic resources identified), provided the footprint does not extend beyond the boundary surveyed in this HRIA.

Table 10.7.1: Potential Project-Heritage & Cultural Resources Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	-
Geotechnical Investigations	X
Implementation of Erosion and Sediment Control measures	x
Tree Clearing and Grubbing	X
Excavating grading and compacting soils for construction	X
Construction of temporary works – Quarries, Batch Plants, Accommodations	X
Access road upgrades and construction	X
Laydown yard and Turbine Pad construction, including foundation excavation, construction and blasting where necessary	X
Transportation of Turbine Components	-
Turbine Assembly	-
Collection System and Substation Construction	X
Transmission System Installation and Commissioning	-
Removal of Temporary Works & Site Restoration	-
Operations and Maintenance (30 years)	
Operations and Maintenance	-
Vegetation Management	-
Environmental Monitoring	-
Decommissioning and Rehabilitation (3 years)	
Infrastructure Removal	-
Site Reclamation	-

10.7.1 Assessment Boundaries

10.7.1.1 *Administrative Boundary*

Administrative boundaries for heritage and cultural resources in the PA include the *Historic Resources Act*.

10.7.1.2 *Technical Boundary*

The technical boundary of the PA is limited to the availability of available data for review, including LiDAR and imagery. The SLWPA and the route to LTWPA are excluded from the model criteria review as the model was developed prior to the inclusion in the Project, as well as lack of availability of LiDAR data for those areas at the time. A desktop review of old forestry and logging records were not included in the PA boundary.

10.7.1.3 *Spatial Boundary*

The LSA for heritage and cultural resources is limited to the proposed footprint within the PA. The RSA is not applicable.

10.7.1.4 Temporal Boundary

The temporal boundaries for the heritage and cultural resources assessment include the site preparation and construction (3 years) phase of the Project, as well as the operations and decommissioning phases (33, 3 years respectively). Although the primary potential for impact will be during the construction phase.

10.7.1.5 Assessment Criteria

Assessment criteria provided in Section 5 also apply to heritage and cultural resources. The VC-specific definition for magnitude is as follows:

- Negligible: Activities have no planned or potential impacts on heritage and cultural resources.
- Low: Activities have a low potential for encountering heritage and cultural resources, or impacted resources have low potential rating according to qualified archaeologists.
- Moderate: Activities have a moderate to high potential for encountering heritage and cultural resources during ground disturbance but risk of harm to identified and potential resources can be mitigated through appropriate actions and procedures.
- High: Activities have a high potential for accidentally encountering and impacting heritage and cultural resources during ground disturbance, and there is an unavoidable and high potential for accidental and irrevocable loss of heritage and cultural resources.

The approach to determine the significance of effects from the Project on VCs is described in Section 5 and has been reviewed with the PAO prior to submission of this EIS.

10.7.1.6 Effects

There is potential for direct effects on heritage and cultural resources across the PA, through ground disturbance during construction. The IPA and SPA were fully assessed in the field with no historic or archaeological resources identified. Provided the footprint doesn't extend beyond the surveyed area, these PAs (excepting the ammonia pipeline) are excluded from further consideration and can be mitigated through adherence to the Mitigation Plan and Accidental Finds Protocol (Appendix N.1) if any historic resources are encountered.

There are three known archaeological sites within or near the PA. Two sites are located within the LTWPA and one site within 50 m of the LTWPA. Only one site was verified in the field and is currently located within 150 m of a proposed access road for multiple turbines. It is recommended that this area be avoided until the site is further assessed by a qualified archaeologist. If the Project infrastructure cannot be re-routed to avoid this area then it is recommended that a qualified archaeologist conduct a more detailed HRIA prior to construction, to further delineate the archaeological site, to assign an adequate buffer.

High potential areas identified during the desktop model were shown to most likely occur near waterbodies. As EVREC is maintaining a regulatory setback of 30 m from known watercourses, avoidance of many high potential areas is already achieved, except at river crossings. Despite

the lack of archaeological sites found to date, the likelihood of discovery of archaeological resources is still possible within the WPA. Further desktop review (with follow up HRIA) is required for the WPAs once the final turbine, road and other infrastructure footprint is finalized. As an additional measure, EVREC will adhere to the Accidental Finds Protocol that describes the measures to follow if any suspected historical resources are encountered during any phase of the Project.

10.8 Mitigation

Avoidance of direct impact to heritage and cultural resources is the highest priority in the mitigation sequence. Throughout the iterative process of developing the Project, avoidance of direct effects to water was attained through several key design considerations to reduce potential impacts to water, and therefore, some high potential areas for heritage and cultural resources.

Mitigation measures will be employed to further reduce potential effects to heritage and cultural resources. The following mitigation measures will be included in the design of the Project:

- Avoid the two registered identified archaeological sites by 50 m.
- Avoid the new registered archaeological sites through re-routing of infrastructure or buffer avoidance to be determined in consultation with PAO and a qualified archaeologist.
- Maintain avoidance of modelled high potential areas where possible.
- HRIA will be required for those high potential areas within the WPAs once footprint is finalized.
- Follow the Mitigation Plan and Accidental Finds Protocol in Appendix N.1.

10.9 Monitoring

A qualified archaeologist will apply for a HRIA permit and conduct monitoring and/or testing if disturbance of heritage and cultural resources are encountered during the construction phase. Examples include stone/metal tools, ceramics and pottery, clay pipes, old root cellars, stone walls and lines/circles of stone. The mitigation plan and Accidental Finds Procedure (Appendix N.1) shall be followed for the Project, throughout the construction period.

10.10 Conclusion

After mitigations, residual effects on heritage and cultural resources associated with the Project have been assessed, including the potential to find and accidentally impact those resources. Based on the assessment and through the implementation of proposed mitigation and monitoring strategies, residual effects on heritage and cultural resources are characterized as follows in Table 10.10.1:

Table 10.10.1: Heritage & Cultural Resources Residual Effects

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Accidental Loss Direct impact to heritage and cultural resources	Avoidance where possible, and adhere to Mitigation Plan and Accidental Finds Protocol, further desktop and field review of footprint within the WPA once finalized.	A	M	PA	ST	O	IR	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

11.0 ECONOMY, EMPLOYMENT, & BUSINESS

Economic conditions may be affected by development, Construction, Operations and Maintenance, and Decommissioning and Rehabilitation of the Project. Economic effects (e.g., labour income and contributions to GDP and government revenues) are of interest to the public, stakeholders, Indigenous groups, regulators and governments. Economic, employment and business conditions are foundational to the livelihoods of residents and associated benefits provide security and enhance quality of life.

The NLECCC (2025) EIS guidelines for the Project directs the proponent to provide information on the economy, existing industries, major employers, employment and availability of labour, employment equity and diversity, and existing businesses. These aspects are captured in the economy, employment and business VC.

The assessment of effects on the economy, employment and business VC is linked to the assessment of effects on communities due to potential changes in community wellbeing resulting from enhanced employment opportunities and income. The Project is expected to make a strong contribution to the local, regional and provincial economies resulting from taxation and royalties as well as employment and business activity throughout all Project phases.

11.1 Methods

For the assessment of Project-related effects, the report “Exploits Valley Green Hydrogen Project: An Economic Impact Assessment” was prepared by Jupia Consultants based on Statistics Canada’s Input-Output tables, which provide a detailed profile of how expenditures in specific sectors flow through the provincial and national economy as well as through international trade (Appendix O.1). This assessment used the PA as defined by the components in Project Introduction, the Local Study Area (LSA) as Statistics Canada Census Districts 6 and 8, and the Regional Study Area (RSA) as the province of NL (Drawing 11.1-1, Appendix A). The Economic Impact Assessment estimated the financial contribution of the Project to the NL (RSA) and national economies. The study determined direct, indirect and induced GDP, income, jobs, taxes, household spending, and other impacts for Project construction, operations and maintenance. The full report is included in Appendix O.1

11.1.1 Key Indicators and Measurable Parameters

Key indicators and measurable parameters of the Economy, Employment and Business VC are identified in Table 11.1.1 The effects of the Project on this VC are mainly positive though the benefits of major industrial projects are generally not distributed evenly across jurisdictions and throughout the population.

Table 11.1.1: Measurable Parameters for Economy, Employment and Business

Key Indicator	Scope	Measurable Parameters
Economy	The Project has the potential to affect economic, employment and business conditions at the local and regional scales, and beyond	Gross Domestic Product (GDP) Government revenue
Employment		Project-generated employment Project-generated training Opportunities for under-represented groups
Business		Opportunities for local/regional businesses Opportunities for under-represented groups Effects on other businesses

11.1.2 Issues and Opportunities

Table 11.1.2 identifies issues and opportunities by key indicator, which will be discussed in the following sections. Generally, Project activities result in economic stimuli that provide revenue or income to governments, businesses and individuals. Potential adverse effects of the Project, identified in Table 11.1.2, include an ageing labour force that may result in increased labour competition.

Green hydrogen is a new sector for which training and experience is limited and personnel may not be readily available. Some population segments may require support to ensure their successful participation in the Project. Increased year-round business in the service sector (e.g., accommodations, restaurants, convenience stores, supermarkets, service stations) is beneficial and may result in increased demand for businesses (e.g., accommodations) that are used seasonally by tourists. Additionally, while local and regional businesses are experienced with heavy industry, green hydrogen is a new sector representing both an opportunity and a challenge.

Table 11.1.2: Summary of Issues and Opportunities for Economy, Employment and Business

Key Indicator	Issues and Opportunities
Economy	Major projects contribute to GDP, tax revenue, royalties, and other government income.
Employment	Major projects result in short- and long-term employment (direct, indirect, induced).
	The NL labour force is ageing with competition for labour with required skill sets.
	The green hydrogen sector is new with limited local training and experience.
	Certain population segments may be underrepresented in employment opportunities, particularly in industrial sectors.
Business	Procurement for major projects stimulates business activity (direct, indirect, induced) locally, regionally, provincially and beyond.
	Certain segments may be underrepresented in business opportunities, particularly in industrial sectors.
	The culture and tourism sector may experience beneficial and adverse effects depending on Project component (e.g., recreation facilities, public events, hotels and short-term accommodations) and phase.

11.2 Economy of Newfoundland and Labrador

For analysis, the Government of NL divides the economy into two main sectors: goods-producing and services-producing. In 2023, the largest four contributors to NL GDP were “Oil Extraction”, “Mining”, “Health Care and Social Assistance”, and “Public Administration” (Table 11.2.1). Together, these made up 42.1% of GDP. In 2024, employment in NL increased by 6,400 person-years, or 2.8%, compared to 2023. The four sectors with the highest person-years of employment were “Construction”, “Retail Trade”, “Healthcare and Social Assistance”, and “Public Administration”.

Table 11.2.1: NL 2024 Gross Domestic Product at Basic Prices, by Industry (2023 in millions of chained 2017 dollars)

Indicator	GDP 2023e Millions (\$)	Total (%)	Employment 2024 [Person Years (000s)]	Total (%)
Agriculture, Forestry & Logging	167.3	0.5	1.5	0.6
Fishing, Hunting & Trapping	623.4	1.7	2.2	0.9
Mining	3,324.8	9.3	8.2	3.3
Oil Extraction	5,512.7	15.4	3.1	1.3
Support Activities for Oil & Mining	489.9	1.4	2.9	1.2
Manufacturing	1,137.7	3.2	9.9	4.0
Fish Products	423.9	1.2	3.4	1.4
Other	713.9	2.0	6.5	2.7
Construction	2,951.7	8.3	19.8	8.1
Utilities	801.4	2.0	2.1	0.9
Goods-Producing Sector Subtotal	15,008.9	42.0	49.8	20.3
Wholesale Trade	880.1	2.5	5.4	2.2
Retail Trade	1,992.8	5.6	32.6	13.3
Transportation & Warehousing	1,216.5	3.4	13.0	5.3
Finance, Insurance, Real Estate & Business Support Services	1,962.2	5.5	14.1	5.8
Professional, Scientific, & Technical Services	1,313.1	3.7	12.4	5.1
Educational Services	1,907.0	5.3	21.0	8.6
Health Care & Social Assistance	3,202.1	9.0	47.6	19.4
Information, Culture & Recreation	744.2	2.1	6.4	2.6
Accommodation & Food Services	636.8	1.8	13.8	5.6
Public Administration	3,016.1	8.4	20.7	8.4
Other Services	3,898.3	10.9	8.3	3.4
Services-Producing Sector	20,769.1	58.1	195.2	79.7
All Industries	37,778.0	100.0	245.0	100.0

Source: (Newfoundland and Labrador, 2025e)

11.2.1 Offshore Oil and Gas

In 2023-2024, NL accounted for about 12% of Canada's total oil production (Newfoundland and Labrador, 2025e). The NL oil and gas industry contributed about 14% of the province's real GDP in 2023. The province has four producing offshore oilfields: Hibernia, Terra Nova, White Rose and Hebron. Two fields have recently undergone major asset life extension projects: Terra Nova shut down in 2019 and resumed production in November 2023 and production at White Rose was paused between January 2024 and March 2025. Thus, three of the four fields were producing oil in 2024 when oil production totaled 76.5 million barrels, an increase from 2023.

11.2.2 Mining and Mineral Exploration

The NL mining industry includes mineral exploration and development for minerals such as gold, iron ore, critical minerals (e.g., nickel, copper, cobalt, lithium) and rare earth elements (Newfoundland and Labrador, 2025e). In 2024, exploration expenditures totalled \$243.9 million, an increase of 6% from 2023.

At the end of 2024, mineral shipments were estimated at \$4.4 billion, a decrease of 0.6% from 2023. This decrease is primarily due to lower prices for iron ore and nickel. Along with sale of ore, the mining industry creates employment and stimulates the economy through procurement, community investments and major capital investments such as construction of Equinox's Valentine Gold Project in central Newfoundland.

Total mining-related employment was approximately 7,900 people in 2024, a decrease of 11.5% from 2023 (Newfoundland and Labrador, 2025e). While employment increased in mineral exploration and at several mines, it was offset by closure or restructuring of other mines.

11.2.3 Manufacturing

In 2023, the NL manufacturing sector experienced increased activity (Newfoundland and Labrador, 2025e). The total value of manufacturing shipments was \$4.4 billion, up 25.3% from 2023. Shipments of durable goods (e.g., fabricated metal products and refined metals) declined by 12.3%, while export of non-durable goods (e.g., newsprint and seafood) increased by 51.5%. Manufacturing employment averaged around 9,900 people, an increase of 1.5% compared to 2023.

11.2.4 Major Capital Projects

A significant portion of construction industry activity in NL is linked to major capital project development, especially in the non-residential sector (Newfoundland and Labrador, 2025e). In 2024, construction-related investment was approximately \$9.2 billion, a 26.0% decrease from 2023. However, employment in the NL construction industry increased by 1.0% in 2023 to about 19,800 people (Newfoundland and Labrador, 2025e).

11.2.5 Seafood Harvesting and Processing

Seafood harvesting, processing and aquaculture are important economic contributors in NL. In

2024, employment in fish harvesting, aquaculture hatcheries, grow-out facilities and seafood processing plants totaled 16,700 individuals, increasing from 16,100 in 2023. Seafood product exports from NL were valued at \$971.5 million in 2024 (Newfoundland and Labrador, 2025e). Commercial fish landings and landed value increased over 2023, primarily due to an increase in the average landed price of snow crab, though the aquaculture industry had important increases in production and value in 2024.

Commercial aquaculture production in NL consists of salmonids including Atlantic salmon and steelhead trout, as well as shellfish such as blue mussels and oysters (Newfoundland and Labrador, 2025e). Total market value of the aquaculture industry increased by 21.9% to \$281.5 million from 2023 to 2024. In 2024, salmonid production increased by 48% due to production rebound and commencement of salmon harvesting by Grieg Seafood Newfoundland in Placentia Bay. In 2024, while shellfish production decreased by 31.6%, total value was consistent as market prices for mussels increased. Aquaculture developments continued in 2024 including licencing of operations to grow marine plants (Newfoundland and Labrador, 2025e).

11.2.6 Tourism

NL's tourism infrastructure is well-developed, with significant investments in accommodations and facilities to support both leisure and business travelers. The province received 443,300 non-resident visitors in 2024, a slight decline from the previous year (NLTCAR, 2025b).

The five most popular outdoor experiences in 2023 for visitors to NL were walking and hiking, coastal sightseeing, visiting a beach, seabird watching and whale watching experiences (NLTCAR, 2025b). The top five most popular culture and heritage experiences in 2023 were enjoying local cuisine, exploring small communities, connecting with local people, historic sites/museums and lighthouses.

The peak travel season from May to October, particularly in July and August, shows a high demand for hospitality services during these months (NLTCAR, 2025b). This is indicative of a strong leisure travel market.

The province of NL has approximately 250 outfitters in 2023 (Kennedy, 2023). The Newfoundland and Labrador Outfitters Association (NLOA) is a non-profit organization representing 145 outfitters that provide hunting, fishing and wilderness adventures (NLOA, n.d.). The NLOA estimates the industry hosts thousands of clients annually, contributes \$50 million to provincial GDP and supports local communities and the rural way of life through employment and procurement.

Accommodation occupancy rates are used as a tourism indicator. The LSA offers various short-term accommodations, including hotels, efficiency apartments, and bed and breakfast guest homes (Table 11.2.2).

Table 11.2.2: Total Rooms Available Per Year

Study Area	Region	2023	2024 (January – December)
LSA	Central	449,915	498,753
RSA	NL	3,001,431	3,063,036

Source: (NLTCAR, 2025a)

In 2023, Central Region accommodations had an annual occupancy rate of 47% (NLTCAR, 2024; Table 11.2.3). The overall NL annual occupancy rate was more than 10% higher than the Central Region.

Table 11.2.3: Annual Occupancy Rates

Study Area	Region	2023	2024 (January – December)
LSA	Central	47.08%	43.14%
RSA	NL	57.35%	53.15%

Source: (NLTCAR, 2025a)

11.2.7 Real Estate

The NL real estate sector showed growth in 2024, as strong demand for housing and low supply of homes for sale resulted in increased housing prices (Newfoundland and Labrador, 2025e). The average annual home price in NL increased by 8.9%, from \$292,403 in 2023 to \$319,634 in 2024. Despite the increase, the average home price remains the lowest of all Canadian provinces. Additionally, higher demand for rental properties led to a decrease in the vacancy rate and increased average rent prices.

11.2.8 Forestry

In 2024, the NL forestry industry operated under ongoing challenging market conditions, with declining paper shipment values due to falling prices and reduced newsprint demand (Newfoundland and Labrador, 2025e). The value of lumber shipments increased compared to 2023 but remained below 2022 levels. The Annual Allowable Cut (AAC) was reduced, and a spruce budworm infestation resulted in damage to forests despite application of a spray program.

11.3 Regional Economy

Central Newfoundland has a rich history that dates back thousands of years, with early Indigenous peoples such as the Dorset and Beothuk inhabiting the region (NL Tourism, n.d.). European exploration led to establishing fishing settlements along the coast. Over time, the region developed natural resource-based industries, including logging, pulp and paper production and mining in the interior. Seaports were established at Botwood and Lewisporte, both of which were connected to the Newfoundland Railway. An airport was developed at Gander. Today, Grand Falls-Windsor and Gander serve as the main government, commercial/retail, education and health care service centres of the central region (Pitt & Pitt, 2015a, 2015b).

11.3.1 Mining and Mineral Exploration

Currently, various mining exploration and development activities are present in the LSA. Hi-Point Industries in Bishop's Falls harvests peat deposits to produce oil spill containment and horticultural peat products (Hi-Point Industries, 2019). Mining related operations in central Newfoundland include Barite BarCan in Buchans, which produces barite from the historic tailings of the ASARCO zinc mine (Barite Mud Services Inc., 2020). The Beaver Brook Antimony Mine Inc. (BBAM) at Glenwood suspended operations indefinitely in 2023 (NLEM, 2024).

Gold mining in central Newfoundland has experienced renewed interest and investment. Equinox Gold's Valentine Gold Mine is in the pre-commissioning stage (Equinox Gold Corp., 2026). New Found Gold Corp. is continuing its exploration program and undertaking studies to assess the Project's mineral inventory, economic feasibility, and potential development scenarios (New Found Gold Corp, 2025).

Exploits Discovery Corp. is a Canadian mineral exploration company focused on gold exploration (Exploits Discovery Inc., 2025). The company has seven exploration projects in central Newfoundland near Gander, Glenwood, Appleton and Bishop's Falls. The Bullseye project on the Appleton Fault Corridor (near New Found Gold's Queensway project) is considered a flagship discovery.

Several historic mines in central Newfoundland are under new ownership. Canterra Minerals has acquired the Buchans mine property (operated from 1935 to 1981) and is evaluating five properties for zinc, lead, copper, silver, and gold (Canterra Minerals Corp., 2026). FireFly Metals has acquired the Green Bay Copper Gold Project on the Baie Verte Peninsula, including the Ming Mine, Little Deer exploration project, and mine infrastructure (FireFly Metals, n.d.). New Found Gold Corp. has acquired and is redeveloping the Hammerdown gold mine and related infrastructure (also on the Baie Verte Peninsula) as well as conducting exploration on four properties (New Found Gold Corp, 2025).

11.3.2 Manufacturing

Central Newfoundland had a long history of manufacturing pulp and paper from softwood. However, closure of the AbitibiBowater pulp and paper mill at Grand Falls-Windsor in February 2009 ended nearly a century of operations, with loss of employment for about 450 workers (Barry, 2019). The mill's closure also resulted in loss of employment in the logging industry.

Various other manufacturing facilities operate in central Newfoundland. Ontario-based Superior Glove, which has been manufacturing work gloves in Point Leamington since 1988, opened a second production facility in Springdale in 2016 (Superior Glove, 2025).

Gander has several manufacturing facilities. D-J Composites Inc. (a division of D-J Engineering, Inc.) in Gander specializes in engineering and manufacturing of specialized composite and bonded metal components for the aerospace industry (D-J Engineering, Inc., 2021). DT Martin in Gander provides custom design services and machining and

manufacturing of components (DT Martin, 2024).

11.3.3 Major Capital Projects

In 2024, the Government of NL identified 40 ongoing or initiated major capital investments (Newfoundland and Labrador, 2024b). Planned total spending was approximately \$12.4 B, of which most (\$8.2 B) was in the “Mining and Oil & Gas” category. Three major projects were identified in central Newfoundland with the majority of investments in mining (Table 11.3.1).

Table 11.3.1: Major Capital Projects in the LSA

Project	Description	Value (\$M)	Timeline
Valentine Gold Project – Phase I	Development of an open pit gold mine and milling operation with a 14-year mine life	534.0	2022-2024
Hammerdown Mine	Development of an open pit and underground mine for the Hammerdown deposits with an expected mine life of five years	75.0	2024-2025
Trans-Canada Highway Twinning	Twinning of segments of the highway including a 15-km section between Bishop’s Falls and Grand Falls-Windsor in central Newfoundland.	5.0	2023-2026

Source: (Newfoundland and Labrador, 2024b, 2025f; NLDOTI, 2024)

Table 11.3.2 describes other proposed industrial developments in central Newfoundland.

Table 11.3.2: Proposed Industrial Developments

Proposed Industrial Development	Description
Botwood Airport Quarry	NFLD Inc. is proposing to establish and operate a 1.0-hectare sand and gravel quarry in Botwood. The proposed quarry, which is proximate to historic quarries, would produce material for construction. In June 2024, the project was released from EA.
Botwood Flowers Hill Quarry	C&H Construction is proposing to develop and operate a two-hectare sand and gravel quarry near Botwood. The quarry will provide material for construction. In December 2024, the project was released from EA after submitting an Environmental Preview Report (EPR).
Lewisporte Biomedical Waste Incineration	Paul Dalley Holdings Inc. is proposing to construct and operate a biomedical waste incineration facility in Lewisporte to collect, transport, store and incinerate biomedical waste for NL Health Services. In December 2024, the final Environmental Impact Statement (EIS) was issued.
Abitibi Mill Lands	The Town of Grand Falls-Windsor has acquired some of the former Abitibi mill lands in Grand Fall-Windsor with intention to develop road access from the TCH, and a potential future ATV trail. The process for this acquisition began in 2015 and was finalized in early October 2024.

Proposed Industrial Development	Description
Park Street Expansion	The Town of Grand Falls-Windsor is planning a road expansion to provide convenient access to the TCH, facilitate movement of trucks, reduce traffic congestion and minimise transportation conflicts in residential neighbourhoods. No further news was communicated about this development.

Source: (Hannaford, 2024; NLECCC, 2024b, 2024c, 2024d; Tract Consulting Inc., 2021a)

11.3.4 Seafood Harvesting and Processing

Many areas of NL were settled based on the fishery and, despite industrial changes and a groundfish moratorium, seafood harvesting and processing still play a notable role in the economy, especially in rural areas. Aquaculture is a newer part of the seafood sector.

DFO Small Craft Harbours identifies 10 core fishing harbours in central Newfoundland (DFO, 2025f). Most core fishing harbours, which are critical to the fishing and aquaculture industries, have been transferred from the Federal Government to harbour authorities, which manage operations. The LSA also has seven non-core fishing harbours.

The NL Department of Fisheries and Aquaculture lists 27 aquaculture licenses in central Newfoundland (NLFAL, 2025b). Many of these licenses are concentrated in Notre Dame Bay near Triton Island, with most cultivating blue mussels. Additionally, two licenses near Fogo Island focus on cultivation of marine plants. Out of the 27 aquaculture licenses in central Newfoundland, three that cultivate blue mussels, are located near Botwood. Two of these licenses are held by Black Gold Inc., while the other is owned by Terry Mills (NL FAL, 2024).

Seafood processing facilities are located throughout coastal areas. In 2024, NL Department of Fisheries and Aquaculture identified 10 processors in various locations in central Newfoundland (Table 11.3.3). Products included pelagic species, mussels, lobster, groundfish and others.

Table 11.3.3: Seafood Processors in the LSA (2024/2025)

Producer	Location(s)	Products
Change Islands Fishermen's Improvement Committee	Change Islands	Pelagic species
Dorman Roberts Limited	Triton	Lobster, mussels (aquaculture)
Doyle W. Sansome & Sons Limited	Hillgrade	Squid, lobster
Fogo Island Co-Op Society Ltd.	Fogo	Lobster, lumpfish, seal, pelagic species, snow crab, groundfish, crab, shrimp, sea cucumber, scallops
Hodder's Shellfish Inc.	Stoneville	Sea urchin, seal, eel, lobster, pelagic species, groundfish, scallop
Leading Tickles Seafoods Inc.	Leading Tickles	Lumpfish, groundfish
Norlantic Processors Limited	Pleasantview	Mussels (aquaculture), scallop

Producer	Location(s)	Products
Notre Dame Seafoods Inc.	Comfort Cove-Newstead	Lobster, snow crab, pelagic species, groundfish
Ocean Choice International	Triton	Pelagic species, groundfish, snow crab, lobster
Waterside Fish Market	Twillingate	Pelagic species, shellfish, groundfish

Source: (NLFAL, 2025b)

11.3.5 Tourism

NL offers various types of attractions for visitors. Table 6.9 shows popular attractions in central Newfoundland and the percentage of parties who visited the attraction while in each area. As discussed in Section 11.2.6, visitors to NL indicated (in 2023) a preference for outdoor experiences (e.g., walking and hiking, coastal sightseeing, visiting a beach, seabird watching and whale watching). In central Newfoundland, these activities are available at tourist destinations such as Terra Nova National Park, Fogo Island, Change Islands and Twillingate (Table 11.3.4). Gander is a service centre for tourist with an airport, hotels and restaurants.

Table 11.3.4: Popular Attractions in the LSA (2023)

Tourism Region within LSA	Attraction	% of Parties who Visited the Region	Type of Attraction
Central Region	Terra Nova National Park	30%	Hiking/walking
	Fogo and Change Islands	14%	Coastal site/seabird watching
	Twillingate	53%	Sightseeing/wildlife boat tour
	Gander	58%	Historic sites, museums

Source: (NL Department of Tourism, Culture, Arts, and Recreation, 2024a)

Annual festivals also attract tourists to central Newfoundland. These include Botwood Flying Boat Festival, Point Leamington Festival, Leading Tickles Day, Peterview Day, Exploits Valley Salmon Festival at Grand Falls-Windsor, Mussel Bed Soiree in Lewisporte, Gander's Festival of Flight and Fogo Island Punt Race (NL Tourism, 2026b). Lewisporte has the only recreational boating marina in central Newfoundland.

The Newfoundland and Labrador Outfitters Association (NLOA) directory lists 35 members in Central Newfoundland (NLOA, n.d.). Outfitters may be accessible by conventional motor vehicle or by air transportation (helicopter or float plane) only. Central Newfoundland outfitters (e.g., Mount Peyton Outfitters, Central Newfoundland Expeditions, Hideaway Lodge, A1 Hunts) offer fishing for Atlantic salmon or brook trout and hunting for moose, black bear or woodland caribou (Explore Exploits, 2026a; NLOA, n.d.). Adventure seekers may also participate in a variety of activities including snowmobile tours, canoeing, ATV tours, river rafting, salmon angling, hiking and ziplining in the Exploits Valley (Explore Exploits, 2026b; Riverfront Chalets, 2026).

11.4 Employment

Based on the size of the labour force, the most important industries (Statistics Canada, 2024b) in the LSA and NL in 2020 were "Health care and social assistance," "Retail trade," "Public

administration,” “Construction,” and “Educational services” (Table 11.4.1). In each jurisdiction, these made up nearly 53% of employment. Representation of men+ and women+ varies by economic sector and often follows gender norms though these are more pronounced in NL compared to the LSA.

Table 11.4.1: Labour Force¹ by Industry and Gender (2020)

Sector	LSA (%)						RSA (%)		
	Division 8	Men+	Women+	Division 6	Men+	Women+	NL	Men+	Women+
Agriculture, forestry, fishing and hunting (%)	11.2	15.2	6.9	1.4	2.2	0.8	3.9	5.8	1.9
Mining, quarrying, and oil and gas extraction (%)	6.9	12.5	0.7	3.1	5.7	0.5	4.0	6.6	1.3
Utilities (%)	0.4	0.7	0.2	1.2	2.2	0.2	1.1	1.7	0.6
Construction (%)	10.5	18.1	1.9	6.4	11.8	1.1	8.0	13.9	1.8
Manufacturing (%)	8.3	8.6	8.0	2.4	3.3	1.6	4.8	6.4	3.1
Wholesale trade (%)	1.1	1.4	0.7	1.7	2.9	0.5	2.0	2.9	1.0
Retail trade (%)	10.2	7.4	13.3	16.4	15.1	17.7	12.3	10.7	14.0
Transportation and warehousing (%)	5.1	7.3	2.7	6.5	10.3	2.8	4.9	7.2	2.4
Information and cultural industries (%)	0.3	0.1	0.3	0.9	1.2	0.7	1.1	1.2	1.0
Finance and insurance (%)	1.3	0.6	2.0	1.3	0.8	1.7	1.9	1.2	2.6
Real estate and rental and leasing (%)	0.4	0.6	0.3	0.8	0.8	0.6	0.9	1.0	0.7
Professional, scientific and technical services (%)	1.6	2.0	1.2	2.8	2.9	2.6	4.7	5.4	4.0
Management of companies and enterprises (%)	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1
Administrative and support, waste management and remediation services (%)	2.4	2.9	1.8	2.5	3.2	1.9	2.4	3.6	2.5
Educational services (%)	5.0	2.9	7.4	5.9	3.2	8.5	5.7	4.5	9.7
Health care and social assistance (%)	16.1	3.2	30.5	22.5	8.6	36.0	19.4	5.6	27.9
Arts, entertainment and recreation (%)	0.6	0.8	0.5	1.5	1.7	1.4	1.1	1.5	1.6
Accommodation and food services (%)	5.3	2.9	8.1	6.7	5.1	8.3	5.9	4.9	7.8
Other services (except public administration) (%)	3.7	3.3	4.2	4.3	4.7	3.8	4.0	3.8	4.3
Public administration (%)	6.3	7.0	5.6	8.1	10.3	6.0	7.6	8.8	9.1

Sector	LSA (%)						RSA (%)		
	Division 8	Men+	Women+	Division 6	Men+	Women+	NL	Men+	Women+
Other ²	N/A	N/A	N/A	N/A	N/A	N/A	2.8	3.1	2.6

¹ The proportion of individuals aged 15 and older in the labour force who have been employed at any time between January 1, 2020, and May 8, 2021.

² Includes unemployed persons aged 15 years and over who have never worked for pay or in self-employment, or who had last worked prior to January 1, 2020.

Source: (Statistics Canada, 2023a, 2023b)

Grand Falls-Windsor and Gander have concentrations of larger organizations, including provincial government offices, medical diagnostic and treatment facilities, post-secondary institutions and businesses that employ many people. Details on medical facilities and post-secondary institutions are provided in Section 12.0.

11.4.1 Labour Force Characteristics

In 2021, employment rates in the LSA and RSA were similar for men+ and women+ (Table 11.4.2). The unemployment rate for women+ was lower than men+ in Division 8, Division 6, and NL. In each jurisdiction, men+ were more likely to be engaged in part-time, casual, short-term or seasonal work, and women+ were more likely to be employed in full-time, year-round and permanent positions. This could be attributed to higher participation of men+ in the construction (short-term) and fishing (seasonal) industries. The self-employment rate is relatively low for the overall population but remains three times higher for men+ than women+.

Table 11.4.2: Labour Force and Employment (2021)

Indicator	LSA				RSA	
	Division 8		Division 6		NL	
	Men+	Women+	Men+	Women+	Men+	Women+
Labour force participation rate (%)	48.4	42.3	54.4	52.6	58.6	53.7
Employment rate (%)	35.1	32.9	42.7	45.7	48.1	47.0
Unemployment rate (%)	27.4	22.2	21.5	13.1	18.0	12.4
Worked full year full time (%)	13.7	15.0	27.0	25.6	28.2	26.8
Worked part of year and/or part time (%)	39.9	30.9	29.2	27.0	32.2	28.2
Permanent position (%)	46.4	55.8	62.8	71.6	59.8	66.5
Casual, seasonal or short-term position (less than 1 year) (%)	39.4	30.9	20.5	15.4	23.0	18.3
Self-employed (%)	7.6	5.4	9.2	5.1	9.4	6.5

Source: (Statistics Canada, 2023a, 2023b)

11.4.2 Working Age Population

Analysis of population age is useful to understanding availability of an adequate workforce (generally 15 and 64 years) for potential projects and supporting industries. Table 11.4.3 shows the percentage of individuals in the working age group, as well as various cohorts. The largest cohort for both jurisdictions is 50 to 64 years reflecting an ageing workforce in the LSA.

Table 11.4.3: Population Cohorts (2021)

Cohort (years)	LSA	Division 6	RSA
	Division 8		NL
15 to 64 (%)	57.9	61.0	63.0
20 to 34 (%)	9.8	13.8	15.4
35 to 49 (%)	15.7	17.6	18.6
50 to 64 (%)	28.2	24.3	24.1

Source: (Statistics Canada, 2023a, 2023b)

11.4.3 Availability of Skilled and Unskilled Labour

Due to low birth rates and out-migration, the populations of the LSA and RSA are aging and showing little growth. NL's population in general is aging, with people over 65 expected to increase from 25% in 2024 to 28% by 2034 (Buildforce Canada, 2025). Meanwhile, the portion of younger workers is expected to decline from 11% in 2024 to 10% in 2034. Labour force recruitment will be challenging as retirements are likely to outpace new entrants, increasing competition for younger employees and resulting in more workers with less experience.

In 2021, more than 50% of workers in NL and the LSA commuted less than 15 minutes for work (Statistics Canada, 2023a, 2023b). More than 80% of workers indicated they commuted as the driver of a vehicle.

In the absence of natural population growth, stability is sustained by immigration and in-migration from other provinces (Buildforce Canada, 2025). Between 2022 and 2024, NL experienced an influx of migrants. Future growth will depend on immigration and in-migration to alleviate labour market pressures. However, immigration is expected to decline due to reductions in federal targets for 2025 to 2027.

The BuildForce Canada 10-year (2025-2034) construction workforce outlook for NL forecasts 6,100 retirements and 4,500 new entrants (Buildforce Canada, 2025). The non-residential construction market is generally expected to grow based on large volume of resource projects dominating the engineering construction sector, along with the provincial road improvement program, core public infrastructure projects, and construction related to offshore oil and gas.

Employment in the NL non-residential construction sector is expected to rise steadily into 2028. However, a slight contraction is expected in 2029 (Buildforce Canada, 2025).

Weaker labour markets are anticipated for many trades beginning 2028-2029 though companies engaged in heavy-industrial activities could still experience labour shortages (Table 11.4.4). Labour markets for most trades are expected to weaken by 2033. However, this forecast is longer range and several proposed large-scale resource projects (e.g., hydrogen, mining) could be under development at that time.

Table 11.4.4: Non-Residential Construction Market Rankings, NL (adapted from BuildForce Canada, 2025)

Trade or Occupation	2024-2034										
	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34
Boilermaker	4	4	4	4	3	3	4	4	3	3	3
Carpenter	4	4	3	4	3	4	4	4	4	3	3
Concrete finisher	3	4	3	3	2	2	3	4	3	3	3
Construction manager	4	5	4	4	3	3	4	4	3	3	3
Construction millwright and industrial mechanic	4	4	3	3	4	4	5	4	4	3	3
Contractor and supervisor	4	5	4	4	3	3	4	4	3	3	2
Crane operator	4	5	4	4	3	3	4	4	3	3	3
Electrician	3	4	4	4	3	3	3	3	3	3	3
Heavy equipment operator (except crane)	4	4	4	4	3	2	3	3	3	3	3
Heavy-duty equipment mechanic	5	5	4	4	3	3	4	4	3	3	3
Insulator	4	4	4	4	3	3	4	4	4	3	3
Ironworker and structural metal fabricator	4	4	3	3	4	4	4	3	3	3	2
Painter and decorator (except interior decorator)	3	3	3	4	4	4	4	3	3	3	2
Plumber	3	4	3	4	3	3	3	3	3	3	3
Refrigeration and air conditioning mechanic	4	4	4	4	3	3	3	3	3	3	3
Sheet metal worker	4	4	4	4	3	3	4	4	3	3	3
Steamfitter, pipefitter and sprinkler system installer	4	4	4	4	4	4	4	4	3	2	2
Trades helper and labourer	4	4	3	3	3	3	4	4	3	2	2
Truck driver	4	4	4	4	3	3	4	4	3	3	3
Welder and related machine operator	4	4	4	4	3	3	3	3	3	3	3

Numbered rankings represent the following:

2: Workers meeting employer qualifications are available in local markets to meet an increase in demand at the current offered rate of compensation and other working conditions.

3: The availability of workers meeting employer qualifications in the local market may be limited by large projects, plant shutdowns or other short-term increases in demand. Employers may need to compete to attract needed workers. Established patterns of recruiting and mobility are sufficient to meet job requirements.

4: Workers meeting employer qualifications are generally not available in local markets to meet any increase. Employers will need to compete to attract additional workers. Recruiting and mobility may extend beyond traditional sources and practices.

5: Needed workers meeting employer qualifications are not available in local markets to meet current demand so that projects or production may be delayed or deferred. There is excess demand, competition is intense and recruiting reaches to remote markets.

Source: (Buildforce Canada, 2025)

As the retirement rate increases over the next decade in NL, it is anticipated that the construction industry may face a hiring gap of about 3,800 workers (Buildforce Canada, 2025). The construction industry and other sectors will need to expand recruitment programs to

succeed in attracting workers. Recruitment of individuals from groups (e.g., women, Indigenous people and immigrants) who have been traditionally under-represented in the construction sector would have a positive effect on labour supply as well as these groups.

In 2024, there were approximately 2,130 women employed in NL's construction industry, of which 12% worked on site, while the remaining 88% worked in administrative and management-related occupations (Buildforce Canada, 2025). Women made up 2% of the 17,300 tradespeople employed in the industry. They were better represented in non-residential construction and new housing, making up nearly 5% of the workforce. The top trades for women were trade helpers and labourers (33%), carpenters (17%), electricians (14%), construction managers (11%) and contractors or supervisors (8%).

As of 2023, Indigenous people accounted for approximately 12% of the NL construction labour force, which represents a 4% increase over the past decade (Buildforce Canada, 2025). The general labour force had increased its share of Indigenous workers from 2014 to 2023, by 2.5%.

As of 2021, immigrants accounted 3.3% of NL's workforce, and while NL has been successful in attracting and integrating immigrants, the share of immigrants in the NL workforce remains less than 1% and below the Canadian average of 19.4% (Buildforce Canada, 2025). NL is expected to attract more than 44,400 new immigrants between 2025 and 2034, who will make up an increasing share of the NL working-age population.

11.4.4 Gender Wage Gap

In 2020, the after-tax gender wage gap in NL was \$7,400 (Statistics Canada, 2023b). Data for the LSA reveal an even larger wage gap of \$9,000 between men+ and women+ for Division 8, and \$8,600 for Division 6 (Table 11.4.5). These figures underscore the persistent earnings disparity between genders.

Table 11.4.5: Gender Wage Gap (2020)

Indicator	Gender	LSA		RSA
		Division 8	Division 6	NL
Median after-tax income in 2020 (\$)	Men+	32,800	36,800	37,200
	Women+	23,800	28,200	29,800
Wage gap (\$)		9,000	8,600	7,400

Source: (Statistics Canada, 2023a, 2023b)

11.4.5 Business

According to the NL Department of Finance, the Province had 15,299 registered businesses in December 2023. Of these, less than 17% were in two Rural Secretariat Regions, which includes the LSA (Table 11.4.6).

Table 11.4.6: Number of Businesses in the LSA by Rural Secretariat Region (2024)

Rural Secretariat Region	Number	% of Provincial Total
Grand Falls-Windsor - Baie Verte - Harbour Breton	1,243	8.1%
Gander - New-Wes-Valley	1,352	8.8%
Total	2,595	16.9%

Source: (NLSA, 2021)

11.4.6 Business Organizations

Three general business organizations (i.e., chambers of commerce or business directories) were identified in central Newfoundland representing more than 500 members (Table 11.4.7). Based on available member databases, businesses provide industrial services (e.g., heavy and general industry), business services (e.g., financial, legal, information technology, communications), transportation, storage and logistics, safety and security, marine services, consulting and engineering services, construction, travel, accommodation and food services.

Table 11.4.7: General Business Development Organizations in the LSA

Organization	Area Served	# of Members
Exploits Chamber of Commerce	Leading Tickle, Fortune Harbour, Botwood, Norris Arm, Connaigre Peninsula, Harbour Breton, Bishop's Falls and Grand Falls-Windsor	200
Explore Exploits ¹	Leading Tickle, Fortune Harbour, Botwood, Norris Arm, Connaigre Peninsula, Harbour Breton, Bishop's Falls and Grand Falls-Windsor	754
Gander and Area Chamber of Commerce	Gander	300

¹ Explore Exploits joint initiative led by the Exploits Chamber of Commerce, in collaboration with various regional and municipal partners.

Source: (Exploits Chamber of Commerce, 2026; Explore Exploits, 2026b; Gander and Area Chamber of Commerce, 2026)

The Exploits Chamber of Commerce includes nearly 200 members, many of whom are contractors and trades companies or industrial facilities. Industrial suppliers in Grand Falls-Windsor and Botwood include Hi-Point Industries (2019; drip trays and containment berms, industrial tarps and covers), Guillevin International (2026; electrical material, fire, safety and industrial supplies) and Harris & Roome Supply Ltd. Graybar Canada (n.d.), which provides automation, lighting, communications and data, electrical supply, wire and cable, energy, oil and gas, security and technology, utility, and broadband service.

The Gander and Area Chamber of Commerce has approximately 300 members, many of whom provide a diverse range of services to both industry and workers. Services include industrial manufacturing, equipment rental, consulting engineering, electrical services, accommodations, transportation, carpentry, food services, financial and legal services, printing, office supplies, information technology, telecommunications, and automotive rentals, sales, and service (Gander and Area Chamber of Commerce, 2026).

11.4.7 Industrial Parks

Throughout the LSA, various municipalities and other organizations prepare and supply land to facilitate opportunities for industrial and commercial development.

The Town of Botwood aims to develop commercial-industrial and industrial land to meet industry needs and stimulate economic activity (Tract Consulting Inc., 2021b). The Town has designated industrial zones away from residential areas, with access to both the industrial marine areas and Route 350, which connects to the Trans-Canada Highway.

The Town of Bishop's Falls seeks to increase industrial activity and employment. Bishop's Falls has several areas designated for industrial use, including on Dominic Street, Main Street, on the waterfront (Exploits River), adjacent to Exploits Avenue, and between Sunset Drive and Botwood Highway (Tract Consulting Inc., 2016).

The Town of Grand Falls-Windsor has industrial lots for future development (Tract Consulting Inc., 2021a). The Queensway area business park can accommodate large retail developments. Lands zoned for industrial developments are on Hardy Avenue, Whitmore Street, the former Abitibi mill lands, and near the TCH.

Key economic development resources in Grand Falls-Windsor include Excite! Corporation, which is a non-profit business development arm of the Town (Excite! Corporation & Town of Grand Falls - Windsor, 2023). The organization is focused on economic development by facilitating investment and creating research and industry partnerships in healthcare and technology.

The Town of Gander has designated industrial and commercial areas including in the vicinity of McCurdy Drive and Baird Avenue, Roe Avenue as well as in the Ogilvie Street area (Wood Environment & Infrastructure Solutions, 2021). Additionally, Gander Business Park on Roe Avenue includes areas designated for potential future development.

The Town of Lewisporte has a fully serviced industrial park with available lots (Town of Lewisporte, n.d.-b). The park is located at the entrance of the Town, 11 km from the TCH, 5 km from the ice-free port of Lewisporte and 52 km from Gander International Airport

11.4.8 Businesses in the Exploits Valley

The type and number of businesses within the Exploits Valley area vary (Table 11.4.8). The main communities in Exploits Valley are Grand Falls-Windsor, Bishop's Falls, Botwood, Badger, Buchans, Norris Arm, Leading Tickles and Northern Arm.

Table 11.4.8: Businesses in the Exploits Valley

Types of Businesses	# Businesses
Accommodations	86
Automotive	99
Building and Contracting	125

Types of Businesses	# Businesses
Business Services	59
Commercial and Industrial	46
Community Groups	142
Education and Childcare	54
Emergency and Essential Services	40
Medical	44

Source: (Explore Exploits, 2026a)

The Explore Exploits Directory also lists other types of organizations in arts and culture, computers and technology, environmental, financial services, food and dining, government organizations, media, real estate, shopping, and transportation (Explore Exploits, 2026a). The Botwood offers a dental office, grocery stores, hardware stores, restaurants and cafes, construction services, a flower and gift shop, a computer and services business, and body care salon (Explore Exploits, 2026a; Town of Botwood, 2026b). Point Leamington has a butcher shop, restaurants and cafes, contracting and construction businesses, grocery stores and convenience stores, a bed and breakfast, and hair salon (Explore Exploits, 2026a; Town of Point Leamington, 2021a). Leading Ticks offers a seasonal family campground (Oceanview Park) near Glover's Harbour (Atlantic Association of RV Parks and Campgrounds, 2022).

11.5 Effects Assessment

The analysis of environmental effects of the proposed Project on economy, employment and business is provided in the following sections. Where possible, the information is presented in tabular form for enhanced clarity and accessibility with accompanying narrative to offer context and justification. An evaluation of residual effects is provided, considering the mitigations presented in Section 11.4 to determine significance.

Table 11.5.1 outlines potential interactions between Project activities and the Economy, Employment and Business VC. For this VC, Project interactions are identified regardless of the components being constructed, operated or decommissioned, as the interactions result in employment, procurement, and changes in temporary and/or permanent population. Thus, the effects assessment for economy, employment and business focusses on the Project generally rather than by its solar, wind or industrial components.

Table 11.5.1: Potential Project - Economy, Employment and Business Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land Surveys	X
Geotechnical Investigations	X
Implementation of Erosion and Sediment Control measures	X
Tree Clearing and Grubbing	X
Excavating grading and compacting soils for construction	X
Construction of temporary works – Quarries, Batch Plants, Accommodations	X

Project Phase	Potential for Interaction
Access road upgrades and construction	X
Laydown yard and Industrial Facility construction, including foundation excavation, construction and blasting where necessary	X
Laydown yard and Solar Works construction, including piling for solar panel racking, concrete pads for inverter stations and transformers	X
Pipeline construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Solar Panel and Racking Delivery and installation	X
Collection System, Control House and Substation Construction	X
Transmission System Installation and Commissioning	X
Removal of Temporary Works & Site Restoration	X
Operations and Maintenance (33 years)	
Operations and Maintenance	X
Conveyance of product to port via pipelines, including loading onto ships	X
Vegetation Management	X
Environmental Monitoring	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure Removal	X
Site Reclamation	X

11.5.1 Spatial and Temporal Boundaries

Spatial and temporal boundaries have been established to set maximum limits within which the environmental assessment will be conducted (Drawing 11.1-1, Appendix A). The following spatial boundaries have been established for the effects assessment:

- **PA:** The total area bounded by the Project, plus additional lands as outlined in Drawing 11.1-1 (Appendix A). The PA includes the SPA, IPA, and WPA.
- **LSA:** Statistics Canada Census Division 8 and Division 6. These areas are most likely to provide labour, goods and services required for all Project phases.
- **RSA:** The province of NL, as some of the services and infrastructure needed for the Project are not available in the LSA and a portion of the construction workforce is anticipated to come from throughout NL. In addition, the province was selected as the RSA given the potential economic effect of the project such as GDP, taxation and royalties on the provincial economy.

In addition to the PA, each component will have a defined PF, which represents the direct physical disturbance area where Project infrastructure is proposed. Existing conditions have been described for the area representing the geographic extent over which Project activities, and their effects, are likely to occur.

Temporal boundaries have been identified as Project phases: Site Preparation and

Construction (3 years), Operation and Maintenance (nominally 33 years), and Decommissioning and Rehabilitation (2 years). Temporal boundaries are therefore from 2027 to 2064.

11.5.2 Assessment Criteria

The criteria described in Section 5 were used to describe potential residual effects that remain after mitigation and enhancement measures have been implemented.

11.5.3 Definition of Significance

A significant effect on the economy, employment and business VC is defined as a residual Project-related effect that results in:

- A measurable change distinguishable from current conditions and trends, lasting beyond the life of the Project, and cannot be managed through planned Project mitigation measures or by application of current or adjusted public policies, plans or programs.

11.5.4 Effects

Project interactions with the economy, employment and business VC will result in Project-related effects mainly through Project spending. Project Construction, Operations and Maintenance, and Decommissioning and Rehabilitation will require employment of workers, spending on goods and services from businesses, and other contracts as well as government revenue through taxes, fees, levies and royalties. These effects are described in detail in the Economic Impact Assessment Report (Appendix O.1). Information is included in this section as appropriate to the discussion.

The Project will contribute to provincial and national GDP through the value of production, as well as through direct, indirect and induced employment and income generated by companies that supply goods and services to the Project. Taxes generated by the Project will include direct taxes paid by the company, direct personal taxes paid by individuals working on the Project, as well as indirect and induced tax impacts through other spending.

Project Site Preparation and Construction, Operations and Maintenance, and Decommissioning and Rehabilitation will positively affect local and regional employment levels and labour income, including for under-represented groups. Project-generated employment will include specialized roles that require additional training.

During Construction, Operations and Maintenance, the Project will result in spending to procure goods and services and engage staff. These will all result in economic benefits locally, regionally, and provincially through direct, indirect, and induced economic activity and contribution to GDP and taxation revenues of governments.

More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses. The precise value of decommissioning and rehabilitation cannot be

determined at this time as costs will depend on future regulations, costing and other requirements. However, following Decommissioning and Rehabilitation, the local economy will likely retract due to fewer employment and business opportunities.

11.5.4.1 Economy

Other than the oil and gas sector, the Project represents one of the largest private sector investments in the province's history (Appendix O.1). The Project will involve expenditures of \$12-14 billion on wind components, hydrogen and ammonia development facilities and other related infrastructure (Abraxas Power, 2026). Construction procurement contracts and materials/components will result in the largest portion of spending. The Project will also make a positive contribution to GDP: an estimated 5% increase.

Table 11.5.2 provides general overviews from the Economic Impact Assessment of total economic impacts from capital expenditures (CAPEX) and operational expenditures (OPEX) for NL (Appendix O.1). Combining CAPEX and OPEX economic activity, the entire Project is expected to:

- Boost provincial GDP by \$9.3 billion over the life of the Project (in \$2025), excluding GDP impacts arising from spending of tax/royalty revenue;
- Contribute \$5.6 billion in employment income in NL;
- Support 18,200 person years of employment during Site Preparation and Construction and more than 40,700 over the 37-year operating period all in NL;
- Boost annual household spending in NL by over \$4.0 billion;
- Municipal governments are expected to receive \$507 million in tax revenue; and
- The NL government will receive an estimated \$14.8 billion from in-province activity.

Table 11.5.2: Estimated Combined and Cumulative Economic Impacts (\$Millions in \$2025)

Economic Impact	CAPEX	OPEX	Combined
GDP Contribution	\$2,340	\$6,930	\$9,270
Employment Income	\$1,990	\$3,610	\$5,600
FTE person years of employment	18,200	40,755	58,955
Household spending	\$1,430	\$2,600	\$4,030
Taxes		\$690	\$1,620
• Municipal	\$70	\$120	\$190
• Provincial	\$370	\$820	\$1,190
• Federal	\$250	\$670	\$920
Corporate income tax		\$8,440	\$8,440
• Provincial portion		\$6,330	\$6,330
• Federal portion		\$2,110	\$2,110
Municipal royalty		\$200	\$200
Water royalty		\$6,790	\$6,790
Municipal taxes		\$110	\$110

Economic Impact	CAPEX	OPEX	Combined
Land charge		\$40	\$40
Wind tax		\$430	\$430
Wind royalty		\$30	\$30

Source: (Jupia Consulting, 2025)

Government revenue will include fees, taxes and royalties. The Government of NL has created a land title and economic development regime for the wind-hydrogen industry (NLECCC, 2023b). While the terms of agreements may be modified through negotiations, the system established in 2023 is presented in Table 11.5.3.

Table 11.5.3: Wind-Hydrogen Fiscal Framework

Economic Return	Value
Crown Land Fees	Annual charge of 3.5% of the market value of reserved land Annual charge of 7% of the market value of leased land Applicable to Crown land
Wind Electricity Tax	\$4,000 per megawatt on installed capacity Annual charge, payable at in-service Applicable to all wind projects (≥ 5 megawatts) producing electricity for the purposes of producing hydrogen
Water Use Fees	Fee of \$500 per 1,000 m ³ of water licensed and used Fee of \$50 per 1,000 m ³ for water licensed and not used Applicable to all hydrogen facilities Payable with permit issuance as an annual charge with fees adjusted annually by the Canadian consumer price index as per current NLECC regulatory practice
Water Royalties	Payments begin with cost recovery Payable based on the calculated residual value of the water Rates linked to revenue over cost index calculation (10% to 25%) based on tiers

Source: (NLECCC, 2023b)

Government revenues from Operation and Maintenance phase include personal income tax payments, harmonized sales tax (HST) on goods and services and property taxes, among others. The Economic Impact Assessment estimated detailed annual taxes and royalties associated with Project operation (Appendix O.1; Jupia Consulting, 2025).. As shown in Table 11.22, annual operation will contribute a total of \$43.7 million to governments of which \$3.3 million will go to regional municipalities and \$22.3 million to the NL government. In addition, EVREC will pay an average of \$171 million in provincial corporate income tax annually during Operation and Maintenance.

Water royalty payments to Government of NL are estimated to be \$183.5 million per year (Jupia Consulting, 2025; Table 11.5.4). Municipal taxes and royalty payments are expected to be approximately \$8.7 million per year. Annual provincial wind tax and water tax, based on the Wind-Hydrogen Fiscal Framework, will be an expected \$11.6 million and \$0.7 million respectively. Total taxes and royalties from the Project are estimated to be as much as \$17.7

billion or \$477 million per year. The provincial government portion will be \$14.4 billion, an average of \$390 million per year.

Table 11.5.4: Annual and Cumulative Taxes from Project Operation and Maintenance (\$Millions in 2025)

Taxes from Operation and Maintenance	Average Annual	Cumulative
Taxes	\$43.7	\$1,616.9
• Municipal	\$3.3	\$122.1
• Provincial	\$22.3	\$824.4
• Federal	\$18.1	\$669.7
Corporate income tax	\$228.1	\$8,440.0
• Provincial	\$171.1	\$6,330.0
• Federal	\$57.0	\$2,110.0
Municipal royalty	\$5.4	\$198.6
Water royalty	\$183.5	\$6,789.0
Municipal taxes	\$3.1	\$113.7
Land charges	\$1.2	\$44.1
Wind tax	\$11.6	\$428.2
Water tax	\$0.7	\$27.1

Source: (Jupia Consulting, 2025)

11.5.4.2 Employment

The Project will generate employment through all phases. A total of nearly 59,000 person years of employment is anticipated during Site Preparation and Construction, Operation and Maintenance (Table 11.5.5).

Table 11.5.5: Estimated Employment Impacts Value (\$Millions in \$2025)

Employment Indicator	CAPEX	OPEX	Combined
Employment income	\$1,990	\$3,610	\$5,600
FTE person years of employment	18,200	40,755	58,955

Source: (Jupia Consulting, 2025)

Table 11.5.6 shows the anticipated person days of employment, period of employment, and number of jobs generated by the Project for each Project phase. Due to the limited and ageing labour force (Section 11.4.2), the Project is likely to attract workers from throughout the RSA and beyond.

Table 11.5.6: Estimates of Person Days of Employment, Duration, Average Number of Positions Created by the Project

Project Phase	Estimated Person Days			
	NL	Canada	International	Total
Phase				
Development	56	33	173	263
Construction	6,889	1,215	1,487	9,591
Operation and Maintenance	8,466	375	359	9,199
Decommissioning and Rehabilitation	530	17	24	570
Period (years)				
Development	1.67	1.67	1.67	--
Construction	3.50	3.50	3.50	--
Operation and Maintenance	30.50	30.50	30.50	--
Decommissioning and Rehabilitation	3.00	3.00	3.00	--
Estimated Average Headcount				
Development	34	20	104	158
Construction	1,968	347	425	2,741
Operation and Maintenance	278	12	12	302
Decommissioning and Rehabilitation	177	6	8	190

Source: (Strum Consulting, 2024)

More than 17 specific roles have been identified for the Site Preparation and Construction, Operation and Maintenance, Decommissioning and Rehabilitation phases of the Project. All phases will require the support of specialists such as environmental scientists (e.g., biologist, hydrogeologist), health and safety professionals, GIS specialists, consultation and engagement professionals, and waste management specialists.

The Project is expected to create 2,000 jobs during peak construction. Types of construction employment include project managers, engineers, welders, electricians, construction helpers, labourers, supervisors, crane operators, and heavy machinery operators. As is typical in rural areas, residents experience higher unemployment than NL generally, meaning that individuals will likely be available for work.

During Operation and Maintenance, 640 direct and indirect jobs will be created. Operation and Maintenance employment opportunities include wind turbine technicians, control room operators. As the LSA has higher unemployment than NL, residents will likely be seeking work with the Project. However, specialized training will be required for some technical aspects of the Project.

Decommissioning will include employment for construction workers and tradespeople with a smaller labour force than for construction. More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses.

11.5.4.3 Business

The Project represents a large-scale infrastructure investment of over \$14 billion. Business and industrial facilities located in and near the LSA may benefit from opportunities related to the Project. Regional businesses in other sectors may benefit from indirect and induced opportunities. Business opportunities will be realized throughout NL and Canada as well as internationally.

In general, for every dollar of spending in NL, an increase in economic output is experienced in the rest of Canada through both indirect (supply chain) and induced effects (Table 11.5.7). For every \$1.00 spent in non-residential building construction in NL, output rises in the rest of the country by 62 cents (Appendix O.1). This results in considerable economic benefits outside of the province.

The Project could impact many industries across the country (Appendix O.1). As shown in Table 11.5.7, the wholesale trade sector could receive a substantial benefit⁵ as the Project proponent and suppliers purchase goods used in the CAPEX phase. The model estimated the wholesale trade sector will generate nearly \$441 million worth of increased output (wholesale trade margins) in Canada outside NL. This includes \$186 million in the supply chain (indirect) and \$255 million from induced effects. The model predicts there will be increased output in the fabricated metal product manufacturing sector of approximately \$79 million across the country (not including international imports). This will mostly be in the supply chain (\$76 million) The truck transportation sector will see a strong increase in output across the country (\$61 million).

Table 11.5.7: Indirect and Induced Spending in the rest of Canada for Selected Industries (\$Millions)

Industry	Indirect	Induced	Indirect/ Induced Spending
Wholesale trade*	\$185.82	\$254.88	\$440.70
Fabricated metal product manufacturing	\$76.42	\$2.98	\$79.40
Other finance, insurance and real estate services	\$16.10	\$53.10	\$69.20
Truck transportation	\$40.96	\$19.94	\$60.90
Retail trade*	\$7.54	\$47.46	\$55.00
Banking services	\$9.95	\$43.75	\$53.70
Insurance carriers	\$9.62	\$37.78	\$47.40
Petroleum and coal product manufacturing	\$12.43	\$33.87	\$46.30
IT services and other professional, scientific and technical services	\$16.85	\$27.85	\$44.70
Information services	\$8.01	\$35.89	\$43.90
Administrative and support services	\$13.48	\$28.22	\$41.70

⁵ Note this represents increased industry output and not the final GDP contribution by sector.

Industry	Indirect	Induced	Indirect/ Induced Spending
Electrical equipment and component manufacturing	\$38.52	\$0.48	\$39.00
Legal, accounting and architectural, engineering and related services	\$24.70	\$12.90	\$37.60
Accommodation and food services	\$4.74	\$31.66	\$36.40
Other transportation	\$6.56	\$23.04	\$29.60
Electric power generation, transmission and distribution	\$6.00	\$14.30	\$20.30
Cement and concrete product manufacturing	\$5.76	\$0.54	\$6.30
Other	\$148.49	\$331.01	\$479.50
Total	\$631.94	\$999.66	\$1,631.30

*wholesale and retail trade margins.
Source: (Jupia Consulting, 2025)

The Economic Impact Assessment predicted for a project this size and scale, the insurance industry can expect more than a \$47 million increase in output elsewhere in the country and the IT services and other professional, scientific and technical services will benefit from nearly \$45 million in new sector output (Appendix O.1). Service industries will also benefit from this Project. A typical project such as this would boost legal, accounting and architectural, engineering and related services sector spending elsewhere in Canada by \$38 million - \$25 million in the supply chain and \$13 million from induced effects.

The economic impact on accommodation and food services will be welcomed by the business community. However, certain types of organizations and businesses providing special events and tourism excursions may experience pressure as Project-related activity may consume much of the accommodation and services typically used by leisure tourists from spring to fall. EVREC plans to hire locally as much as possible, and to house and provide support services for non-resident workers in dedicated facilities near Project sites, which is of particular importance during Site Preparation and Construction when the presence of non-resident workers will be highest.

The accommodation and food services sector will benefit from year-round business travel stimulated by the Project as well as from serving leisure tourists on a seasonal basis and these effects will also be positive for the economy and employment. However, where competition for labour exists and industrial sectors provide full-time year-round employment with higher compensation and enhanced benefits, small seasonal businesses and non-profit organizations may experience labour shortages and/or pressure to pay higher wages.

11.5.5 Mitigation and Enhancement Measures

EVREC has considered potential beneficial and adverse effects of the Project on economy, employment and business and is designing the Project to avoid or reduce adverse effects and enhance beneficial ones. Key measures to mitigate and/or enhance potential Project effects on

the economy, employment and business VC are listed in Table 11.5.8.

Management of Project effects include compliance with all Project EA conditions and municipal, provincial and federal regulatory requirements and policies that address concerns and manage issues. These include NL statutes such as Occupational Health and Safety Act, which establishes worker health and safety requirements. Other policies and guidance will also apply to the Project.

EVREC is committed to working closely with host communities in central Newfoundland to maximize benefits and address concerns about the effects of the Project. Likewise, EVERC is committed to maximizing employment, training and business opportunities in central Newfoundland and NL. As an equal opportunity employer, EVREC will also focus on diversity, equity and inclusion in all phases of the Project.

Table 11.5.8: Mitigation and Enhancement Measures: Economy, Employment and Business

Project Phase	Key Indicator	Project Mitigations / Enhancements
All	Economy	Procure goods and services provincially as much as possible to the extent that they are available.
All	Employment	Hire locally/regionally as much as possible based on availability of labour with appropriate training and skills.
		Work with education facilities to ensure appropriate training is available.
		Prepare a gender equity, diversity and inclusion plan to outline employment policies.
All	Business	Establish Benefits Agreements to support the local economy and sectors that may be affected.
		Procure goods and services locally/regionally as much as possible to the extent that they are available.
		Prepare a gender equity, diversity and inclusion plan to outline procurement policies.
Construction		Design and install infrastructure to avoid, or maximize distances, to tourism business and facilities.
		Accommodate non-resident Project workers in a dedicated facility with related-services on-site.
		Include local cultural venues and events in sponsorship programs to help alleviate any Project-related effects.

11.6 Conclusion

This chapter presents available information on the economy, employment and business in the LSA and RSA and analyzes potential effects of the Project on this VC. Residual Project effects were identified with the aid of an economic model. Detailed results are presented in the Economic Impact Assessment (Appendix O.1).

Overall, following implementation of mitigation and enhancement measures, residual effects on

economy, employment and business are positive (Table 11.6.1). Positive residual effects are anticipated for GDP, government revenues, employment, training and supply of goods and services for the Project. Mitigation and enhancement measures such as addressing the interests of communities, local and regional businesses and segments of the population generally under-represented in employment and procurement opportunities for major industrial projects will serve to improve the overall quality of life in central Newfoundland and NL. EVREC will enter into a provincial Benefits Agreement and a Gender Equity, Diversity and Inclusion Plan with the NL government as well as benefits agreements with the host community.

An evaluation of residual effects has been completed to determine significance (based upon significance definition and criteria in Section 11.5.3. Effects on economy and employment are anticipated to be positive, high and extend to the RSA – the province of NL (Table 11.6.1). Positive economic effects also extend beyond NL. These effects are of long-term duration and occur continuously across Project phases though there will be some variation by phase and within phases depending on type of activity. These effects are not subject to timing considerations as they will occur throughout the year, regardless of season. The effects are reversible as conditions for the economy and employment will be less favourable following Decommissioning and Rehabilitation. As they are all reversible, these effects on economy and employment were determined to be not significant.

Adverse residual effects of low magnitude are anticipated to be limited to some types of businesses/organizations in the culture and tourism sector during Site Preparation and Construction and to a lesser extent in Decommissioning and Rehabilitation due to potential limited services for leisure tourists in the spring to fall tourism season and upward pressure on labour supply and wages. Mitigation measures such as hiring locally and housing non-resident workers in dedicated accommodations with supporting services will help to ensure that these effects are beneficial to the accommodations and food service sector as well as cultural and tourism organizations. These effects are likely to be experienced in the LSA as NL generally has a more diverse economy and available labour for the tourism industry. The effects are anticipated to long-term, regular and affected by seasonally due to the nature of the tourism industry. The effects will be reversible following Decommissioning and Rehabilitation of the Project. These effects on business were determined to be not significant based on the significance definition and criteria.

Table 11.6.1: Economy, Employment, and Business Residual Effects

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Economy	Procure goods and services provincially	P	H	RSA	LT	C	R	Not Significant
Employment	Hire locally/regionally Prepare and implement gender equity, diversity and inclusion plan	P	H	RSA	LT	C	R	Not Significant
Business	Establish benefits agreements Procure goods and services locally/regionally Prepare and implement ender equity, diversity and inclusion plan	P	H	RSA	LT	C	R	Not Significant
Business (during site prep & construction)	Avoid, or maximize distances, to tourism business and facilities Accommodate Project workers in a dedicated facility with on-site services Establish sponsorship program for local cultural venues and events	A	L	LSA	LT	I	R	Not Significant

LEGEND (Refer to Section 5.0 for definitions)

Nature of Effect: A – Adverse, P – Positive

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

Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area

Duration: ST – Short Term MT – Medium Term, LT – Long Term

Frequency: SE – Single Event, I – Intermittent, C – Continuous

Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible

12.0 INFRASTRUCTURE & COMMUNITY SERVICES

This section provides information on relevant topics for communities, services and infrastructure. The objective of this section is to review demographic profiles of the communities to better understand the region and potential opportunities or vulnerabilities related to the Project. Municipalities, local service districts, unincorporated communities, and rural residents may be affected by construction, operations and maintenance, and decommissioning and rehabilitation of the Project.

Community services and infrastructure (such as transportation, permanent housing, temporary accommodations, education and training, childcare, health care and social supports, water and sewer services, solid waste management, utilities, communications, prevention and emergency services, and recreation) may be affected by changes in demand arising from Project activities and the presence of a large Project labour force, particularly during construction.

The EIS Guidelines (NLECCC, 2025) directs EVREC to provide information on various topics including communities, population demographic data, health services and social programs, family life, recreation and culture, education and training, fire and emergency services and housing and property values. For the EIS, these are captured in the Infrastructure and Community Services VC.

12.1 Methods

Secondary sources of information have been used to describe existing conditions. The desktop assessment accessed information from government agencies (e.g., Statistics Canada, federal departments, departments of the Government of NL and municipal governments), along with publicly available data and literature from a variety of organizations.

Much of the Infrastructure and Community Services baseline description relies on the 2021 Census of the Population. For this assessment, the PA includes the Project components in the Project Introduction, the LSA includes the communities of Botwood, Point Leamington, and Leading Tickles, and the RSA covers the central NL census divisions No.6 and No.8 (Drawing 12.1-1, Appendix A). The Census data may be suppressed to protect sensitive information in small communities and to address data quality issues. Data suppression and / or rounding may result in zero (0) where numbers and percentages are below five (5). Where relevant data were not available for the LSA or RSA, information for a comparable jurisdiction was used. For instance, as some demographic data sets are not readily available for the RSA, the area covered by Central Health Authority in the census profile has been used.

12.1.1 Key Indicators and Measurable Parameters

Key indicators and measurable parameters of the Infrastructure and Community Services are identified in Table 12.1.1. The Project may have both positive and adverse effects on this VC as population demographics may improve due to employment and business opportunities. Additionally, the presence of a major industrial project could potentially result in increased demand for and/or improved access to services.

Table 12.1.1: Measurable Parameters for Infrastructure and Community Services

Key Indicator	Scope	Measurable Parameters
Population demographics	The Project has the potential to affect demographic trends particularly locally.	Population growth / trends Age Migration Diversity Education Income
Services and Infrastructure	The Project has the potential to affect the capacity, availability and affordability of services and infrastructure, particularly locally but also in the RSA.	Availability and/or affordability of: • Housing • Health and social services • Water and sewer • Waste management • Transportation • Utilities and communications • Prevention and emergency services • Recreation

12.1.2 Issues and Opportunities

Table 12.1.2 identifies issues and opportunities by key indicator, which will be discussed in following sections. Key issues identified for the Project reflect the primary concerns raised by regulatory authorities, Indigenous groups, stakeholders, residents, business owners and interested parties.

Table 12.1.2: Key Indicators for Infrastructure and Community Services

Key Indicator	Issues, Concerns and Opportunities
Population demographics	The ageing population may be unable to supply adequate labour for the Project resulting in potential gains of new and younger people to the region.
Services and Infrastructure	Existing electrical, water and sewage infrastructure Potential effects on demand and costs of housing and accommodation Potential effects on demand for community services and infrastructure, particularly health care, child care, education and emergency services Potential effects on transportation infrastructure and an increase in road traffic

12.2 Existing Community Setting

Information was obtained from various sources, including municipal, provincial and federal government departments/agencies and websites of businesses, service providers and industry organizations, to better understand current trends in services and infrastructure. An overview of key sources of information for the EIS follows:

- Environmental Impact Statement Guidelines: Botwood and Area EVREC Green Energy Project, Botwood Area, NL (NLECCC, 2025).
- Environmental Assessment Registration Document: EVREC Green Energy Hub.
- Federal agencies (Statistics Canada, Canada Mortgage and Housing Corporation, Royal Canadian Mounted Police).
- Government of NL and its departments and related agencies (i.e., Department of Finance, Department of Social Supports and Well-Being, Department of Education and Early Childhood Development, Department of Environment, Conservation, and Climate Change, Department of Health and Community Services, Department of Jobs, Growth and Rural Development, Department of Transportation and Infrastructure, Department of Tourism, Culture, Arts and Recreation, NL Hydro, NL Statistics Agency, NL Health Services, NL Tourism, NL Public Libraries, NL Fire and Emergency Services, NL Schools, Conseil scolaire francophone provincial, Central Health, Legal Aid Commission).
- Municipalities and regional agencies (i.e., Town of Botwood, Town of Point Leamington, Town of Bishop's Falls, Town of Grand Falls-Windsor, Town of Lewisporte, Town of Gander, Central Regional Services Board, Explore Exploits).
- Media outlets (i.e., CBC News, The Canadian Press, The Globe and Mail).
- Internet and cellular phone service providers (i.e., Bell Aliant, Rogers, Eastlink).
- Education and training providers (i.e., College of the North Atlantic, Corona College, DieTrac Technical Institute, Gander Flight Training, Keyin College, Memorial University).
- Non-profit agencies (i.e., Canadian Institute for Health Information, Food Banks Canada, T'Railways Association, United Way, Canadian Centre for Policy Alternatives, The Canadian Encyclopedia).

Where possible, quantitative information has been provided to indicate the capacity and availability of services and infrastructure. This is supplemented by qualitative data and insights gained through engagement for the EIS.

12.2.1 Demographic Profile

As discussed, the LSA includes Botwood, Point Leamington and Leading Tickles. The RSA includes Census Division No.8, and Census Division No.6. Between 2016 and 2021, the population of the LSA, RSA and NL decreased (Table 12.2.1). The province has experienced general trends of out-migration and low birth rate, which result in declining and ageing population.

Table 12.2.1: Population Change

Community/Area	Population		Change	
	2016	2021	#	%
LSA	3,758	3,648	110	-2.97%
RSA	74,139	71,279	2,860	-3.93%
NL	519,550	510,550	9,166	-1.8%
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)				

For the province, the median age of the population rose by 5% in a 10-year period from 46 years in 2011 to 48.4 years in 2021 (Statistics Canada, 2023b). In 2021, the median age in NL was 13.2 years younger than that of Point Leamington, marking the largest age gap of the LSA (Table 12.2.2).

Table 12.2.2: Population Average/Median Age (2021)

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickles	Division No.8	Division No.6	
Median age	56.4	61.6	59.6	55.6	50.0	48.4
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

12.2.1.1 Natural Population Change

In 2021 and 2022, the number of deaths in the Central Health Authority exceeded births resulting in net natural population decline (Table 12.2.3). Similar trends have been experienced in NL generally especially in rural areas. The data also confirm that newcomers from other provinces or countries are the source of population stability/growth in the province.

Table 12.2.3: Births versus Deaths, Central Health Authority and NL

Indicator	Central Health Authority		NL	
	2021	2022	2021	2022
Births	540	525	3,900	3,585
Deaths	1,210	1,360	5,820	6,375
Net	-670	-835	-1,920	-2,790
Sources: (Newfoundland and Labrador Statistics Agency, n.d.-a, n.d.-b)				

12.2.1.2 Family Life

For each jurisdiction examined, the proportion of couple families in 2021 exceeded that of one-parent families (Table 12.2.4). Among couple families, the proportion without children exceeded those with children across each jurisdiction, with the higher percentage of couple families without children in Point Leamington. One-parent families accounted for a smaller share of households. Among one-parent families, women+ were far more likely than men+ to head a household.

Table 12.2.4: Census Family⁽¹⁾ Private Households (2021)

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
Total couple families (%)	84.2	90.2	95.0	89.1	84.6	84.2
Total with children (%)	19.8	22.0	25.0	23.0	26.2	28.6
Total without children (%)	50.8	61.0	60.0	53.3	43.4	40.0
Total one-parent families (%)	15.8	9.8	5.0	10.9	15.5	15.8
In which the parent is a woman+ (%)	12.4	9.8	5.0	8.3	12.0	12.3
In which the parent is a man+ (%)	3.4	0	5.0	2.6	3.4	3.5
¹ A census family is defined as a married couple (with or without children), a common-law couple (with or without children) or a one-parent family (Statistics Canada, 2023a). "Men+" include men (and/or boys), as well as some non-binary persons, and "women+" includes women (and/or girls), as well as some non-binary persons (Statistics Canada, 2023a). These data do not appear to total are likely affected by rounding. Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

For each jurisdiction examined, the percentage of one person households in 2021 was higher than those living with others (Table 12.2.5). In each jurisdiction, persons living alone were most often identified as women+.

Table 12.2.5: Non-Census⁽¹⁾ Family Private Households (2021)

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
Living alone (%)	13.2	12.3	12.1	11.4	12.5	12.4
Living with other relatives (%)	1.9	0.9	1.7	1.5	1.8	2.1
Living with non-relatives only (%)	2.1	0.9	0	1.6	2.4	3.3
¹ Non-census-family households are either one person living alone or a group of two or more persons who live together but do not constitute a census family. Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

In the 2021 to 2023 period, life expectancy at birth in NL was 81.24 years for females and 77.11

for males (Statistics Canada, 2026). Since 2017, life expectancy has decreased for males (from 77.97) and for females (from 81.98). Declines in life expectancy for both sexes have been most evident since 2019.

12.2.2 Migration

Table 12.2.6 shows in-migration data over the previous year (2020) in the LSA, RSA, and NL.

Table 12.2.6: Migration Status⁽¹⁾ One Year Ago (2021)

Migrants	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
# people	10	0	0	215	645	20,180
%	0.4	0	0	0.6	1.8	4
¹ In the Canadian Census of Population (2021, 2016), migrants include internal migrants, who moved to a different city, town, township, village or Indian reserve within Canada. External migrants include persons who lived outside Canada at the earlier reference date. Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

12.2.3 Indigenous Population

In the 2021 census, Botwood had the highest percentages of population with Indigenous identity and/or ancestry in the LSA (Table 12.2.7).

Table 12.2.7: Indigeneity Indicators 2021

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
Indigenous identity ¹ (%)	3.8	2.3	0	4.3	7.1	9.3
Indigenous ancestry (only) ² (%)	5.8	1.5	0	3.4	4.9	6.3
Indigenous and non-Indigenous ancestries ³ (%)	4.5	0	0	2.8	4.6	5.4
¹ This category includes persons who identify as First Nations (North American Indian), Métis and / or Inuit (Inuit) and / or those who report being Registered or Treaty Indians (that is, registered under the Indian Act of Canada), and / or those who report having membership in a First Nation or Indian band. ² 'Indigenous ancestry (only)' includes persons who have First Nations (North American Indian), Métis and / or Inuit ancestry. It excludes persons with non-Indigenous ancestry. ³ 'Indigenous and non-Indigenous ancestries' includes persons who have First Nations (North American Indian), Métis and / or Inuit ancestry, as well as non-Indigenous ancestry. Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

12.2.4 Diversity

Several diversity criteria have been selected for the study areas based on the 2021 census (Table 12.2.8). In the LSA, few to no individuals indicated being an immigrant or part of a visible minority, compared to the RSA. In 2021, people in the RSA identify as being part of a visible minority originating from countries in Asia, Africa and the Middle East.

Table 12.2.8: Selected Diversity Indicators 2021

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickles	Division No.8	Division No.6	
Immigrants ¹ (%)	0.4	0	0	0.6	1.8	2.8
Visible minorities ² (%)	0	0	0	0.4	2.0	3.4
¹ 'Immigrants' includes persons who are, or who have ever been, landed immigrants or permanent residents. Such persons have been granted the right to live in Canada permanently by immigration authorities. ² The Canada Employment Equity Act defines 'visible minorities' as "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in color." The visible minority population consists mainly of the following groups: South Asian, Chinese, Black, Filipino, Arab, Latin American, Southeast Asian, West Asian, Korean and Japanese.						
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

12.2.5 Education

In 2021, people in the LSA had a lower tendency towards pursuing a university education than in the RSA and NL generally (Table 12.2.9). However, residents of the LSA had a higher incidence of engagement in apprenticeship than NL residents. A higher proportion of the LSA residents had no certificate, diploma or degree, including high school completion or equivalency compared to NL.

Table 12.2.9: Education of Individuals Aged 25 to 64 Years (2021)

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickles	Division No.8	Division No.6	
No high school diploma or equivalency certificate (%)	25.5	28.3	27.0	28.4	15.6	14.4
Apprenticeship or trades certificate or diploma (%)	13.5	8.2	0	12.2	11.6	11.2
Bachelor's degree or higher (%)	3.0	0	0	4.5	10.3	13.4
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

Women+ had higher high school and university education achievement levels than men+ in the LSA, RSA and NL (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c). In each jurisdiction, men+ were more likely to hold an apprenticeship or trades certificate or diploma than women+.

Major fields of study are shown in Table 12.2.10. In 2021, the most common field of study in NL

was “Architecture, Engineering and Related Trades”, largely dominated by men+. Women+ were more likely to be educated in “Education”, “Business Management and Public Administration” or “Health and Related Fields”.

Table 12.2.10: Major Field of Study for Population Aged 25-64 Years (2021)

Indicator		LSA			RSA		NL
		Botwood	Point Leamington	Leading Tickles	Division No.8	Division No.6	
Education (%)	Men+	4.0	3.6	0	2.6	2.6	2.2
	Women+	6.1	4.7	5.6	4.1	5.8	6.0
Humanities (%)	Men+	0	0	0	0.9	1.2	1.7
	Women+	1.2	4.7	0	1.1	1.2	2.2
English language and literature/ letters (%)	Men+	0	0	0	0.1	0.3	0.4
	Women+	0	0	0	0.2	0.3	0.6
Social and behavioral sciences and law (%)	Men+	0	0	0	0.5	1.3	2.6
	Women+	2.0	0	0	2.3	3.6	6.5
Business, management and public administration (%)	Men+	2.2	3.6	0	1.8	4.9	6.5
	Women+	12.7	10.9	13.9	9.7	16.1	20.5
Physical and life sciences and technologies (%)	Men+	0	0	0	0.7	1	1.6
	Women+	0	0	0	0.3	0.9	1.6
Mathematics, computer and information sciences (%)	Men+	1.3	0	0	0.8	1.3	3.1
	Women+	0.8	0	0	0.6	1.3	2.3
Architecture, engineering, and related trades (%)	Men+	21.9	23.2	10.7	19.5	23.8	29.1
	Women+	0	0	0	0.9	1.0	3.3
Agriculture, natural resources and conservation (%)	Men+	0	0	0	1	1.5	1.5
	Women+	0	0	0	0.4	0.6	1.1
Health and related fields (%)	Men+	1.8	3.6	0	1.4	3.7	3.3
	Women+	14.8	7.8	8.3	8.4	15.5	15.4
Personal, protective and transportation services (%)	Men+	5.8	3.6	14.3	8.0	8.1	8.8
	Women+	4.1	0	0	3.6	3.9	4.7
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)							

12.2.6 Employment and Income

Based on the size of the labour force, the most important industries (Statistics Canada, 2024b) in the RSA and NL in 2020 were “Health care and social assistance,” “Retail trade,” “Public administration,” “Construction,” and “Educational services” (Table 12.2.11). Detailed data were not available for the LSA. In the RSA and NL, these industries made up nearly 53% of employment in 2020. Representation of men+ and women+ varies by economic sector and often follows gender norms though these are more pronounced in NL compared to the RSA.

Table 12.2.11: Labour Force by Industry and Gender (2020)

Sector	RSA (%)						NL (%)		
	Division No.8	Men+	Women+	Division No.6	Men+	Women+	NL	Men+	Women+
Agriculture, forestry, fishing and hunting (%)	11.2	15.2	6.9	1.4	2.2	0.8	3.9	5.8	1.9
Mining, quarrying, and oil and gas extraction (%)	6.9	12.5	0.7	3.1	5.7	0.5	4.0	6.6	1.3
Utilities (%)	0.4	0.7	0.2	1.2	2.2	0.2	1.1	1.7	0.6
Construction (%)	10.5	18.1	1.9	6.4	11.8	1.1	8.0	13.9	1.8
Manufacturing (%)	8.3	8.6	8.0	2.4	3.3	1.6	4.8	6.4	3.1
Wholesale trade (%)	1.1	1.4	0.7	1.7	2.9	0.5	2.0	2.9	1.0
Retail trade (%)	10.2	7.4	13.3	16.4	15.1	17.7	12.3	10.7	14.0
Transportation and warehousing (%)	5.1	7.3	2.7	6.5	10.3	2.8	4.9	7.2	2.4
Information and cultural industries (%)	0.3	0.1	0.3	0.9	1.2	0.7	1.1	1.2	1.0
Finance and insurance (%)	1.3	0.6	2.0	1.3	0.8	1.7	1.9	1.2	2.6
Real estate and rental and leasing (%)	0.4	0.6	0.3	0.8	0.8	0.6	0.9	1.0	0.7
Professional, scientific and technical services (%)	1.6	2.0	1.2	2.8	2.9	2.6	4.7	5.4	4.0
Management of companies and enterprises (%)	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1
Administrative and support, waste management and remediation services (%)	2.4	2.9	1.8	2.5	3.2	1.9	2.4	3.6	2.5
Educational services (%)	5.0	2.9	7.4	5.9	3.2	8.5	5.7	4.5	9.7
Health care and social assistance (%)	16.1	3.2	30.5	22.5	8.6	36.0	19.4	5.6	27.9
Arts, entertainment and recreation (%)	0.6	0.8	0.5	1.5	1.7	1.4	1.1	1.5	1.6
Accommodation and food services (%)	5.3	2.9	8.1	6.7	5.1	8.3	5.9	4.9	7.8
Other services (except public administration) (%)	3.7	3.3	4.2	4.3	4.7	3.8	4.0	3.8	4.3
Public administration (%)	6.3	7.0	5.6	8.1	10.3	6.0	7.6	8.8	9.1
Other	N/A	N/A	N/A	N/A	N/A	N/A	2.8	3.1	2.6
1. The proportion of individuals aged 15 and older in the labour force who have been employed at any time between January 1, 2020, and May 8, 2021. 2. Other includes unemployed persons aged 15 years and over who have never worked for pay or in self-employment, or who had last worked prior to January 1, 2020. Source: (Statistics Canada, 2023a, 2023b)									

Regional service centres in the RSA, like Grand Falls-Windsor and Gander, have concentrations of larger organizations, including provincial government offices, medical diagnostic and treatment facilities, post-secondary institutions and businesses that employ many people. Details on medical facilities and post-secondary institutions are provided in Section 12.3.

In 2021, employment rates in the RSA and NL were similar for men+ and women+ (Table 12.2.12). The unemployment rate for women+ was lower than men+ in Division No.8, Division No.6, and NL. In each jurisdiction, men+ were more likely to be engaged in part-time, casual, short-term or seasonal work, and women+ were more likely to be employed in full-time, year-round and permanent positions. This could be attributed to higher participation of men+ in the construction (short-term) and fishing (seasonal) industries. The self-employment rate is relatively low for the overall population but remains three times higher for men+ than women+.

Table 12.2.12: Labour Force and Employment (2021)

Indicator	RSA				NL	
	Division No.8		Division No.6		Men+	Women+
	Men+	Women+	Men+	Women+		
Labour force participation rate (%)	48.4	42.3	54.4	52.6	58.6	53.7
Employment rate (%)	35.1	32.9	42.7	45.7	48.1	47.0
Unemployment rate (%)	27.4	22.2	21.5	13.1	18.0	12.4
Worked full year full time (%)	13.7	15.0	27.0	25.6	28.2	26.8
Worked part of year and/or part time (%)	39.9	30.9	29.2	27.0	32.2	28.2
Permanent position (%)	46.4	55.8	62.8	71.6	59.8	66.5
Casual, seasonal or short-term position (less than 1 year) (%)	39.4	30.9	20.5	15.4	23.0	18.3
Self-employed (%)	7.6	5.4	9.2	5.1	9.4	6.5
Source: (Statistics Canada, 2023a, 2023b)						

In 2020, the median total income of households in NL was \$71,500, while it was an average of \$56,266 in the LSA (Table 12.2.13). Other aspects of employment and income including the gender wage gap are presented in Section 11.0 of the Economy, Employment and Business VC.

Table 12.2.13: Median Total Income of Households (2020)

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
Median total income of households (\$)	54,800	55,200	58,800	57,600	67,000	71,500
Median total income among recipients (\$)	29,800	28,800	30,800	29,400	35,200	36,800
Median employment income in 2020 among recipients (\$)	24,000	22,400	13,500	20,200	30,000	31,600
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

12.3 Services and Infrastructure

The introduction of development projects can affect usage and availability of services and infrastructure. Generally, permanent population increases, with a higher number of households

and families, result in demand for housing, education, health care, childcare and recreation, as well as usage and capacity of water, sewerage, solid waste, communications and utilities. Population increase may also enhance the tax base and ability of communities to offer services. Temporary population increases (e.g., for a large-scale construction project) also result in increased demand for services and infrastructure, but mainly for water, sewerage, solid waste, communications and utilities, though they may also affect housing and transportation services and infrastructure depending on how non-resident workers are housed and transported during construction.

12.3.1 Transportation

The RSA is connected by road, air and marine transportation services and infrastructure. Each community is accessed via roads off the Trans-Canada Highway (TCH), which is managed by NL Department of Transportation and Infrastructure. In 2024, the Government of NL announced a federal/provincial investment in the TCH that will result in the expansion of approximately 15-kilometre section of the TCH between Bishop's Falls and Grand Falls-Windsor in the RSA (NLDOTI, 2024). Bush-clearing between Route 350 and Grand Falls-Windsor began in 2024. The government is seeking a proponent to design, construct, finance, and maintain the highway section as a public-private partnership.

The nearest airports with regularly scheduled services are Gander International Airport and Deer Lake Regional Airport (NLDOTI, 2026a). These airports are owned by Transport Canada and operated by airport authorities (i.e., Gander International Airport Authority and Deer Lake Regional Airport Authority Inc.). Landing strips are found at Fogo Island and Exploits Valley. Heliports are at Grand Falls-Windsor and in Gander at James Paton Memorial Regional Health Centre (SkyVector, 2026a, 2026b). The largest airport in Newfoundland, St. John's International Airport (also owned by Transport Canada) is operated by St. John's International Airport Authority.

The Port of Botwood is a marine industrial port owned and operated by the Exploits Valley Port Corporation, which took control of the port infrastructure from Transport Canada in 2014 (Régimbal, 2014; VesselFinder, 2026). The Town of Lewisporte owns and operates the Deep Sea Port at Lewisporte following divestiture from the province of NL in 2023 (CBC News, 2023; Town of Lewisporte, n.d.-a). Ferry services transport freight, vehicles, and passengers to and from Long Island/Pilley's Island, and Fogo Island/Change Islands/Farewell all owned and operated by the NL Department of Transportation and Infrastructure (NLDOTI, 2026b).

12.3.2 Housing and Accommodation

In 2016, the LSA had 1,919 total private dwellings with 1,667 (86%) of total private dwellings occupied by usual residents (i.e., dwellings in which a person or a group of persons is permanently residing; Table 12.3.1; Statistics Canada, 2022a, 2022b, 2023).

Table 12.3.1: Household and Dwelling Characteristics (2021)

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
Single-detached house (%)	83.2	92.9	100.0	91.6	71.5	72.3
Semi-detached house (%)	6.4	1.8	0	2.1	5.7	3.9
Row house (%)	4.8	0	0	2.5	6.8	4.8
Apartment or flat in a duplex (%)	1.6	0	0	1.2	8.0	12.3
Apartment in a building that has fewer than five stories (%)	3.2	5.4	0	2.0	7.1	5.5
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

The 2021 home ownership rate for Canada was 66.5% a reduction of 2.5% from 2011 (Statistics Canada, 2022a). NL had the highest rate of home ownership (75.7%) among the provinces and territories in 2021, but the rate decreased by 1.8% in a 10-year period (i.e., 77.5% in 2011). The LSA had a slightly higher rate of home ownership and a lower rate of households with mortgages than NL in general (Table 12.3.2). Notably, Leading Tickle had the highest percentage of homeowners with the second lowest percentage of owner households with mortgages.

Table 12.3.2: Home Ownership (2021)

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
Household owner (%)	71.2	83.1	96.8	85.7	70.3	75.7
Household renter (%)	28.8	16.9	6.5	14.3	29.7	24
Owner households with a mortgage (%)	49.7	15.1	17.2	27.1	54.9	47.4
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

Housing conditions are generally favourable in the LSA, RSA and NL. For each jurisdiction, in 2021 a high proportion of housing was considered suitable and not in need of major repairs (Table 12.3.3). Overcrowding is not likely as the communities showed small percentages of households (i.e., Botwood: 3.4% and Point Leamington: 2.4%) with five or more persons in 2021 (Statistics Canada, 2022c, 2023c). The average household size was similar in the LSA, RSA and NL.

Table 12.3.3: Housing Suitability (2021)

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
Suitable housing (%)	99.2	100.0	100.0	99.0	98.6	98.3
Unsuitable housing (%)	0.8	0.0	0.0	1.0	1.5	1.7
In need of major repairs (%)	7.2	13.8	9.7	7.2	5.5	5.5
Average household size (people) (%)	2.1	2.1	2.1	2.2	2.2	2.3

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickles	Division No.8	Division No.6	
Multigenerational households (%) ¹	1.6	0	0	1.3	1.7	2.0
5 or more people within a household (%)	3.4	2.4	0	3.2	3.8	4.1
¹ "Multigenerational households represent all households where there is at least one person who is both the grandparent of a person in the household and the parent of another person in the same household. They also represent all households where there is at least one person who is both the child of a person in the household and the grandchild of another person in the same household."						
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

Households in core housing that live in unsuitable, inadequate or unaffordable dwellings cannot afford alternative housing in their community (Statistics Canada, 2023b). Renters in Canada are more than four times as likely to be in core housing need than homeowners, core housing needs are higher in urban areas and more than one in ten households has more than one housing challenge (e.g., financial, repairs, crowding; Statistics Canada, 2023). In NL, 4% of owner-households were in core housing need in 2021 and renters (at 20.8%) were five times as likely to be in core housing need.

In central Newfoundland, several agencies help to address housing needs. The NL Housing and Homelessness Network and Canadian Mental Health Association – Central Region/Central Housing and Homelessness Program provide support for individuals experiencing, or at risk of, homelessness (NL Housing and Homelessness Network, 2026). NL Housing Corporation provides subsidized rent-controlled housing based on income, support for homeowners for repairs and modifications (e.g., energy efficiency, accessibility), funding for first-time home buyers, grants for installation of secondary apartments (NLHC, 2019). Funding is also available for contractors, developers and non-profit groups to supply low-income housing, social housing and supportive living housing.

12.3.2.1 Housing Cost and Affordability

In NL, the average value of dwellings increased by 1.5% from 2016 to 2021. In contrast, the LSA experienced an increase in average dwelling values during the same period (i.e., Botwood: 15.71%, Point Leamington: 10.87%, Leading Tickles: 10.40%; Statistics Canada, 2017a, 2017b). Housing is more affordable in the LSA (Table 12.3.4). This is generally true in more rural areas.

Table 12.3.4: Housing Value and Monthly Costs

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickles	Division No.8	Division No.6	
Median value of dwellings (\$)	155,000	125,000	85,000	120,000	200,000	240,000
Median monthly shelter costs for owned dwellings (\$)	628	396	436	412	860	750
Median monthly shelter costs for	760	650	N/A	710	850	870

rented dwellings (\$)						
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

Despite the increase in housing value and rents in NL, the proportion of people spending 30% or more of their income on housing decreased between 2016 and 2021 (Table 12.3.5). The LSA had slightly fewer residents spending 30% or more of their income on housing compared to the RSA though the percentage of renters spending 30% or more of their income on was at least three times higher than homeowners. In 2021, the proportion of tenant households receiving housing subsidies in the LSA was similar to that in the RSA and NL.

Table 12.3.5: Housing Affordability

Indicator	LSA			RSA		NL
	Botwood	Point Leamington	Leading Tickle	Division No.8	Division No.6	
Owner households spending 30% or more of income on shelter (%)	9.0	7.5	0	5.0	9.2	8.9
Tenant households spending 30% or more on income on shelter (%)	28.8	0	N/A	31.7	34.4	32.5
Tenant households in subsidized housing (%)	21.9	36.4	N/A	18.0	20.5	19.6
Source: (Statistics Canada, 2022a, 2022b, 2023a, 2023b, 2023c)						

12.3.2.2 Short-Term Accommodations

NL Tourism lists nearly 225 facilities offering short-term accommodations in the RSA (NL Tourism, 2025a). Most of the accommodations are cottages, Bed and Breakfast and small inns, that likely cater to vacationers. Short-term rentals in private housing are also available but may not be comprehensively listed on the provincial tourism website.

Various accommodation options are available close to the PA with the most capacity in Gander (Table 12.3.6). Other facilities are in nearby communities (e.g., Bishop's Falls, Botwood and Point Leamington).

Table 12.3.6: Short-term Accommodations in the LSA

Name	Location	Capacity
Brookdale Country Inn	Bishop's Falls	7 bedrooms, meeting facilities
Exploits River Motel	Bishop's Falls	22 bedrooms
Carriage House Inn	Grand Falls-Windsor	13 bedrooms
Hill Road Manor Bed & Breakfast	Grand Falls-Windsor	6 bedrooms, business services centre
Hotel Robin Hood & Suites	Grand Falls-Windsor	22 bedrooms
Mount Peyton Resort & Conference Centre	Grand Falls-Windsor	101 hotels rooms, 32 motel rooms, and 16 efficiency units, business services centre, meeting facilities

Name	Location	Capacity
Albatross Inn	Gander	88 rooms, meeting facilities
Comfort Inn	Gander	79 rooms, business services centre
Quality Hotel & Suites	Gander	137 rooms, business services centre, meeting facilities
Sinbad's Hotel and Suites	Gander	107 rooms
Irving West Hotel	Gander	26 rooms
Source: (NL Tourism, 2026a)		

12.3.3 Education and Training

The NL English School District operates more than 250 public schools throughout the province with a 2024-2025 enrolment of over 63,000 English-speaking students (NLSchools, 2026a). Conseil scolaire francophone has six public schools (two in St. John's, two in western Newfoundland, and two in Labrador), with a total enrolment of more than 350 students (Conseil Scolaire Francophone Provincial, n.d.).

Four schools are in the LSA, Botwood has two schools (i.e., Botwood Collegiate and Memorial Academy), Leading Tickles has one (i.e., Leading Tickles Primary), and Point Leamington has one school (i.e., Point Leamington Academy; NLSchools, 2026). Additional schools are in the surrounding towns and areas.

Since 2020, enrollment at schools in the LSA remained relatively stable with the highest enrollment, a total of 610 students, in the 2023–2024 academic year (NLDE, n.d.-c). Botwood had the highest number of enrolled students in its two schools, followed by Point Leamington. Leading Tickles had the lowest enrollment, with just two students registered in each year since 2020. Schools across NL, particularly those in rural and remote areas, are facing persistent challenges in teacher recruitment (Kennedy, 2024).

The College of the North Atlantic (CNA) is a public college with 17 campuses across NL, including Baie Verte, Gander, and Grand Falls-Windsor in the RSA (CNA, 2026). The CNA system offers a diverse range of programs, including Aircraft Maintenance and Structural Technician, Automotive Service Technician, Accounting, College Transition, Early Childhood Education, Construction Craftworker, Hairstylist and Practical Nursing, Mental Health and Addictions, and Human Resources at the Gander and/or Grand Falls-Windsor campuses.

Two private colleges offer post-secondary education in the RSA. Keyin College has five campuses in NL (Keyin, 2026). The Grand Falls-Windsor and Gander campuses offer programs in health and personal care, business and applied arts, information technology and adult basic education through in-person and online learning. Corona College offers Adult basic education (ABE) in Grand Falls-Windsor and in Norris Arm (Corona College, 1987).

DieTrac Technical Institute offers industrial trade training programs in Lewisporte, such as carpenter, construction electrician, heavy duty equipment technician, industrial electrician and instrument mechanic, powerline technician, small engine service technician, Steamfitter/Pipefitter, and welder (DieTrac Technical Institute, 2026).

Gander Flight Training offers various flight training programs including commercial pilot training (Gander Flight Training, 2025). The school, which is affiliated with Exploits Valley Air Services, is also an official Cessna Aircraft Service Center.

Memorial University of Newfoundland and Labrador (Memorial University), which is the province's only university, has six campuses: three in St. John's and one in each of Corner Brook, Happy Valley-Goose Bay, and Harlow, United Kingdom (Memorial University, 2026a). Memorial offers programs granting certificates, diplomas, and degrees (undergraduate, graduate, and post-graduate) through in-person and online programs. Programs are provided in various faculties and schools (e.g., Arctic and Subarctic Studies, Arts and Social Science, Business Administration, Education, Engineering and Applied Science, Fine Arts, Humanities and Social Sciences, Human Kinetics and Recreation, Maritime Studies, Medicine, Music, Nursing, Ocean Technology, Pharmacy, Science, Science and Environment, Social Work). A French immersion program is offered in Sainte-Pierre-et-Miquelon, a French collectivity off the south coast of Newfoundland (Memorial University, 2026b).

12.3.3.1 Childcare

The NL Department of Education (NLDE) lists regulated early learning and childcare services including childcare centres, family childcare homes and family childcare agencies. Many are in the RSA, mostly in Grand Falls-Windsor and Bishop's Falls (NLDE, n.d.-b).

Botwood has one childcare centre. Nearby communities within the RSA provide additional childcare facilities. Grand Falls-Windsor offers nine childcare centres, including a YMCA centre that offers pre-kindergarten programs on behalf of the Government of NL as part of the Federal-Provincial Early Learning Action Plan (NLDE, n.d.-b). Bishop's Falls offers three childcare centres, including a YMCA centre, Lewisporte has two childcare centres, including one pre-kindergarten program, and Gander has seven childcare centres, including one pre-kindergarten program. It is likely that informal childcare arrangements exist with family and/or friends as caregivers.

NL faces a childcare shortage, particularly in rural communities (Friendly & Macdonald, 2023). Many families struggle to find available spaces, with nearly 80% of young children living in areas classified as "child-care deserts".

12.3.4 Health Care and Social Support

NL Health Services is the direct provider of health care to residents throughout the province on behalf of the NL Department of Health and Community Services (NLHCS, 2026c). The Project is within the Central Health Authority area.

In the RSA, NL Health Services provides acute care at two hospitals, two health centres and six community clinics (NLHCS, 2026a). Emergency medical services are offered in Grand Falls-Windsor (Central Newfoundland Regional Health Centre) and Gander (James Paton Memorial Regional Health Centre). The Town of Botwood has one health centre (Dr. Hugh Twomey Health Care Centre) offering long-term care, emergency services and diagnostic services (Town of

Botwood, 2026c). Emergency departments across Canada are experiencing temporary or permanent closures due to staffing shortages (Sun et al., 2025). Central NL has been impacted as well, including closures at the Lewisporte Health Centre. Virtual emergency rooms have been developed to help ensure emergency coverage to departments experiencing challenges with coverage (NLHCS, 2026a).

NLHCS provides integrated road ambulance services through 911, which connects to the Provincial Medical Communications Centre (NLHCS, 2026a). The NLHCS provides provincial air ambulance services through two dedicated King Air 350 airplanes and supplementary aircraft along with contracted helicopter services in areas not accessible by fixed wing aircraft (NLHCS, n.d.).

While location specific information is not available in the RSA, the Provincial health care system was compared to Canada in 2024 (Canadian Institute for Health Information, n.d.). NL performance on availability of a regular health care provider was slightly lower than the Canadian average, while the province rated higher for access to hip fracture surgery. Wait times for mental health counselling were longer in NL than Canada generally. In 2023-2024, NL faced a median wait time of 51 days for mental health counselling, twice as long as the national median of 25 days.

12.3.4.1 Social Programs

The NLHCS delivers support programs in addition to the acute health care system. Publicly funded community-based services are provided in clinics by social workers, counselors, nurses and other health professionals to promote and protect health and provide services for mental health and addictions counselling for youth and adults (NLHCS, 2026b).

NLHCS services include prenatal and postnatal care, adoptions, child protection and youth corrections (NLHCS, 2026c). Programs address concerns with development/behavior, disabilities, mental health, communicable diseases, immunization, access to health care and treatment of youth with complex mental health needs. Various programs (e.g., prescription drug plan, dental and vision) are provided to those in need and not covered by private insurance. Advice and referrals are provided through the provincial 811 Healthline service.

Health care programs focus on conditions that affect a large proportion of the population (NLHCS, 2026c). Chronic conditions such as arthritis, cancer, chronic pain, diabetes, heart disease, kidney disease, lung disease and stroke, often share risk factors (e.g., tobacco use, physical inactivity, unhealthy eating, excessive alcohol use).

In NL, care for seniors and people with disabilities is provided in private homes, personal care homes and long-term care facilities. In the RSA, 26 personal care homes are in various locations, including Gander, Lewisporte, Grand Falls-Windsor, Bishop's Falls and Twillingate (NLHCS, 2026c). Seven long term care facilities are found in Botwood, Gander, Lewisporte, Grand Falls-Windsor, Badger and Springdale. While many seniors and people with disabilities are cared for in their homes, a shortage of home care workers has been reported due to low wages, wage

discrepancies and challenging working conditions (Whitten, 2025).

NL Health and Community Services, Mental Health and Addictions Division provides mental health and addictions programs through NL Health Services and community-based organizations (NLHCS, 2026b). Mental health and addictions services include Doorways, which offers access to counselling (in-person, by phone or video call) without referral (NLSA, n.d.). Free naloxone kits are distributed in case of opioid overdoses. “Bridge the gApp” is an online platform offering self-help information, programming and a directory of services, and the 811 Healthline is also available for mental health crises or addictions (2026).

Family Resource Centres (FRCs) can be found in communities near the PA with satellite locations (i.e., Botwood, Bishop's Falls and Grand Falls-Windsor; NLDE, n.d.). FRCs are community-based organizations funded by the NLDE to deliver programs to promote positive parent-child interactions intended to support healthy child development (NLDE, n.d.-a).

The NL Department of Children, Seniors and Social Development (NLCSSD) offers services, such as an Income Support Program for low-income individuals and families. The NLCSSD provides loans, grants and scholarships for youth-serving community organizations (NLCSSD, n.d.). Employment support is available through Employment Assistance Services, which helps with job search and interview preparation (NLJGRD, 2026). Legal advice and representation are provided by the Legal Aid Commission. The Child Care Subsidy Program provides financial assistance to allow low-income families to access affordable childcare.

Community-based organizations in the RSA provide services to those in need. For instance, the Salvation Army operates a thrift store in Grand Falls-Windsor (Status of Women Central, 2026). The Botwood Interfaith Goodwill Center offers a thrift and consignment store. The Salvation Army operates food banks in Grand Falls-Windsor, Botwood, Bishop's Falls, Lewisporte and surrounding areas (United Way of Canada, n.d.). Usage data were not available, but food security is most often attributed to having low income and increased cost of living. Food prices have increased and demand at Canada's food banks has peaked to previously unseen levels. In 2024, food bank usage in NL increased by 6% compared to 2023 and by more than 90% since 2019. In NL, an increase of 33% in total visits was experienced between 2019 and 2024 and more than 44% since 2019 (Food Banks Canada, 2026). However, total visits to food banks in NL decreased by 7.71% between 2023 and 2024.

Resources are available for individuals experiencing specific challenges. While many services are provided on a provincial basis, some are physically present in central Newfoundland. Status of Women Central in Grand Falls-Windsor offers information, support services and programs for women and non-binary individuals and provides advocacy and input into issues and initiatives (Status of Women Central, 2026). Cara Transition House in Gander provides a 24-hour crises telephone line, a 13-person emergency shelter and second stage housing (Cara Transition House, 2025). Grand Falls-Windsor Pride (Pride GFW) provides support to the LGBTQ+ community in Central NL through education, advocacy and events (Pride GFW, 2024). Violence Prevention South and Central is in Grand Falls-Windsor (CMHA Newfoundland and Labrador,

2026). Exploits Valley Community Coalition (EVCC) in Grand Falls-Windsor supports the well-being (e.g., health, education, and empowerment) of individuals, families and communities (Exploits Connect, 2026). No information was available on demand versus capacity for these services.

The YMCA of Exploits Valley located in Grand Falls-Windsor offers health and fitness programs for people of all ages (YMCA of Exploits Valley, n.d.-a). Youth 2000 Centre (Y2C), offered in partnership with the YMCA, provides programs to foster physical and mental wellness in youth and young adults aged 5 to 29 years (YMCA of Exploits Valley, n.d.-b).

12.3.5 Municipal and Regional Services and Infrastructure

In NL, municipalities are responsible for delivery of public infrastructure, including water, wastewater and waste management services, to households and businesses. Communities may also work in partnerships to deliver services on a regional basis.

12.3.5.1 *Water and Sewer*

Some communities near the PA have protected public water supply areas under the NL *Water Resources Act* (Table 12.3.7). The identified water supplies appear to have safe drinking water. As of July 14, 2025, only the Buchan's water supply was on boil water advisory, which was temporary for maintenance or repairs (Department of Municipal Affairs and Environment, 2026). None of these water supplies was identified as having a non-consumption advisory as of June 11, 2025 (NLECCC, n.d.-a). On July 15, 2025, the Town of Botwood issued a water conservation order to residents of Botwood, Northern Arm, Peterview and Swanee Pool Road due to low water levels (Town of Botwood, 2025).

Table 12.3.7: Provincially Protected Water Supplies (June 9, 2025)

Community	Public Water Supply Watershed
Badger	Badger Wellhead
Bishop's Falls	Northern Arm Lake
Botwood	Northern Arm Lake
Buchans	Buchans Lake
Gander	Gander Lake
Grand Falls-Windsor	Northern Arm Lake
Leading Tickles	Cook's Pond
Lewisporte	Stanhope Pond
Point Leamington	Little Pond
Source: (NLECCC-WRMD, 2025)	

The Towns of Gander and Grand Falls-Windsor hold permits to operate public drinking water and wastewater systems (NLECCC, n.d.-d). Bishop's Falls and Lewisporte are licenced to treat and distribute public drinking water. No permits were listed for Badger, Botwood, Buchans, Leading Tickles, or Point Leamington.

12.3.5.2 Waste Management

The Central Regional Service Board governs Central Newfoundland Waste Management (CNWM), which provides waste management services to 186 communities in central Newfoundland from Terra Nova National Park in the east to Buchans in the west and including Twillingate, Change Islands and Fogo Island (CNWM, 2017). Each household is charged an annual fee for curbside collection of domestic waste, recycling and bulk garbage (seasonal) as well as household hazardous waste collection events. The waste management facility was constructed with capacity to receive 15,000 tonnes of waste annually (CBC News, 2015).

CNWM operates a waste management facility, which includes a landfill, in Norris Arm and transfer stations throughout the region including one at Point Leamington (CNWM, 2017). The Norris Arm waste management facility is the only landfill in the RSA that accepts domestic and industrial/commercial/institutional waste. Additionally, residents may deliver some waste materials (e.g., hazardous and bulk waste) to a public drop-off at the landfill.

The Town of Grand Falls-Windsor offers weekly collection services for domestic waste and recycling, along with an annual spring clean-up collection (Town of Grand Falls-Windsor, 2026a). Additionally, the town hosts a Community Composting Program.

Commercial operators may deliver waste to the regional landfill or to one of seven transfer stations or at the Central Regional Waste Management Site. CNWM applies waste management fees for businesses and waste haulers at each of its sites (Table 12.3.8). However, some materials (e.g., electronics, hazardous waste, paint) are not accepted from commercial users.

Table 12.3.8: Norris Arm North Commercial Waste Disposal Fees (2024-2025)

Waste Type	Fees
Blue Transparent Bag (recycling)	155.00/tonne
Clear Bag (garbage)	155.00/tonne
Special Waste	155.00/tonne
Construction and Demolition (unsorted)	155.00/tonne
Construction and Demolition (Sorted)	70.00/tonne
Contaminated soil/gravel (15-1000 ppm)	70.00/tonne
Cardboard	70.00/tonne
Source: (CNWM, 2017)	

12.3.6 Utilities and Communications

Communities in the RSA receive electrical power from NF Power, which sources its electricity from NL Hydro's hydroelectric generating stations (NL Hydro, 2026a). In the RSA, NL Hydro operates the Exploits Generation System on behalf of the Provincial Government (NL Hydro, 2026b). Hydroelectric facilities on the Exploits River system (i.e., Star Lake, Grand Falls-Windsor and Bishop's Falls) generate a total electrical capacity of 80 MW for the island interconnected grid. Terminal stations are in Botwood, Bishop's Falls, Grand Falls-Windsor, Lewisporte and Gander (NL Hydro, 2024).

Three major service providers (Bell Aliant, Rogers and Eastlink) offer combinations of internet, wireless, mobile, land line telephone, cable/satellite television and home security services to homes and businesses in NL (Bell Canada, 2026; Eastlink, 2026; Rogers Communications, 2026).

Bell provides internet services throughout central Newfoundland with service levels varying by community (Bell Canada, 2026). 5G is offered in some central communities, including Botwood, Bishop's Falls, Grand Falls-Windsor and Gander. Rogers and Eastlink also provide several internet options though coverage varies by location (Eastlink, 2026; Rogers Communications, 2026).

Bell, TELUS, Koodo Mobile (owned by TELUS) and Virgin Mobile (owned by Bell) offer the most extensive cellular coverage in Newfoundland with limited service provided by Rogers and Fido (owned by Rogers; SearchHounds, 2026). Cellular coverage is fair from Grand Falls-Windsor to Botwood but often limited in more remote areas.

In 2024, SaltWire Network, an Atlantic Canadian daily and weekly newspaper publisher, was purchased by United States-based Postmedia (The Canadian Press, 2024), ending daily print newspapers in NL. The Telegram, a province-wide daily print newspaper (originally independent and later purchased by SaltWire) was part of the purchase by Postmedia and has become a weekly print newspaper with daily online content.

12.3.7 Prevention and Emergency Services

Prevention of crime and safety issues and timely response to incidents require sufficient capacity in services such as policing, fire and emergency medical services. The following sections address policing and fire prevention and response in the RSA. Health emergency response services are described in Section 12.3.4.

12.3.7.1 Policing and Crime

In NL, the Royal Canadian Mounted Police (RCMP) has 42 detachments (RCMP, 2025). The NL headquarters is in St. John's, and four detachments (i.e., Grand Falls-Windsor, Fogo Island, Lewisporte and Gander) are in the RSA. NL has a lower ratio of police personnel relative to its population compared to the Canadian average (Statistics Canada, 2024a). In 2023, NL had 161.2 police personnel per 100,000 people, while the Canadian average was 178.2 per 100,000.

Most communities in NL do not have municipal enforcement or policing services. Many small municipalities and local service districts have no enforcement capacity.

12.3.7.2 Fire Prevention and Response

The RSA has 12 fire departments (Canada Pages, 2024; Explore Exploits, n.d.; Town of Gander, 2026a; Town of Lewisporte, n.d.-c). Badger, Buchans, Leading Tickles, Norris Arm and Northern Arm have volunteer firefighter crews, whereas Grand Falls-Windsor, Bishop's Falls, Peterview, Botwood, Point Leamington, Lewisporte and Gander have professional fire departments.

A 2015 report on municipal fire protection services in NL prepared by NL Fire and Emergency

Services (Table 12.3.9) rated four fire departments in central Newfoundland as Acceptable (includes the ability to have a minimum of six firefighters on scene within 14 minutes, 80% of the time) for offensive interior fire suppression/rescue, meaning firefighters have the training, equipment and resources required to enter a structure and provide search and rescue operations as well as interior fire suppression. The same departments were also rated as Acceptable for ability to provide a defensive exterior response (i.e., the ability to safely commence attack within two minutes after assembling necessary resources on scene, 90% of the time, with a minimum of four firefighters. Defensive exterior means firefighters do not enter the structure to extinguish a fire or rescue anyone trapped inside (NL Fire and Emergency Services [NLFES], 2015).

Table 12.3.9: Fire Department Assessment (2015)

Fire Department	Ratings	
	Offensive Interior	Defensive Exterior
Badger	Needs Improvement	Acceptable
Bishop's Falls	Acceptable	Acceptable
Botwood	Needs Improvement	Acceptable
Buchans	Needs Improvement	Acceptable
Gander	Acceptable	Acceptable
Grand Falls-Windsor	Acceptable	Acceptable
Leading Tickles	Needs Improvement	Acceptable
Lewisporte	Acceptable	Acceptable
Norris Arm	Needs Improvement	Needs Improvement
Northern Arm	Needs Improvement	Acceptable
Peterview	Needs Improvement	Acceptable
Point Leamington	Unacceptable	Needs Improvement
Source: (NLFES, 2015)		

12.3.8 Recreation

Municipalities in the RSA offer facilities for sports, recreation and leisure. Along with special events, the communities provide opportunities to participate in community-based activities and organizations such as sport teams, heritage committees, Scouts, seniors' groups, and service clubs (Explore Exploits, 2026b; Town of Botwood, 2026a; Town of Point Leamington, 2021b). NL Public Libraries offers public lending libraries and other services in Bishop's Falls, Botwood, Gander, Grand Falls-Windsor, Lewisporte, and Point Leamington (NL Public Libraries, 2026).

The Towns of Bishop's Falls, Gander and Grand Falls-Windsor have additional facilities for sports and recreation. Bishop's Falls offers a range of recreation facilities that accommodate activities such as soccer, volleyball, water aerobics, and pickleball. The Town of Bishop's Falls also features community gardens, playgrounds, and parks for outdoor activities (Town of Bishop's Falls, 2026). Gander has the most recreational facilities with a wide range of activities. Gander features various parks and playgrounds, including a skate park, golf course and range, tennis courts, curling rinks, swimming pools, and Nordic ski trails (Town of Gander, 2026b). Grand Falls-Windsor has two arenas and a field complex accommodating a variety of activities including hockey, volleyball, baseball, and tennis. Grand Falls-Windsor also has a dog park and a Nordic

ski club (Town of Grand Falls-Windsor, 2026b). The Town of Lewisporte has an indoor arena, community garden, playgrounds, and recreation complex equipped with a soccer field, tennis courts, skate parks, running track, and a dog park (Town of Lewisporte, 2026). Lewisporte has access to more than 10km of marked and groomed ski and snowshoe trails at Notre Dame Park.

Hiking/walking trails, and some ATV corridors are available in each of the towns (Explore Exploits, 2026b; NL Tourism, n.d.; Town of Bishop's Falls, 2024; Town of Gander, 2026b; Town of Grand Falls-Windsor, 2026b; Town of Lewisporte, 2026; Town of Point Leamington, 2021b). The T'Railway Provincial Park, operated by the Newfoundland T'Railway Council, runs nearly 900 km on a former railbed from St. John's to Port aux Basques connecting to more than 30 communities including Gander, Bishop's Falls, and Grand Falls-Windsor (Newfoundland T'Railway, 2026). The multi-use system permits biking, Nordic skiing, snowmobiling, ATV use and horseback riding. Other former rail lines connecting to communities such as Botwood, Lewisporte and Buchans are used for recreational activities. Snowmobile trails near Botwood include Exploits Valley Snowmobile Trails. More information on recreation and tourism infrastructure is available in Section 9.0 in the Land and Resource Use VC.

12.4 Effects Assessment

The analysis of environmental effects of the proposed Project for the Infrastructure and Community Services VC is presented in the following sections. Where possible, the information is presented in tabular form for enhanced clarity and accessibility with accompanying narrative to offer context and justification. An evaluation of effects is provided, considering the mitigations presented in Section 12.4.4, to determine significance.

Table 12.4.1 outlines potential interactions between the Project activities and the Infrastructure and Community Services VC. Generally, all Project phases (i.e., Site Preparation and Construction, Operation and Maintenance, and Decommissioning and Rehabilitation) are likely to interact with population demographics and services and infrastructure. Potential effects of these interactions are discussed below. From the perspective of the Infrastructure and Community Services VC, Project effects would be similar regardless of the components being constructed, operated or decommissioned, as socioeconomic effects on the Infrastructure and Community Services VC will most likely be the result changes in temporary or permanent population.

Table 12.4.1: Potential Project – Infrastructure and Community Services Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction (3 years)	
Land surveys	X
Geotechnical investigations	X
Implementation of erosion and sediment control measures	X
Tree clearing and grubbing	X
Excavating grading and compacting soils for construction	X
Construction of temporary works – quarries, batch plants, accommodations	X
Access road upgrades and construction	X

Project Phase	Potential for Interaction
Laydown yard and Industrial Facility construction, including foundation excavation, construction and blasting where necessary	X
Laydown yard and solar works construction, including piling for solar panel racking, concrete pads for inverter stations and transformers	X
Pipeline construction	X
Transportation of turbine components	X
Turbine assembly	X
Solar panel and racking delivery and installation	X
Collection system, control house and substation construction	X
Transmission system installation and commissioning	X
Removal of Temporary Works & Site Restoration	X
Operation and Maintenance (33 years)	
Operation and maintenance	X
Conveyance of product to port via pipelines, including loading onto ships	X
Vegetation management	X
Environmental monitoring	X
Decommissioning and Rehabilitation (2 years)	
Infrastructure removal	X
Site reclamation	X

12.4.1 Spatial and Temporal Boundaries

Spatial and temporal boundaries have been established to set maximum limits within which the environmental assessment will be conducted (Drawing 12.1-1, Appendix A). The following spatial boundaries have been established for the effects assessment:

- **PA:** The overall PA as outlined in Drawing 12.1-1 (Appendix A).
- **LSA:** for the assessment of Project effects on Infrastructure and Community Services, the LSA is a combination of Botwood, Point Leamington and Leading Tickles. These communities are most likely to provide services to the Project and experience interactions with Project activities and the workforce.
- **RSA:** the RSA encompasses Division No.8, and Division No.6, Census division (CDR), as some of the services and infrastructure required for the Project are not available in the LSA. Likewise, due to small populations in the LSA, a portion of the construction workforce is anticipated to come from throughout central Newfoundland.

In addition to the PA, each component will have a defined PF, which represents the direct physical disturbance area where Project infrastructure is proposed. Existing conditions have been described for the area representing the geographic extent over which Project activities, and their effects, are likely to occur.

Temporal boundaries have been identified as Project phases: Site Preparation and Construction (3 years), Operation and Maintenance (nominally 33 years), and Decommissioning and Rehabilitation (2 years). Temporal boundaries are therefore from 2027 to 2064.

12.4.2 Assessment Criteria

Table 12.4.2 presents definitions for predicted environmental effects characterization of the Project on the Infrastructure and Community Services VC. The criteria are used to describe potential adverse residual effects that remain after mitigation and enhancement measures have been implemented.

Table 12.4.2: Assessment Criteria

Rating Criteria	Rating
Magnitude The amount of change in measurable parameters or the VC relative to existing conditions	Negligible – No measurable change Low – the Project will have a measurable effect on Infrastructure and Community Services but within the range of normal variation in baseline capacity and/or conditions Moderate – the Project will have a measurable effect on Infrastructure and Community Services that exceeds the normal variation in baseline capacity and/or conditions, but which can be managed using existing resources and will not result in a reduction in standards of service High – the Project will have a measurable effect on Infrastructure and Community Services, which will exceed the management capacity of existing resources and will result in a reduction in standards of service
Geographic Extent* The geographic area in which an effect occurs * Criteria used for describing context of the effect; however, these criteria do not factor directly into the significance definition.	PA – residual effects are restricted to the PA LSA – Botwood, Point Leamington and Leading Tickles RSA – Census Division No.8 and Census Division No.6
Likelihood* Considers the probability of the residual effect occurring * Criteria used for describing context of the effect; however, these criteria do not factor directly into the significance definition.	Unlikely – the residual effect is unlikely to occur Possible – it is possible that the residual effect will occur Likely – it is likely that the residual effect will occur Almost Certain – it is almost certain that the residual effect will occur
Duration The time required until the measurable parameter or VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	Short term – residual effect restricted to no more than the duration of Site Preparation and Construction Medium term – residual effect extends through Operation and Maintenance Long term – residual effect extends beyond operations into Decommissioning and Rehabilitation
Frequency Identifies how often the residual effect occurs and how often in a specific phase	Single event – occurs once Intermittent – occurs occasionally or intermittently during one or more phase of the Project Continuous – occurs continuously

Rating Criteria	Rating
Reversibility Describes whether a measurable parameter or the VC can return to its existing condition after the activity ceases	Reversible – the residual effect is likely to be reversed after the activity is completed Irreversible – the residual effect is unlikely to be reversed Partially Reversible – the residual effect will be partially reversed after the activity is completed.

12.4.3 Definition of Significance

A significant effect on the Infrastructure and Community Services VC is defined as a residual Project-related effect to the environment that results in either, or both, of the following:

- Long term exceedance of available capacity, or a substantial decrease in availability and quality of infrastructure or services, which cannot be managed through planned Project mitigation measures, or current or adjusted public policies, plans and programs.

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.

12.4.4 Effects

The effects analysis describes the potential effects of the Project relative to existing conditions. Effects are described for each of the indicators (i.e., population demographics and services and infrastructure) for the effects identified.

These sections mainly discuss effects of the Project during Site Preparation and Construction and Operation and Maintenance. More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses. Project Decommissioning and Rehabilitation may require the support of a non-resident labour force as with construction. Following Decommissioning and Rehabilitation, conditions may decline to pre-Project levels.

12.4.4.1 Population Demographics

The Project may result in temporary or permanent increases in population, which will vary by Project phase. Population increases are generally considered positive in communities experiencing stagnant or negative population growth. The Project will especially have a positive effect in the RSA due to employment opportunities and the possibility of retaining and/or gaining new permanent residents. This may result in a younger and more diverse population.

As the existing permanent population may not be able to supply sufficient labour and support for businesses during a construction project of this scale, non-resident workers may reside short term in the community to help satisfy the demand for workers (peak 4,500 positions) during the Site Preparation and Construction phase. Non-resident workers are not expected to relocate permanently to the community while working on a construction project, except perhaps for long-term key positions. Workers during construction will be housed at one of the three to five construction accommodation camps (one in the IPA, remaining in the WPA).

The Project will require a temporary workforce anticipated to be drawn from the labour force of Botwood, Point Leamington and Leading Tickles, central Newfoundland and other areas of NL. Specialized technical workers may be recruited from other areas of Canada or internationally since Green Hydrogen is a new industry to the province.

The population may be maintained during the Operation and Maintenance phase, or new residents may be attracted to permanent employment with the Project or in supporting businesses during Operation and Maintenance (up to 835 positions). These workers will be housed in one of two to three accommodation camps (one in the IPA, remaining in the WPA). Additionally, non-residents may consider relocating for such opportunities as the Project may present an opportunity to attract workers including subsets of the population typically underrepresented in heavy industry. Additional population (e.g., accompanying spouses) may also help to meet demand for workers in other sectors such as education, health care, childcare and home care where shortages have been identified.

Effects on population demographics are anticipated to be positive as a result of the Project.

12.4.4.2 Services and Infrastructure

The Project will have a positive impact on individuals and families as more people benefit from favourable employment and income conditions. However, temporary and permanent changes to population during site preparation and construction and operation and maintenance may affect usage and capacity of services and infrastructure. The type and degree of changes will depend on the number of individuals, the family composition of newcomers and the type of service or infrastructure. Key services and infrastructure are discussed in the following sections.

Transportation

Transportation of goods, services and personnel to Project sites will increase use of roads in the LSA during all Project phases. Increases in vehicle activity and movement of large equipment and components and are likely to occur primarily on highways, such as the TCH (Route 1), Route 350 (Botwood Highway) and access roads constructed as part of the Project (heavy haul road), during site preparation and construction and decommissioning and Rehabilitation. Given most of the haulage routes use major roads that have capacity for additional light and heavy vehicles, the Project is not likely to lead to traffic congestion or increases in travel times for other roads users, except for temporary increases in traffic volumes as indicated in the traffic study (Appendix P.1) (e.g., for activities during site preparation and construction and decommissioning and Rehabilitation). Residents are likely to easily adapt to increases in vehicle movements on roads associated with the operation and maintenance phase.

Gander Airport, Deer Lake and the Botwood airstrip will likely be utilized for the Project to transport goods via air freight, and for transport of out-of-province workers and business people throughout the Project. Although there will be some use of commercial flights by staff and/or contractors, this is not likely to adversely affect availability or cost as most non-resident workers are expected to come from the Island of Newfoundland and will likely be transported to the project

site by project buses. Additional demand may potentially result in an expansion of services and increased competition, which would benefit the region. EVREC will continue to coordinate with stakeholders to inform them of potential increases and timelines for Project activities.

Project construction may affect traffic at different sites in the LSA. During site preparation and construction, traffic may increase because of the number of workers commuting to the Project from and through the Botwood Highway (Route 350). EVREC plans to avoid transporting through urban areas during high traffic times. As workers will remain onsite during construction and will be transported to/from the airport following completion of their shift, traffic during construction should be minimal. A Traffic Management Plan will be developed for the Project (recommendations in the traffic study form the Management Plan, Appendix P.1) and applied to the Wind Project, Solar Project, and Industrial Facility. Traffic concerns should be slightly alleviated during the operation and maintenance phase, as the number of workers will be reduced (e.g., from 4,200 to 835 workers). EVREC plans to install a non-public heavy haul road from the Port of Botwood to the Industrial Facility and Wind Project. A separate access road will extend from the Industrial Facility into BWPA to service the WPA only. Coordination with stakeholders, especially to communicate activities such as movement of slow-moving large equipment will help notify motorists to anticipate temporary slowdowns to reduce inconvenience.

Transportation systems have the capacity and EVREC will implement a Traffic Management Plan to address traffic issues. A Traffic Study was conducted and is located in Appendix P.1.

Housing and Accommodation

Due to labour shortages, the Project will require non-resident workers during construction, operation and maintenance, and decommissioning and rehabilitation. However, EVREC will prioritize employment of residents of the RSA for the Project, particularly during operation and maintenance. There is still a possibility that individuals and families will relocate to central Newfoundland for employment with the Project. This could increase demand for, and cost of, housing in the LSA, reducing availability and affordability for existing residents, particularly those in market rental housing. EVREC is proposing use of worker accommodations to mitigate potential adverse effect on housing demand in the LSA and will work with municipalities and stakeholders to manage demands of the Project on housing and accommodation in the LSA.

For the site preparation and construction phase, it is anticipated that at least some construction workers will come from host communities (i.e., Botwood, Point Leamington, Leading Tickles) and others will commute daily from within the RSA or on a rotation schedule if they live too far for daily commuting. To address this, EVREC plans to provide temporary accommodations to minimize effects on the availability and cost of rental properties normally used by residents.

Rental affordability and availability are less likely to be problematic in rural areas of NL due to declining population (Section 12.2.1). While data were not available for the LSA (i.e., Botwood, Point Leamington and Leading Tickles), Grand Falls-Windsor rental prices are decreasing and the vacancy rate increasing (CMCH Rental Market Survey, 2025). In October 2024, average rental in Grand Falls-Windsor showed a year-over-year decrease of 3.62%, while the vacancy rate

increased from 0.5% to 2.5%. As some Project staff may occupy rented dwellings, the overall reduction in vacancy rates will benefit property owners through increased demand and rental rates.

Any shortages or price increases in rental housing should stabilize during operation and maintenance as the non-resident construction workforce will no longer be present. Presumably, operation and maintenance workers moving into communities will be permanently housed as houses are likely to be available and new dwellings can be constructed. If challenges arise with availability and affordability of housing, they are most likely to affect women who generally earn lower incomes and more specifically single-parent women who are about three times more likely to head a single parent household in the LSA and RSA compared to men (Section 12.2.6).

Individuals and families with low- or fixed-income using market rental housing are more likely to be at risk of dwelling shortages or rent increases, which may contribute to other issues such as food insecurity. In the LSA, 17.4% of households are renters and 71% of renters live in market housing (Section 12.3.2). For the RSA, 22% of households rent and 81% of renters live in market housing. Those who own their own homes (with or without a mortgage) and individuals or families living in publicly subsidized housing (rent controlled and restricted to those meeting specific income criteria) are less likely to be affected by rental shortages and increased value of housing.

EVREC's accommodations strategy for non-resident construction workers will help to alleviate any direct adverse effects on housing and accommodation. As mentioned above, construction workers will be housed in one camp in the IPA and two to four camps in the WPA.

Education and Training

Direct and indirect population growth associated with the Project may result in an increase in school-aged children in the LSA. Section 12.3.3 indicates that schools in the LSA are likely to have physical capacity for additional school children. However, challenges with attracting and retaining teaching and support staff for schools may affect their ability to meet demand. This indicates that even with advanced notice of potential increase in permanent population associated with the Project, education services may not be able to fully meet demand. Therefore, increased demand for these services could affect schools in central Newfoundland.

The presence of the Project in the area may result in an increase in interest and enrolments in post-secondary programs. This could benefit students wishing to study programs and increase the proportion of residents in the LSA who have relevant qualifications to work at the Project during Operation and Maintenance. Given this will also affect a small proportion of local students, this is likely to be a positive effect of the Project.

Industrial wind and hydrogen developments are new to NL with limited relevant education and training opportunities. EVREC will work with colleges in NL (especially in central Newfoundland) on training needs for the Project.

Women tend to have lower labour force participation and income than men (Section 12.2.6).

However, the Project will result in opportunities for employment that may require formal education and/or on-the-job training. These opportunities will enhance the ability of participants to engage in employment that provides higher income and better conditions for individuals and families. With a focus on gender equity, diversity and inclusion, EVREC can have a positive effect on employment and training opportunities of women and others often overlooked in traditionally male-dominated industries and professions found in construction projects and natural resource developments.

EVREC's gender equity, diversity and inclusion plan will help to meet the labour needs of the Project and to provide opportunities for women and other under-represented groups. EVREC will also work with stakeholders in central Newfoundland to anticipate demand for educational services and to enhance training opportunities related to the Project. Given these predictions, positive and adverse effects on education and training are anticipated.

Health Care and Social Support

Health care and medical facilities may be used through Site Preparation and Construction and Operation and Maintenance by non-resident workers in the event of accident, illness or for urgent medical care. Resident workers and their families who are attracted to the area by the Project would also require access to health care and medical facilities in the RSA. This could increase demand on service providers and reduce availability for existing residents. Health care facilities in rural areas of NL are likely to have physical capacity due to small and declining populations (Section 12.2.1) but have challenges with meeting existing demand primarily due to staffing shortages (Section 12.3.4). This indicates that, even with advanced notice of a potential increase in both non-resident as well as resident workforces and their families, health services may not be able to fully meet demand due to challenges with attracting and retaining staff.

EVREC will comply with regulations protecting the health and safety of workers and provide support and prevention programs for their health and wellbeing. Hiring locally and regionally will help to prevent additional stress on health care and childcare facilities through increased population but it is understood that it will not be possible to fulfill all labour needs of the Project in the RSA.

The presence of a non-resident construction workforce could possibly contribute to shortages of health services. Limited urgent care services are available in Botwood with additional support available in Grand Falls-Windsor and Gander. Despite a declining population potentially leading to excess capacity in certain health and social services, the healthcare system in NL is facing numerous job vacancies (Section 12.3.4). This issue is particularly pronounced in Grand Falls-Windsor, whereas Botwood has only one vacancy as of May 2025 (NL Health Services, 2026). EVREC and its contractors will provide health and safety training for workers to help ensure their safety and wellbeing, and to limit demand on local facilities.

Direct and indirect population growth generated by the Project could increase demand for childcare services in the LSA. The provision of childcare is a key challenge in rural areas (Section 12.3.3.1). Additional demand on childcare facilities could affect capacity and lack of availability could indirectly affect the ability of primary care givers to access education and/or

employment opportunities. Although EVREC will coordinate with service providers to communicate potential increase in demand generated by the Project, inadequate facilities are available, and existing facilities in NL are sometimes unable to operate at full capacity due to difficulties attracting and retaining staff. This indicates that, even with notice, childcare services may not be able to expand operations to fully meet demand.

Other community support programs may experience an increase in demand due to population growth. However, this would be dependent on the demographic profile of workers and families moving into the RSA. It is most likely that programs targeted for children and youth, women and families would be affected by an increase in demand, as the Project is likely to attract residential workers with families or couples of a working age. Services targeted at low-income families, such as financial support and food banks, may notice an increase in demand in services if the cost of housing or a lack of affordable childcare increases financial stress for some residents.

EVREC will coordinate with stakeholders to keep apprised of adverse effects on demand for services such as health care and childcare as these supportive programs are essential for the health, safety and wellbeing of workers and their families. Additionally, childcare is essential to maximizing participation of working age population with the Project. EVREC will also work with municipalities and stakeholders to explore opportunities to support community organizations. As there are potential Project-related effects, it is conservatively estimated that there is potential for adverse effects on health care and social support.

Municipal and Regional Services and Infrastructure

Temporary or permanent population growth related to the Project could increase demand for water, wastewater and waste management systems in the LSA and RSA. During construction, the presence of a non-resident workforce can increase demands for water and sewer infrastructure. Water and wastewater infrastructure will be installed to support Project activities and to service worker accommodation facilities. EVREC plans to use local water resources, which is not a designated Protected Public Water Supply Area, to supply potable water for worker accommodations and other Project facilities. Temporary worker accommodations will also be installed in other parts of the LSA, where increased demand for water and wastewater infrastructure may occur. The Town of Botwood is identified as having drinking water supply shortages (Section 12.3.5).

Increased demand for water, sewer, and waste management is anticipated to be slightly relieved during Operation and Maintenance due to completion of construction activities and a smaller operational workforce (i.e., 640 workers). During Operation and Maintenance, the Project will require a clean water supply and EVREC plans to use Peters Pond for clean and potable water for the Industrial Facility for this purpose.

Large scale projects can generate high volumes of waste especially during Site Preparation and Construction and Decommissioning and Rehabilitation. Waste will be managed according to the Waste Management Plan that will be developed and implemented for the Project. This includes trucking materials for waste for diversion and/or disposal to an approved recycling centre, landfill

or other facilities depending on waste type. EVREC will coordinate with municipalities and other stakeholders throughout Site Preparation and Construction and Operation and Maintenance to monitor any concerns to avoid negative effects on waste management for residents, businesses and industry.

More information on Decommissioning and Rehabilitation will be available as Project planning progresses and waste management will be addressed through the Waste Management Plan for the Project. This phase is likely to produce the highest mass/volume of waste due to deconstruction and dismantling of industrial components. Following Decommissioning and Rehabilitation, waste management infrastructure utilization and associated services are likely to return to pre-Project levels.

EVREC will coordinate with municipalities and other relevant agencies to provide advance notice of any increase in demand for public infrastructure to avoid service disruptions and enable expansion of infrastructure to support additional population associated with the Project. This is expected to minimize adverse effects of the Project on these public services and infrastructure, but municipalities may be required to expand infrastructure or services to support additional population. Thus, potential adverse effects are conservatively anticipated for municipal and regional services and infrastructure.

Utilities and Communications

Development of a large-scale industrial Project and an increase in associated temporary and permanent population may result in additional demand for utilities and communications services and infrastructure. The Project has been designed to be completely off-grid during operations with potential future grid connections. The Project has requested 10MW of construction power from NL Power and up to 150 MW of interruptible power from NL Hydro. EVREC has engaged NF Power to connect to the existing NF Power Botwood substation to provide construction power. EVREC has executed a Contribution Agreement with NL Hydro evaluating the cost and schedule to deliver the 150MW of interruptible power to the Project. Within the WPA, EVREC will develop new transmission lines along the road network, where applicable, connecting to two substations in the BWPA and one each in TLWPA and LTWPA.

Telecommunications service reliability can be an issue in central Newfoundland, especially for internet and cellular (Section 12.3.6). EVREC will collaborate with service providers to ensure adequate services are available for the Project and to prevent its Wind Project from interfering with other telecommunications or radar systems. The need for additional capacity in utilities and communications will be satisfied during Site Preparation and Construction through installation of new services as required. Any new telecommunications infrastructure will likely remain in service following completion of the Project.

Any Project-related telecommunications infrastructure improvements will have a positive effect on central Newfoundland. Thus, no adverse effects are anticipated for utilities and communications. The effects are positive.

Prevention and Emergency Services

Safety and emergency services will be required in the event of a Project-related workplace accident, road accident or other incidents. This could increase demand for these services, but the likelihood of such an event occurring is low, due to safety policies and procedures that will be implemented by EVREC and its contractors.

Temporary or permanent population growth associated with the Project may increase demand for safety and emergency services. Therefore, it is expected that there may be effects on existing emergency services. To address potential concerns, EVREC will coordinate with relevant police and other emergency services in advance of the Project to notify them of schedule and potential population growth to enable additional resources to be assigned if warranted.

Based on findings of a 2015 study, the Botwood, Point Leamington and Leading Tickles fire departments do not meet satisfactory ratings for residential fire suppression. However, Bishop's Falls and Grand Falls-Windsor fire departments met the satisfactory ratings for residential fire suppression (Section 12.3.7). Nevertheless, these departments may not have the capacity, skills or equipment necessary to respond to a potential Project-related incident. To address these concerns, EVREC will develop its own emergency response teams that will coordinate with other emergency response teams within the Exploit Valley region that will work with the Town of Botwood to develop a specialized emergency response team for the Project.

The specialized emergency response team for the Project will improve emergency services during the lifecycle of the Project and the increased capacity may be a lasting legacy in central Newfoundland. Likewise, community fire services in the LSA may experience an increase in volunteerism due to population growth. These inputs are anticipated to be positive for prevention and emergency services.

Recreation

The LSA and RSA are served with recreational infrastructure and cultural events (Section 12.3.8). Increased temporary or permanent population may use community recreational facilities and attend events. Residents may notice increases in demand that could potentially affect capacity but also increase revenues for service providers and event organizers.

Users of recreational facilities and cultural events in the LSA and RSA may notice an increase in demand generated by permanent population growth associated with the Project during Operation and Maintenance. This is likely to be advantageous for sports facilities and cultural events, as organizations may benefit from increases in membership, participation and volunteerism.

While most of the recreational facilities are within communities and will not be directly affected by the Project, some outdoor activities (i.e., walking, hiking, ATV and snowmobile trails) are within the PA. EVREC plans to work with municipalities and recreation organizations to ensure continued access to recreation sites, especially for ATV trails. Given this intervention, effects are not anticipated for recreation.

12.4.5 Mitigation and Enhancement Measures

EVREC has considered potential beneficial and adverse effects of the Project on Infrastructure and Community Services and designed to avoid or reduce adverse effects and enhance beneficial ones. Key measures to mitigate and/or enhance potential Project effects on the Infrastructure and Community Services VC are listed in Table 12.4.3.

Management of Project effects include compliance with all Project EA conditions and municipal, provincial, and federal regulatory requirements and policies that address concerns and manage issues. Other policies and guidance will also apply to the Project. Managing direct effects of the Project on services and infrastructure, and providing support to help alleviate indirect effects, will require coordination with regulators, municipalities and stakeholders, such as those identified throughout Section 12.3.

Table 12.4.3: Mitigation and Enhancement Measures: Infrastructure and Community Services

Project Phase	Key Indicator	Mitigation / Enhancement
All	Population Demographics	Hire locally/regionally as much as possible based on availability of labour with appropriate training and skills.
	Services and Infrastructure	Development and implement a Traffic Management Plan
		Develop incentives to encourage worker carpooling to reduce Project traffic.
		Hire locally/regionally as much as possible based on availability of labour with appropriate training and skills to reduce effects on rental housing that may become occupied by companies or individuals associated with the Project.
		Accommodate non-resident Project workers in a dedicated facility with related services on-site.
		Cooperate with educational institutions (e.g., College of North Atlantic) with training opportunities for the new industry sector.
		Ensure corporate and contractor compliance with workers' health and safety regulations.
		Institute worker health and safety programs for employees and contractors to avoid or reduce use of local health and social services.
		Establish agreements to support municipalities and Local Service Districts that may be affected.
		Prepare and implement a waste management and waste reduction plan for the Project with special emphasis on Site Preparation and Construction and Decommissioning and Rehabilitation.
		Work with municipalities to develop a Project-specific emergency response plan and increase training and capacity for emergency response infrastructure and services.

Project Phase	Key Indicator	Mitigation / Enhancement
		Design and install Project infrastructure to avoid or maximize safe distances to recreation infrastructure and facilities.

12.5 Conclusion

This section presents available information on the Infrastructure and Community Services VC in the LSA and RSA and analyzes potential effects of the Project on this VC. An evaluation has been completed to determine the significance of residual effects (based upon significance criteria) for the Infrastructure and Community Services VC resulting from Project activities once appropriate mitigation has been implemented (Table 12.4.5).

Design changes have been made to the Project to avoid effects on services and infrastructure to the extent possible, such as the inclusion of worker accommodations facilities to house non-resident workers. EVREC will collaborate with regulators, municipalities and stakeholders to monitor Project-related issues on the capacity, availability and affordability of services and infrastructure as relevant.

Overall, with implementation of mitigation and enhancement measures, residual effects on Infrastructure and Community Services are mixed (positive and adverse). Timing is inapplicable as the effects of the Project on this VC are not subject to seasonal variation. As all predicted Project-related effects on the Infrastructure and Community Services VC are considered reversible (following completion of the Project), no significant effects were identified for this VC.

Several types of services and infrastructure are experiencing challenges meeting demand of the existing population, and any population growth associated with the Project would increase demand and possibly lead to exceeding capacity. Concerns are mainly for sectors such as health care, home care and education, which are all challenged with human resources shortages. Childcare is also limited in terms of both facilities and staffing.

It is anticipated that during site preparation and construction and operations and maintenance the Project may result in stabilization of, or an increase in, population in the RSA. This positive effect is considered moderate as it will be outside of normal variability of population change. These effects will likely affect the RSA as any communities within commuting distance may experience population growth though at least some of the workforce will be recruited from within the region. Increased population may also have a positive effect on non-industrial sectors which experience challenges recruiting and retaining staff. The effects are expected to be continuous and long-term and will likely begin to reverse following the completion of Operation and Maintenance as employment contracts terminate, and some people leave the region.

Project construction, decommissioning and rehabilitation could potentially result in positive and adverse residual effects on services and infrastructure. The presence of non-resident workers and permanent population increases could affect usage of services and infrastructure during construction, operation and maintenance, and decommissioning and rehabilitation. In consideration of existing conditions, planned mitigation and enhancement measures, and

uncertainty around the extent of permanent population change, the effects related to permanent population change are conservatively predicted to be medium in magnitude as they will be a change outside of normal variation and also be continuous and long-term throughout the life of the Project. Effects caused by permanent population change are reversible if population declines after Project completion, which is likely to happen. Ongoing collaboration and coordination with local stakeholders, service providers, government and other operators, is required to share information, manage adverse effects and adapt to changing socioeconomic conditions.

Adverse effects are predicted for transportation as an increase in traffic is anticipated during all Project phases with transport of higher numbers of workers and large equipment during site preparation and construction and decommissioning and rehabilitation, thus long-term. As EVREC will implement a Traffic Management Plan including measures to reduce traffic and to keep stakeholders informed of schedule and anticipated traffic slowdowns and other disruptions, the residual effects are anticipated to be moderate. Effects are anticipated to extend to the RSA as workers and equipment may be transported to and from other parts of the province and beyond. Traffic disruptions are expected to be intermittent based on the work schedule, worker rotations and transport of materials and equipment as required and reversible upon completion of the Project.

Effects on housing and accommodation are anticipated to be both adverse and positive. Non-resident workers are likely to be present in the community, especially during Site Preparation and Construction and Decommissioning and Rehabilitation. When some of these workers rent housing, it can lead to availability and affordability issues for a small portion of the permanent population. EVREC's planned worker accommodation facilities will help to alleviate pressure on rental dwellings. It is still likely that some workers or business people may use rental housing. However, given the higher vacancies in central Newfoundland, this could be advantageous for rental property owners in the RSA. EVREC will collaborate with stakeholders to understand and address issues with housing and accommodation. These effects are determined to be moderate in magnitude as they will be outside of normal variation and continuous during these Project phases. The effects will be long-term throughout the Project though somewhat variable depending on phase and reversible following completion of the Project. The conclusion is conservative as it is based on an unknown number of locally hired workers compared to those from the RSA and other areas and an unknown number of low-income people in market housing.

Project-related effects on education and training are expected to be both positive and adverse, somewhat depending on how well services can adapt to increased demand. Population growth may increase the number of children in schools, while schools in the RSA may currently experience staffing shortages, limiting their ability to meet demand. College and trades education providers may acquire new programs and students for the duration of the Project. The Project may boost interest and enrollment in relevant college programs, helping residents qualify for jobs during Operation and Maintenance. Wind and hydrogen energy are new to NL, and EVREC will coordinate with colleges to develop training programs, where appropriate. EVREC's gender equity, diversity and inclusion plan aims to improve access to these opportunities and meet labour needs especially for women and other underrepresented groups. Anticipated effects on education

and training are generally expected of moderate magnitude, long-term, continuous for the life of the Project and reversible upon Project completion.

Both non-resident workers and new residents may increase use of health care and social support services during site preparation and construction, operation and maintenance and decommissioning and rehabilitation resulting in adverse effects. Currently, rural NL health care facilities have physical capacity but face staffing shortages, limiting their ability to meet increased demand. Childcare facilities are lacking in the region and childcare workers are limited throughout NL. EVREC will offer worker safety programs and aim to hire locally to reduce pressure, though not all labour needs can be filled locally. The Project may adversely affect health care and social support throughout the RSA and the ability of primary caregivers (mainly women) to pursue employment to support the Project. EVREC will coordinate with local stakeholders and municipalities to share information, anticipate changes and address Project-related effects. Anticipated effects on health care and social support are generally expected of moderate magnitude, long-term, continuous for the life of the Project and reversible upon Project completion.

Adverse effects are predicted for municipal and regional services and infrastructure as an increase in usage of water and sewer infrastructure, and waste management services is possible during all Project phases with a larger volume of solid waste generated during Site Preparation and Construction and Decommissioning and Rehabilitation. EVREC will work with the Town of Botwood and other stakeholders to address water supply needs and will comply with all relevant legislation related to water supplies, effluent discharge and solid waste. EVREC will supply water and sewer services for worker accommodation facilities. EVREC will implement a Waste Management Plan (Appendix Q.12) including measures to reduce and divert waste and to keep stakeholders informed of schedule and anticipated waste generation. Given these management measures and coordination with stakeholders, the residual effects are anticipated to be moderate. Effects are anticipated to extend to the RSA as waste management services and infrastructure are regional. The effects anticipated to be continuous and long-term for the life of the Project and reversible upon Project completion.

Effects on utilities and communications are anticipated to be positive as new infrastructure will be developed to support the Project improving services and infrastructure such as electricity, internet and cellular in central Newfoundland. EVREC is working with stakeholders such as NL Hydro and NF Power to plan for the Project. As it is possible to avoid adverse effects and enhance services through planning and coordination, the residual effects are anticipated to be moderate in magnitude as they will represent a change from usual conditions. Effects are anticipated to extend to the RSA as telecommunications are likely to be improved in central Newfoundland as a result. The effects are anticipated to be continuous and long-term for the life of the Project and potentially reversible upon Project completion but likely to be maintained.

The effects of the Project on prevention and emergency services will be positive as the capacity of emergency response services will be expanded in the LSA. EVREC will work with the Town of Botwood to develop a specialized emergency response team that will be of benefit to the Project

and municipalities. The effects are expected to be moderate in magnitude. The effects are anticipated to be continuous and long-term for the life of the Project and potentially reversible upon Project completion, though this expansion of capacity may represent a positive legacy beyond the Project.

Table 12.4.4: Infrastructure and Community Services Residual Effects

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Population Demographics	Hire locally/regionally Develop and implement a gender equity, diversity and inclusion plan	P	M	RSA	LT	C	R	Not Significant
Transportation	Develop and implement a Traffic Management Plan Develop incentives to encourage worker carpooling Coordinate with stakeholders	A	M	RSA	LT	I	R	Not Significant
Housing and Accommodation	Accommodate Project workers in a dedicated facility with on-site services Coordinate with stakeholders	P/A	M	RSA	LT	C	R	Not Significant
Education and Training	Coordinate with educational institutions and other stakeholders	P/A	M	RSA	LT	C	R	Not Significant
Health Care and Social Support	Ensure corporate and contractor compliance with workers' health and safety regulations Health care and social supports: Establish worker health and safety programs Hire locally/regionally Coordinate with stakeholders Support community programs	A	M	RSA	LT	C	R	Not Significant

VC Interactions	Mitigation and Compensation Measures	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Municipal and Regional Services and Infrastructure	Establish shared services agreements with municipalities Prepare and implement a Waste Management Plan with special emphasis on Site Preparation and Construction and Decommissioning and Rehabilitation Design and install Project infrastructure to avoid, or maximize safe distances to, recreation infrastructure Coordinate with stakeholders	A	M	RSA	LT	C	R	Not Significant
Utilities and Communications	Install utilities and communications services for the Project Coordinate with stakeholders	P	M	RSA	LT	C	R	Not Significant
Prevention and Emergency Services	Work with the Town of Botwood to develop a specialized emergency response team and increase training and capacity for emergency response infrastructure and services Coordinate with stakeholders	P	M	LSA	LT	C	R	Not Significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I – Intermittent, C – Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

13.0 EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING

The following sections examine how aspects of the external environment may impact Project infrastructure and operations, with a focus on extreme weather events and natural hazards. The Project is expected to be operational for up to 33 years, such that the effects of climate change are highly relevant to the Project. Incorporating climate change and sustainability considerations into the Project's design will increase its resilience, and a series of mitigation and design strategies to minimize potential impacts have therefore been developed.

The primary mitigative measure employed during the construction and operation of the Project will be to educate and train site personnel. Environmental and safety orientations will be conducted prior to the start of construction, and all staff will be informed of the potential effects of the environment on the Project. Staff responsible for the operation and maintenance of the Project will be trained in the design and/or operation of the WPA, SPA, and IPA infrastructure, including applicable operating procedures, safety protocols, and evacuation plans. To further mitigate damages that cannot be controlled by education and training alone, all applicable infrastructure will be equipped with safety mechanisms to limit damage from extreme weather events. Additionally, all infrastructure will be designed in consideration of the potential impacts of climate change throughout the lifetime of the Project.

13.1 Climate Change

Climate change refers to long-term, persistent change in average and extreme weather conditions (IPCC, 2018). Contemporary climate change (i.e., since the beginning of the industrial period) is being caused by increases in GHG emissions associated with human activities. Warming temperatures, altered precipitation regimes, and sea level rise are three notable aspects of climate change with potential to impact Project operations.

Project infrastructure (i.e., fuel storage, hydrogen ammonia storage and production, water treatment facilities, roads, and solar facilities) will be designed to contain excess rainfall and withstand extreme heat events. Additionally, all facilities will be regularly maintained and checked for leaks or damage associated with storm events. All infrastructure will be designed to withstand a one in one-hundred-year storm.

Potential effects of the environment on the Project associated with climate change are discussed in the following sections.

13.1.1 Increased Air Temperature

A key aspect of climate change is global warming, which refers to the long-term rise in the Earth's average surface temperature, measured over 30 years, in comparison to preindustrial levels (IPCC, 2018). Air temperatures are an important driver of many environmental processes, including the intensity of severe weather events such as hurricanes (Gilford et al., 2024). Based on a range of emissions scenarios (Coupled Model Intercomparison Project Phase 6), median temperatures in the PA are expected to be 2.4°C warmer during the period 2041-2070 relative to the 1971-2000 baseline (ClimateData.ca, 2025).

Climate change predictions for Comfort Cove, which is the nearest regional site used for provincial climate change projections, estimate the average daily mean temperature for 2041 to 2070 for December to February, March to May June to August, and September to November. Compared to the 20th century climate, the daily mean temperature is estimated to increase by 4.4°C, 2.1°C, 2.6°C, and 3.2°C, respectively (NLECCC, n.d.-b).

Temperature increases associated with global warming may impact all phases of the Project as well as the comfort of on-site personnel. For example, the demand for cooling in construction vehicles will increase with warmer temperatures and may require Project personnel to take regular breaks to cool down and rehydrate. Additionally, higher temperatures are known to reduce solar photovoltaic efficiency, therefore, as temperatures rise, efficiency may be reduced (Bamisile et al., 2025).

Warmer temperatures also have the potential to enhance the spread and abundance of disease vectors such as ticks (Bouchard et al., 2019), with associated increases in health risks. Longer and more intense heat waves under climate change may also increase the risk of forest fires (ECCC, 2019c). Warming temperatures, along with changes in precipitation (described in Section 13.1.2), and sea level rise (described in Section 13.1.3) also have the potential to lead to an increase in harmful algal blooms, which can produce toxins harmful to human and animal health (US EPA, 2013).

The direct risks of increased temperatures to Project personnel will be managed by ensuring staff are trained to understand the importance of regular breaks, proper hydration, and unsafe working conditions. Indirect risks to Project personnel will be managed through education on how to recognize and understand hazards such as ticks and harmful algal blooms. Risks and mitigations for forest fires are discussed in Section 13.2.2.

13.1.2 Changes in Precipitation

Heavy rainfall events are a common, highly probable natural hazard in Newfoundland and Labrador that may be exacerbated by climate change. Although it is difficult to accurately forecast decadal-scale changes in rainfall events, future climate scenarios suggest that conditions will become “wetter” over the Project’s lifespan. For example, total annual precipitation in the PA is expected to range from 98 mm/year to 106 mm/year higher by 2041-2070 relative to the 1971-2000 baseline (ClimateData.ca, 2025). Heavy rainfall events are expected to increase slightly (NLECCC, n.d.-b) and have the potential to impact construction and operations by increasing the risk of overland flooding throughout the PA, which may temporarily restrict site access, overwhelm ditches and culverts, cause flooding of infrastructure, and require operational strategies to be implemented (e.g., sedimentation and erosion controls).

The IPA and SPA infrastructure are at risk of flooding due to close proximity to streams and wetlands. Turbines and roads within lower lying areas in the WPA are also more susceptible to flooding. BWPA, TLWPA, SLWPA and LTWPA have 117, 57, 50, and 25 turbines below the average altitude, respectively, which would be more susceptible to flooding than the turbines

and associated roads located in areas above the average elevation. The heavy haul road from the Industrial Facility to the Port are located at lower elevations along the coast and are consequently more susceptible to flooding from increased precipitation and sea level rise. Although the ammonia pipeline will be buried, there are still risks associated with flooding, such as structural damage, erosion, displacement, and operational issues (Abegaz et al., 2024). Changes in soil characteristics such as weight and density and the rising water table associated with flooding may lead to a rupture or separation of pipes due to a loss of soil support, soil swelling, or upward force from the rising water table (Abegaz et al., 2024). Corrosion and abrasion caused by floodwater containing contaminants and debris in the ground may also damage the pipeline (Abegaz et al., 2024). Furthermore, soil erosion and scouring caused by flooding may expose the pipeline, making it more susceptible to damage (Abegaz et al., 2024).

Section 7.6.7.3 speaks to modelled impacts of additional discharge into the natural creek that flows into Botwood Harbour. The additional plant discharge will not produce any measurable change in flooding risk to residences along Botwood Highway on the most westerly end of IRID51.

The Project will mitigate the risks of flooding by maintaining regular upkeep and grading of roads to reduce formation of ruts, designing roadside ditches and water off-take infrastructure next to all roads to encourage drainage of rainwater off the roads, and revegetating roadsides to absorb excess water.

Changes in winter precipitation, including seasonal snow patterns, may also pose a risk to Project Infrastructure (e.g., accommodations, solar panels, and Industrial Facility). For example, an increased snowfall accumulation over a short period may cause damage to Project Infrastructure (e.g., roof collapse), or hail may cause physical damage to solar panels. In contrast, areas that experience significant decreases in snow-water equivalent (i.e., the amount of water released from the snowpack when it melts) may also see a reduction in freshwater availability. This could impact vegetation growth, limit water supplies, and increase the risk of forest fires in the area surrounding the Project (ECCC, 2019b)

If it is unsafe to work during high precipitation events, a stop-work authority may be issued.

While the climate of the PA is expected to become wetter overall, prolonged periods of dry conditions are also expected to become more common (NLECCC, n.d.-b). Periods of dry conditions may impact Project operations (e.g., by limiting construction activities) if forest access is restricted due to increased wildfire risk (woods access restrictions). Droughts may also limit the ability to fight fires if water levels in nearby lakes and rivers are low. Drier-than-normal conditions may also cause an increase in fugitive dust emissions during construction that will require management via mitigations. The availability of abundant freshwater is essential for the Project to operate at capacity. Freshwater withdrawal from Peters Pond is required for the Project, and periods of drought may impact Project operations by reducing the amount of water available for withdrawal. Lower water levels within Peters Pond will be

mitigated by recycling water back to Peters Pond as needed. The Project will mitigate the risks of changes in precipitation by:

- Developing and implementing a Surface Water Management Plan.
- Minimizing alterations to wetlands.
- Sizing culverts appropriately for anticipated increased precipitation events.
- Designing roadside ditches and water off-take infrastructure next to all roads to encourage rainwater drainage.
- Maintain a minimum 30 m vegetated buffers surrounding watercourses, where possible.
- Grade roads in areas where water is likely to collect (i.e., hills and flat, low-lying areas) to avoid the formation of ruts.
- Recycling of water to Peters Pond from the Industrial Facility if/as needed to ensure water is available in Peters Pond to protect surface water features (Peters Pond and Peters River).
- Maintaining regular upkeep of surface water infrastructure.
- Allowing for natural revegetation of roadsides to absorb excess water.
- Implementing strategies for reducing the production of fugitive dust during construction

13.1.3 Sea Level Rise

On a global scale, sea levels are currently rising because of warming air and ocean temperatures (via thermal expansion of ocean water, changes in ocean currents, and increased inputs of melting sea ice/glaciers; IPCC, 2022). Sections of the Atlantic coastline have been highlighted as some of Canada's most severely threatened areas from sea level rise and resulting impacts, with rising sea levels expected to amplify coastal flooding, erosion, and storm surge across the Atlantic region (ECCC, 2023). Sea level rise across Newfoundland is projected to increase by up to 0.8 m by 2100, relative to 1986 to 2005 (Newfoundland and Labrador, 2025a).

The Newfoundland & Labrador Atlas of Storm Surge and Wave Climates was used to provide insight into future characteristics of storm surges and waves. An Extreme Value Analysis (EVA) returns extreme values for various return periods for Water Level Residual (Storm Surge) and Significant Wave Height. The EVA was conducted at 78 locations along the coast of Newfoundland and Labrador. The closest EVA to the Project is EVA-017, which is located northwest of the Leading Tickles coastline (Drawing 13.1-1, Appendix A). For a 20-year return period, EVA-017 is projected to experience storm surges of 0.7 m and an omni-directional significant wave height of 7.3 m. For a 100-year return period EVA-017 is projected to experience storm surges of 0.8 m and omni-directional significant wave height of 8.2 m (DHI Water and Environment, Inc, 2024).

The Climate Central Coastal Risk Screening Tool was used to identify areas that may be at risk of impacts from sea level rise and storm surges. Based on a sea level rise of 0.8 m, the haul road and ammonia pipeline within the IPA are the only infrastructure that may be impacted by sea level rise and storm surges (Climate Central Inc., n.d.).

The PA is located at elevations ranging from 1 to 332 metres above sea level (masl). The heavy haul road and ammonia pipeline from the Industrial Facility to the Port are located at elevations as low as 1 masl along the coast and are consequently more susceptible to coastal flooding and erosion. The Industrial Facility and SPA are unlikely to be directly impacted by coastal flooding, erosion, or storm surges due to the distance from the coast and the elevation (average of 46 masl in the SPA and 31 masl in the Industrial Facility). The WPA and associated infrastructure is also located at distances and elevations that Project infrastructure is unlikely to be directly impacted by coastal flooding, erosion, or storm surges (Climate Central Inc., n.d.). Portions of the ammonia pipeline and haul road along Water Street are located on the coast, making those areas the most susceptible to coastal flooding from sea level rise, erosion, waves, and storm surges, which could cause disruptions to the Project.

Rising sea levels, storm surges, and higher wave heights may impact infrastructure near the coast such as the ammonia pipeline and haul road due to coastal flooding and erosion. However, detailed engineering design will consider projected sea level rise, storm surges, and wave height to ensure the sound operation of all infrastructure.

The Project will mitigate the risks of sea level rise to the Project by:

- Sizing culverts appropriately for anticipated increased flooding
- Designing roadside ditches and water off-take infrastructure to encourage drainage.
- Grade roads in areas where water is likely to collect (i.e., hills and flat, low-lying areas) to avoid the formation of ruts.
- Constructing elevated roads, where practical and required.
- Maintaining and inspecting roadway and pipeline integrity.
- Maintaining regular upkeep of surface water infrastructure.
- Allowing for natural revegetation of roadsides to reduce erosion.
- Ensure the shoreline is stabilized using vegetation or rip rap.
- Grade shoreline slopes to reduce erosion and absorb wave energy

13.2 Natural Hazards

Newfoundland and Labrador regularly experiences natural hazards, including severe weather events (e.g., blizzards, hurricanes) and wildfires. These events can lead to adverse outcomes such as power outages, health-related emergencies, infrastructure damage, and road damage, thereby posing direct risks to infrastructure (Public Safety Canada, 2024). In addition to severe weather events and wildfires, a natural hazard that is unique to wind energy projects is the possibility of turbine icing.

13.2.1 Severe Weather Events

Hurricanes, blizzards, ice storms, heavy rainfall, droughts, and other severe weather events are natural hazards that have the potential to impact the Project through power outages, health related emergencies, infrastructure damage, and road damage, and therefore may pose direct risks to Project infrastructure. During severe weather events, safety risks may be elevated due to hazardous driving conditions, poor visibility, cold temperatures, and falling/blowing debris.

Throughout the life of the Project, the safety of Project personnel will be managed by developing and implementing safe work procedures, and ensuring staff are trained in the use of Personal Protective Equipment (PPE) and understand unsafe work conditions.

Heavy rainfall is a common, highly probable natural hazard in the Province. Heavy rain or snow melt has the potential to deposit high quantities of water within the PA in a short period of time. Project design features will incorporate erosion control measures that will mitigate the effects of heavy rainfall and snow melt to maintain road access to critical Project infrastructure during severe precipitation events.

High winds and lightning, which may be associated with heavy rainfall or hurricane conditions, may increase the risk of mechanical issues or electrical fires. To mitigate this risk, turbines will be monitored remotely and equipped with an automatic shutdown that will engage when wind thresholds are reached (i.e., cut-out speed). Turbines will also be designed with a built-in grounding system for lightning strikes. Industrial operations will also monitor these severe weather events for temporary shutdowns. In the event of high winds and blowing debris, Project operations may be impacted by damage to electrical infrastructure, solar panels, and the transmission line.

The heavy haul road and ammonia pipeline are located along the coast and may experience impacts from storm surges, erosion, and waves associated with hurricane conditions. Ensuring coastal infrastructure is designed to withstand the likely impacts of hurricanes and other storm systems will help to increase the resilience of the Project. Mitigations associated with storm surges, erosion, and waves are discussed in Section 13.1.3.

Blizzards and ice storms occur during the winter months and can result in disruption of power supply, downed power lines, road closures, and ice build-up on infrastructure, including buildings, turbines, Industrial Facility, solar panels, and plants. Mitigation for such events would include back-up power supplies for critical systems, remote monitoring and operation capacity for critical systems, and construction and maintenance protocols to ensure minimal build-up of snow and ice on critical infrastructure.

EVREC will ensure site access is maintained in adverse conditions by clearing critical roads or providing vehicles that can traverse all conditions

The availability of abundant freshwater in Peters Pond is essential for the Project to operate at capacity (required for the Industrial Facility during operations and accommodations during construction). Periods of intense drought may limit freshwater availability for the Industrial Facility and accommodations. A Surface Water Management Plan will be developed to mitigate impacts, along with additional recycling of water back to Peters Pond as needed.

Drier-than-normal conditions may also cause an increase in dust, resulting in fugitive dust emissions. Dust will be managed via mitigations as necessary.

13.2.2 Wildfire

Wildfire poses a potential risk to the Project during all Project phases. A substantial portion of the PA is surrounded by forest cover and there is potential for naturally occurring and/or human-caused forest fires to damage Project infrastructure, elevate safety risks for Project personnel, reduce solar photovoltaic energy generation, and interrupt operations. If a wildfire occurs near fuel sources such as ammonia and hydrogen, which will be stored in storage tanks within the Industrial Facility, there is a risk of explosion, which could impact Project personnel and Infrastructure. Fire and explosions are discussed in more detail in Section 14.0. Additionally, the smoke generated by wildfires reduces solar photovoltaic performance by reducing solar irradiance through dimming and soiling, which decreases energy yield (Ford et al., 2024). Furthermore, wildfires may lead to evacuations or power outages, which could lead to Project infrastructure being shut down.

Fire is one of the sources of natural disturbance in NL. Based on a 20 year average, 118 wildfires burn 22,993 ha in Newfoundland and Labrador each year (NL FAL, n.d.-b). Although it is challenging to precisely predict changes to fire regimes, wildfire risk in NL is expected to increase under climate change as a result of warmer and drier conditions (Newfoundland and Labrador, 2025a).

The Forest Fire Regulations, NL Reg. 11/1996 outline restrictions for burning and operating timber harvesting equipment. Burning restrictions are determined by the Fire Weather Index (FWI). The Newfoundland and Labrador government employs an FWI during the fire season to determine fire hazard ratings (low to extreme) across the forested areas in Newfoundland and Labrador (NL FAL, n.d.-a). A higher fire hazard rating indicates that if a fire were to start, it would be of high intensity and pose greater danger than a low fire hazard rating. Operation of timber harvesting equipment and/or clearing saws in forested areas within the PA will only occur when and as permitted under the Forest Fire Regulations, NL Reg. 11/1996, and the fire hazard rating. Any activities requiring burning during the Project lifetime will be timed according to local burning restrictions.

As a best practice, the fire hazard rating can be used to determine fire danger associated with activities that may result in burning. The fire hazard rating will be checked regularly during summer months to determine the potential for highly dangerous wildfires. Precautions should be taken when undergoing construction or maintenance activities that could result in fires on days when the fire hazard rating is high to extreme, such as mechanical brushing/land clearing, using spark-producing tools, or piling of woody debris (NL FAL, n.d.-a). Should the risk of fires increase throughout the lifetime of the Project, mitigation strategies to protect Project Infrastructure will be adapted accordingly. Fire and explosion risk associated with fuel sources (including ammonia and hydrogen) and associated mitigations are further described in the Accidents and Malfunctions chapter of this EIS (Section 15.0).

The following operational and technological measures will also be implemented:

- Incorporate a site-specific fire safety plan with the Project's Emergency Response Plan, in coordination with local fire and emergency response departments.
- Engage with first responders on site access and availability of water resources for fire suppression.
- Ensure fire response equipment is available and that site personnel are trained in its use.

13.2.3 Turbine Icing

Turbine icing occurs when ice accumulates on the surface of turbine blades, a condition created by specific temperatures and levels of humidity or the presence of freezing rain. Icing occurs more frequently when turbine blades reach 150 m above ground where lower clouds may contain supercooled rain during the cold season (Seifert et al., 2003). Turbine icing may lead to ice throw or ice fall, and the distance and direction in which the ice is thrown/falls is dependent on factors such as wind speed, rotor speed, rotor azimuth, the position of the ice on the blade, and the characteristics of the ice itself.

The risk of injury or damage because of ice throw is present within the maximum throwing distance of ice from a turbine, as determined using the following equation (CanREA, 2020).

$$d_t = 1.5 * (D + H)$$

Where:

d_t = Maximum throwing distance (m)

D = Rotor diameter (m)

H = Hub height (m)

Based on the above equation and the turbine model specifications, (182 m rotor diameter and up to 140 m hub height), the maximum throwing distance associated with the Project's turbines is 483 m. The closest receptor to a turbine is a remote-no title receptor (WRID 867), located 211 m away from T249 in the BWPA, which is within the maximum throwing distance. Below is a table of all receptors within throwing distance (Table 13.2.1, Drawing 13.2-1A-AZ, Appendix A).

Table 13.2.1. Receptors Within Turbine Ice Throwing Distance

Receptor	Type	Closest Turbine	Distance to Receptor (m)	PA
WRID 867	Remote-no title	T249	211	BWPA
WRID 860	Remote-no title	T202	216	BWPA
WRID 839	Remote-title	T253	253	BWPA
WRID 564	Remote-title	T59	259	BWPA
WRID 858	Remote-no title	T203	295	BWPA
WRID 859	Remote-no title	T73	300	BWPA

Receptor	Type	Closest Turbine	Distance to Receptor (m)	PA
WRID 811	Remote-title	T59	345	BWPA
WRID 877	Remote-no title	T15	238	LTWPA
WRID 878	Remote-no title	T15	295	LTWPA
WRID 873	Remote-no title	T32	301	LTWPA
WRID 879	Remote-no title	T36	385	LTWPA

Botwood Highway 350, which goes through the BWPA and LTWPA, is also within the maximum throwing distance of 18 turbines (T133, 134, 138, 130, 140, 129, 127, 131, and 132 in the BWPA and T9, 16, 15, 20, 23, 22, 26, 10, and 11 within the LTWPA), with the closest turbines being 343 m away in the LTWPA (T9) and 351 m away in BWPA (T133). There are 87 locations where secondary roads are within the maximum throwing distance. There are also many resource roads, logging roads, and trails within the WPA that are within the maximum throwing distance (Drawing 13.2-1A-AZ, Appendix A). However, considering turbines will be equipped with automatic shutdown procedures to avoid damage to the turbines and ice throw, there is little risk associated with ice throw to the public using these roads or receptors.

Even with the automatic shutdown procedure, the risk is not zero, therefore, for additional mitigation, areas along roads that are within the maximum throwing distance, public warning signage can be placed in visible locations to warn drivers of the danger and to not stop/park their vehicles within the ice throw zones. Signage can also be placed near receptors within the maximum throwing distance. Additionally, turbines will incur operational curtailment until ice is removed by weather, as part of the sector management plan.

Ice throw also presents a risk to maintenance workers who will frequent the Project throughout its operational lifespan. Such access may be required when icing is a factor, and possibly because of icing. Appropriate safety practices in line with safe work procedures will be developed and followed to ensure the highest degree of worker safety.

To further reduce the risk of injury from ice throw or falling ice, mitigation measures to protect recreation users and site workers from ice throw or shedding will include:

- Continue engagement with the public regarding the safe continued use of lands within the PA.
- Continue engagement with provincial and municipal regulators to ensure concerns about access within and near the PA are addressed.
- Install signage illustrating and warning of potential hazards associated with ice throw and shedding around wind turbines, including on any recreational or logging trails, receptors, or roads within the danger zone of ice throw or shedding.
- Equip staff and workers accessing the PA with necessary PPE and associated safety protocols and procedures to mitigate risk of injury and/or fatality, especially during potential icing conditions.

- Equip turbines with automatic shutdown procedures to avoid damage to the turbines and ice throw. Identification of icing and automatic shutdown can be triggered by factors such as temperature, anemometer (wind) speeds, and power curve comparison.

13.3 Summary of Effects

The environmental effects associated with climate change and natural hazards have the potential to affect all phases of the Project. Project location siting, design measures, and education of Project personnel will help to minimize many of the risks associated with these factors. The mitigation measures described above will allow for both proactive and adaptive management of remaining risks, thus limiting the overall impact on the Project.

14.0 ACCIDENTS & MALFUNCTIONS

Accidents and malfunctions are unplanned events that are not anticipated to be part of any phase of the Project but can potentially arise at any time during construction, commissioning, operation, or decommissioning activities. The risks associated with accidents and malfunctions are determined by both the likelihood of an event occurring as well as the potential consequences the event could have. Without proper mitigation, accidents and malfunctions have the potential to result in adverse effects. However, effective planning and preventative measures limit the probability of occurrence, and appropriate response procedures reduce the magnitude of adverse residual effects.

Accidents, malfunctions, and unplanned events considered for this Project are detailed below and include (but are not limited to):

- Accidental Emissions Release
- Accidental Spills and Releases
- Dislodging of a Wind Tower, Turbine Blade (Structural Damage)
- Energy Generation/Transmission Failure
- Erosion and Sediment Control Failure
- Failure of a Water Supply
- Fire and Explosions
- Thermal Runaway (Battery Storage)
- Traffic Accidents
- Wildlife Emergencies/Incidents

Note that the mitigation strategies reviewed below have been developed based on the Project's current Pre-FEED status. EVREC intends to design the Project to meet or exceed all applicable safety guidelines, with clear and well-established emergency response plans in place to manage potential incidents. An Emergency Response Plan (ERP) document has been developed (Appendix Q.2). Additionally, EVREC will develop their own Emergency Response Team (ERT) that is a dedicated team with advanced training and can respond to site specific situations that may occur.

As the Project advances through the FEED phase and into detailed engineering, mitigations will be further refined to reflect the more detailed technical specifications, regulatory requirements, and site-specific considerations. Ongoing refinement and optimization of the Project's design will ensure that mitigation strategies remain effective, practical, and aligned with the Project's environmental and operational objectives.

14.1 Risk Matrix

To assist in assessing the probability and severity of an unplanned event, the following risk matrix was developed (Figure 14.1.1)

		Impact (measures the potential severity of the event's consequence)				
		Insignificant	Minor	Moderate	Major	Severe
Probability (measures how likely it is that the event will occur)	Almost Certain	Medium	High	Very High	Very High	Very High
	Likely	Medium	Medium	High	Very High	Very High
	Possible	Low	Medium	Medium	High	Very High
	Unlikely	Very Low	Low	Medium	Medium	High
	Rare	Very Low	Very Low	Low	Medium	Medium

Figure 14.1.1: Unplanned Event Risk Matrix

Description of probability categories of an event occurring:

- **Rare:**
 - Very unlikely to occur; would only occur in exceptional circumstances.
- **Unlikely:**
 - Unlikely to occur, but not impossible.
- **Possible:**
 - Might occur but is not expected; plausible.
- **Likely:**
 - Will likely occur, is not unexpected.
- **Almost Certain:**
 - Expected to occur, nearly inevitable.

Description of severity categories for an event:

- **Insignificant:**
 - On site incident that can be managed by immediate site resources/personnel.

- No offsite risk of impact.
- No risk to on- or off-site personnel or property.
- No residual environmental impact.
- No likelihood of media attention.
- External communications are not required.
- Costs of incident response under 10K.
- **Minor:**
 - On site incident that can be controlled using general site resources/personnel.
 - Low potential for off-site impact.
 - Low risk to on- or off-site personnel or property.
 - Minor residual environmental impact, easily mitigated in a short timeline (<1 year)
 - Media attention is unlikely
 - External communications are unlikely.
 - Costs of incident response >10K but under 50K.
- **Moderate:**
 - On site or offsite incident that can be mitigated and controlled using site resources/personnel but may require elevation to site's ERT and may require offsite resources.
 - Potential for offsite impacts.
 - Medium risk to on- or off-site personnel or property.
 - Some residual environmental impact (>1 year but less than 3 years).
 - Media attention is possible but not expected.
 - External communications may be required but are not expected.
 - Costs of incident response >50K but less than 150K.
- **Major:**
 - On site or offsite incident that cannot be mitigated and controlled using onsite resources/personnel; offsite support is required.
 - ERT support is required.
 - Offsite impacts are likely.
 - High risk to on- or offsite personnel or property.
 - Residual environmental impact is anticipated (>3 years but less than 10 years, long term monitoring anticipated).
 - Media attention is expected.
 - External communications are likely.
 - Costs of incident response >150K but less than 1M.
- **Severe:**
 - On or offsite incident that cannot be mitigated and controlled using onsite resources/personnel; offsite support is required and extends beyond local community resources.

- ERT support is required.
- Offsite impacts are likely.
- Very high risk to on- or offsite personnel or property.
- Residual environmental impact is anticipated (>10 yrs, long term monitoring expected).
- Media attention is expected.
- External communications will be required.
- Costs of incident response > 1M.

This risk matrix has been applied to each described scenario below to assist in defining the potential probability of occurrence and magnitude of the event.

14.2 Accidental Emissions Release

14.2.1 Air Emissions

During normal operations air emissions will remain within the applicable regulatory limits (Appendix D.1), however, the potential release of air pollutants into the atmosphere during commissioning, abnormal operations, and operational upset/emergency relief conditions at the Industrial Facility poses environmental concerns due to the potential for impact on ambient air quality.

Commissioning represents a short-duration (~2 months) scenario characterized by the temporary operation of several emission sources required to safely start-up and test plant systems. Anticipated emissions would be due to the use of process and jetty flares for system purging, testing and stabilization; including gas flaring from the process flare, ammonia storage flare, and jetty flare; short-term emissions are also anticipated to be associated with operation of diesel-fired emergency and light-duty generators (Appendix D.1).

Abnormal operations can be described as infrequent and non-routine conditions that may occur under no or low wind conditions in which power is supplied by emergency generators, and renewable energy power sources are considered unavailable. Anticipated releases would be short-term (anticipated to be no more than 24-hours in duration) and contributing emissions may include propane-fueled pilots at the ammonia process flare, storage flare, and jetty flare; a continuous flash gas purge from the ammonia washing column (to prevent inert gas accumulation during operation at approximately 10% turndown throughput); and the operation of (low-sulphur) diesel-fired emergency generators (Appendix D.1).

Operational upset/emergency relief conditions are unplanned, short-duration (anticipated to be less than 1-hour in duration) deviations from normal operating conditions and anticipated emissions would primarily be associated with excess or off-spec process gases associated with activation of the pressure relief systems which would involve increased flaring via the process flare, ammonia storage flare, jetty flare and associated relief streams routed to these locations. Emissions from diesel-fired emergency equipment is also likely as this scenario also assumes that no power is available from renewable energy power sources (io consulting,

2026a).

Based on the above described scenarios, air dispersion modelling was completed and results of the modelling indicate that during commissioning, abnormal operations and/or operational upset/emergency relief conditions (of intermittent frequency), the Industrial Facility is shown to exceed the NLAPCR regulatory thresholds for NO_x (1-hour and 24-hour) and PM₁₀ (24-hour) emissions (io consulting, 2026a).

The potential release of NO_x and PM₁₀ may result in localized air quality impacts, health hazards, and potential safety risks at local receptors (Appendix D.1). Emissions such as NO_x and PM transported by wind and air currents can contribute to photochemical smog formation, acid rain, and nitrate particulates in the atmosphere (Majewski, 2024). Inhalable particulates (PM₁₀) can cause health impacts, including worsening of respiratory illnesses such as asthma and chronic obstructive pulmonary disease (COPD; California Air Resources Board, 2026).

A flare system failure could result in the potential release of gases from incomplete combustion. If the flare fails to ignite or sustain combustion, unburned process gases, including NO_x, SO_x, CO, PM_{2.5}, and PM₁₀, may be vented directly into the atmosphere.

It should be noted that emissions are expected to reduce rapidly with distance from the source and for the abnormal operating conditions, and operational upset/emergency relief scenarios, the modelled exceedances were short-term and intermittent and will be further refined and reviewed during subsequent (FEED) design phases. Furthermore, the air dispersion model incorporated conservative assumptions and will require additional inputs (i.e., a detailed-level air dispersion model) at subsequent stages of the Industrial Facility's design and development to better characterize the extent of impacts (Appendix D.1).

14.2.2 Noise Emissions

The potential for excessive noise generation during emergency conditions at the Industrial Facility raises environmental concerns since it could affect the surrounding acoustic environment.

Emergency blowdown relief conditions are those that deviate from normal operating conditions and are primarily associated with safely managing excess or off-spec process gases via relief systems. In the context of noise, these conditions are characterized by elevated sound levels generated by rapid depressurization and venting of the main plant flare (Appendix F.3).

Based on the above-described scenario, noise modelling was completed, and results indicated that during an emergency blowdown relief scenario, the maximum predicted noise level was determined to be 89 dBA at the nearest residential receptor to the Industrial Facility (IRID37). This value exceeds the Health Canada noise guidelines for sleep (45 dBA) and outdoor speech comprehension (55 dBA; Health Canada, 2023; Appendix F.3).

14.2.3 Mitigation

Mitigation measures may limit the probability of an emissions incident and reduce the magnitude and extent of potential effects. The following are general mitigation measures to reduce the probability and/or magnitude of an accidental emissions release, these include:

- Establish a comprehensive maintenance schedule for inspections of the flare tip, pilot burners, pressure relief valves, and ignition systems.
- Regularly test the ignition system and calibrate all control systems and sensors that monitor gas flow and flame presence.
- Conduct routine inspections to ensure the integrity of all critical equipment.
- Install gas detectors to detect any hazardous or explosive gas leaks.
- Train Project personnel on system operation, failure response, and troubleshooting.
- Develop and implement a Project-specific ERP.
- Train Project personnel on the ERP and conduct periodic emergency drills.
- Ensure Project personnel working near potential (air and noise) emission sources are provided with appropriate PPE to ensure safety during emergency events, servicing or repair scenarios.
- Remodel air and noise emissions during subsequent design phases as vendor data, final layouts and emissions inventory details are refined.

The following are specific mitigation measures to reduce the probability and/or magnitude of an accidental air emission release, these include:

- Coordinate with local and regional emergency management agencies to ensure a rapid and coordinated response in the event of an accidental emission release.
- Locate, if possible, the flare system upwind relative to other industrial processes to prevent flammable vapours (i.e., ammonia) from being carried towards the flare by prevailing winds.

The following are specific mitigation measures to reduce the probability and/or magnitude of an accidental noise emission release, these include:

- Consider designing blowdown relief system to use multi-stage pressure reduction.
- Locate the flare system away from residential receptors (while within the Industrial Facility fenceline) to reduce overall sound emissions at the nearest receptor.

An accidental emissions release could result in changes to local air quality and generate elevated noise creating harm or disturbance to local receptors. With the implementation of risk mitigation measures and best management practices, the likelihood of an abnormal or emergency/upset condition occurring will be reduced and potential environmental impacts will be limited. The probability of an air or noise accidental emissions release is unlikely and the impact would be minor making the risk low.

14.3 Accidental Spills and Releases

14.3.1 Ammonia Release (Hazardous Release)

Anhydrous ammonia will be transported via pipeline and stored at the Industrial Facility in liquid form (stored under pressure); in the event of a release to atmosphere, anhydrous ammonia becomes gaseous. Anhydrous ammonia is caustic and flammable, and exposure to high enough concentrations can result in chemical burns and respiratory damage, soil and water contamination, and contribute to potential nitrogen loading in the atmosphere (Kuchta et al., 2025). Accidental ammonia release, although unlikely, may occur at the Industrial Facility or along associated pipelines during the commissioning, operations, or decommissioning phases of the Project. An ammonia release scenario could take place as a result of the following events:

- Processing plant release
- Storage tank release
- Transfer pipeline release
- Loading pipeline release
- Valve failure
- Failure due to corrosion
- Failure due to freeze/thaw cycles
- Failure during repair or maintenance activities

The consequences of a toxic ammonia release depend on the dilution rate and dispersion (of the ammonia cloud) to safe levels in the atmosphere. Liquid releases rely heavily on the pooled surface area within the release area, where the pooled surface area is proportional to the evaporation rate. The evaporation rate of the chemical pool determines the toxic gas cloud volume, hazard zone, and/or impact radius. Humidity, temperature, precipitation, wind speed and terrain can all impact the way in which a release can behave, and these factors should be considered when responding to and/or mitigating a release.

To limit the impacts of a potential ammonia release, the following mitigations will be applied:

- Response planning will align with the ECCC Environmental Emergency Regulations (E2 Regulations; Canada, 2019) and comply with the requirements of an environmental emergency response plan to ensure readiness and compliance.
- Emergency response scenarios will be incorporated into the Project's ERP and regularly reviewed through training exercises involving the on-site Emergency Response Team (ERT) and regional Mutual Aid Partners, including local Volunteer Fire Departments.
- Automated shut-off valves will be equipped on connection points for ammonia transfer points.
- Nitrogen gas (N₂) will be stored on site and used to control ammonia storage and limit reactivity.
- Flare systems will be used in the event of an emergency situation to safely burn off

- excess product
- Detailed design will incorporate a winterization evaluation along piping and instrumentation for hydrate formation (and additional winterization considerations that could result in release); tracing or other engineered controls will be incorporated, as required.
- Ammonia storage tanks and pipelines will be constructed of corrosion resistant materials.
- The layout of the Industrial Facility will locate infrastructure in such a way as to minimize the risk of domino events (e.g., as per the results of the QRA, the hydrogen plant and ammonia storage tanks will be appropriately staged to allow sufficient buffer in the event of an emergency)
- Routine inspection and monitoring of ammonia storage systems and connection/transfer points will be completed, and repairs will be completed as necessary.
- Leak detection systems will be implemented and may include acoustic monitoring, ammonia-specific sensors and/or balance-based systems.

An accidental ammonia release could result in an emergency scenario; however, mitigation measures and emergency response planning will limit potential impacts and reduce the likelihood of significant environmental effects and risk to Project personnel and surrounding communities. The probability of an accidental ammonia release is low but the impact is moderate making this risk medium.

14.3.2 Hydrogen Release (Fire or Explosion)

Hydrogen will be stored on site at the hydrogen plant and as a component of the PEM electrolyzer units. Hydrogen is a non-toxic gas with a low vapour density and a large flammable range. Hydrogen can diffuse rapidly in air, and when stored under pressure, a release or leak can result in a highly flammable and volatile circumstance leading to fire or explosion. An accidental hydrogen release could adversely impact air, soil, aquatic habitat, terrestrial habitat, wildlife, avifauna, human health and safety.

Potential confined vapour cloud explosion, (cVCE), as well as unconfined vapour cloud explosion, (uVCE), and fireball hazard events may occur (although they are unlikely) during the Project's process operations.

Hydrogen release scenarios considered to be the most probable emergency event scenarios for potential loss of containment include the following:

- Explosion event due to a connection leak at an electrolyzer stack.
- Explosion event due to a connection leak within the hydrogen compressor enclosure (on the high-pressure discharge line).
- Fireball event due to a connection leak on a hydrogen main manifold.
- Fireball event/explosion due to a rupture of high-pressure hydrogen storage.

Regarding explosion scenarios, projectiles are typically part of explosion events and may significantly impact infrastructure and/or the integrity of process buildings which may compromise the safety of Project personnel.

To mitigate the impacts of a potential hydrogen release, the following will be applied:

- Mitigations to protect personnel and respond to damage from projectiles during an emergency event will be included in the Project's ERP.
- Detailed fire response plans for each potential fire or explosion scenario will be developed and detailed in the Hazard and Operability (HAZOP) study, used in training, and exercised by the ERT and Mutual Aid Partners (e.g., local Volunteer Fire Departments) per the requirements of ECCC Environmental Emergency (E2) regulations (Canada, 2019a).
- Ignition sources will be managed and electrical components within the hydrogen plant shall comply with the applicable electrical hazard zone to minimize probability of ignition.
- Pressure relief devices designed to vent to open-air locations will be installed.
- Fast-acting gas monitoring/detection systems will be installed. The monitors/detection systems will be interfaced with the control system in such a way so that appropriate alarms will be activated based on an alarm hierarchy. Safety controls, where practical, will automatically shutdown upstream valves to control or prevent releases of hydrogen. Manual intervention will be incorporated into the design should automatic systems fail under release conditions.
- High-level ventilation to prevent hydrogen accumulation will be installed.
- The layout of the Industrial Facility will locate infrastructure in such a way as to minimize the risk of domino events (e.g., as per the results of the QRA, the hydrogen plant and ammonia storage tanks will be appropriately staged to allow sufficient buffer in the event of an emergency event)
- Positive pressure and/or blast safe enclosures/control rooms will be available to protect operations personnel from the effects of a release or explosive scenario.
- Detailed design will consider the impacts of hydrogen embrittlement and utilize appropriate materials (e.g., stainless steel cladding and/or coatings) to prevent damage or failure that could result in release.
- Detailed design will incorporate a winterization evaluation along piping and instrumentation for hydrate formation (and additional winterization considerations that could result in release); tracing or other engineered controls will be incorporated, as applicable.
- The electrolyzer system will employ maintenance strategies, integrity evaluations, and safe operating procedures to minimize and maintain a very low probability of loss of containment of hydrogen.

Accidental release, fires, and/or vapour cloud explosions are potential hazards associated with the use and storage of hydrogen; however, these accidents have a low probability of occurrence due to the engineered safeguards and industry best practices inherent to safety-in-

design principles that will be implemented. The probability of a hydrogen release is unlikely but the impact could be major making this risk medium.

14.3.3 Untreated Liquid Effluent Release

Untreated liquid effluent releases, including black water, grey water, impacted surface water, or processed water from the Industrial Facility, have the potential to cause adverse environmental effects. Untreated effluent may be introduced into the environment by malfunction of the water treatment system which would fail to effectively treat process wastewater and stormwater, which could lead to the discharge of contaminated effluent into the environment. Failure of the camp sewage treatment system or damage to portable toilets can result in sewage releases and impacts to water through accidental spills or releases. The discharge of untreated and/or poorly treated effluent may result in the following impacts:

- Eutrophication of water sources
- Degradation of water quality
- Endangerment of aquatic species and habitat
- Contamination of soils and sediments
- Contamination of groundwater; impacts to residential potable groundwater

To mitigate potential impacts of untreated effluent, spills and releases will be managed and controlled on site using the site's surface water management system, including the site's stormwater/effluent water pond. This pond will be sampled to confirm compliance with applicable regulatory limits prior to discharge. Outflow(s) will be controlled and pond capacity will be designed in accordance with best management practices and applicable engineering standards.

At facility locations with potential for ammonia release (e.g., ammonia processing units, ammonia storage/loading pumps, and the ammonia storage BoG refrigeration) an ammonia contaminated wastewater collection system will direct impacted water into an underground pipeline to an ammonia contaminated water sump. The sump will be blanketed with nitrogen gas and directed to vent at the ammonia storage flare, as necessary.

The quality and contaminant risk of the untreated effluent is dependent on the final Industrial Plant components selected and will be further refined and determined during future FEED iterations. Mitigations for the release of untreated effluent into the environment will be included in Project design and addressed within the ERP and as a component of the site's surface water management system. The probability of an untreated liquid effluent release is unlikely with an impact of minor making the risk low.

14.3.4 General Hazardous Material Spills and Releases

Hazardous spills resulting from the use of fuel (i.e., storage, refueling, operation of combustion vehicles) and other on-site hazardous chemicals may occur during the Project's construction, commissioning, operations, and decommissioning activities. Hazardous spills can adversely impact air, soil, surface water groundwater quality, human health, and safety. In addition,

hazardous spills may risk the health of aquatic, avian, and terrestrial wildlife. The severity of the impacts will depend on the nature and volume of the hazardous material(s) released.

General mitigation measures to limit the probability of a spill or release and reduce the magnitude and extent of potential impacts include:

- Comply with all relevant regulations related to storage, transportation, handling, and use of hazardous materials.
- Store all dangerous goods in compliance with the Workplace Hazardous Material Information System (WHMIS).
- Store all fuels, lubricants, and hazardous materials in designated containers and dedicated storage areas.
- Provide secondary containment in product storage areas and unloading and handling areas.
- Design and implement high-integrity storage and piping systems.
- Schedule regular inspections for all mobile and processing equipment to assess for potential leaks, wear, or damage, particularly associated with hosing, joints, seals, transfer points, and valves. Identify and repair leaks promptly.
- Complete mobile equipment servicing off-site, where possible. If this is not possible, require that the work is completed in a designated area, greater than 30 m from a watercourse or wetland.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.
- Provide Safety Data Sheets (SDS) for all chemicals and train personnel to ensure proper handling, storage, and response in the event of spills or exposure.
- Develop spill prevention and response procedures as part of the Project's ERP.

Application of the above mitigations and effective implementation of the ERP will ensure a timely response in the event of an incident and reduce the likelihood of a significant release event and subsequent residual impacts. The probability of a general hazardous release is unlikely with an impact of moderate making the risk medium.

14.4 Dislodging of a Wind Tower or Turbine Blade (Structural Damage)

The collapse of a wind tower or dislodgement of a turbine blade may occur during the operation of the Project. These incidents may happen during construction, as a result of adverse weather effects, and/or due to mechanical failure. The collapse of a wind tower or the dislodgement of a turbine blade may result in potential adverse effects to wildlife, avifauna, and the biophysical environment as well as compromise Project personnel and public safety and result in damage to Project infrastructure and property.

The most frequent causes of damage to turbines that may result in failure include damage from lightning, material fatigue over time, leading edge erosion, and damage from icing. Turbine

icing is described in greater detail in Section 13.2.3.

To mitigate these risks, the following methods will be applied:

- Setbacks from public infrastructure, transmission lines, roads, and residences will be incorporated into the Project design. The setbacks will serve as a buffer to ensure that in the event of a structural failure, the potential for offsite impact is minimized.
- To detect damage before it can result in a complete failure, including partial or full blade detachment, structural health monitoring through use of advanced sensors which can detect anomalies in performance, and the presence of abnormal vibrations that might indicate an imbalance (Algolfat et al., 2023), will be employed.
- Routine monitoring and inspection of the structural integrity of all components of turbines will also be incorporated (Enlita, 2024).
- Ensure sufficient lubrication in bearings, and that bearings are free of debris that could cause excess friction.
- Prepare and enact severe weather plans to reduce the risk of physical damage from flying debris or hail and minimize the risk that thermo-electric damage by lightning results in blade failure. Further mitigation relating to ice throw is described in Section 13.2.3.
- Inspect and properly maintain turbine brake function.
- Check and change lubrication regularly in the turbine gearboxes to prevent excess heat and minimize wear.
- Test full suite of sensors regularly to ensure that anomalous conditions are detected early and managed before they result in damage to turbines.

Consideration and implementation of the mitigations supplied will minimize the likelihood of a structural failure that could result in damages to property, personnel and/or the environment. The probability of a wind turbine blade or tower is rare with an impact of moderate making the risk low.

14.5 Energy Generation/Transmission Failure

The Project will rely primarily on electricity generated from the Project's renewable energy (wind and solar) sources. Electrical power is essential for the operation of electrolysis units, compressors, refrigeration systems, pumps, instrumentation, gas detection systems, and emergency shutdown systems. Energy generation and transmission failures may occur due to extreme weather events common to NL, including high winds, icing, lightning, storm surge, and salt exposure, as well as equipment malfunction such as transformer failure, protection relay trips, transmission conductor damage, or substation fire. These events may result in partial power loss, full plant blackout, or interruption of pipeline transfer operations.

A loss or instability of electrical power would result in automated and controlled process shutdowns which could potentially impact systems designed to protect equipment and prevent uncontrolled releases. Temporary process upsets in ammonia synthesis systems may result in controlled pressure relief to flare systems, which could result in short-term increases in air and

noise emissions; and substation or transformer failures could result in localized fires or release of insulating oil.

Mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include:

- Automatic shutdown of electrolysis systems, and hydrogen and oxygen systems would undergo controlled depressurization to designated vent systems.
- Automated closure of emergency shutdown valves and isolation of transfer systems, preventing loss of containment at pipeline pumps and valves.
- Oil-filled equipment (such as substations and transformers) will be located within secondary containment systems to prevent migration to soil, groundwater, or the aquatic environment in the event of a release.
- Wind turbines, substations, and transmission infrastructure will be designed to applicable CSA standards, and take into account the province's wind, ice loading, and extreme weather conditions.
- Lightning protection systems for turbines, substations, and transmission lines will be installed.
- Use of corrosion-resistant materials and protective coatings for coastal environments will be considered.
- Storm surge and flood-resilient design for electrical infrastructure will be incorporated.
- Routine inspection, preventative maintenance, and asset integrity management programs will be applied.
- Continuous monitoring of electrical systems and power quality will be conducted and backup power generation from diesel-fired emergency and electrolyzer generators will be incorporated.
- Automated load-shedding and controlled shutdown sequences will be implemented to stabilize plant operations in the event of power loss
- Safety Instrumented Systems (SIS) to initiate safe shutdown during abnormal conditions will be employed
- Surge protection systems and pressure protection on process equipment and pipelines will be installed.
- Uninterruptible Power Supply (UPS) will be considered for critical instrumentation, monitoring, and control systems
- Critical valves will be designed to move to fail-safe positions upon loss of power
- Stormwater management and isolation controls to prevent migration of contaminants to soil, groundwater, or other environments will be considered

With the implementation of appropriate engineering design and mitigation measures, potential environmental effects from energy generation and transmission failures would be localized and short-term. Process systems will be designed to fail in a safe and controlled manner, and containment, relief, and isolation systems will prevent uncontrolled releases to soil, groundwater, surface water, or the aquatic environment. The probability of an energy/transmission failure is possible with an impact of minor making the risk medium.

14.6 Erosion and Sediment Control Failure

Erosion and sediment control (ESC) failures may occur during construction of all components of the Project. Failure of erosion and sedimentation controls implemented by the Project may result in potential adverse effects on the surrounding terrestrial and freshwater environments.

ESCs are implemented to minimize impacts to watercourses, wetlands (and to fish and fish habitat), and terrestrial environments from the migration of fine sediment from disturbed soils (i.e., grubbing, excavation), stockpiled material (i.e., removed fill), and former infill locations (i.e., previously filled/graded areas) during all phases of the Project.

ESCs may fail due to extreme weather conditions (e.g., flooding), improper installation, improper maintenance, and unforeseen accidents (e.g., on-site vehicle or equipment collisions with ESCs). Failure of these control measures may release sediment into the environment, impacting water quality and aquatic and terrestrial habitats.

Mitigation measures to limit the probability of an ESC failure and reduce the magnitude and extent of potential effects include:

- Provide workers with training to properly install and repair ESCs.
- Develop and implement an Erosion and Sedimentation Control Plan for all phases of the Project.
- Conduct regular monitoring of all erosion and sediment controls, and repair or replace as necessary.
- Heed Environment Canada's special weather warnings to ensure proper care is given to stabilize erosion and sediment controls in advance of, and following, extreme weather events (i.e., precipitation).
- Ensure surface water management systems are designed according to regulatory specifications and are capable of receiving and managing sufficient volume during precipitation events.

An erosion and sediment control failure may have a potentially significant impact on the surrounding environment due to its effects on water quality. However, implementing the above mitigations, along with best management practices and procedures, will reduce the likelihood of a failure occurring. EVREC is committed to the development of a site specific Erosion and Sedimentation Control Plan to ensure that erosion and sediment control measures are implemented throughout all Project phases. The probability of an erosion and sediment control failure is possible with an impact of minor making the risk medium.

14.7 Failure of a Water Supply

A continuous supply of fresh water is a critical operational requirement for the production of molecular hydrogen via electrolysis through the PEM electrolyzer process. Interruption or loss of the industrial water supply would necessitate a temporary suspension of Project operations until the supply is re-established.

Failure of water management infrastructure (e.g., pipeline rupture or associated conveyance system malfunction) could result in disruption of process water availability and/or an unintended release of water to the receiving environment. In such circumstances, the magnitude of potential adverse effects to human health, worker safety, and environmental receptors would be contingent upon the nature of the failure and the volume of water released.

A high-volume release could result in localized flooding, with associated risks including infrastructure damage, soil erosion, and electrical hazards where energized equipment is present. In the event that infrastructure damage occurs, there is also the potential for concurrent impacts to adjacent hydrogen conveyance systems, thereby introducing the possibility of a simultaneous hydrogen release. Preventative controls and emergency response procedures specific to accidental hydrogen releases are outlined in Section 14.3.2.

Mitigation measures to limit the probability of a water supply failure include the following:

- The Project will be supplied by a reliable water source from Peters Pond, reducing the likelihood of supply interruption.
- To preserve emergency response capability in the event of a process water disruption, a dedicated reserve of fire response water will be maintained separately from the electrolyzer facility.
- Water storage, containment, and conveyance infrastructure will be subject to routine inspection and preventative maintenance to identify and mitigate potential failure mechanisms.

While an industrial water supply failure would materially affect Project continuity, the overall risk to human health and the environment is anticipated to be low.

14.8 Fire and Explosions

An accidental fire may occur from Project activities which could lead to larger events (explosions) and potentially adversely affect the atmospheric environment (emissions), the natural environment, Project infrastructure, and neighbouring communities.

In addition to the fire and explosion risk presented by the use and storage of hydrogen (Section 14.3.2) generally, fires may occur as a result of equipment accidents, hot works, malfunction of fuel storage tanks or use of power tools and machinery, on-site burning, human carelessness, or natural causes such as a lightning strike under dry conditions. Of these potential sources, fires originating from, or in proximity to, fuel sources (including ammonia and hydrogen) are inherently dangerous as fuel may sustain a fire for longer periods and lead to explosions and/or extensive damage. In addition, fires may release hazardous materials, which could impact air quality and cause adverse effects on the surrounding environment (i.e., terrestrial or aquatic habitat).

14.8.1 Electrical Fires

Electrical fires pose a risk due to the presence of low, medium, and high voltage electrical equipment. Potential electrical fire hazards associated with all phases of the Project include the presence of high-voltage equipment, control panels, and interconnected systems that are critical for the safety and continuity of product production. Electrical fires could potentially result in explosions due to the presence of fuel and volatile materials located at the Industrial Facility. Some electrical fire hazards include:

- Central inverter failure (due to overheating or component failure of Solar Project components)
- Arc Flash or Arc-fault
- Overloaded circuits due to the exceedance of the electrical capacity of a circuit.
- Faulty wiring or equipment failure.
- Malfunctioning electrical equipment, appliances, or devices.
- Poor maintenance of electrical systems.
- Mobile equipment operating in violation of the clearance requirements of substation and transmission line equipment.

14.8.2 Hydrogen and/or Oxygen Release

Hydrogen and oxygen will be generated from the electrolyzers with hydrogen stored on-site at the Industrial Facility as components of the PEM electrolysis process. Hydrogen is classified as a hazardous material for storage and a dangerous good for transportation. Oxygen in and of itself is not flammable, however, it is an oxidizer which supports combustion and results in materials igniting more easily and burning with intensity. With respect to this system, scenarios considered most probable in an emergency event are as follows:

- PEM electrolyzer membrane degradation (mechanical, chemical, thermal).
- Presence of ignition sources (static energy or sparks).
- System failure/crossover.

For details and controls considered for this scenario, refer to Section 14.3.2.

14.8.3 Use of Explosives & Blasting

Quarrying activities may pose risks associated with explosive use and the potential for improper handling, accidental detonation, and projectiles/fly rock impacts.

The likelihood of fire or explosion will be reduced through careful management of fuels and explosives, chemical storage, and adherence to established handling and transport procedures. Explosives will be stored and handled by certified third-party blasters in accordance with recognized safety practices and regulatory requirements for hazard management and worker competency. On-site blasting will only be conducted under the direction and control of a certified blaster and will comply with the requirements of the Newfoundland and Labrador Regulation 5/12, Part XIX (Newfoundland and Labrador, 2012).

14.8.4 Mitigations

General mitigation measures to limit the probability of a fire or explosion occurrence and reduce the magnitude and extent of potential effects include:

- Develop a fire prevention and evacuation plan, in addition to general safety protocols and training, as part of the ERP and share with local fire departments.
- Prohibit burning within the Project area by staff and contractors.
- Allow smoking in designated areas only and stage these smoking areas away from flammable products and chemical storage zones.
- Dispose of all flammable waste regularly at an approved facility (e.g., flammable chemicals, waste fuels, spill response materials).
- Implement mitigation related to chemical and fuel storage (Section 14.3.4).
- Install fire suppression systems suitable to the plant area and equipment protection needs.
- Require that installation of electrical equipment and wiring be completed by qualified, licensed electricians in accordance with CSA requirements.
- Maintain corridors containing electrical infrastructure during operations to ensure flammable materials/wastes do not accumulate and vegetation (where applicable) is controlled and managed.
- Implement fire detection and protection systems in vulnerable areas (e.g., fuel storage areas).
- Establish buffer zones or firebreaks between the Industrial Facility and the neighbouring properties.
- Provide appropriate PPE where the risk of arc-flash or arc-blast is present.
- Consult with local fire departments to review the suitability of access routes for emergency vehicles.
- Maintain access and conduct regular maintenance for fire water storage.
- Conduct regular inspections, capacity assessments, and maintenance to ensure water availability and compliance with fire safety regulations.
- Require that an inventory of ancillary firefighting equipment is well-maintained and readily accessible to effectively manage on-site fires.
- Ensure that access to the on-site Fire Station is maintained and access preserved and that an appropriate inventory of in-stock materials is on hand to respond to Industrial Facility emergency situations.
- Train all personnel in emergency response, fire prevention and evacuation plans, and the use of firefighting equipment.
- Require that the selection of pumps, motors, instrumentation, and other electrical components comply with the applicable electrical hazard zone, which will minimize the probability of ignition.
- Conduct regular inspection of wiring connectors, and switch gear for signs of wear, corrosion, or damage, and maintain a protection relay testing program.
- Conduct regular maintenance and inspection of solar panel arrays and central inverter components
- Ensure lockout/tagout protocols are in place and followed to prevent arc flash and arc

- fault; install Arc-Fault Circuit Interrupters during maintenance activities.
- Central inverter stations will use prefabricated, weather-resistant enclosures with electrical protections systems, isolation systems and grounding fully installed.
- Schedule preventative maintenance of electrical systems to identify potential failure occurrences.
- Design electrical systems with adequate load capacity to prevent overloading.
- Require compliance with applicable Electrical Codes and Standards.
- Install, where feasible, emergency shutdown systems to isolate electrical power during critical electrical fire incidents to reduce the risk of fire spread and ensure the safety of personnel.
- Develop a lock-out/tagout program for any work done on energized systems.

The probability of an electrical fire is possible with an impact of minor making the risk medium. The probability of a hydrogen/oxygen fire is unlikely with an impact of moderate making the risk medium. The probability of an explosives/blasting fire is unlikely with an impact of moderate making the risk medium.

14.9 Thermal Runaway (Battery Storage)

A long-term BESS composed of industrial scale lithium-batteries will be located at the Industrial Facility and used to provide power to critical loads, at times of insufficient or no energy generation from the Wind Project.

Thermal runaway reactions, although rare, can result in lithium battery failures. Thermal runaway occurs when a battery fails resulting in a self-sustaining, unstable, chemical chain reaction in which the internal heat generation within a battery cell exceeds the external heat dissipation resulting in extreme temperatures, fire, explosion, release of toxic gases and the risk of a domino effect (on other batteries). Lithium fires can burn without oxygen and are prone to re-ignition; and the failure of the battery's internal structure results in the release of chemicals which could include hydrogen fluoride, carbon monoxide, hydrogen cyanide and other volatile organic compounds.

The most likely causes of thermal runaway include overcharging or over-discharging, overheating, physical damage of the battery, and short circuits.

To mitigate the potential for thermal runaway, the BESS will be designed with multiple automatic and manual shutdown, isolation and safety mechanisms.

- Electrical and fire-and-gas related systems will be designed to alarm, stop operations, and isolate affected equipment or blocks automatically during abnormal or fault conditions, in accordance with the final vendor design and site protection philosophy.
- Each BESS enclosure or block will be provided with vendor-defined emergency shutdown and isolation means, including automatic shutdown logic and manual shutdown interfaces.
- The BESS will be equipped with means for electrical isolation that can be operated

manually to de-energize portions or all of the system for maintenance or emergency response.

- Maintenance and emergency isolation procedures will include lockout/tagout, safe waiting periods where required, and verification of zero-energy state before work is undertaken.
- Staff will be trained in safe operation, isolation, emergency shutdown, and emergency response procedures.
- The BESS will incorporate early-warning monitoring and alarm functions, including temperature, smoke, fault, and where appropriate gas detection, integrated with the site control and emergency systems.
- The BESS layout will incorporate appropriate enclosure spacing, thermal management, fire separation, explosion relief, and propagation-mitigation measures to reduce heat transfer and limit escalation between adjacent units.
- Controlled ventilation and, where applicable, explosion-relief / deflagration features will be incorporated to manage the accumulation and release of potentially hazardous gases.
- Batteries will be stored and operated in a manner that protects them from vehicle collision, unauthorized access, and other physical damage, and in accordance with NFPA 855 and applicable codes and standards.
- The ERP will define the roles, equipment, and training requirements for site personnel and external emergency responders, including access to appropriate PPE/SCBA and fire response equipment where required.
- Containment and drainage measures will be incorporated, where practicable, to control contaminated firewater and chemical releases and to prevent off-site migration to terrestrial and aquatic environments.
- Spill prevention and response procedures will be developed as part of the Project ERP.

Application of these mitigations and effective implementation of the ERP will support timely response to abnormal events and reduce the likelihood and consequence of a significant release or escalation event. The probability of a thermal runaway is rare with an impact of major making the risk medium.

14.10 Traffic Accidents

Vehicular incidents could occur at any stage of the Project although the type and intensity of vehicular traffic will vary depending on the Project phase with the construction and decommissioning phases of the Project likely to experience the highest volume of traffic and largest vehicle and equipment inventories.

Vehicles and equipment in operation during the course of the Project will include (but are not limited to): excavators, dozers, graders, roller (compactor), haul trucks, concrete trucks, maintenance truck, fuel truck, loaders, crawler and hydraulic cranes, forklifts, scissor lifts, man lifts, and light-duty vehicles. Additionally, off-site contractors may access the site using their own vehicles or service equipment. During and following power plant operating periods with demand for diesel fuel, there may also be significant fuel truck traffic to maintain and replenish

diesel fuel storage inventory.

Mitigation measures to limit the probability of an incident and reduce the magnitude and extent of potential effects include:

- Comply with all relevant regulations related to storage, transportation, handling, and use of hazardous materials.
- Conduct periodic inspections to ensure all mobile equipment is in good condition and follow manufacturers' specifications for preventative maintenance.
- Establish and implement speed limits to minimize dust and potential collisions.
- Set in place applicable signage in accordance with relevant traffic regulations.
- Develop and maintain roads in accordance with the Project's Erosion and Sediment Control Plan (TOC in Appendix Q.9).
- Require that public road speed limits are followed by Project vehicles.
- Require that drivers follow all laws and regulations pertaining to distracted (e.g., cell phone usage) or impaired driving on and off-site.
- Minimize transportation-related traffic in school zones and on school bus routes during school hours and bus pick-up and drop-off times.
- Follow weather statements and alerts and adjust plans accordingly to avoid transportation in extreme weather conditions whenever possible.
- Establish the following, within the Project Area, to the extent possible:
 - a. Keep vehicles and pedestrians apart.
 - b. Minimize vehicle movements.
 - c. Minimize reversing by providing adequate room to turn vehicles.
- Ensure adequate visibility by operating in appropriate weather and providing ample lighting and visibility aids (e.g., mirrors around tight turns).
- Ensure visitors are familiar with the Project layout or are accompanied by Project personnel as necessary.
- Ensure compliance by operations personnel, fuel suppliers, contractors, and all visitors to the Industrial Facility.
- A Traffic Impact Study was completed (Appendix P.1); recommendations found in this report shall be implemented to limit the risk of traffic accidents on public roadways (notably the Botwood Highway).

In addition, the Project's ERP will include plans for spill prevention and response related to the storage and transportation of chemicals and products to and from the site. EVREC will ensure that employees, suppliers, and clients comply with safety measures, spill prevention protocols, and best management practices during Project activities. EVREC will also consult with local emergency services to strengthen coordinated response efforts and ensure an aligned approach.

Application of the above mitigations and effective implementation of the ERP will minimize the likelihood of a significant incident occurring. The probability of a traffic accident is likely with an impact of minor making the risk medium.

14.11 Wildlife Emergencies/Incidents

Wild animals generally avoid human contact; however, with prolonged exposure, they may become habituated and more inclined to approach people and built infrastructure. In serious cases, wildlife encounters can result in physical injury, disease transmission, or damage to property and facilities. By applying proactive and precautionary measures, the potential for wildlife interactions can be significantly reduced.

Wildlife attraction to the Project area will be minimized by:

- Storing all food waste and edible garbage indoors or in secure, wildlife-resistant disposal bins.
- Posting signage throughout the Project area outlining proper waste management practices.
- Prohibiting personnel from approaching or feeding wildlife.

For specific response plans associated with large or potentially dangerous wildlife, including bear, ungulate, coyote or lynx encounters, refer to the Wildlife Response Plan, within the ERP (Appendix Q.2).

In the event of a wildlife encounter, response actions will prioritize personnel safety. Once safety has been established, reasonable efforts will be made to minimize impacts to the animal during the use of deterrents. The probability of a wildlife incident is likely with an impact of minor making the risk medium.

14.12 Risk Matrix Conclusions

The risks associated with accidents and malfunctions are determined by both the likelihood of an event occurring as well as the potential consequences the event could have. With appropriate mitigations in place, the magnitude of adverse residual effects from accidents and malfunctions can be reduced. Expected risk levels associated with the discussed potential accidents and malfunctions, following mitigations, have been evaluated based on the risk matrix in Section 14.1 and listed in Table 14.12.1.

Table 14.12.1: Risk Matrix Evaluation

Potential Risk	Risk Rating
Air Emissions Release	Low
Noise Emissions	Low
Ammonia Release	Medium
Hydrogen Release	Medium
Untreated Liquid Effluent Release	Low
General Hazardous Release	Medium
Dislodging of Wind Turbine/Tower	Low
Energy/Transmission Failure	Medium

Potential Risk	Risk Rating
Erosion/Sediment Control Failure	Medium
Failure of Water Supply	Low
Electrical Fires	Medium
Hydrogen/Oxygen Fires	Medium
Explosives/Blasting	Medium
Thermal Runaway	Medium
Traffic Accidents	Medium
Wildlife Emergencies/Incidents	Medium

15.0 CUMULATIVE EFFECTS

15.1 Overview

Cumulative effects are changes to environmental, social, and economic values caused by the combined effect of past, present, and potential future human activities and natural processes (Government of British Columbia, 2024). Concerns are often raised about long-term changes that may occur not only as a result of a single action but of the combined effects of each successive action on the environment (Hegmann et al., 1999). While a single undertaking might not cause significant adverse effects, multiple undertakings sharing similar spatial and temporal boundaries may result in incremental impacts, referred to as cumulative effects. These cumulative effects may potentially result in an overall impact to a VC of interest.

15.2 Cumulative Effects Assessment Methodology

The objective of the CEA is to evaluate potential changes to a VC that may result from the combined influence of the proposed Project and other past, present, or reasonably foreseeable future projects or activities. The CEA is conducted using publicly available information, with uncertainties clearly identified, and in accordance with the Cumulative Effects Assessment Practitioners Guide (Hegmann et al., 1999).

As outlined by Hegmann et al. (1999), the CEA scoping process involves the following steps:

- Selection of VCs to be included in the CEA.
- Determination of spatial and temporal boundaries for the CEA.
- Identification and description of other projects or activities within those boundaries.
- Confirmation of which VCs will proceed through the CEA analysis.

For those VCs selected for the CEA process, an analysis was conducted considering the residual effects of the Project on that VC, the effect of other activities or projects on that VC, and potential cumulative effects. If cumulative effects are predicted, mitigation measures and proposed monitoring programs and follow-up are described. At this stage, the certainty in effects predictions was considered. It is not uncommon for data on effects of other projects or activities to be limited, increasing the uncertainty of the CEA predictions.

15.3 Selection of VCs for Evaluation in the CEA

The primary pathways of effects to VCs from the Project are numerous and include particulate, gaseous, and noise emissions, the loss and alteration of streams, forests, and wetland habitats (and therefore effects to species that rely on those habitats), potential bird and bat mortality resulting from interactions with Project infrastructure, glare, and more. Based on the effects assessment for each VC evaluated and proposed mitigation measures and follow up programs, no significant adverse residual effects were identified.

Despite the finding that individual pathways' effects are not significant, there is a possibility that pathways interact in a cumulative fashion with other activities in the vicinity. Table 15.3.1. summarizes the potential for VCs to have cumulative impacts with other undertakings in the area.

Table 15.3.1: Potential for Cumulative Negative Effects on Identified VCs

VC	Project Component	Cumulative Effects Assessed	Reasoning
Air Quality	Industrial Facility	Yes	While emissions associated with the Industrial Facility are generally within regulated limits, commissioning emissions exceed guidelines as modelled, and while further work is required to mitigate this effect, the potential for cumulative interactions with other projects should be considered. Emissions modelling was conducted using a VC-specific boundary, but for the purposes of CEA, a conservative assumption about the boundary is made for comparability with other effects; therefore, the extent is broadened to the IPA + 5 km.
	Solar	No	Airborne particulates and exhaust associated with construction and maintenance of these components carry non-significant residual effects and their effects are highly localized, making cumulative effects with other projects unlikely.
	Wind and Transmission		
GHGs	Industrial Facility	No	The Project overall is expected to have a positive net effect on reliance of GHG emitting technologies in the adoption of less-carbon-intensive supply chains and tools.
	Solar	No	Project is expected to have a positive effect.
	Wind and Transmission		
Sound	Industrial Facility	Yes	Although mitigated operational noise levels at the Industrial Facility do not exceed thresholds for human comfort, both operational and construction noise may interact with other sound sources cumulatively.
	Solar	No	Sound produced during construction will not exceed regulatory thresholds with mitigations, is expected to be difficult to discern at nearby receptors, rated as negligible, and unlikely to act cumulatively.
	Wind and Transmission	Yes	Sound produced during construction will not exceed regulatory thresholds with mitigations applied and are relatively short-lived; turbine operational noise generally requires adjacent wind projects to act cumulatively but may interact with projects of other types as well.
Shadow Flicker	Industrial Facility	No	These Project components do not produce shadow flicker.
	Solar		
	Wind and Transmission	Yes	Modelled exceedances of shadow flicker thresholds are expected to be mitigated in practice and would interact cumulatively with other very nearby wind projects.
Solar Glare	Industrial Facility	No	This Project component does not produce solar glare.
	Solar	Yes	The Project produces glare that is dangerous but may interact with other sources of reflected light to produce a cumulative effect.
	Wind and Transmission	No	This Project component does not produce solar glare.

VC	Project Component	Cumulative Effects Assessed	Reasoning
Groundwater Hydrogeology	Industrial Facility	Yes	The radius of influence for groundwater extends beyond the IPA and may interact cumulatively with nearby projects if they produce a groundwater ROI great enough to overlap with the Project's.
	Solar	No	No significant effect on groundwater quantity or recharge due to the shallow depth of excavation, correspondingly small radius of influence, setback of Project components from other projects, and low proportional Project footprint that would affect recharge. Blasting controls and small footprint mitigate the possibility of cumulative interactions with other projects on groundwater quality.
Surface Water Hydrology	Industrial Facility	Yes	The overprinting of two watercourses within the Industrial Facility footprint and Project water use (withdrawal and discharge) has the potential to act cumulatively on hydrological regime with other nearby projects, in addition to the potential for changes in water quality during Project construction especially.
	Solar	No	Detectable changes in water quantity are not anticipated, and potential water quality changes are associated with the construction phase, both limited temporally and mitigatable through identified measures with no significant residual effect.
	Wind and Transmission	Yes	Effects on water quality can be mitigated but changes in timing and magnitude of flows are anticipated exclusively where quarrying is planned, whereas quarries adjacent to watercourses may result in direct or indirect effects on water quantity. While the relatively low footprint of this Project activity does not result in a significant effect when considered alone, there is a potential to interact cumulatively with nearby projects.
Fish and Fish Habitat	Industrial Facility	Yes	Commensurate with the effects on surface water hydrology, the destruction of a limited number of watercourses will result in a loss of fish habitat quantity, although unaffected streams will likely continue to provide consistent fish habitat quality and quantity. Water use (withdrawal and discharge) can also affect local watersheds and fish habitat quality.
	Solar	No	Detectable changes in water quantity are not anticipated, and potential water quality changes are associated with the construction phase, both limited temporally and mitigatable through identified measures with no significant residual effect.
	Wind and Transmission	Yes	Commensurate with the effects on surface water hydrology, changes in flow volume and timing associated with quarrying may affect fish habitat quality in a manner that can potentially interact with other nearby projects cumulatively.
Vegetation and Wetlands	Industrial Facility	No	Avoidance of flora SAR and SOCC with legislated protection status and low loss of sensitive flora habitat and wet areas result in a low likelihood of cumulative effects from interactions with nearby activities.

VC	Project Component	Cumulative Effects Assessed	Reasoning
	Solar	Yes	While not deemed a significant residual effect, the moderate magnitude impacts to wetland area and function are in part a result of the high loss of wetland area as a proportion of the assessed area, and the large scale of the SPA. Therefore, the wetland area effects should be studied in the context of other projects in the area to determine if there is a potential for a cumulative effect.
	Wind and Transmission	Yes	While not deemed to have significant residual effects, moderate magnitude effects on vegetation cover, landscape fragmentation, and loss of rare flora have the potential to interact cumulatively with nearby projects with similar effects. The low proportion of wet areas impacted by the Project leads to a low-magnitude impact after mitigations that is unlikely to interact with other nearby activities.
Terrestrial Fauna (excluding bats and caribou)	Industrial Facility	Yes	Habitat disturbance including alteration and fragmentation is expected through a large geographic area that may interact with habitat disturbance from nearby projects.
	Solar		
	Wind and Transmission		
Bats	Industrial Facility	Yes	The Industrial Facility poses possible impacts to bats including sensory disturbance and the potential for mortality and should be examined in the context of other activities nearby.
	Solar	No	This Project component is not expected to have a significant effect on bats or bat habitat.
	Wind and Transmission	Yes	While not deemed a significant residual effect, the moderate magnitude effects on bats through habitat loss and fragmentation and injury and mortality may interact with nearby projects, if any, in a cumulative fashion.
Caribou	Industrial Facility	Yes	Both the low proportional and absolute loss of caribou habitat and low abundance of observed caribou near these project components means the effect is unlikely to have a cumulative effect, but this potential should be examined in the context of other nearby activities.
	Solar		
	Wind and Transmission	Yes	While not deemed a significant residual effect, the moderate magnitude impact to caribou through habitat alteration may interact cumulatively with nearby projects that have a similar impact.
Avifauna	Industrial Facility	Yes	While not deemed a significant residual effect, the moderate magnitude impact to avifauna through habitat loss and fragmentation may interact cumulatively with nearby projects that have a similar impact.
	Solar		
	Wind and Transmission		

VC	Project Component	Cumulative Effects Assessed	Reasoning
Land & Resource Use	Combined Facility Components	Yes	While not deemed to have significant residual effects, the low to moderate magnitude impacts to land and resource availability, and impacts to outfitting, recreational, and cultural uses may interact with nearby projects, if any, to produce a cumulative effect.
Heritage & Cultural Resources	Combined Facility Components	No	Any potential effects are limited to the PF and effects can likely be avoided; therefore, a cumulative effect is unlikely both from the intersection the Project and another and a broader-scale effect of the combined loss of heritage and cultural resources.
Economy, Employment, & Business	Combined Facility Components	No	Project is expected to have an overall positive effect, although some adverse effects on business are possible, the overall economic stimulus is expected to be positive and activities are not likely to act cumulatively in a negative fashion with other projects or activities, as the cumulative effect of multiple activities tends towards positive economic outcomes overall.
Infrastructure & Community Services	Combined Facility Components	No	Although residual effects across the range of VCs and pathways identified are a mix of positive and negative, the Project as a whole is poised to present a significant economic benefit to the region. While straining some resources, the Project will contribute meaningfully to the region and work with regional authorities and communities to produce overall improvements to infrastructure and community services such that the area may become more attractive for additional development and increase tax and other revenue to support improved transportation networks, housing and accommodation, education, health care, regional services, and more.

Several VCs are assessed for cumulative effects in the context of the respective identified Project components (Table 15.3.2). In addition to the potential for individual Project components to interact cumulatively with other nearby activities, for VCs where more than one Project component has an identified pathway for potential cumulative effects (Table 15.3.2), those Project components must also be studied for the potential of intra-Project cumulative effects between components.

Pathways to cumulative effects were found to be similar among several of the identified VCs and for the purpose of simplification, will be grouped accordingly within the CEA. The grouping of VCs is summarized in Table 15.3.2. In many cases in the CEA, individual VCs are considered separately, but these VCs may be considered in aggregate where it simplifies the assessment and reduces redundancy.

Table 15.3.2: VCs Assessed for Cumulative Effects

VC	VC Group	IPA	SPA	WPA
Air Quality	Immissions ¹	Yes		
Sound		Yes		Yes
Shadow Flicker				Yes
Solar Glare			Yes	
Groundwater Hydrogeology	Freshwater Aquatic Effects	Yes		
Surface Water Hydrology		Yes		Yes
Fish and Fish Habitat		Yes		Yes
Vegetation and Wetlands	Terrestrial Effects		Yes	Yes
Terrestrial Fauna (excluding bats and caribou)		Yes	Yes	Yes
Bats		Yes		Yes
Caribou		Yes	Yes	Yes
Avifauna		Yes	Yes	Yes
Land & Resource Use	Land & Resource Use	Yes	Yes	Yes

¹ Immission refers to the measurement of physical, chemical, or radiological properties affecting humans, animals, plants, and materials (receptor), versus emission which is the measurement of these properties at the source.

15.4 Selection of Spatial and Temporal Boundaries

To identify other projects for inclusion in the CEA, a 10 km buffer Study Area was selected as a conservatively inclusive boundary (Drawing 15.5-1, Appendix A). This distance was selected as it is twice the greatest biophysical LSA buffer (5 km) on individual Project components. This buffer size is consistent with current best practices (Hegmann et al., 1999; IAAC, 2023) and remains sufficiently constrained for data analysis and meaningful analytical relevance.

For the CEA, Strum considered past and ongoing projects as those that are visible on the landscape, selected by a visual search of the buffered area in Google Earth. Additionally, for past, present, and future projects, Strum conducted a keyword search of the NLECCC list of projects with registered Environmental Assessments since 2000 to filter the list of 1,488 projects to those most likely to be proximal to the Project (NLECCC, n.d.-c), which provided several results (indicated in parentheses):

- “Botwood” – 16
- “Exploits” – 13
- “Leading” and “Tickles” – 0
- “Peterview” – 4
- “Wooddale” – 7
- “Twin Lake” – 1
- “Locks Harbour” – 0
- “Point Leamington” – 0
- “Point of Bay” – 1
- “Philips Head” – 0
- “Northern Arm” – 9

Some of the above results were duplicates because of multiple keyword search terms in the activity names. Activities noted as “withdrawn” were not included for consideration. The compiled results were then manually geolocated and determined to be either inside of the 10 km buffer (included for further consideration) or outside (excluded from further consideration).

15.5 Other Undertakings in the Area

There are several activities observed within the CEA buffer (Drawing 15.5-1, Appendix A) based on both the visual search and search of provincial records. Detected projects are categorized by the following types:

- Agriculture, including upland and wetland (cranberry) farming of generally unknown products.
- Airport, represented only by the Exploits Valley Airport.
- Farming (trees), a single tree farm that is treated as a hybrid between an agricultural and forestry operation.
- Farming (other), including peat moss harvesting, tree nurseries, mink farms, and mixed agricultural operations.
- Industrial process, represented only by one apparently unbuilt pressure treating facility in Point of Bay.
- Marine activities, harbour infilling in Point Leamington and proposed upgrades to the Port of Botwood.
- Quarries, including several with registered EARDs, and more that are observable on the landscape but without EA registration or easily findable registration information.
- Residential, including two multi-parcel cottage developments.
- Utilities, including hydroelectric infrastructure, water and wastewater treatment facilities, and a water supply line.

Newfoundland’s landscape is a mosaic of various agricultural land types, intact and disturbed forests, communities, and residential development. While these activities all affect the landscape and land use by humans and other species, there is no meaningful way to determine or quantify the effect of these activities on various VCs. No meaningful quantitative

or rigorous qualitative data are available to support an assessment of cumulative effects associated with general land use. Furthermore, the existing land use was considered in the determination of residual environmental effects within each VC within the Project's EARD, so no additional conclusions can be made through the lens of a CEA. Therefore, general land use, which includes these activities, is not accounted for in the CEA.

While not fitting into either the agriculture or forestry categories, the single tree nursery is in many ways a hybrid of an agricultural operation and forestry in that it sees land management similar to agriculture, albeit with less soil disturbance, and sees the growth and harvest of trees. Because the tree nursery is a hybrid of two excluded categories, it too will be excluded as general land use.

After excluding general land use, there are 31 detected activities within 10 km of the Project (Table 15.5.1). It should be noted that the status of these activities is based on the apparent activity visible from aerial photographs or satellite imagery, accessed using the most recently available images on Google Earth. Activities found on the NLECCC projects page that are either approved or released and may have already commenced or may do so in the future. For the purposes of the CEA, such activities should be assumed likely to be built. If projects are released from submission of an EA, this means that little quantitative data will be available about the project; therefore, for projects with an EARD, the minister's decision is also indicated in Table 15.5.1. Although some activities released from EA do require an Environmental Preview Report, these reports have varying levels of qualitative and quantitative information (sometimes very little) that can be used to determine either the baseline conditions or the activity's expected effects as they may pertain to the potential for cumulative effects.

Table 15.5.1: Other Activities Detected Near the Project

Activity	Activity Type	Activity Status ¹	EA Status ²	Distance to Project Area ³
Exploits Valley Airport	Airport	Active	No EARD found	3.2 km
Bishops Falls South Mink Fur Farm Expansion	Farming (other)	Unclear	Released with conditions, 2006 (RN: 1280)	8.6 km
Botwood (Northern Arm) Mink Fur Farm	Farming (other)	Built	Released with conditions, 2004 (RN: 1152)	0.4 km
Exploits River Non-Commercial Animal and Vegetable Farm	Farming (other)	Built	Released, 2017 (RN: 1912)	9.5 km
Exploits Valley Mink Farm	Farming (other)	Unclear, appears abandoned	Released, 2006 (RN: 1307)	8.6 km
Green Valley Regional Abattoir – Northern Arm	Farming (other)	Unbuilt	Released, 2021 (RN: 2102)	0.7 km
Horticultural Peat Moss Manufacturing	Farming (other)	Built	No EARD found	5.3 km
Tree Nursery	Farming (other)	Built	No EARD found	5.3 km
Point of Bay Pressure Treating Facility	Industrial Process	Unbuilt	Released with conditions, 2008 (RN: 1355)	1.1 km
Point Leamington Harbour Infilling	Marine Activities	Built	No EARD found	4.0 km
Port of Botwood Upgrades	Marine Activities	Unbuilt	No EARD found	Within PA
Botwood Airport Road Quarry	Quarry	Unbuilt	Released, 2024 (RN: 2304)	2.0 km
Botwood Airstrip Sand Quarry	Quarry	Built	Released, 2010 (RN: 1484)	1.8 km
Botwood Flowers Hill Quarry	Quarry	Unbuilt	Released, 2024 (RN: 2287)	Within PA
Botwood Peters River/Peters Pond Quarry	Quarry	Built	Released, 2009 (RN: 1440)	0.9 km
Peters River, Botwood Quarry	Quarry	Built	Released, 2010 (RN: 1459)	Within PA
Peterview Gravel Quarry	Quarry	Unbuilt	Released, 2017 (RN: 1886)	Adjacent to PA

Activity	Activity Type	Activity Status ¹	EA Status ²	Distance to Project Area ³
Quarry 1	Quarry	Built	No EARD found	Within PA
Quarry 2	Quarry	Built	No EARD found	Adjacent to PA
Quarry 3	Quarry	Built	No EARD found	Adjacent to PA
Quarry 4	Quarry	Built	No EARD found	5.6 km
Quarry 5	Quarry	Built	No EARD found	6.0 km
Quarry 6	Quarry	Built	No EARD found	4.1 km
Quarry 7	Quarry	Built	No EARD found	5.3 km
Quarry 8	Quarry	Built	No EARD found	Within PA
Quarry 9	Quarry	Built	No EARD found	Within PA
Bishop's Falls Engineered Wetland Sewage Treatment Facility	Utility	Built	Released, 2013 (RN: 1691)	6.2 km
Botwood/Peterview Exploits Regional Water Supply Transmission Line	Utility	Built	Released, 2003 (RN: 1065)	Within PA
Exploits Valley Water Treatment Facility	Utility	Built	No EARD found	1.0 km
Hydroelectric facility	Utility	Built	No EARD found	8.6 km
Road Maintenance Depot	Utility	Built	No EARD found	1.2 km
Waste Facility Expansion	Utility	Built	No EARD found	2.8 km

¹ Activity status is based on visual assessment from satellite or aerial imagery, obtained from Google Earth.

³ EA Status refers to whether a project has a finable EARD with NLECCC and if so, the Minister's decision, the date of decision, and project registration number (RN).

² Distance to the Project Area is determined from the approximate centre point of the activity to the nearest point of the Project Area by a straight line.

Following examination of 32 activities detected within the 10 km CEA buffer, none were found to have required an EIS. Therefore, detailed and quantitative assessment for the potential of cumulative impacts between the Project and nearby activities is not possible. A more general assessment is possible but the lack of detailed information about any one activity means this assessment is most effective looking at projects grouped by type. Additionally, some activities that were released from the EA process do not appear to have been built. In the case of the Point of Bay Pressure Treating Facility, the activity was released in 2008 but there are no signs that this activity was developed, meaning that there are no industrial process activities already developed, released, or approved to discuss. Based on the above considerations, the following types of activities will be considered for the CEA:

- Airport
- Farming (other)
- Marine activities
- Quarries
- Utilities

No detected activities resembled the Project's three components. No wind or solar projects have been proposed or otherwise found within the CEA buffer. Similarly, while the wood pressure treating facility was proposed within the buffer, it does not appear to have been built and seems unlikely to be approximately 18 years later. Therefore, there are no industrial facilities within 5 km of either the IPA or PA in general with which the Industrial Facility can interact to produce cumulative effects.

15.6 Cumulative Effects Assessment

Cumulative effects for the Project were assessed by considering potential residual effects (as identified in VC sections) in relation to past, existing, and reasonably foreseeable future activities within the surrounding area (i.e., projects currently under regulatory review, approval, or construction). Because only some of the nearby activities have an EPR (with varying to minimal quantitative assessment completed) and none of the nearby activities have an EIS, there is minimal to no quantitative data available about these activities' effects; therefore, the potential cumulative effects of these projects are evaluated primarily through a qualitative assessment.

Nearby activities are considered for the possibility that they produce effects that potentially interact with the Project's residual effects in a cumulative fashion (Table 15.6.1). These effects are grouped, as previously described. If an interaction is not being carried through the CEA process, a rationale for exclusion is provided in the table.

Table 15.6.1: Potential Interactions Between Nearby Activities and Grouped VCs.

Activity Type	VC Groups for Potential Cumulative Interaction				Rationale for Exclusion
	Immissions	Freshwater Aquatic Effects	Terrestrial Effects	Land and Resource Use	
Airport	No	No	Yes	No	The single airport in the Exploits Valley, approximately 3 km from the Project, has relatively low traffic and is often not staffed. The occasional recreational traffic will not present a persistent source of immissions. The facility is primarily in a different watershed than the Project. Airports typically have a benefit on tourism and would be expected to have a correspondingly positive effect on land use.
Farming (other)	No	Yes	Yes	No	The variety of farming practiced in the CEA buffer includes mink farming, peat moss quarrying, sod harvesting, an abattoir, and a tree nursery. These types of activities are not sufficient sources of various emissions to potentially interact cumulatively with the Project on immissions. They also do not present a mortality risk to avifauna. While this type of land use typically does not constitute a tourism draw, they present minimal restrictions on other land uses and are not unexpected on the overall landscape.
Marine modifications	No	No	No	No	The marine modification in Point Leamington resulted in the infilling of part of the harbour and construction of a building that is now a glove museum. This is being excluded from the CEA as the Projects impacts are limited to the freshwater environment, and this interaction occurs in the marine environment. The planned upgrades at the Port of Botwood are likely to cause a variety of low-magnitude and manageable impacts to VCs, including temporary immissions (noise, air quality) and increases in traffic during construction, and impacts to the marine environment. While port upgrades are expected to be proposed, the nature, scale, and extent of changes is not foreseeable and therefore it is not possible to conduct a CEA in relation to this anticipated activity. Because of this, and whereas many of the effects of the jetty required for this Project are already considered in various VCs, this activity will not be considered for its potential to produce cumulative effects with the Project.

Activity Type	VC Groups for Potential Cumulative Interaction				Rationale for Exclusion
	Immissions	Freshwater Aquatic Effects	Terrestrial Effects	Land and Resource Use	
Quarries	Yes	Yes	Yes	No	Quarries are an important source of materials to support growth and economic development. While their presence on the landscape might be unpleasant to some when viewed from above, they are necessary to business and supporting development through regional economic prosperity.
Utilities	Yes	Yes	Yes	Yes	No exclusions from consideration are identified.
Intra-Project Interactions	Yes	Yes	Yes	Yes	No exclusions from consideration are identified.

In addition to the potential for the Project to interact with nearby activities to produce cumulative effects, different Project components may also interact with one another to produce cumulative effects (intra-Project interactions in Table 15.3.2. This is the case wherever more than one Project component is identified as having the potential to interact externally to produce cumulative effects (Table 15.3.1), such as the potential of both the IPA and WPA to interact to produce cumulative sound effects.

15.6.1 Immissions

Immissions impacts are discussed in terms of pathways for cumulative effects with the following nearby grouped activities:

- Quarries
- Utilities
- Intra-project interactions

Each of these assessed grouped activities exhibit some degree of spatial and temporal overlap with the Project. Examination of the potential for cumulative effects looks at air quality from exhaust and particulate emissions, sound, shadow flicker, and solar glare. Because exhaust and particulate emissions and sound attenuate rapidly with distance, the potential for a cumulative effect is closely tied to the proximity of nearby activities to Project activities that generate similar effects.

Quarries

Quarries are sources of exhaust and particulates that affect air quality and sound from heavy machinery and blasting. These types of effects with the potential to result in a cumulative effect are expected from the IPA (air quality and sound) and the WPA (sound only).

Examining the location of nearby activities relative to the Project (Table 15.5.1; Drawing 15.5-1,

Appendix A), there are several quarries either close to or overlapping the PA, however closer examination shows that non-Project quarries are either distant from potential receptors, distant from Project quarries, or both. In either case, the rapid attenuation of both particulates and sound mean that there is either little to no possibility to act cumulatively, or no receptors on which to produce an effect.

Utilities

The closest utility to the Project is the Botwood/Peterview Exploits Regional Water Supply Transmission Line, with the Exploits Valley Water Treatment Facility 1.0 km from the PA and located at an unidentified road maintenance depot at 1.2 km from the nearest point of the PA. A waste facility located 2.8 km from the PA was detected using Google Earth historical imagery, although no corresponding EARD could be found describing the nature or scale of the facility. Additional activities are located 6.2 km and 8.6 km from the PA. Activities of these types would potentially result in effects to air quality and sound. These types of effects with the potential to result in a cumulative effect are expected from the IPA (air quality and sound) and the WPA (sound only).

The water transmission line is a buried pipe that supplies water to surrounding communities and is unlikely to affect immissions. The water supply plant is fully enclosed except for uncovered coagulate drying areas and is over a kilometre away from likely sources of exhaust, particulate matter, and noise associated with the Project. A road maintenance depot is unlikely to emit significant noise except for the use of light to heavy duty equipment for moving materials and loading trucks, and particulate and exhaust emissions should be minimal, dependent on the machinery used. Because of the rapid attenuation of exhausts, particulate emissions, and sound, the scale and nature of activities within the CEA buffer, and their distance from the PA, it is highly unlikely that these activities will interact with the Project's effects in a cumulative manner.

Intra-Project Interactions

The three Project components have the potential to interact to produce a cumulative effect for sound. While each of the Project components produces other residual effects, they are not anticipated to have the potential for cumulative interactions with other Project components. The primary source of noise in the IPA is the Industrial Facility itself, while the primary source in the WPA is each individual turbine. The nearest turbine to the Industrial Facility is over 3 km away (Drawing 6.1-2A, Appendix A), and outside of the 35 dB contour associated with the wind component of the Project (Appendix F.1). With no receptors directly between the nearest turbine and the Industrial Facility (Appendix F.1), there is a low likelihood that the sound from these two components would interact to produce a cumulative effect on any existing receptors.

Immissions Conclusion

This assessment examined the potential for cumulative effects from the following:

- Quarries
- Utilities

- Intra-project interactions

Pathways and the potential to produce cumulative effects with different Project components were identified in some cases. Following assessment of identified pathways for air quality and sound VCs, no cumulative effects are anticipated. No nearby activities were identified with the potential to interact with the Project to produce a cumulative effect for shadow flicker or solar glare.

15.6.2 Freshwater Aquatic Effects

Freshwater aquatic effects impacts are discussed in terms of pathways for cumulative effects with the following nearby grouped activities:

- Farming (other)
- Quarries
- Utilities
- Intra-project interactions

Each of these assessed grouped activities exhibit some degree of spatial and temporal overlap with the Project. Examination of the potential for cumulative effects looks at changes to groundwater hydrogeology, surface water hydrology, and fish and fish habitat. Because the potential for aquatic effects depends on hydrological connectivity, the potential for cumulative effect is closely tied to potentially interacting effect sources inhabiting the same watersheds.

Farming (Other)

Different types of farming can interact with the aquatic environment in a variety of ways, including affecting both the quality and quantity of water in streams depending on where water for a facility comes from, how water is used, and how wastewater is treated and returned to the environment. These types of effects with the potential to result in a cumulative effect on the aquatic environment may be possible from the IPA (groundwater hydrogeology, surface water hydrology, and fish and fish habitat) and WPA (surface water hydrology and fish and fish habitat).

Within the farming (other) activity category, five identified activities are farms rearing or otherwise handling either unspecified animals or mink. Additional projects are two peat moss quarries and a tree nursery (Drawing 15.5-1, Appendix A). Of these projects, two mink farms released in 2006 and 2007 appear to be unbuilt or subsequently abandoned, and one peat moss quarry released in 2010 does not appear to have been developed. These activities will be removed from consideration due to the time that has lapsed since being released from an EA and subsequent inactivity. The remaining, developed peat moss quarry and a mixed-use, non-commercial farm on the south bank of the Exploits River are in separate watersheds from the Project and will also be removed from consideration.

The remaining activities for consideration are the Green Valley Regional Abattoir, which was released from EA in 2021 and the Botwood Mink Fur Farm along Highway 350 (Drawing 15.5-

1, Appendix A). These activities both occupy the same watershed as the Project and are either already developed or have a reasonable chance of being developed. The Green Valley Regional Abattoir appears to have been built but reporting indicates that it may already be closed, and its future uncertain (Careen, 2023). Regardless of the status of the business, the same reporting indicates that strict environmental controls are ensuring that the facility does not conduct business in a way that would affect water resources, especially by requiring that they haul animal waste to an incinerator or open a purpose-built compost facility to mitigate the risk of environmental harms. Because of the demonstrated rigor of controls on this facility, it is not expected to interact with the Project in a cumulative fashion.

The Botwood Mink Fur Farm along Highway 350 is at the edge of the WPA (Drawing 15.5-1, Appendix A). While little is known about its operations due to it being released from EA, requiring no EPR or EIS, the EARD does provide information on waste handling. The EARD states that planned waste runoff measures employed would include a roofed manure storage area on a concrete pad to prevent runoff, all designed and constructed in alignment with the Environmental Guidelines for Livestock Producers (NLECCC, 2004). The identified waste disposal strategy is through short-term stockpiling, land application, and possibly composting. Mink farms are known to increase levels of bacteria, viruses, and other pathogens, as well as being associated with elevated levels of heavy metals and other contaminants from the animals' waste (Kissinger et al., 2023). Although these impacts may be significant on their own, the EARD identifies mitigation measures and there is no way to quantitatively evaluate the actual effects of this facility on nearby waterways to determine the potential for a cumulative interaction. Additionally, the closest apparent streams or waterbodies to the facility are approximately 0.6 to 1 km away based on provincial water mapping, leading to uncertainty as to whether the mink farm discharges water into receiving waterways or waterbodies. Finally, the potential effects of the mink farm differ greatly in nature from those possible from the Project, which is primarily associated with the potential for reduced flow, and a lower, and mitigated risk of sedimentation. Because the mink farm has identified mitigations in the EARD, there is no clear direct pathway from the farm to receiving streams or waterbodies, and the nature of the effect is wholly different between the two activities, they are highly unlikely to produce a cumulative effect.

Quarries

Quarries are expected to affect the aquatic environment through changes to groundwater and the quality and quantity of surface water flows, and corresponding effects on fish and fish habitat. Corresponding effects that have the potential to interact cumulatively with nearby activities are generally likely in the IPA and WPA.

Of the identified nearby quarries, all but two (Quarries 4 and 6) are found in watersheds in which the either the IPA or WPA are also found. The watershed that outlets south of Botwood into Peters Arm of the Bay of Exploits, especially, is home to seven of the 13 quarries that are either already developed, or that are proposed and released from EPR or EIS. This watershed includes a portion of the IPA, one Project quarry, and includes Peters Pond, from which water for the Industrial Facility will be withdrawn. There is a potential for a cumulative effect in this

watershed, although because there is no quantitative study of the seven non-Project quarries and other water users in the watershed, it is not possible to quantify either the probability of a cumulative effect or the magnitude of the effect itself.

While quarries may affect groundwater movement, Project quarry placement away from established watercourses and mitigation measures that ensure quarry sediments do not end up in streams mean that the likely effect on both stream water quality and quantity is small and will align with CCME guidelines. Whereas other quarries are found throughout the landscape in many of the same watersheds as proposed Project quarries, there is a potential for cumulative effect, but the small size of both existing quarries and those planned for the Project make this likelihood small. Furthermore, the spatial impact of effects from small quarries tends to be localized, with minimal pathways for cumulative effects throughout a watershed. Monitoring programs that are designed to assess effects on water quality by the Project will capture any potential cumulative effects associated with upstream quarries.

Utilities

Of the identified utilities within the 10 km CEA buffer, only the Exploits Valley Water Treatment Facility, Botwood/Peterview Exploits Regional Water Supply Transmission Line, and a road maintenance depot share a watershed with the Project (Drawing 15.5-1, Appendix A). Of these, the water supply transmission line is an already installed, buried pipe with presumably little exposure to or effects on watercourses and groundwater. The road maintenance depot has the potential to impact stream water quality if poorly managed, and the regional water supply implicitly affects water quantity through pumping water for potable supply.

Both the regional water supply and road maintenance depot share watersheds with the WPA, where the relevant potential Project effects on the aquatic environment are to surface water hydrology and fish and fish habitat. Effects on water quantity are expected due to the water pumped from Peters Pond for the Industrial Facility and also possible from Project quarries withdrawal from local water sources. Importantly, the Grand Falls-Windsor water supply facility draws water from upstream of any Project infrastructure, meaning that any potential cumulative effects are unlikely to threaten the availability of water for the 21,000 or more people who depend on the facility for their potable water (NLECCC, 2021). The facility, upstream of Project effects, is rated to pump 27,000 m³ of water per day. Water supply modelling conducted for the Peters Pond water system included water use for the regional water supply, showing that both the Project and existing water use can be supported sustainably (Section 7.6.7.3). The low magnitude of expected or potential Project effects on water quantity in consideration with nearby activities, the potential for a cumulative effect here is low, and the likely magnitude of such an effect would also likely be very low. Ongoing monitoring will allow for validation of this finding and ensure that any cumulative effects that may exceed these expectations are detected and can be managed adaptively.

The primary potential impacts to surface water and corresponding impacts on fish and fish habitat from a road maintenance depot that includes salt storage is potential runoff of salt into water courses and waterbodies. The depot is located along Highway 350 in a watershed with

relatively low Project footprint (eight turbines and two quarries), and approximately 400 m from the nearest waterbody (Drawing 15.5-1). The amount of salt stored on site is not known, nor are runoff prevention and environmental protection measures employed at the depot, so it is not possible to quantify the potential effects, or their corresponding potential to interact cumulatively with Project effects. Based on the qualitative understanding of the possible pathways of effect at the depot and the spatial separation from Project components, a cumulative effect is possible but of a low potential, and low magnitude. Thus, this potential cumulative effect does not warrant additional controls or monitoring of surface water in addition to those already planned.

Intra-Project Interactions

Two of the Project components, the IPA and WPA have the potential to interact to produce a cumulative effect for the aquatic environment. This potential relates to both surface water hydrology and fish and fish habitat, which are intrinsically linked. The WPA and IPA are largely in different watersheds. Where there is a small overlap, there is no Project infrastructure planned. Therefore, there is no potential for a cumulative effect on the aquatic environment from these two components of the Project.

Aquatic Environment Conclusion

This assessment examined the potential for cumulative effects on the aquatic environment from the following:

- Farming (other)
- Quarries
- Utilities
- Intra-project interactions

Pathways and the potential to produce cumulative effects with different Project components were identified in some cases. Different types of farming can interact with the aquatic environment through impacts on water quality and quantity, though nearby activities were found to be in secluded watersheds or of such low magnitude, that any corresponding potential cumulative effects were of a similarly low magnitude. Of the nearby quarries that were assessed, existing mitigation measures employed at the Project and ongoing monitoring will serve to prevent cumulative effects on the aquatic environment but will monitor for any unexpected results. Similarly for nearby utilities, both spatial separation and planned mitigation measures will reduce the risk of cumulative effects, while planned monitoring will serve to identify unexpected cumulative effects. Finally, no intra-Project interactions are expected to produce cumulative effects on the aquatic environment due to a lack of spatial overlap. Following assessment of identified pathways for the aquatic environment category of VCs, no significant cumulative effects are anticipated.

15.6.3 Terrestrial Effects

Terrestrial effects impacts are discussed in terms of pathways for cumulative effects with the following nearby grouped activities:

- Airport
- Farming (other)
- Quarries
- Utilities
- Intra-Project interactions

Consistent with previous sections of the CEA, the assessment of effects on the terrestrial environment will proceed organized by grouped activities, with consideration for any identified pathways of effects that may interact cumulatively with the Project. In contrast to non-Project activities, for which there are minimal data to support a detailed qualitative or quantitative assessment, more is known about the Project, and therefore intra-Project interactions are broken down explicitly by effect to add clarity to the ensuing discussion, especially where a higher likelihood of cumulative effects is assessed.

Each of these assessed grouped activities exhibit some degree of spatial and temporal overlap with the Project. Examination of the potential for cumulative effects looks at changes to vegetation and wetlands, terrestrial fauna, bats, caribou, and avifauna.

Airstrip

One airstrip is found in the region, located approximately 3.2 km from the IPA. Airstrips can interact with the terrestrial environment through a variety of mechanisms. The development of an airport will likely result in the loss of terrestrial habitat and introduce landscape fragmentation that affects a variety of terrestrial species. During operations, air traffic represents a sensory disturbance and potential hazards for ground dwelling animals and bats and avifauna through different mechanisms. Except for the potential loss of vegetation and wetlands that occurs with development, terrestrial effects during operations are largely tied to the volume of air traffic using the airport. The possibility of collisions and sensory disturbance both become higher with increased traffic. The ongoing effect of habitat fragmentation should be contextualized in terms of landscape patterns.

The Exploits Valley (Botwood) Airport is a recreationalist airstrip with minimal air traffic that has been noted by Project staff to be periodically closed to visitors. Because of the low volume of air traffic that is restricted to smaller, recreational planes, there is a possibility of a cumulative effect with the Project on the terrestrial environment through sensory disturbance and direct mortality, with a corresponding low overall magnitude.

The closest Project infrastructure to the airstrip is the water intake pipe at Peters Pond at approximately 4.5 km away, with the Solar PF being the next closest infrastructure at approximately 5 km. Because of the distance between the airfield and Project infrastructure, a cumulative effect due to landscape fragmentation is possible but low and would be of low

magnitude based on the distance between the airstrip and Project, and the airstrip's size.

Farming (other)

Different types of farming can interact with the terrestrial environment in a variety of ways, including through landscape fragmentation and habitat or wetland loss, and sensory disturbance. These types of effects with the potential to result in a cumulative effect on the terrestrial environment may be possible from all three Project component areas (Table 15.3.2).

Within the farming (other) activity category, five identified activities are farms rearing or otherwise handling either unspecified animals or mink. Additional projects are two peat moss quarries and a tree nursery (Drawing 15.5-1, Appendix A). Of these projects, two mink farms released in 2006 and 2007 appear to be unbuilt or subsequently abandoned, and one peat moss quarry released in 2010 does not appear to have been developed. These activities will be removed from consideration due to the time that has lapsed since being released from an EA and subsequent inactivity. The remaining activities included for consideration are the Green Valley Regional Abattoir, which was released from EA in 2021, the Botwood Mink Fur Farm along Highway 350, Exploits River Non-Commercial Animal and Vegetable Farm, and Horticultural Peat Moss Manufacturing on the north shore of the Exploits River (Drawing 15.5-1, Appendix A).

Due to the scale and proximity of the abattoir to developed areas and the enclosed nature of such facilities, direct and indirect effects to the terrestrial environment are not expected. This, combined with the possible closure of this facility as discussed above, means that the potential for effects that could interact with the Project to produce cumulative effects are very low. Similarly, the Botwood Mink Fur Farm along Highway 350 at the edge of the WPA (Drawing 15.5-1, Appendix A) is within a relatively discrete footprint and its operations are almost entirely enclosed within buildings. This facility's placement in an area with otherwise low development and the low intensity of PF that would be located within the neighbouring WPA means that the potential for cumulative effects affecting landscape fragmentation are low also. Due to the small footprint and minimal landscape fragmentation, enclosed structure, and lack of mechanisms for physical or sensory disturbance with fauna, the mink farm has a low possibility of producing effects of a similar nature to those of the Project, that would allow for a cumulative effect.

The peat moss manufacturing on the north bank of the Exploits River is over 6 km from the nearest Project infrastructure and there are substantial amounts of agricultural, forestry, and infrastructure activity between the two (Drawing 15.5-1, Appendix A). Given the very different nature of peat moss quarrying and the activities associated with the Project, the distance between the two, and the lack of landscape continuity between the two, there is a low chance of cumulative effects, with a corresponding low magnitude. For similar reasons, the small Exploits River Non-Commercial Animal and Vegetable Farm, at almost 10 km from the Project and on the opposite bank of the Exploits River, is unlikely to have effects that would interact cumulatively with the Project and would be of low magnitude.

Quarries

Quarries have the potential to affect the terrestrial environment in a variety of ways, especially habitat loss and fragmentation. Corresponding effects from the Project with the potential to interact cumulatively with nearby activities are possible in all three Project component areas.

Of the 15 quarries identified that are either already active or released from EA, two quarries (4 and 6) are on the opposite bank of the Exploits River, and Quarry 5 on the opposite side of the Bay of Exploits. Additionally, Quarry 7 is over 5 km from and in a separate watershed from the nearest portion of the WPA. For similar reasons as under farming (other) above, these quarries will be omitted from consideration due to distance from the Project and a lack of overall connectivity with the PA. There is a potential for a cumulative effect with the Project, especially on habitat fragmentation, but this potential is very low and of similarly low magnitude, especially when compared to activities more connected with, or closer to the Project.

The remaining 11 quarries are either overlapped, directly adjacent to, or within approximately up to 2 km away from the PA. These quarries, whether operating or planned for development, will likely cause a variety of effects on the terrestrial environment similar in nature to the Project's own quarries and there are several pathways for potential cumulative effects. Although a quantitative analysis of these effects is not possible due to a lack of information on non-Project quarries, it is useful to compare the number and distribution of non-Project quarries to the Project's own, with which the non-Project quarries have the highest likelihood of generating cumulative effects given their similarities.

Non-Project quarries are concentrated in or near the east of the PA, close to the population centres of Botwood and up the west coast of the Bay of Exploits. In contrast, the Project's quarries are distributed throughout the PA, especially the WPA, close to where the quarried aggregates will be needed for road and turbine construction. Although the addition of more quarries in the eastern PA will likely contribute similar effects to those already probably caused by existing quarries, the density of existing and planned non-Project quarries is already greater than proposed anywhere in the PA. These existing quarries are also nearest to population centres, where a variety of human impacts have resulted in a fragmented landscape with low continuous, undisturbed land cover based on visual observations using satellite imagery. By locating additional Project infrastructure, including quarries, the Industrial Facility, and Solar Project close to these already disturbed landscapes, it concentrates the disturbance where terrestrial habitat is already highly patchy or fragmented. Although additional habitat loss is not desirable, concentrating it is in many instances more favourable than dispersing it across landscapes.

The Project is likely to have a cumulative effect on some of the effect pathways already triggered by nearby existing and planned quarries; however, it is important to contextualize these changes in the environment in which they are found. The degree of existing landscape disturbance and apparent dedication of these areas to resource extraction make it favourable to concentrate the Project's infrastructure, especially the IPA and SPA, near these areas rather than creating additional landscape heterogeneity elsewhere. Whereas this landscape is

already disturbed, and the placement of Project infrastructure increases existing disturbance patches rather than opening new ones, a cumulative effect is probable but unlikely to be a significant detriment to the terrestrial environment that it would be characterized as more than a low magnitude effect. Monitoring and management plans to be developed for the Project will allow for detection of unexpected cumulative effects and identify adaptive management steps to avoid higher magnitude effects.

Utilities

The Bishop's Falls Engineered Wetland Sewage Treatment Facility and hydroelectric facility are excluded from consideration under the same rationale as above (Drawing 15.5-1, Appendix A), at 6.2 and 8.6 km, respectively, from the nearest PA and with substantial landscape discontinuity separating them. The four remaining activities classified as utilities are the Exploits Valley Water Treatment Facility, Botwood/Peterview Exploits Regional Water Supply Transmission Line, and a salt storage depot, and a waste facility expansion (Drawing 15.5-1, Appendix A). Of these, the water supply transmission line is already installed, and a buried pipe with presumably little exposure to or effects on terrestrial habitat as it is comparable in most locations to a small road or a trail. The salt storage depot is small, discrete, and has no easily identifiable hazards that would threaten wildlife or the terrestrial environment. Similarly, the water treatment facility is relatively compact, mostly enclosed, and poses few obvious risks to the terrestrial environment. A waste facility expansion detected through historical imagery near Point Leamington is the only non-enclosed utility identified remaining, and it has a very small footprint and is near developed areas where it would presumably have a lower risk of impacts to wildlife, or disruptions to the terrestrial environment.

Based on the discrete footprints of utilities, these activities have a low potential to interact with the Project to produce cumulative effects. The largest of the identified and considered utilities, the water transmission line, is functionally similar to the roads and trails that are ubiquitous in the area and create some landscape fragmentation, but with dubious effects on both terrestrial habitats and the species that dwell within them. No additional monitoring or mitigation is required.

Intra-Project Interactions

While there are several pathways for potential interactions between Project components that could result in cumulative effects on the terrestrial environment, the nature of effects between these components is in most cases very different. The SPA and WPA are both identified as having potential pathways of cumulative effects on vegetation and wetlands, and both the IPA and WPA with respect to bats. Additionally, all three Project component areas have potential pathways of cumulative effects on terrestrial fauna, caribou, and avifauna. The rationale for these VCs under terrestrial effects is due to the similar effect pathways and the cumulative effects they may cause, especially the loss and fragmentation of habitat for terrestrial species (including avifauna), direct mortality risks, and sensory disturbance. Terrestrial effects as a category will be considered against these effect pathways and corresponding effects for the potential of intra-Project cumulative effects.

Habitat Loss and Fragmentation

When considering the disturbance patterns that may cause a loss or fragmentation of terrestrial habitat, the IPA and SPA are far more similar to one another than to the WPA. Both IPA and SPA represent a concentrated disturbance on the landscape where a high density of infrastructure will reside on an area without natural vegetation growth. In contrast, the dispersed disturbance of the WPA produced a larger scale, lower intensity landscape heterogeneity. While each landscape pattern has its own consequences on vegetation, wetlands, and the species that dwell in or otherwise depend on them, their spatial arrangement makes them unlikely to have a cumulative effect between Project components. The IPA and SPA are located close to one another, and to existing landscape disturbances including the three aggregate quarries and one peat quarry located nearby (Drawing 15.5-1, Appendix A). From a habitat fragmentation standpoint, this concentrated disturbance is generally less problematic than a spatially dispersed disturbance. As a spatially dispersed disturbance, the WPA is already examined in the context of terrestrial habitat loss and fragmentation and is found to have a non-significant residual effect. Because of the differences in disturbance pattern, distance between the components, and proximity to already disturbed areas, the SPA, IPA, and WPA are not expected to have a significant cumulative effect on habitat loss or fragmentation.

Direct Mortality

Direct mortality risk is of greatest concern affecting avifauna and bats, particularly in reference to hazards in the WPA (collision with wind turbines) and the IPA (stack exhaust and flaring); therefore, this assessment will focus on these two pathways of direct mortality. The nearest turbine is approximately 3.5 km to the Industrial Facility, a reasonable distance for birds and resident bats to travel (Drawing 6.1-2A, Appendix A). Beyond the closest turbine, additional turbines are found at increasing distances from the Industrial Facility. Separating the two Project components is a river valley in which some turbines but no IPA is found (Drawing 15.5-1, Appendix A).

A variety of mitigation measures are planned for the Industrial facility to reduce the likelihood of avian mortality including preventing perching on or near facility infrastructure to discourage flight in the vicinity of the stacks. A similar concern is also present for bats, who are likely resident in the area, and may be drawn to food sources that are drawn to lights at the facility. Whereas most light sources are close to the ground and away from the stack flares, this should help prevent mortality. In contrast, the risk of avian and bat mortality from turbines is related to direct collisions. While avifauna mortality from turbines is a known phenomenon and will be managed, the detection of primarily resident bat species that fly below turbine wind-swept altitudes reduces concern for bat mortality. There is a pathway for direct avifauna and bat mortality from both the IPA and WPA, but the geographic separation, differences in each pathway, and mitigation measures employed make it unlikely that direct mortality effects on avifauna and bats will be significantly cumulative between Project components.

Sensory Disturbance

There are a variety of pathways of sensory disturbance effects in the different Project

components, especially those described in depth within the Terrestrial Fauna, Bats, and Avifauna sections (Sections 6.10-6.12, 7.9-7.10, 8.9-8.10). These can be summarized as disturbance from noise, especially construction, turbine blades, Industrial Facility operations, blasting, and light, anywhere lights illuminate infrastructure and reflections from the solar array. Whether the different Project components can interact to produce cumulative effects depends on whether those sensory disturbance effect pathways can interact. Construction, which will take place in phases and over a shorter time, is unlikely to act cumulatively because of the distance between the major Project components. Similarly, the noise produced by the Industrial Facility (Appendix F.3) attenuates rapidly with distance to approximately 35 dB in less than 2 km, and the nearest turbine at 3.5 km away also produces noise that attenuates to 35 dB before reaching the Industrial Facility (Appendix F.1). The zone between these Project components will receive noise from both sources, but at different tonalities and low volumes that will not pose a risk to terrestrial fauna occupying the area.

Sources of light will be both common to all Project components as light is necessary for safe facility access and maintenance and to prevent navigational risks to aircraft. The separation of the IPA and SPA from the WPA makes the possibility of a cumulative effect unlikely, and sources of light are minimized in keeping with best practices to avoid unduly attracting terrestrial fauna to Project infrastructure. Because of the physical separation of these major Project areas by over 3 km and a river valley, and the minimizing of unnecessary light, cumulative effects between the IPA/SPA and WPA are unlikely. The IPA and SPA are much closer, and each will have necessary overnight lighting for safety that may confuse animals, although this will be kept to a minimum in keeping with best practices.

Fencing of some sites will deter ground-dwelling fauna, while avifauna and bats may be drawn to the light sources. While there are risks present at the Industrial Facility for which mitigation measures will be employed to help avifauna and bats avoid the area, the infrastructure at the SPA is relatively low-lying and benign. Because light emissions will be minimized and represent little threat to fauna at the SPA, it is unlikely that facility lighting will cause a cumulative sensory disturbance effect for terrestrial fauna. Finally, reflected light from the SPA represents a unique pathway for sensory disturbance. Because no other Project component produces significant amounts of reflected light, light reflected from solar panels does not represent a pathway for potential cumulative effects.

Terrestrial Effects Conclusion

This assessment examined the potential for cumulative effects on the terrestrial environment from the following:

- Airport
- Farming (other)
- Quarries
- Utilities
- Intra-Project interactions

Pathways and the potential to produce cumulative effects with different Project components were identified in some cases. The airport, other farming, and utilities were all determined to have low probabilities of cumulative effects with the Project due to distance, existing landscape disconnection, and the small scale of existing activities. Quarries, located closer to and sometimes within the PA, are likely to have a cumulative effect with the Project on habitat fragmentation, but contextualized in the existing landscape, the magnitude of this effect is expected to be low. There were no identified non-Project activities that are likely interact cumulatively with the Project's potential effects from wind turbines on direct mortality on avifauna and bats.

15.6.4 Land and Resource Use

Land and resource use impacts are discussed in terms of pathways for cumulative effects with the following nearby grouped activities:

- Utilities
- Intra-project interactions

Each of these assessed grouped activities exhibit some degree of spatial and temporal overlap with the Project.

Utilities

Utilities deliver necessary services and perform important functions that, while they may at times be unsightly, are often critical to enabling a region's habitability. When located too closely to some land uses, utilities may detract from property values, affect other land users (e.g. hunting or fishing), or impact an area's desirability for tourists. These potentially negative influences must be balanced against the enabling role they play in increasing property values and promoting tourism from an available services perspective.

Each of the identified nearby utilities, regardless of distance from the Project, serve necessary public functions and are in relatively discrete locations where they can quietly serve their purposes. Only the Botwood/Peterview Exploits Regional Water Supply Transmission Line overlaps with the PA (Drawing 15.5-1, Appendix A), with the next closest being the Exploits Valley Water Treatment Facility at approximately 1 km from the nearest PA. The identified utilities in the area are also noted as having relatively discrete footprints that largely do not restrict other land uses either because they are compact and remote, or because they are near existing development. Because of the discreteness of identified nearby utilities, their importance to desirability of living and working in the area due to available services, and physical separation of most from the Project, it is highly unlikely that effects on land use and tourism from the Project will interact with effects of nearby utilities in a cumulative fashion.

Intra-Project Interactions

Potential effects of different Project components that may interact to produce cumulative effects on land use and tourism can be grouped by their potential to affect traditional land uses, access to resources, property value or desirability of the region, and desirability for tourists.

In general, the pathways of effects are different between Project components due to differences in their locations and overall composition. The IPA and SPA, located close to Botwood and generally presenting as one contiguous industrial development, are unlikely to produce a cumulative effect to this VC category due to that contiguous presence. Additionally, the distinct nature of each part of the IPA/SPA complex diversifies the visual impact such that the effect for observers is less severe than for two neighbouring industrial complexes. When comparing the IPA and SPA to the WPA, the pathways of effects on land and resource use are notably different due to the dispersed nature and scale of the WPA. Because of the fundamental differences between the IPA/SPA and the WPA, and the relatively small size of the IPA/SPA versus the WPA, it is unlikely that these Project areas will interact in a manner that produces a significant cumulative effect markedly greater than the effects associated with any one of the Project component areas.

Land and Resource Use Conclusion

This assessment examined the potential for cumulative effects on land and resource use from the following:

- Utilities
- Intra-Project interactions

Utilities are not expected to produce a cumulative effect on land and resource use with the Project. Intra-Project interactions that produce a cumulative effect were assessed as possible, but the differing nature of each Project component means that the cumulative effect of components combined is unlikely to be significantly greater than the effect of any one component.

15.7 Conclusion

The CEA applied a structured approach consistent with established guidance documents (Government of British Columbia, 2024; Hegmann et al., 1999) to identify relevant VCs, define appropriate spatial and temporal boundaries, and assess the combined influence of the Project and other existing or foreseeable activities. This process also incorporated an acknowledgment of uncertainties associated with data gaps and the limited availability of publicly available information for other developments.

Based on the CEA analysis, the potential for several cumulative effects has been identified, however no significant cumulative effects are anticipated. Cumulative effects are possible and existing monitoring and management plans provide the tools to detect and address effects on the aquatic and terrestrial environments. Overall, the CEA indicates that cumulative effects for the relevant VCs are expected to be low and not significant and can be effectively managed through Project level mitigation and ongoing monitoring.

16.0 RESIDUAL EFFECTS

Tables 16.1 to 16.4 summarize the results of the effects assessment for each VC within the WPA, IPA, SPA, and those applicable to the entire PA. Refer to Section 6.0 for the Wind and Transmission Effects Assessment, Section 7.0 for the Industrial Facility Effects Assessment, Section 8.0 for the Solar Farm Effects Assessment, and Sections 9.0, 10.0, 11.0 and 12.0 for the Land and Resource Use, Heritage and Cultural Resources, Economy, Employment, and Business, and Infrastructure and Community Service Effects Assessments for the entire PA, respectively.

Table 16.1.1: Summary of VC Residual Effects in the WPA

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Air Quality								
Fugitive Emissions Increased level of airborne particulate	See Section 6.2	A	L	LSA	ST	I	R	Not significant
Exhaust Emissions Increased level of combustion related emissions	See Section 6.2	A	L	LSA	ST	I	R	Not significant
Greenhouse Gases								
Construction Burning of fossil fuels	See Section 6.3	A	M	LSA	ST	C	PR	Not significant
Operation Reduction in GHG emissions	See Section 6.3	P	M	RSA	MT	C	PR	Not significant
Noise								
Construction Sound/Noise Impacts to residential receptors	See Section 6.4	A	L	LSA	ST	I	R	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Operational Sound/Noise Impacts to residential receptors	See Section 6.4	A	L	LSA	MT	C	R	Not significant
Shadow Flicker								
Shadow flicker	See Section 6.5	A	H	LSA	MT	I	R	Not significant
Groundwater								
Groundwater Quantity	See Section 6.6	A	L	LSA	MT	I	R	Not significant
Groundwater	See Section 6.6	A	L	LSA	ST	I	R	Not significant
Recharge Maintenance	See Section 6.6	A	L	WPA	LT	C	R	Not significant
Surface Water								
Changes to water quantity	See Section 6.7	A	L	WPA/LSA	LT	I	PR	Not significant
Changes to water quality	See Section 6.7	A	L	WPA/LSA	LT	I	PR	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Fish and Fish Habitat								
Change in fish habitat quantity	See Section 6.8	A	M	WPA/LSA	LT	SE	PR	Not significant
Change in fish habitat quality	See Section 6.8	A	L	WPA/LSA	LT	I	PR	Not significant
Change in fish health and survival	See Section 6.8	A	L	WPA/LSA	MT	SE	PR	Not significant
Flora and Vegetation Communities								
Loss and Alteration of Vegetation Cover	See Section 6.9	A	M	LSA	LT	SE	PR	Not Significant
Landscape Fragmentation and Edge Effects	See Section 6.9	A	M	LSA	LT	I	PR	Not Significant
Loss of Rare Flora	See Section 6.9	A	M	LSA	ST	SE	IR	Not Significant
Impacts to Wetland Area and Function	See Section 6.9	A	L	LSA	LT	SE	PR	Not Significant
Terrestrial Fauna								
Habitat Alteration and Fragmentation	See Section 6.10	A	M	LSA	LT	SE	PR	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Injury or Mortality	See Section 6.10	A	L	LSA	MT	I	R	Not significant
Sensory Disturbance	See Section 6.10	A	L	LSA	MT	I	R	Not significant
Avifauna								
Habitat Loss and Fragmentation/Edge Effect	See Section 6.11	A	M	WPA	LT	SE	PR	Not Significant
Mortality and Injury Risk	See Section 6.11	A	L	WPA	LT	I	R	Not Significant
Sensory Disturbance	See Section 6.11	A	L	LSA	LT	C	R	Not Significant
Bats								
Habitat Loss and Fragmentation	See Section 6.12	A	M	WPA	LT	SE	PR	Not significant
Injury and Mortality	See Section 6.12	A	M	WPA	LT	I	IR	Not significant
Sensory Disturbance	See Section 6.12	A	M	WPA	LT	I	R	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Caribou								
Habitat Alteration Selection	See Section 6.13	A	M	LSA	LT	SE	PR	Not significant
Sensory Disturbance	See Section 6.13	A	L	LSA	MT	I	R	Not significant
Injury/Mortality	See Section 6.13	A	L	LSA	MT	I	R	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE - Single Event, I - Intermittent, C - Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

Table 16.1.2: Summary of VC Residual Effects in the IPA

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Air Quality								
Fugitive Emissions Increased level of airborne particulate	See Section 7.2	A	L	LSA	ST	I	R	Not significant
Exhaust Emissions Increased level of combustion related emissions	See Section 7.2	A	L	LSA	ST	I	R	Not significant
Process Emissions Commissioning	See Section 7.2	A	H	RSA	ST	SE	PR	Not significant
Process Emissions Normal Operations	See Section 7.2	A	L	LSA	MT	C	R	Not significant
Greenhouse Gases								
Construction Burning of fossil fuels	See Section 7.3	A	L	LSA	ST	C	PR	Not significant
Operation Reduction in GHG emissions	See Section 7.3	P	M	RSA	MT	C	PR	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Noise								
Construction Sound/Noise Impacts to residential receptors	See Section 7.4	A	L	LSA	ST	I	R	Not significant
Operational Sound/Noise Impacts to residential receptors	See Section 7.4	A	L	LSA	MT	C	R	Not significant
Groundwater								
Changes in Groundwater Quantity	See Section 7.5	A	L	LSA	ST to LT	I	R	Not Significant
Changes in Groundwater Quality	See Section 7.5	A	L	LSA	ST to MT	I	R	Not Significant
Infrastructure Decommissioning	See Section 7.5	A	N	PA	ST	SE	R	Not Significant
Surface Water								
Changes to water quantity	See Section 7.6	A	M	LSA	LT	I	PR	Not Significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Changes to water quality	See Section 7.6	A	L	LSA	LT	I	PR	Not Significant
Fish and Fish Habitat								
Change in fish habitat quantity	See Section 7.7	A	M	IPA	LT	SE	PR	Not Significant
Change in fish habitat quality	See Section 7.7	A	L	LSA	LT	I	PR	Not Significant
Change in fish health and survival	See Section 7.7	A	L	LSA	MT	SE	PR	Not Significant
Flora and Vegetation Communities								
Loss and Alteration of Vegetation Cover	See Section 7.8	A	L	LSA	LT	SE	PR	Not Significant
Landscape Fragmentation and Edge Effects	See Section 7.8	A	L	LSA	LT	SE/I	PR	Not Significant
Loss of Rare Flora	See Section 7.8	A	L	LSA	ST	SE	IR	Not Significant
Impacts to Wetland Area and Function	See Section 7.8	A	L	LSA	LT	SE	PR	Not Significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Terrestrial Fauna								
Habitat Alteration and Fragmentation	See Section 7.9	A	M	LSA	LT	SE	PR	Not significant
Injury or Mortality	See Section 7.9	A	L	LSA	LT	I	R	Not significant
Sensory Disturbance	See Section 7.9	A	L	LSA	LT	I	R	Not significant
Avifauna								
Habitat Loss and Fragmentation/Edge Effect	See Section 7.10	A	M	IPA	LT	SE	R	Not Significant
Mortality and Injury Risk	See Section 7.10	A	L	IPA	LT	I	R	Not Significant
Sensory Disturbance	See Section 7.10	A	L	LSA	LT	C	R	Not Significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE - Single Event, I - Intermittent, C - Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

Table 16.1.3: Summary of VC Residual Effects in the SPA

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Air Quality								
Fugitive Emissions Increased level of airborne particulate	See Section 8.2	A	L	LSA	ST	I	R	Not significant
Exhaust Emissions Increased level of combustion related emissions	See Section 8.2	A	L	LSA	ST	I	R	Not significant
Greenhouse Gases								
Construction Burning of fossil fuels	See Section 8.3	A	M	LSA	ST	C	PR	Not significant
Operation Reduction in GHG emissions	See Section 8.3	P	N	RSA	MT	C	PR	Not significant
Noise								
Construction Sound/Noise Impacts to residential receptors	See Section 8.4	A	N	LSA	ST	I	R	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Operational Sound/Noise Impacts to residential receptors	See Section 8.4	A	N	LSA	MT	C	R	Not significant
Solar Glare								
Solar Glare Impacts to residential and transportation-related receptors	See Section 8.5	A	L	LSA	MT	I	R	Not significant
Surface Water								
Changes to water quantity	See Section 8.6	A	L	LSA	MT	I	PR	Not significant
Changes to water quality	See Section 8.6	A	L	LSA	MT	I	PR	Not significant
Fish and Fish Habitat								
Change in fish habitat quantity	See Section 8.7	A	N	LSA	MT	I	PR	Not significant
Change in fish habitat quality	See Section 8.7	A	L	LSA	MT	I	PR	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Change in fish health and survival	See Section 8.7	A	L	LSA	MT	I	PR	Not significant
Flora and Vegetation Communities								
Loss and Alteration of Vegetation Cover	See Section 8.8	A	L	SPA	LT	SE	PR	Not Significant
Landscape Fragmentation and Edge Effects	See Section 8.8	A	L	LSA	LT	SE	PR	Not Significant
Loss of Rare Flora	See Section 8.8	A	N	N/A	N/A	N/A	N/A	Not Significant
Impacts to Wetland Area and Function	See Section 8.8	A	M	LSA	LT	SE	IR	Not Significant
Terrestrial Fauna								
Habitat Alteration and Fragmentation	See Section 8.9	A	L	LSA	LT	SE	PR	Not significant
Injury or Mortality	See Section 8.9	A	L	LSA	LT	I	R	Not significant
Sensory Disturbance	See Section 8.9	A	L	LSA	LT	I	R	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Avifauna								
Habitat Loss and Fragmentation/Edge Effect	See Section 8.10	A	M	SPA	LT	SE	R	Not Significant
Mortality and Injury Risk	See Section 8.10	A	L	SPA	LT	I	R	Not Significant
Sensory Disturbance	See Section 8.10	A	L	LSA	LT	C	R	Not Significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE – Single Event, I - Intermittent, C - Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

Table 16.1.4: Summary of VC Residual Effects in the PA

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Land and Resource Use								
Changes to land accessibility	See Section 9.0	A/P	M	LSA	LT	I	PR	Not Significant
Changes to resource availability	See Section 9.0	A/P	M	LSA	LT	I	PR	Not Significant
Impacts to outfitting, recreational and cultural use	See Section 9.0	A/P	M	LSA/RSA	LT	I	PR	Not Significant
Impacts to the visual landscape	See Section 9.0	A	L	LSA	LT	C	PR	Not Significant
Changes to land value	See Section 9.0	A	N	LSA	LT	I	R	Not Significant
Heritage and Cultural Resources								
Accidental Loss Direct impact to heritage and cultural resources	See Section 10.0	A	M	WPA	ST	SE	IR	Not significant
Economy, Employment, and Business								
Economy	See Section 11.0	P	H	RSA	LT	C	R	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Employment	See Section 11.0	P	H	RSA	LT	C	R	Not significant
Business	See Section 11.0	P	H	RSA	LT	C	R	Not significant
Business (during site prep & construction)	See Section 11.0	A	L	LSA	LT	I	R	Not significant
Infrastructure and Community Services								
Population Demographics	See Section 12.0	P	M	RSA	LT	C	R	Not significant
Transportation	See Section 12.0	A	M	RSA	LT	I	R	Not significant
Housing and accommodation	See Section 12.0	P/A	M	RSA	LT	C	R	Not significant
Education and training	See Section 12.0	P/A	M	RSA	LT	C	R	Not significant
Health care and social support	See Section 12.0	A	M	RSA	LT	C	R	Not significant

VC Interactions	Mitigations	Nature of Effect	Magnitude of Effects	Geographic Extent of Effects	Duration of Effects	Frequency of Effects	Reversibility of Effects	Significance Level
Municipal and regional services and infrastructure	See Section 12.0	A	M	RSA	LT	C	R	Not significant
Utilities and communications	See Section 12.0	P	M	RSA	LT	C	R	Not significant
Prevention and emergency services	See Section 12.0	P	M	LSA	LT	C	R	Not significant
LEGEND (Refer to Section 5.0 for definitions) Nature of Effect: A – Adverse, P – Positive Magnitude: N – Negligible, L – Low, M – Moderate, H – High Geographic Extent: PA – Project Area, LSA – Local Study Area, RSA – Regional Study Area Duration: ST – Short Term MT – Medium Term, LT – Long Term Frequency: SE - Single Event, I - Intermittent, C - Continuous Reversibility: R – Reversible, IR – Irreversible, PR – Partially Reversible								

17.0 MITIGATIONS & COMMITMENTS MADE

Commitments made in the document, including mitigations, were compiled below for each VC identified for each component of the Project. Refer to the VC Sections for more detailed descriptions of mitigations and commitments:

17.1 Mitigations

Table 17.1.1 summarizes the mitigations committed to, and which VC and Project component the mitigation applies to. Refer to Section 6.0 for the Wind and Transmission Effects Assessment, Section 7.0 for the Industrial Facility Effects Assessment, Section 8.0 for the Solar Project Effects Assessment, and Sections 9.0, 10.0, 11.0 and 12.0 for the Land and Resource Use, Heritage and Cultural Resources, Economy, Employment, and Business, and Infrastructure and Community Service Effects Assessments, respectively.

Table 17.1.1: Summary of Mitigations

VC ¹	Mitigations	Component
AQ, LRU	Minimize the footprint of disturbance to the extent practicable.	WPA, IPA, SPA
GHG, FVC, TF, Bats, Caribou	Minimize clearing, by using pre-existing roads and previously altered areas (e.g., clearcuts) during detailed design, where possible.	WPA, IPA, SPA
AQ	Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust and airborne particles.	WPA, IPA, SPA
AQ	Compact and/or ridge disturbed soil, as practicable, to prevent dust formation.	WPA, IPA, SPA
AQ	Implement dust control measures during dry periods (i.e., drought) when winds are high, where practical.	WPA, IPA, SPA
AQ	Wet aggregate, soil stockpiles or trench mounds with water to control dust, as required.	WPA, IPA, SPA
AQ	Design storage areas and material stockpiles with prevailing wind directions in mind.	WPA, IPA, SPA
AQ, FVC	Limit the use of approved dust suppressant to control road dust to minimize airborne emissions, where required.	WPA, IPA, SPA
AQ, FVC, TF, Av, Bats, Caribou, AM	Establish and implement speed limits to minimize dust and potential collisions.	WPA, IPA, SPA
AQ	Tie down, cover, and/or store loose site materials and/or products prior to inclement weather and wind events to prevent materials from becoming airborne.	WPA, IPA, SPA
AQ	Wash down vehicles and equipment with water to remove accumulated mud/dirt on undercarriages, tracks, wheel wells, etc., on vehicles that will be utilizing public roadways.	WPA, IPA, SPA
AQ	Require that Project personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) as an identification of a member of the Project	WPA, IPA, SPA
AQ, GHG	Require that equipment meets all applicable provincial and air quality regulations and emissions standards.	WPA, IPA, SPA
AQ, GHG	Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.	WPA, IPA, SPA
AQ, GHG	Remove malfunctioning equipment and/or equipment generating excess amounts of smoke, odour, or noise from service until an assessment and necessary repairs can be completed.	WPA, IPA, SPA
AQ, GHG	Implement an anti-idling policy to limit GHG emissions from vehicles and equipment and limit the use of fossil fuels, where feasible.	WPA, IPA, SPA

VC ¹	Mitigations	Component
AQ, GHG	Inspect and maintain gas lines, seals, and control equipment in accordance with an established maintenance program to prevent leaks and malfunctions.	IPA
AQ, GHG	Ensure burners undergo regular maintenance to achieve efficient combustion and minimize pollutants.	IPA
AQ, GHG	Ensure personnel are adequately trained and specialized to perform daily inspections and maintenance on the combustion and emissions control equipment.	IPA
GHG	Incorporate the shortest construction/transport routes where possible to minimize the use of fossil fuels during construction.	WPA, IPA, SPA
GHG	Recover and recycle construction and demolition waste, where possible.	WPA, IPA, SPA
GHG	Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations.	WPA, IPA, SPA
GHG, Noise, TF, Av, Caribou	Conduct regular maintenance of machinery and equipment to ensure they are in good working order to minimize potential noise and air emissions and increase fuel efficiency.	WPA, IPA, SPA
GHG	Require preventative maintenance and inspections (e.g., leak testing) of equipment containing coolant (i.e., air conditioning units).	WPA, IPA, SPA
GHG	Train Project personnel (as appropriate) in the proper disposal of halocarbon-containing materials.	WPA, IPA, SPA
GHG	Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements.	WPA, IPA, SPA
GHG	Require that trucks removing waste from or bringing materials to the WPA are filled to the maximum allowable capacity where practical (dependent on the truck size and load weight) to reduce transportation requirements and limit the number of trips.	WPA
Noise, TF, Av, Bats, Caribou, LRU	Use noise controls (e.g., mufflers) on machinery and equipment, where applicable, to limit disturbance.	WPA, IPA, SPA
Noise	Conduct noisier construction activities (e.g., drilling or blasting) within daytime shift hours to the greatest extent possible.	WPA, IPA
Noise	Consider additional noise mitigation (e.g., temporary screening, rehousing) where necessary, as part of a construction noise management plan.	WPA, IPA

VC ¹	Mitigations	Component
Noise	Conduct regular maintenance of turbines to ensure they are in good working order and continue to comply with sound level standards.	WPA
Noise	Operate the WTG in one of four SRMs for 69 WTGs if required upon final selection of turbine manufacturer and detailed design.	WPA
Noise	Remove seven WTGs from the proposed layout if required upon final detailed design.	WPA
Noise, SF, SG, LRU	Develop a “good neighbour program” to register and respond to concerns, which will consider complaints and outline a process to investigate complaints.	WPA, IPA, SPA
Noise, GW, SW, FFH	Conduct blasting activities in accordance with best management practices, including the use of a certified contractor holding a valid NLECCC certificate and following a site-specific blast design to maintain vibration limits.	WPA, IPA
Noise	Utilize enclosed, attenuated, or low noise flares (as required).	IPA
Noise	Procure diesel generators with a higher performance package, including noise controls (as required).	IPA
Noise	Ensure during detailed design that compressors are enclosed and compressor piping is acoustically insulated or underground (as required).	IPA
SF	Update shadow flicker modelling once detailed engineering is completed, with further on-site investigations performed if exceedances are noted through analysis or the complaint response protocol.	WPA
SF	Conduct an updated shadow flicker assessment to reduce impacts to nearby receptors upon final selection of turbine manufacturer and detailed design.	WPA
GW	Manage dewatering by directing groundwater to vegetated areas or sediment control structures to facilitate natural infiltration.	WPA, IPA
GW	Complete technical validation for groundwater supply systems, including pumping tests, to confirm sustainable well yields.	WPA, IPA
GW	Direct runoff from less permeable Project surfaces, such as access roads and turbine pads, to constructed ditches.	WPA, IPA
GW	Remove Project Infrastructure during decommissioning to a depth determined by final engineering and regulatory requirements, and grade and contour the areas to restore natural drainage where possible.	WPA, IPA

VC ¹	Mitigations	Component
GW, Caribou, TF	Implement site remediation activities to promote natural vegetation by recovering and distributing overburden and organic material and decompacting soils where possible.	WPA, IPA, SPA
GW	Design the accommodation camps septic systems in accordance with provincial Environmental Control Water and Sewage Regulations.	WPA, IPA
GW, SW, FFH, FVC, AM, TF, Bats, EEnv	Maintain a minimum 30 m vegetated buffer surrounding watercourses, where possible.	WPA, IPA, SPA
FFH, SW, FVC, GW, AM, Av	Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water feature. Implement a hazardous substances management and spill prevention plan, which outlines the requirement for spill kits on all equipment as needed.	WPA, IPA, SPA
GW, SW, FFH, FVC, TF, Caribou, AM	Implement an Erosion and Sediment Control Plan.	WPA, IPA, SPA
SW, FFH	Complete further micro-siting of infrastructure during the detailed design and permitting phase to with the intent to avoid impacts to surface water features.	WPA, IPA, SPA
SW, FFH	Complete culvert installations and upgrades (where applicable) in accordance with the Environmental Guidelines for Watercourse Crossings.	WPA, IPA, SPA
SW, FFH	Identify surface water/fish & fish habitat features and ensure they are clearly marked.	WPA, IPA, SPA
SW	Fit any watercourse crossings with appropriately sized infrastructure, as prescribed by a certified professional.	WPA, IPA, SPA
SW	Design any necessary alterations in a way that maintains the natural grade of a watercourse.	WPA, IPA, SPA
SW, FFH, FVC	Integrate water management systems including diversion and collection ditches, roadside drainage channels, vegetated swales, and stormwater retention ponds.	WPA, IPA, SPA
SW, FFH	Develop a maintenance schedule for regular maintenance and inspection of Project water management infrastructure.	WPA, IPA, SPA
SW, FFH	Treat wastewater discharge prior to release to ensure it meets applicable regulatory requirements, if required.	WPA, IPA
GW, SW, Bats, FFH	Draft and implement a Surface Water Management Plan to support drainage and ensure water quality conforms to applicable regulations and guidelines.	WPA, IPA
SW, FFH	Use rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life.	WPA, IPA

VC ¹	Mitigations	Component
SW, FFH	Require that workers are fully trained in spill response.	WPA, IPA, SPA
SW, FFH	Ensure operators remain with equipment during refueling.	WPA, IPA, SPA
SW	Plan any construction activities that may impact stream banks and substrate to align with low-flow periods, when possible.	WPA, IPA, SPA
SW	Revegetate along the watercourse edge and above the ordinary high-water mark to facilitate bank stabilization, where applicable.	WPA, IPA SPA
SW, FFH	Locate stockpiles a minimum of 30 m from any surface water feature and stabilize to reduce the likelihood of erosion and sedimentation.	WPA, IPA, SPA
SW	Integrate outlet protection features on settling ponds to dissipate flow velocities and decrease erosion at the outflow.	WPA, IPA, SPA
SW, FFH	Adhere to all Approval conditions outlined in all regulatory approvals.	WPA, IPA, SPA
SW, FFH	Complete site kick-off meetings with relevant staff/contractors to educate and confirm policies related to working near surface water resources, and that all Approval conditions are clearly communicated and adhered to.	WPA, IPA, SPA
SW	Implement water level monitoring thresholds and adaptive water management strategies (including adjusting plant operations to reduce water needs) as per the Groundwater and Surface Water Monitoring Management Plan to ensure the protection of ecological flows downstream in Peters River.	IPA
SW	Conduct instream works associated with underground stream crossings during dry conditions.	IPA
SW	Ensure the trench created in the stream bed is partially filled with suitable materials; these materials can then be compacted and the stream bed brought back to its previous elevation and grade using a topping of clean, non-erodible materials containing a minimum of fines.	IPA
SW	Ensure the materials used for the "topping" in the crossing area is consistent with the material substrate of the stream in this area and should be large enough to resist displacement by peak flows.	IPA
FFH	Using existing roads, trails, and cutlines whenever possible.	WPA, IPA, SPA
FFH	Micro-site crossings away from sensitive fish habitat (i.e., salmonid spawning sites), where possible.	WPA, IPA, SPA

VC ¹	Mitigations	Component
FFH	Consider redesign requirements for existing watercourse crossings to facilitate habitat upgrades, including unblocking culverts and making waterways more conducive to fish passage.	WPA, IPA, SPA
FFH, TF	Prioritize structures that maintain the natural watercourse bottom and hydraulic conditions (e.g., bridges, bottomless arch culverts) where possible.	WPA, IPA, SPA
TF	Wherever possible, install open span, natural bottom culverts or oversize pipe culverts to support safe wildlife passage and preserve ecological connectivity to prevent obstacles for muskrat movement.	WPA, IPA, SPA
FFH	Limit riparian vegetation removal to the immediate work area.	WPA, IPA, SPA
FFH	Restore stream banks and riparian vegetation to their natural state (when possible).	WPA, IPA, SPA
FFH	Educate Project personnel on the sensitivity of fish and fish habitats.	WPA, IPA, SPA
FFH	Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff.	WPA, IPA, SPA
FFH	Avoid conducting any work in water, where possible.	WPA, IPA, SPA
SW, FFH	Require that surface run-off containing suspended materials or other harmful substances be minimized.	WPA, IPA, SPA
SW, FFH	Ensure water discharge meets CCME FWAL guidelines (including temperature) prior to release.	WPA, IPA, SPA
FFH	Ensure fish passage is considered in the design and construction of ditching around the Industrial Facility.	IPA
SW, FFH	Complete additional water balance assessments if/when indirect impacts to flow are anticipated to nearby watercourses from quarry development (to be determined in consultation with DFO).	WPA, IPA
SW, FFH	Maintain drainage patterns via grading and hydraulic connectivity structures.	WPA, IPA, SPA
FFH	Adhere to the buffers outlined in the Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador for quarries, roads, camps, fuel storage, and grubbing, whenever possible.	WPA, IPA, SPA
FFH	Ensure explosive materials storage meets government regulations including required separation distances as regulated by the Explosives Regulatory Division of NRCAN.	WPA, IPA
FFH	Complete fish rescues in habitats to be directly impacted.	WPA, IPA, SPA
FFH	Time in-water work, when possible, as per DFO Timing Windows for Newfoundland and Labrador.	WPA, IPA, SPA

VC ¹	Mitigations	Component
FVC	Conduct vegetation management activities (through application of herbicides and manual brush cutting) in accordance with the Pesticide Control Regulations under the NL EPA.	Entire PA
TF, Bats, FVC, Caribou	Revegetate cleared areas with native species, to the best extent possible.	Entire PA
FVC	Use quarried, crushed materials for road construction to reduce the introduction of invasive vascular plant species.	Entire PA
FVC	Clean and inspect equipment to prevent the introduction of non-native species.	Entire PA
FVC	Prioritize the avoidance of flora SAR and maximize avoidance of flora SOCC during the detail design stage, where possible.	Entire PA
FVC	Conduct pre-construction surveys of identified potential sensitive flora habitat within the PF to inform detailed design.	Entire PA
FVC	Maintain undisturbed buffers around flora SAR and SOCC to the extent possible to minimize impacts to supporting habitat.	Entire PA
FVC	Consult with NL FAL-Wildlife Division to confirm the origin of red pine trees in the BWPA to confirm whether the trees observed are part of Newfoundland's natural red pine population that is protected under NL ESA	WPA
FVC	Consult with NL FAL-Wildlife Division if a flora SAR is incidentally observed in the SPA (e.g., during site preparation, construction).	SPA
FVC	Avoid unnecessary travel through wetlands, where possible.	Entire PA
FVC	Where undisturbed buffers cannot be maintained an application for a permit to Alter a Body of Water will be made in accordance with the Water Resources Act.	Entire PA
FVC	Design wetland crossings to avoid permanent diversion, restriction or blockage of natural flow, as practical, such that hydrologic function of wetlands will be maintained.	Entire PA
FVC	Direct run-off from construction activities away from wetlands, where possible.	Entire PA
TF	Wherever possible, avoid gating culverts and minimize culvert length.	Entire PA
TF, Caribou, LRU	Inform all Project-related staff working on the site of dangers to wildlife and create awareness around wildlife hotspots on the site.	Entire PA
Caribou	Ensure personnel are made aware of caribou potential in the WPA and on roads especially for Project traffic/transportation. Specifically, signage will be posted to indicate caribou presence where previously identified and at any future observation locations.	WPA

VC ¹	Mitigations	Component
TF, Caribou	Install signage where specific wildlife concerns have been identified.	Entire PA
TF, Av, Bats	Install motion activated lights on-site infrastructure, where feasible, to reduce insect attraction.	WPA, IPA
Bats, Av, TF	Limit unnecessary lighting as much as possible, especially at night.	WPA, IPA
TF	If SAR species are observed in the area during blasting, blasting shall be paused, until animal has left the area.	WPA, IPA
TF	Provide wildlife awareness training to all site personnel to reduce interactions between personnel and wildlife.	Entire PA
TF, Caribou, Av, Bats	Feeding, hunting or harassment of wildlife by onsite Project personnel will be prohibited.	Entire PA
TF, LRU	Store hazardous and non-hazardous waste in designated areas, in appropriate containers to reduce potential for spills and to avoid attracting wildlife.	Entire PA
TF, Caribou, LRU	Complete visual surveys for wildlife (moose and caribou) prior to blasting.	WPA, IPA
Caribou	If caribou are observed in the area during blasting, blasting shall be paused, until animal has left the area.	WPA, IPA
TF, Caribou	Install fencing surrounding the solar facility and main industrial facility, substations, high voltage areas, pump house and critical port and pipeline areas	Entire PA
TF, Bats	Install anti-reflective coating on panels to reduce reflection, if feasible.	SPA
TF, Bats	Maintain avoidance of potential bat habitat (i.e., mature forests, riparian areas, and wetlands) to the greatest extent possible.	Entire PA
Bats	Retain snags and suitable roosting trees to the extent possible.	WPA
Bats	Develop and implement an Adaptive Management Plan to reduce any observed bat mortalities during monitoring, including use of deterrents and targeted data-driven curtailment if and when needed.	WPA
Caribou	The extent of land clearing and grubbing will be restricted such that naturally vegetated areas between the site and surrounding properties and thoroughfares are maintained.	WPA
Caribou	Disturbance to ground-level vegetation, e.g., herbs, shrubs, and lichens, will be minimized where possible and as practical.	WPA
Caribou	Minimize use of road salt to minimize attraction of ungulates to roadsides during the winter.	WPA

VC ¹	Mitigations	Component
Caribou	Monitor for caribou injuries and fatalities frequently within the facility area during construction and operation within the PA. NLFAL will be notified within 24 hours in the event of the mortality or injury of an individual caribou.	WPA
Caribou	Project personnel will always yield right of way to wildlife.	WPA
Caribou	Multi-passenger vehicles will be prioritized to reduce collision risk.	WPA
Caribou	Fencing will be installed to exclude wildlife from higher risk areas such as substations.	WPA
Av	Adhere to ECCC guidelines on clearing windows for nesting migratory birds, where possible. Due to seasonal variability regarding conditions, if vegetation and tree clearing activities during the nesting/breeding season cannot be avoided, nests will be marked and avoided by appropriate buffers if found.	Entire PA
Av	Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities within stockpiles or exposed areas during construction or operations, until chicks can fly, and the nesting areas are no longer being used. Exposed stockpiles will be limited, covered, or vegetated as much as possible during construction and operation phases.	Entire PA
Av	Limiting and managing exposed sedimentation banks to reduce the attraction of burrow-nesters such as bank swallows (e.g., maintain at least a 70 degree-slope), as per ECCC best management practices and recommendations.	Entire PA
Av	Develop a site reclamation plan in accordance with engineering standards and in consultation with NLECCC and NL FAL.	Entire PA
Av	Incorporate a lighting plan for construction-related activities into the EPP.	Entire PA
Av	Follow Transport Canada requirements for navigational hazard markings and lighting on transmission lines, including the installation of strobe or intermittent/flashing lighting.	WPA
Av	Monitor for bird injuries and fatalities frequently within the WPA. ECCC-CWS will be notified in the event of the mortality or injury. Under the MBR, a scientific permit is required to possess or handle any stranded, injured, or dead migratory bird. Any birds found injured that may require transport to on-land facilities must also be reported. Record will be kept of such incidents.	WPA
Av	Obstruction lighting marking the flare stacks will use lights with short flash durations and the ability to emit no light during the “off-phase” of the flash (i.e., LED lights), with the minimum number of flashes per minute and the briefest flash duration allowable, as recommended by CWS.	IPA

VC ¹	Mitigations	Component
Av	Equip the flare stacks with a custom-fitted spike collar to deter birds from perching on the stacks.	IPA
Av	Eliminate suitable perching areas within a 120 m radius of the flare stacks.	IPA
Av	Where feasible, tinted or frosted glass windows will be used in buildings to reduce bird mortality from collisions.	IPA
Av	Perform routine checks for bird injuries and fatalities especially when the flare stacks are in operation during nights in peak spring and fall migration periods (i.e., April to May, and mid-August to October).	IPA
LRU	Conduct creel surveys to document fishing effort before construction.	Entire PA
LRU	Obtain all required quarry and forestry permits prior to any development.	Entire PA
LRU	Ensure continued access to road networks for users leading to active quarries and forestry activities within the WPA.	Entire PA
LRU	Obtained all required zoning permit within the Botwood MPA prior to development.	Entire PA
LRU	Avoid PPWSAs where possible and, if required, apply for a permit to develop in a PPWSAs. All Project activities will be conducted outside of the required buffer of the PPWSA intake source.	Entire PA
LRU	Schedule transport of oversize loads outside of peak traffic hours.	Entire PA
LRU	Apply limitations to areas posed as safety risks to the public, which includes fencing the substations.	Entire PA
LRU	Ensure turbine locations have been sited outside of major populated areas and relocate turbines with high visual impact as appropriate.	Entire PA
LRU	Avoid or reduce activities that have high ignition potential during periods of high drought conditions.	Entire PA
LRU	Ensure job sites is equipped with fire extinguishers and other fire reduction equipment. Crews should be informed of the available equipment to use and are trained on appropriate drills in case of an emergency.	Entire PA
HCR	Avoid the two registered identified archaeological sites by 50 m.	Entire PA
HCR	Avoid the new registered archaeological sites through re-routing of infrastructure or buffer avoidance to be determined in consultation with PAO and a qualified archaeologist.	Entire PA
HCR	Maintain avoidance of modelled high potential areas where possible.	Entire PA
HCR	HRIA will be required for those high potential areas within the WPAs once footprint is finalized.	Entire PA

VC ¹	Mitigations	Component
HCR	Follow the Mitigation Plan and Accidental Finds Protocol.	Entire PA
EEB	Procure goods and services provincially as much as possible to the extent that they are available.	Entire PA
EEB, ICS	Hire locally/regionally as much as possible based on availability of labour with appropriate training and skills.	Entire PA
EEB, ICS	Work with education facilities to ensure appropriate training is available.	Entire PA
EEB	Prepare a gender equity, diversity and inclusion plan to outline employment policies.	Entire PA
EEB	Establish Benefits Agreements to support the local economy and sectors that may be affected.	Entire PA
EEB	Design and install infrastructure to avoid, or maximize distances, to tourism business and facilities.	Entire PA
EEB	Include local cultural venues and events in sponsorship programs to help alleviate any Project-related effects.	Entire PA
ICS	Development and implement a Traffic Management Plan.	Entire PA
ICS	Develop incentives to encourage worker carpooling to reduce Project traffic.	Entire PA
ICS	Accommodate non-resident Project workers in a dedicated facility with related services on-site.	Entire PA
ICS	Ensure corporate and contractor compliance with workers' health and safety regulations.	Entire PA
ICS	Institute worker health and safety programs for employees and contractors to avoid or reduce use of local health and social services.	Entire PA
ICS	Establish agreements to support municipalities and Local Service Districts that may be affected.	Entire PA
ICS	Prepare and implement a waste management and waste reduction plan for the Project with special emphasis on Site Preparation and Construction and Decommissioning and Rehabilitation.	Entire PA
ICS	Work with municipalities to develop a Project specific Emergency Response Plan and increase training and capacity for emergency response infrastructure and services.	Entire PA
ICS	Design and install Project infrastructure to avoid or maximize safe distances to recreation infrastructure and facilities.	Entire PA
AM	Establish a comprehensive maintenance schedule for inspections of the flare tip, pilot burners, pressure relief valves, and ignition systems.	IPA

VC ¹	Mitigations	Component
AM	Regularly test the ignition system and calibrate all control systems and sensors that monitor gas flow and flame presence.	IPA
AM	Conduct routine inspections to ensure the integrity of all critical equipment.	IPA
AM	Install gas detectors to detect any hazardous or explosive gas leaks.	IPA
AM	Train Project personnel on system operation, failure response, and troubleshooting.	IPA
AM	Train Project personnel on the ERP and conduct periodic emergency drills.	Entire PA
AM	Ensure Project personnel working near potential (air and noise) emission sources are provided with appropriate PPE to ensure safety during emergency events, servicing or repair scenarios.	Entire PA
AM	Response planning will align with the ECCC Environmental Emergency Regulations (E2 Regulations) (Canada, 2019a) and comply with the requirements of an environmental emergency response plan to ensure readiness and compliance.	Entire PA
AM	Emergency response scenarios will be incorporated into the Project's ERP and regularly reviewed through training exercises involving the on-site Emergency Response Team (ERT) and regional Mutual Aid Partners, including local Volunteer Fire Departments.	Entire PA
AM	Automated shut-off valves will be equipped on connection points for ammonia transfer points.	IPA
AM	Store nitrogen gas (N ₂) on site and use to control ammonia storage and limit reactivity.	IPA
AM	Use flare systems in the event of an emergency situation to safely burn off excess product.	IPA
AM	Detailed design will incorporate a winterization evaluation along piping and instrumentation for hydrate formation (and additional winterization considerations that could result in release); tracing or other engineered controls will be incorporated, as required.	IPA
AM	Construct ammonia storage tanks and pipelines of corrosion resistant materials.	IPA
AM	The layout of the Industrial Facility will locate infrastructure in such a way as to minimize the risk of domino events (e.g., as per the results of the QRA, the hydrogen plant and ammonia storage tanks will be appropriately staged to allow sufficient buffer in the event of an emergency).	IPA
AM	Do routine inspection and monitoring of ammonia storage systems and connection/transfer points will be completed, and repairs will be completed as necessary.	IPA
AM	Implement leak detection systems that may include acoustic monitoring, ammonia-specific sensors and/or balance-based systems.	IPA

VC ¹	Mitigations	Component
AM	Include mitigations to protect personnel and respond to damage from projectiles during an emergency event in the Project's ERP.	IPA
AM	Develop detailed fire response measures for known potential significant events and use in training and exercises by the ERT and Mutual Aid Partners (e.g., local Volunteer Fire Departments) per the requirements of ECCC Environmental Emergency (E2) regulations (Canada, 2019a).	IPA
AM	Ignition sources will be managed and electrical components within the hydrogen plant shall comply with the applicable electrical hazard zone to minimize probability of ignition.	IPA
AM	Install pressure relief devices designed to vent to open-air locations.	IPA
AM	Install fast-acting gas monitoring/detection systems. The monitors/detection systems will be interfaced with the control system in such a way so that appropriate alarms will be activated based on an alarm hierarchy. Safety controls, where practical, will automatically shutdown upstream valves to control or prevent releases of hydrogen. Manual intervention will be incorporated into the design should automatic systems fail under release conditions.	IPA
AM	High-level ventilation to prevent hydrogen accumulation will be installed.	IPA
AM	The layout of the Industrial Facility will locate infrastructure in such a way as to minimize the risk of domino events (e.g., as per the results of the QRA, the hydrogen plant and ammonia storage tanks will be appropriately staged to allow sufficient buffer in the event of an emergency event).	IPA
AM	Positive pressure and/or blast safe enclosures/control rooms will be available to protect operations personnel from the effects of a release or explosive scenario.	IPA
AM	Detailed design will consider the impacts of hydrogen embrittlement and utilize appropriate materials (e.g., stainless steel cladding and/or coatings) to prevent damage or failure that could result in release.	IPA
AM	The electrolyzer system will employ maintenance strategies, integrity evaluations, and safe operating procedures to minimize and maintain a very low probability of loss of containment of hydrogen.	IPA
AM	Comply with all relevant regulations related to storage, transportation, handling, and use of hazardous materials.	Entire PA
AM	Store all dangerous goods in compliance with the Workplace Hazardous Material Information System (WHMIS).	Entire PA

VC ¹	Mitigations	Component
AM	Store all fuels, lubricants, and hazardous materials in designated containers and dedicated storage areas.	Entire PA
AM	Provide secondary containment in product storage areas and unloading and handling areas.	Entire PA
AM	If possible, complete these activities on an impervious surface or in such a way as to contain materials (i.e., liners, tarps, spill trays) in the event of a spill or release.	Entire PA
AM	Design and implement high-integrity storage and piping systems.	Entire PA
AM	Schedule regular inspections for all mobile and processing equipment to assess for potential leaks, wear, or damage, particularly associated with hosing, joints, seals, transfer points, and valves. Identify and repair leaks promptly.	Entire PA
AM	Complete mobile equipment servicing off-site, where possible. If this is not possible, require that the work is completed in a designated area, greater than 30 m from a watercourse or wetland.	Entire PA
AM	Provide Safety Data Sheets (SDS) for all chemicals and train personnel to ensure proper handling, storage, and response in the event of spills or exposure.	Entire PA
AM	Implement a structural health monitoring program of wind turbine blades and structures.	WPA
AM	Routine monitoring and inspection of the structural integrity of all components of turbines will also be incorporated.	WPA
AM	Ensure sufficient lubrication in bearings, and that bearings are free of debris that could cause excess friction.	WPA
AM	Prepare and enact severe weather plans to reduce the risk of physical damage from flying debris or hail and minimize the risk that thermo-electric damage by lightning results in blade failure.	WPA
AM	Inspect and properly maintain turbine brake function.	WPA
AM	Check and change lubrication regularly in the turbine gearboxes to prevent excess heat and minimize wear.	WPA
AM	Test full suite of sensors regularly to ensure that anomalous conditions are detected early and managed before they result in damage to turbines.	WPA
AM	Automatic shutdown of electrolysis systems, and hydrogen and oxygen systems would undergo controlled depressurization to designated flare or vent systems.	IPA
AM	Automated closure of emergency shutdown valves and isolation of transfer systems, preventing loss of containment at pipeline pumps and valves.	IPA

VC ¹	Mitigations	Component
AM	Oil-filled equipment (such as substations and transformers) will be located within secondary containment systems to prevent migration to soil, groundwater, or the aquatic environment in the event of a release.	Entire PA
AM	Wind turbines, substations, and transmission infrastructure will be designed to applicable CSA standards, and take into account the province's wind, ice loading, and extreme weather conditions.	WPA
AM	Install lightning protection systems for turbines, substations, critical equipment (tanks and process facility) and transmission lines.	WPA
AM	Use of corrosion-resistant materials and protective coatings for coastal environments will be considered.	IPA
AM	Storm surge and flood-resilient design for electrical infrastructure will be incorporated.	Entire PA
AM	Routine inspection, preventative maintenance, and asset integrity management programs will be applied.	Entire PA
AM	Continuous monitoring of electrical systems and power quality will be conducted and backup power generation from diesel-fired emergency and electrolyzer generators will be incorporated.	IPA
AM	Automated load-shedding and controlled shutdown sequences will be implemented to stabilize plant operations in the event of power loss.	IPA
AM	Safety Instrumented Systems (SIS) to initiate safe shutdown during abnormal conditions will be employed.	IPA
AM	Surge protection systems and pressure protection on process equipment and pipelines will be installed.	IPA
AM	Uninterruptible Power Supply (UPS) will be considered for critical instrumentation, monitoring, and control systems.	IPA
AM	Critical valves will be designed to move to fail-safe positions upon loss of power.	IPA
AM	Stormwater management and isolation controls to prevent migration of contaminants to soil, groundwater, or other environments will be considered.	Entire PA
AM	Provide workers with training to properly install and repair ESCs.	Entire PA
AM	Conduct regular monitoring of all erosion and sediment controls, and repair or replace as necessary.	Entire PA

VC ¹	Mitigations	Component
AM	Heed Environment Canada's special weather warnings to ensure proper care is given to stabilize erosion and sediment controls in advance of, and following, extreme weather events (i.e., precipitation).	Entire PA
AM	Ensure surface water management systems are designed according to regulatory specifications and are capable of receiving and managing sufficient volume during precipitation events.	Entire PA
AM	To preserve emergency response capability in the event of a process water disruption, a dedicated reserve of fire response water will be maintained separately from the electrolyzer facility.	IPA
AM	Water storage, containment, and conveyance infrastructure will be subject to routine inspection and preventative maintenance to identify and mitigate potential failure mechanisms.	IPA
AM	Develop a fire prevention and evacuation plan, in addition to general safety protocols and training, as part of the ERP and share with local fire departments.	Entire PA
AM	Prohibit fire within the Project area by staff and contractors.	Entire PA
AM	Allow smoking ONLY in designated areas and stage these smoking areas away from flammable products, chemical storage zones and highly flammability risk areas.	Entire PA
AM	Dispose of all flammable waste regularly at an approved facility (e.g., flammable chemicals, waste fuels, spill response materials).	Entire PA
AM	Install fire suppression systems suitable to the plant area and equipment protection needs.	Entire PA
AM	Require that installation of electrical equipment and wiring be completed by qualified, licensed electricians in accordance with CSA requirements.	Entire PA
AM	Maintain corridors containing electrical infrastructure during operations to ensure flammable materials/wastes do not accumulate and vegetation (where applicable) is controlled and managed.	Entire PA
AM	Implement fire detection and protection systems in vulnerable areas (e.g., fuel storage areas).	Entire PA
AM	Establish buffer zones or firebreaks between the Industrial Facility and the neighbouring properties.	IPA
AM	Provide appropriate PPE where the risk of arc-flash or arc-blast is present.	IPA
AM	Consult with local fire departments to review the suitability of access routes for emergency vehicles.	Entire PA

VC ¹	Mitigations	Component
AM	Maintain access and conduct regular maintenance for fire water storage.	Entire PA
AM	Conduct regular inspections, capacity assessments, and maintenance to ensure water availability and compliance with fire safety regulations.	Entire PA
AM	Require that an inventory of ancillary firefighting equipment is well-maintained and readily accessible to effectively manage on-site fires.	Entire PA
AM	Ensure that access to the on-site Fire Station is maintained and access preserved and that an appropriate inventory of in-stock materials is on hand to respond to Industrial Facility emergency situations.	Entire PA
AM	Train all personnel in emergency response, fire prevention and evacuation plans, and the use of firefighting equipment.	Entire PA
AM	Require that the selection of pumps, motors, instrumentation, and other electrical components comply with the applicable electrical hazard zone, which will minimize the probability of ignition.	Entire PA
	Conduct regular inspection of wiring connectors, and switch gear for signs of wear, corrosion, or damage, and maintain a protection relay testing program.	Entire PA
AM	Conduct regular maintenance and inspection of solar panel arrays and central inverter components	SPA
AM	Ensure lockout/tagout protocols are in place and followed to prevent arc flash and arc fault; install Arc-Fault Circuit Interrupters during maintenance activities.	Entire PA
AM	Central inverter stations will use prefabricated, weather-resistant enclosures with electrical protections systems, isolation systems and grounding fully installed.	Entire PA
AM	Schedule preventative maintenance of electrical systems to identify potential failure occurrences.	Entire PA
AM	Design electrical systems with adequate load capacity to prevent overloading.	Entire PA
AM	Require compliance with applicable Electrical Codes and Standards.	Entire PA
AM	Install, where feasible, emergency shutdown systems to isolate electrical power during critical electrical fire incidents to reduce the risk of fire spread and ensure the safety of personnel.	Entire PA
AM	Develop a lock-out/tagout program for any work done on energized systems.	Entire PA
AM	Electrical and fire systems will be designed to stop operations and isolate energy sources automatically during fault conditions.	Entire PA

VC ¹	Mitigations	Component
AM	Each BESS enclosure's fire protection system will have a signal that triggers power down in the event of a fire, electrical fire, overheating, etc.	Entire PA
AM	The BESS will be equipped with the means for electrical isolation that can be opened manually to power down portions or all of the energy storage system equipment.	Entire PA
AM	Staff will be trained in the safe operation and response of manual power-down procedures.	Entire PA
AM	Batteries will be stored and operated in a manner that protects them from vehicle collision, unauthorized access, and other physical damage, and in accordance with NFPA 855 and applicable codes and standards.	Entire PA
AM	The ERP will define the roles, equipment, and training requirements for site personnel and external emergency responders, including access to appropriate PPE/SCBA and fire response equipment where required.	Entire PA
AM	Containment and drainage measures will be incorporated, where practicable, to control contaminated firewater and chemical releases and to prevent off-site migration to terrestrial and aquatic environments.	Entire PA
AM	Comply with all relevant regulations related to storage, transportation, handling, and use of hazardous materials.	Entire PA
AM	Conduct periodic inspections to ensure all mobile equipment is in good condition and follow manufacturer's specifications for preventative maintenance.	Entire PA
AM	Set in place applicable signage in accordance with relevant traffic regulations.	Entire PA
AM	Develop and maintain roads in accordance with the Project's ESCP.	Entire PA
AM	Require that drivers follow all laws and regulations pertaining to distracted (e.g., cell phone usage) or impaired driving on and off-site.	Entire PA
AM	Minimize transportation-related traffic in school zones and on school bus routes during school hours and bus pick-up and drop-off times.	Entire PA
AM	Follow weather statements and alerts and adjust plans accordingly to avoid transportation in extreme weather conditions whenever possible.	IPA
AM	Keep vehicles and pedestrians apart.	IPA
AM	Minimize vehicle movements.	IPA
AM	Minimize reversing by providing adequate room to turn vehicles.	IPA

VC ¹	Mitigations	Component
AM	Ensure adequate visibility by operating in appropriate weather and providing ample lighting and visibility aids (e.g., mirrors around tight turns).	IPA
AM	Ensure visitors are familiar with the Project layout or are accompanied by Project personnel as necessary.	IPA
AM	Ensure compliance by operations personnel, fuel suppliers, contractors, and all visitors to the Industrial Facility.	IPA
AM	A Traffic Impact Study (Appendix P.1) was completed and recommendations found in this report shall be implemented to limit the risk of traffic accidents on public roadways (notably Botwood Highway).	Entire PA
EEnv	Risks to Project personnel will be managed through education on how to recognize and understand hazards such as ticks and harmful algal blooms.	Entire PA
EEnv	The Project will mitigate the risks of flooding by maintaining regular upkeep and grading of roads to reduce formation of ruts, designing roadside ditches and water off-take infrastructure next to all roads to encourage drainage of rainwater off the roads, and revegetating roadsides to absorb excess water.	Entire PA
EEnv	Sizing culverts appropriately for anticipated increased precipitation events.	Entire PA
EEnv	Designing roadside ditches and water off-take infrastructure next to all roads to encourage rainwater drainage.	Entire PA
EEnv	Grade roads in areas where water is likely to collect (i.e., hills and flat, low-lying areas) to avoid the formation of ruts.	Entire PA
EEnv	Recycling of water to Peters Pond from the Industrial Facility if/as needed to ensure water is available in Peters Pond to protect surface water features (Peters Pond and Peters River).	Entire PA
EEnv	Maintaining regular upkeep of surface water infrastructure.	Entire PA
EEnv	Allowing for natural revegetation of roadsides and ammonia pipeline to absorb excess water and reduce erosion.	Entire PA
EEnv	Implement strategies for reducing the production of fugitive dust during construction.	Entire PA
EEnv	Sizing culverts appropriately for anticipated increased flooding.	Entire PA
EEnv	Design roadside ditches and water off-take infrastructure next to all roads to encourage drainage.	Entire PA
EEnv	Constructing elevated roads, where practical and required.	Entire PA

VC ¹	Mitigations	Component
EEnv	Maintaining and inspecting roadway and pipeline integrity.	IPA
EEnv	Ensure the shoreline is stabilized using vegetation or rip rap.	IPA
EEnv	Grade shoreline slopes to reduce erosion and absorb wave energy	IPA
EEnv	EVREC will ensure site access is maintained in adverse conditions by clearing critical roads or providing vehicles that can traverse all conditions	Entire PA
EEnv	Incorporate a site-specific fire safety plan with the Project's Emergency Response Plan, in coordination with local fire and emergency response departments.	Entire PA
EEnv	Engage with first responders on site access and availability of water resources for fire suppression.	Entire PA
EEnv	Ensure fire response equipment is available and that site personnel are trained in its use.	Entire PA
EEnv	Continue engagement with the public regarding the safe continued use of lands within the PA.	Entire PA
EEnv	Continue engagement with provincial and municipal regulators to ensure concerns about access within and near the PA are addressed.	Entire PA
EEnv	Install signage illustrating and warning of potential hazards associated with ice throw and shedding around wind turbines, including on any recreational or logging trails, receptors, or roads within the danger zone of ice throw or shedding.	WPA
EEnv	Equip staff and workers accessing the PA with necessary PPE and associated safety protocols and procedures to mitigate risk of injury and/or fatality, especially during potential icing conditions.	Entire PA
EEnv	Equip turbines with automatic shutdown procedures to avoid damage to the turbines and ice throw. Identification of icing and automatic shutdown can be triggered by factors such as temperature, anemometer (wind) speeds, and power curve comparison.	WPA

1 Air Quality = AQ, Greenhouse Gases = GHG, Shadow Flicker = SF, Groundwater = GW, Surface Water = SW, Fish and Fish Habitat = FFH, Flora and Vegetation Communities = FVC, Terrestrial Fauna = TF, Avifauna = Av, Solar Glare = SG, Land and Resource Use = LRU, Heritage and Cultural Resources – HCR, Economy, Employment, and Business = EEB, Infrastructure and Community Services = ICS, Effects of the Environment = EEnv, Accidents and Malfunctions = AM

17.2 Commitments

Table 17.2.1 summarizes the commitments made for each VC. Refer to Section 6.0 for the Wind and Transmission Effects Assessment, Section 7.0 for the Industrial Facility Effects Assessment, Section 8.0 for the Solar Project Effects Assessment, and Sections 9.0, 10.0, 11.0 and 12.0 for the Land and Resource Use, Heritage and Cultural Resources, Economy, Employment, and Business, and Infrastructure and Community Service Effects Assessments, respectively.

All management plans are/will be living documents that will be updated through consultation and further Project work and will continue to be updated if and as needed through the lifetime of the Project.

Table 17.2.1: Summary of Commitments

VC ¹	Commitments	Component
General Commitments		
AQ	Implement construction mitigation measures (e.g., watering of roadways, reduce roadway speeds), as required.	WPA
AQ	Implement construction mitigation measures (e.g., restrict idling or reduce roadway speeds), as required.	WPA
AQ	Ensure that the final engineering design of the Industrial Facility reduces all ground-level concentrations of pollutants below the NLAPCR limits as required through consultation with NLECC through a phased commissioning approach, where exceedances are allowable, and minimize this risk if grid connection is established.	IPA
AQ	Pre-operation ambient air quality levels will be measured on-site to establish baseline conditions.	IPA
Noise	Additional noise mitigation (e.g., temporary screening) will be considered as part of a construction noise management plan once further engineering design of the Wind Project is complete and detailed construction works have been planned.	WPA, IPA
Noise	Noisier construction activities (e.g., blasting) will operate during daytime shift hours (where feasible and required) to minimize impacts on nearby receptors.	WPA, IPA
Noise	Use enclosed, attenuated, or low noise flares and improved noise reduction performance packages of diesel generators.	IPA
SF	Upon detailed design, additional modelling will be undertaken following investigation at receptors with predicted exceedances to determine the actual potential for exceedance, and the nature of the receptor.	WPA
GW	Well locations will be field verified prior to the initiation of Project development activities.	IPA
GW	Site-specific drilling and hydrogeological testing and monitoring during Project pre-construction geotechnical programs will be completed.	IPA
GW	The proposed groundwater supply systems will undergo technical validation, including pumping tests, to confirm sustainable well yields. These assessments will be completed during the provincial Water Use License and non-domestic well construction permit application processes.	IPA

VC ¹	Commitments	Component
SW, FFH	All watercourses will be field assessed as part of the permitting process. Roads will be micro-sited to minimize impacts by working to design the roads perpendicular to watercourse crossing locations and designing roads to cross watercourses along a straight section of stream, where feasible and as practical..	WPA, IPA
SW, FFH	All turbine pads will be micro-sited to avoid direct impacts to surface water features, to the greatest extent possible	WPA
SW, FFH	During the permitting process, as surface water features are confirmed and assessed, quarries and laydown areas will be micro-sited to avoid direct impacts to surface water features to the greatest extent possible.	WPA, IPA
SW, FFH	Accommodation camps will be micro-sited to avoid direct impacts on surface water features, where feasible.	WPA, IPA
SW	Water management infrastructure will be designed to maintain natural flow within each respective watershed, where possible. This may require the installation of two settling ponds, one on each side of the watershed divide to collect on-site runoff.	SPA
SW	Detailed designs for the water management infrastructure will be prepared during the permitting phase. At that time, if more substantial site grading is required, a contributing drainage area assessment may be completed to evaluate any potential changes in surface water quantity affecting nearby water features.	SPA
SW	All watercourse crossings associated with the pipeline will be field verified and described during the detailed design phase.	IPA
FFH	Fish habitat will be confirmed and characterized at every modelled watercourse expected to be impacted in advance of Project permitting.	WPA
FFH	Wherever possible, quarrying will be limited to areas above the design flood high water mark and no closer than 100 m from all watercourses. Vegetation within this buffer zone will remain undisturbed.	WPA
FFH	Water balance assessments may be completed to evaluate any potential changes in surface water quantity affecting nearby water features.	IPA
FFH	Wastewater discharge will be quantified and assessed during detailed engineering and permitting.	IPA
FFH	Explosive charge weights will be restricted based on setbacks to fish habitat to achieve the 100 kPa guideline criteria.	WPA, IPA
FFH	Time in-water work, when possible, as per DFO Timing Windows for Newfoundland and Labrador.	WPA

VC ¹	Commitments	Component
FVC	To avoid impacts to red pine, engagement with NL FAL will be undertaken to confirm whether the trees observed are part of Newfoundland's natural red pine population that is protected under NL ESA. If the trees are determined to be of part of the natural population, additional engagement with NL FAL will be undertaken to develop a strategy to avoid direct losses of red pine, as is practicable.	WPA, IPA
FVC	During detailed design and engineering, efforts will be made to microsite Project infrastructure to reduce direct losses of blue felt lichen and flora SOCC and maintain vegetated buffers where possible.	WPA
FVC, LRU	During the detailed design phase, the location of WTGs and other infrastructure will be micrositied to avoid unnecessary impacts to wetlands, including locating crossings of large wetlands along edge or narrow portions of the wetland where possible.	Entire PA
TF	With the exception of road crossings, infrastructure will be placed away from riparian areas.	WPA
TF	Subtle modifications may be made to panel angle, where feasible, to reduce the overall effect on bats.	SPA
Bats	A detailed Post-Construction Bat Monitoring Plan will be developed and submitted to NL FAL for review. Monitoring activities may include: - Adaptive management/contingency plan if post-construction monitoring identifies bat mortality in exceedance of pre-determined thresholds developed in consultation with NL FAL and CWS, - Carcass searches at a representative sample of turbines (stratified by habitat/risk, including any exceeding thresholds), with protocol driven searcher efficiency and carcass persistence trials to enable corrected fatality estimates, and - Feedback loop: update the curtailment rule sets/thresholds based on measured outcomes; document any turbine long term operating changes.	WPA
Av	Adaptive management options will be considered if continuous incidents occur and/or a concerning number of avian injuries or deaths are observed.	Entire PA
Av	Speed limits will be established within the WPA for construction vehicles and traffic signs will be installed to alert road users of speed limits.	WPA
Av	Perform routine checks for bird injuries and fatalities especially when the flare stacks are in operation during nights in peak spring and fall migration periods (i.e., April to May, and mid-August to October).	IPA

VC ¹	Commitments	Component
LRU	Project activities and infrastructure will avoid impacting the control monument within the BWPA as required in Section 65(1) of the <i>Lands Act</i> (1991).	Entire PA
LRU	EVREC will continue to engage with Corner Brook Pulp and Paper and NLFAL related to harvest activities in this area.	Entire PA
LRU	EVREC will engage with local quarry operators to ensure that access to existing active quarries be maintained and avoid impacts to operation where feasible.	Entire PA
LRU	Appropriate follow-up efforts will also be made to communicate with neighboring landowners, which may include a community liaison committee and public engagement forums.	Entire PA
LRU	EVREC is working with the outfitters in the PA to understand and outline the impacts to the outfitters during construction and operation so they can retain their business opportunities.	Entire PA
LRU	Allow continued access throughout the PA, except fenced areas in the IPA, SPA, and substations in the WPA.	Entire PA
LRU	Ensure turbine locations have been sited outside of major populated areas and relocate turbines with high visual impact as appropriate.	WPA
HCR	Project Personnel to adhere to sensitive sites until they are further assessed by a qualified archaeologist.	Entire PA
HCR	Avoid the two registered identified archaeological sites by 50 m.	WPA
EEB	EVREC will also focus on diversity, equity and inclusion in all phases of the Project.	Entire PA
ICS	EVREC will coordinate with municipalities and other relevant agencies to provide advance notice of any increase in demand for public infrastructure.	Entire PA
ICS	EVREC will develop a project-specific Emergency Response Plan that will address all expected construction and operational issues. Local communities will be advised of all activities and may be asked to support certain aspects of the situation.	Entire PA
ICS	During Project development, EVREC will coordinate with stakeholders to avoid or maximize safe distances to recreation trails or redevelop trails in safe locations if avoidance is not possible.	Entire PA
AM	Remodel air and noise emissions during subsequent design phases as vendor data, final layouts and emissions inventory details are refined.	Entire PA

VC ¹	Commitments	Component
AM	The layout of the industrial facility will locate infrastructure in such a way as to minimize the risk of domino events (e.g., as per the results of the QRA, the hydrogen plant and ammonia storage tanks will be appropriately staged to allow sufficient buffer in the event of an emergency event)	IPA
AM	As appropriate, conservative setbacks from public infrastructure, transmission lines, roads, and residences will be incorporated into the Project design.	Entire PA
AM	To mitigate the potential for thermal runaway, the BESS will be designed with multiple automatic and manual power-down/safety mechanisms.	Entire PA
Monitoring Programs and Plans		
Bats	A post-construction monitoring program will be conducted.	WPA
Av	Additional acoustic and radar monitoring will occur, if required	Entire PA
Av	Post-construction mortality monitoring and carcass searches will be conducted to assess mortality levels caused by turbine, for a minimum of one year, developed in consultation with government regulatory bodies.	WPA
AQ	Operational air quality monitoring will be conducted at the Industrial Facility for the first year of operation to verify modelling results and ensure compliance with ambient air quality levels.	IPA
GW, SW, TF, FFH	Implement an Explosives and Blasting Management Plan.	WPA, IPA
GW, Av, AM	Implement a Hazardous Substances Management and Spill Prevention Plan.	Entire PA
SW, FFH, LRU, EEnv	Implement a Groundwater and Surface Water Monitoring Management Plan.	Entire PA
SW, FFH, FVC, LRU, AM	Implement an Erosion and Sediment Control Plan.	Entire PA
SW, FFH, AM, EEnv	Implement an Emergency Response Plan.	Entire PA
SW, TF	Implement a Water Management Plan.	Entire PA
TF, Caribou, Bats	Implement a Wildlife Response Plan.	IPA, SPA
TF, Av, ICS	Implement a Waste Management Plan.	Entire PA
Av	Implement an Avifauna Management Plan.	WPA, SPA
LRU	Implement a Domestic and Commercial Wood Cutting Consultation Plan.	Entire PA
LRU	Implement a Mineral Resource Industry Consultation Plan.	Entire PA
LRU	Implement an Outfitter Environmental Effects Monitoring Plan.	Entire PA
LRU	Implement a Project Public Participation Plan.	Entire PA
LRU ICS	Implement a Traffic Management Plan.	Entire PA

VC ¹	Commitments	Component
LRU	Implement a Quarry Resource Consultation Plan.	Entire PA
ICS	Implement a Gender Equity, Diversity and Inclusion Plan.	Entire PA

1 Air Quality = AQ, Greenhouse Gases = GHG, Shadow Flicker = SF, Groundwater = GW, Surface Water = SW, Fish and Fish Habitat = FFH, Flora and Vegetation Communities = FVC, Terrestrial Fauna = TF, Avifauna = Av, Solar Glare = SG, Land and Resource Use = LRU, Heritage and Cultural Resources – HCR, Economy, Employment, and Business = EEB, Infrastructure and Community Services = ICS, Effects of the Environment = EEnv, Accidents and Malfunctions = AM

18.0 PROJECT MITIGATION STRATEGY – PROPOSED LAND ADJUSTMENT

18.1 Existing Land Assemblage – EIS PA

EVREC has worked with NLEM and NL FAL since 2022 to confirm the lands required to build the Botwood Green Energy Hub Project. The process has consisted of the securement of initial lands (reserve lands), the securement of additional lands (ancillary lands) to support land requirements for Project considerations (not turbine placement) including the Industrial Facility itself, the Solar Project, transmission and collector lines, service and haul roads, water intake and management, accommodations and other smaller components of the Project.

An additional package of land has also been requested through Crown application to support the Seabrights Lake Wind Project Area (SLWPA). These lands acquired by EVREC are described in further detail below.

Awarded Reserve Lands

Through the Crown lands process, EVREC nominated 3 phases of land and, in the end, was awarded four main parcels of an overall total of 30,712 ha of land under the *Wind Energy Reserve Order* for the development of the Project. These lands are called the awarded reserve lands (Figure 18.1.1 below), and the components of this land assemblage include:

1. The Botwood Wind Site
2. The Twin Lakes Wind Site
3. The Leading Tickles Wind Site
4. The Production Facility Site

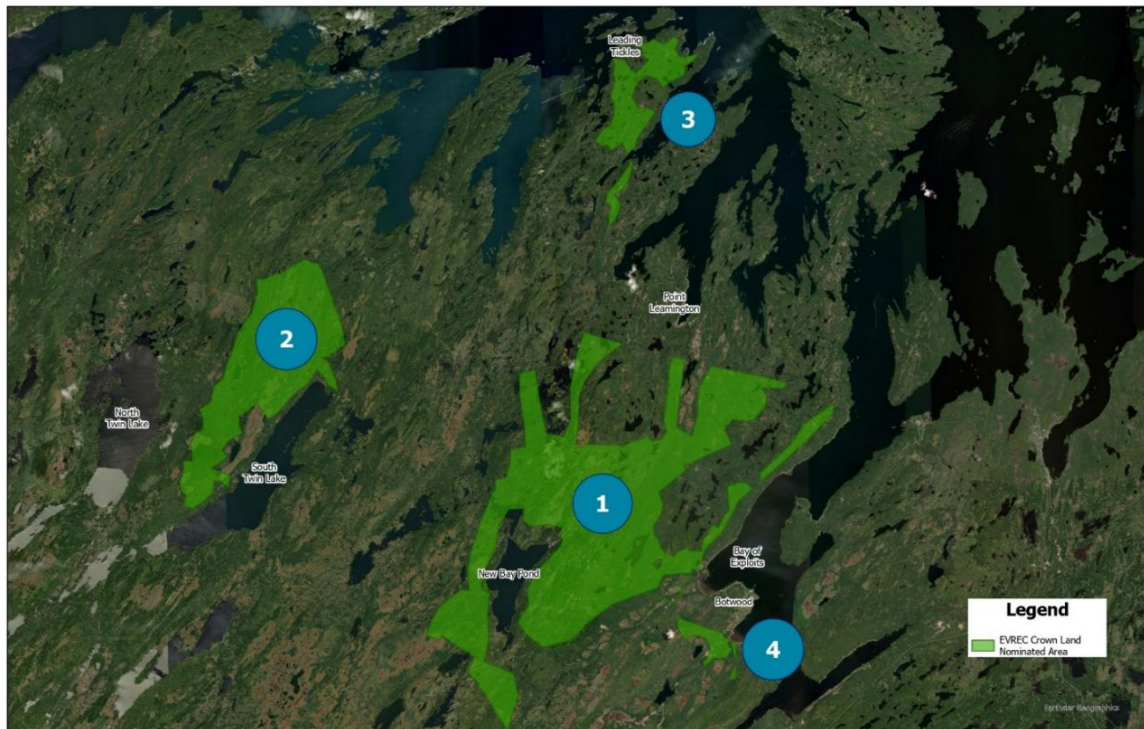


Figure 18.1.1: Awarded Reserve Lands

Ancillary Lands

The Crown Lands process stipulated that the Project could apply for additional lands for the Balance of Plant, in addition to the awarded lands. Those ancillary lands may be used for access roads, electrical infrastructure, water supply, temporary facilities and other project related support infrastructure. EVREC applied for 1,685 ha of ancillary lands (as shown in yellow in Figure 18.1.2).

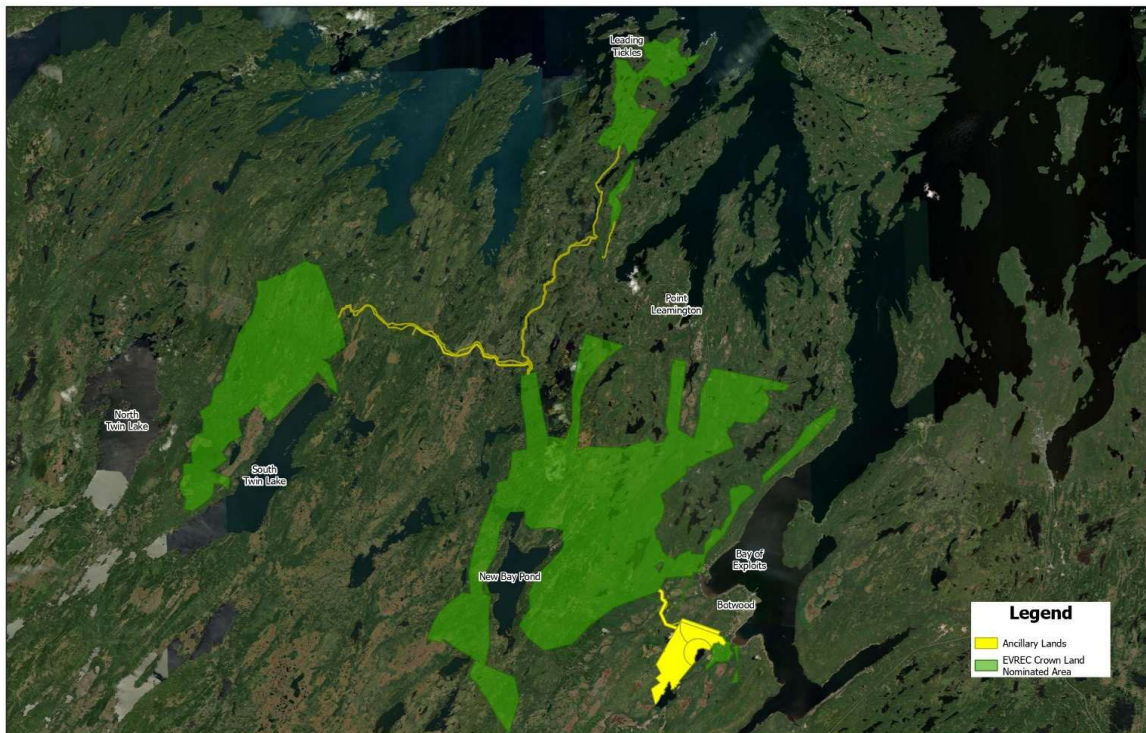


Figure 18.1.2: Ancillary Lands

These lands include:

- Areas around the Industrial Facility and Solar Project to form the IPA as presented in the EIS
- Transmission Connector from BWP to TLWP and BWP to LTWP, as presented in the EIS

In addition to the applications submitted to date, the Project anticipates additional ancillary applications when Project infrastructure locations are finalized. At the time of EIS submission, these lands will be required for additional wind park service roads, collector lines, quarries, camp locations, and other Project infrastructure that may fall just outside or on the edge the PA. Based on the current layout, the approximate area outside the PA for the roads, collector lines, and quarries that are not currently under application is estimated at approximately 486 ha.

Together, the applied for ancillary lands and the estimated additional ancillary lands have been included in the EIS PA.

Constraints Analysis – Nominated Reserve Lands

As part of the Crown Lands process, EVREC had to apply for the nominated reserve lands within 18 months of receiving the Wind Recommendation Letter. This process incorporated a

constraints analysis to determine what areas of the awarded reserve lands were not viable for building a wind project and excluding them from the nomination reserve lands.

The areas that were excluded from the reserve lands are the regulated water bodies (rivers, lakes, wetlands), Crown 15 m reservations on waterbodies, and issued land titles (e.g., existing grants, leases and licenses). Without any regulatory setbacks being applied, the result of these exclusions of water and existing issued land titles is an immediate land reduction of 5,378 ha or approximately 18% of the reserve lands.

EVREC's application was made in February 2025, for 25,333 ha, as shown below in Figure 18.1.3:

- Botwood Wind Site: 16,876 ha
 - Twin Lakes Wind Site: 6,673 ha
 - Leading Tickles Wind Site: 1,785 ha
- Total = 25,333 ha

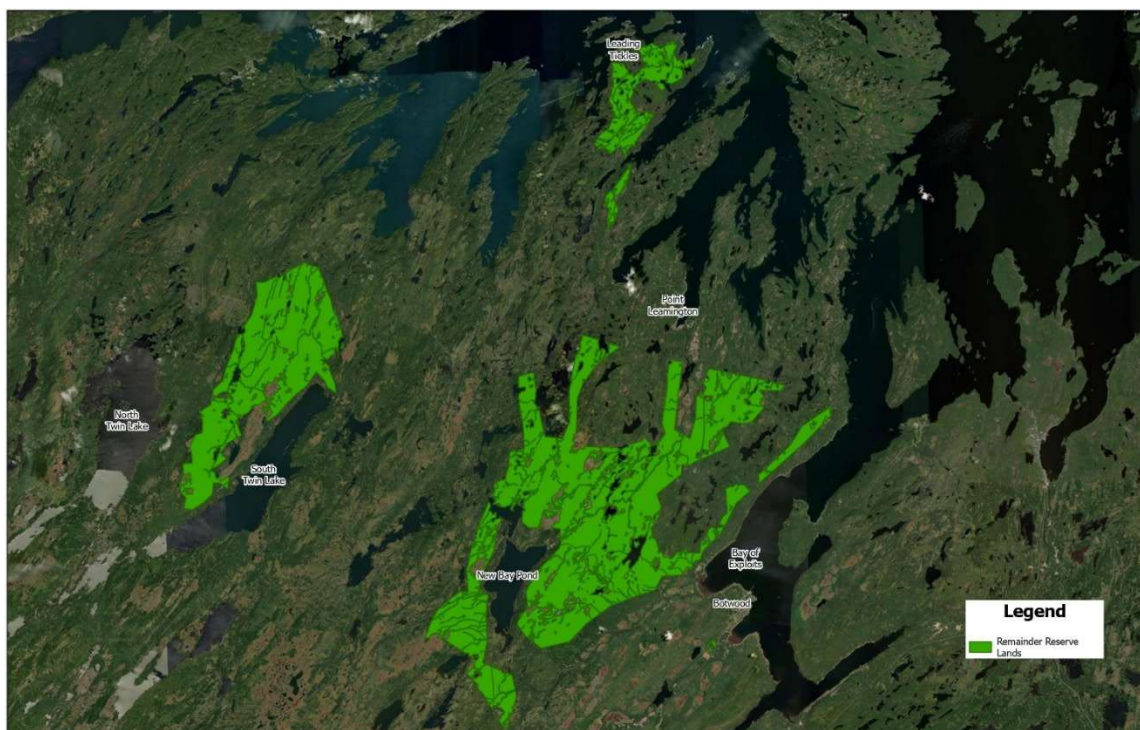


Figure 18.1.3: Nominated Reserve Lands

These nominated reserve lands are Crown lands reserved under the Wind Energy Reserve Order that were nominated by EVREC on February 21, 2025 and have been extended to February 28, 2027. Note that the nominated reserve lands were not used for the EIS PA but rather as a constraint analysis for permitting and so were not carried forward into design of the PA.

Addition – Seabrights Lake Wind Site (License to Occupy)

Following the nominated reserve lands constraints analysis, additional lands were identified along the road and transmission corridor between the Twin Lakes Wind Site lands and the Botwood Wind Site lands that could offset some of the loss of overall hectareage of suitable lands for development between the overall reserve lands and the nominated reserve lands to maintain the generative capacity of the wind project. This area was referred to as the Seabrights Lake Wind Site. The Seabrights Lake Wind Site (Figure 18.1.4) includes the road and transmission corridors (already applied for under ancillary lands) and the Seabrights Lake Wind Site additional area to form the Seabrights Lake Wind Project Area (SLWPA) for a total of 3,555 ha.

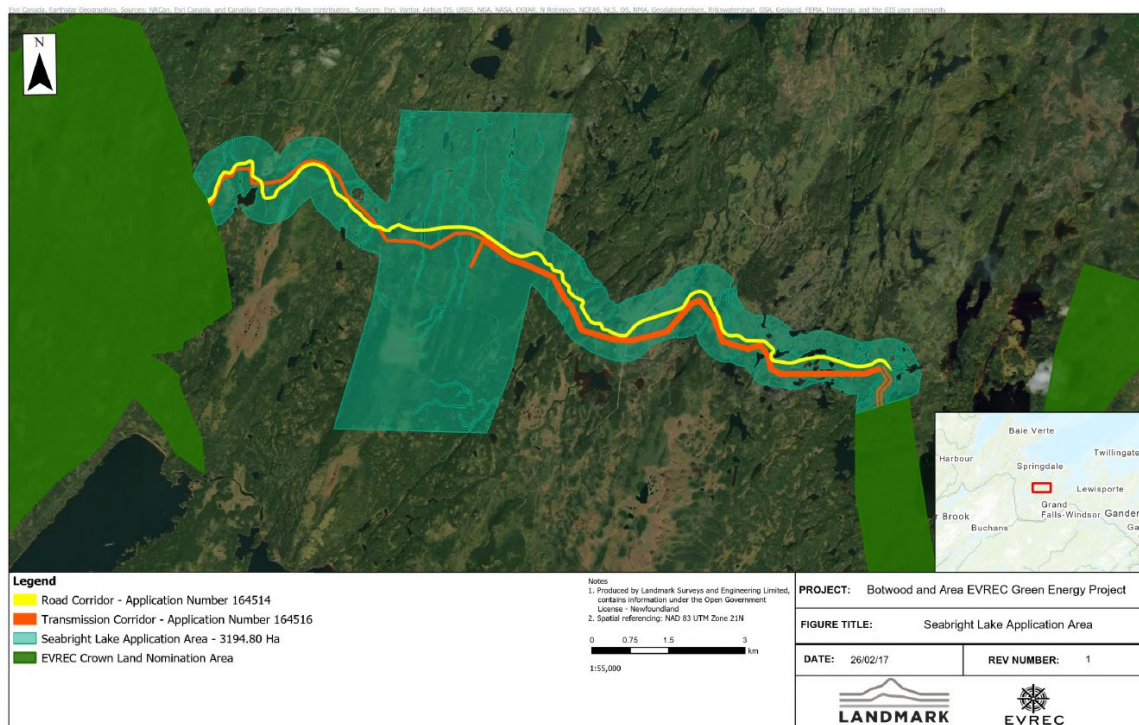


Figure 18.1.4: Seabrights Lake Wind Site

This SLWPA area was then added to the awarded reserve lands and the ancillary land to form the EIS Project Area (PA) that is presented in the EIS.

Project Area for the EIS

The EIS PA is inclusive of the awarded reserve lands, the ancillary lands and the SLWPA lands which encompasses a total of 35,834 ha.

The EIS has been completed for the Project as described in the three project description sections (Section 6.1, 7.1, 8.1) for Wind (up to 534 turbines), Industrial and Solar and across the area defined as the PA (Botwood Wind Project Area (BWPA), Leading Ticks Wind Project Area (LTWPA), Twin Lakes Wind Project Area (TLWPA), and Seabrights Lake Wind Project

Area (SLWPA), transmission corridor and road to Leading Ticks, transmission corridor between Twin Lakes WPA and Botwood WPA, plus the additional 486 ha of lands that are adjacent/just outside of the PA), as described above. Documentation of baseline conditions, assessment of effects, proposed mitigation measures and follow up monitoring programs have been described in each VC section for the three components of this Project (Wind, Industrial and Solar) based on the project description herein and the PA as described forms the base spatial boundary for the assessment.

18.1.1 Limitations within the Reserve Lands for Project Wind & Associated Infrastructure

To support Project planning and environmental permitting, EVREC worked to understand additional considerations that might limit where turbines and associated infrastructure could be placed within the awarded reserve lands. During early planning, regulatory setbacks were identified which further limited available lands for the wind component of the Project. These regulated setbacks included:

- Buffers from water bodies and wetlands (30 m) (inclusive of the 15 m setback identified above)
- 330 m setback from Botwood Highway
- Blade setback 105 m from water bodies
- 90 m setback from reserve land boundary

These regulated setbacks further reduce the lands available for turbine and infrastructure placement. A Hydrology analysis using depth to water, watercourses, waterbodies, and wetlands to remove wet areas unsuitable for construction was also included. These areas were included in unbuildable lands but no setback was added, only direct area.

Throughout the planning and design phase of the Project and to support the environmental assessment process, additional commitments were made which further limited available lands for turbine and other balance-of-plant infrastructure placement. These commitments included those made throughout this EIS across multiple VCs (species at risk, wet areas, noise and shadow flicker setbacks, archaeology, slopes etc.). These commitments also included those that were discussed with individual communities during Project engagement, assuming additional lands were made available by the government to support these commitments. These engagement commitments included the proposed avoidance of the Northern Arm-Phillips Head-Point of Bay area for infrastructure placement, a proposed 1000 m setback for the New Bay Pond cabins, a proposed setback of 550 m for all residential receptors and seasonal receptors (remote-titled), and the proposed avoidance of the LTWPA for infrastructure placement.

As a result of these proposed commitments and outcomes resulting from the planning exercise that is inherent within the EIS, the available lands for turbine placement and balance-of-plant infrastructure were further reduced beyond the initial loss of area due to land title, waterbodies and regulated setbacks. Table 18.1.1 represents the total calculated land losses across the awarded reserve lands because of regulatory, constructability and community land

considerations.

Table 18.1.1: Buildable Land Losses Within the Awarded Reserve Lands

Land Description	Setback (m)	Impact of Loss (ha)	Remaining Area (ha)	% Loss	% Total Remaining
Awarded Reserve Lands	-	-	30,712	-	-
Regulated Water and Wetlands	30	6,886	23,826	22	78
Crown remote-title Cabins	550	2,736	21,090	9	69
Northern Arm-Phillips Head-Point of Bay	Exclude (~40 turbines)	1,200	19,890	4	65
Main New Bay Cabin Area	1000	791	19,099	3	62
Leading Tickles	Exclude (~44 turbines)	2,189	16,910	7	55
Additional wet areas from Hydrology Study and Gov NL Mapping	0	2,475	14,435	8	47
Additional Blade Setback to Mitigate Water Encroachments	105	3,685	10,750	12	35
Total	-	19,962	10,750	65	35

Of the 30,712 ha of awarded reserve lands, 19,962 ha are unbuildable due to the various constraints and commitments, leaving only 10,750 ha usable for wind construction, representing approximately one third of the reserved land package. Generally, the expectation is that this land reduction calculation is still optimistic given it doesn't consider other potential exclusions such as roads, terrain relief/slopes, and additional environmentally sensitive areas (species at risk, archaeology) as described in the EIS.

18.2 Botwood Green Energy Hub Mitigation Strategy: Request for Additional Lands

As a result of this reduction in available lands within the EIS PA, EVREC are requesting additional Crown lands in addition to those that form the EIS PA to support the optimization of the Project's wind project layout and associated balance-of-plant infrastructure (e.g., access roads, collector/gathering lines, and transmission corridors) as detailed engineering and mitigation planning advance. The additional lands "mitigation lands" are surrounding the Seabrights Lake and Twin Lakes Project Areas, including an expanded service/utility corridor and an additional parcel to provide siting flexibility and constructability options while maintaining regulatory buffers and community setbacks. The mitigation lands are considered additional to the EIS PA lands within this mitigation chapter. Additionally, lands would be removed (Leading Tickles and Northern Arm "removed lands") from the EIS PA. A Proposed Mitigation Project Area (PMPA) has been drawn to collectively show what the new area would look like if the aforementioned areas are removed and adding the mitigation lands (Drawing 18.2-1, Appendix A).

The intended outcomes are to enable a more efficient, socially responsible, and regulatorily compliant layout—reducing overall civil and electrical works where possible, improving energy performance and reducing losses, and providing opportunities to shift turbines away from more sensitive or higher-conflict areas (e.g., cabin concentrations and certain northern communities)

while still meeting the Project's renewable generation and green ammonia production objectives. This request does not result in any change to the IPA or the SPA and associated infrastructure and is thus, only relevant to the WPA.

The PMPA total area is 58,851 ha in size. As with the EIS PA, there are considerations which reduce the amount of buildable land including waterbodies, associated setbacks, other regulatory setbacks and additional environmental considerations stemming from the environmental assessment process.

The intent for the WMPA will be for a wind park of up to 463 turbines (reduced from up to 534 turbines) at 8 MW each, with an expected maximum capacity of 3.5 GW.

Buildable Land Comparison EIS PA vs PMPA

A constraints analysis similar to what was run on the reserve lands was ran on the full EIS PA and on the PMPA to be able to make an estimated comparison of the available buildable area. These constraints include:

- 30 m setback on CANVEC water bodies (rivers/streams, waterbodies, wetlands)
- 550 m setback on remote-title receptors
- 330 m setback from Botwood Highway
- Blade setback 105 m from water bodies
- Crown land 15 m water reservations (setback from water) and issued land titles (e.g. existing grants, leases and licenses)
- Exclusion of the Northern Arm area (684 ha) from EIS PA
- Exclusion of the LTWPA (571 ha) from the EIS PA
- Optimization of transmission line

This was used as a comparison of the two project areas as a representation for the buildable land area understanding that this calculation is still optimistic given it doesn't consider other potential exclusions such as roads, terrain relief/slopes, and additional environmentally sensitive areas and the same in depth hydrology analysis that was available for the awarded reserve lands analysis. Because of the plan to not pursue the LTWP and Northern Arm lands, the amount of buildable area that remained in these two locations has then also been removed from the total buildable lands in the EIS PA. The breakdown is shown in Table 18.2.1 below.

Table 18.2.1: Buildable Land Losses Within the Awarded Reserve Lands

Land Description	EIS PA (ha)	PMPA (ha)
PA	35,834	58,851
PA which is not buildable	16,218	25,345
Total Buildable Area	18,397 ha	33,506 ha
% Total Remaining	51.3%	56.9%
Compare buildable to 30,712 ha awarded reserve lands	-12,315 ha	+2,794 ha

Adding the mitigation lands brings the total buildable lands available to EVREC up to levels similar to the original awarded reserve lands. The area within the PMPA which is not buildable

is 25,345 ha, leaving a total buildable area of 33,506 ha. Generally, the expectation is that this land reduction calculation is still optimistic given it doesn't consider other potential exclusions such as roads, terrain relief/slopes, and additional environmentally sensitive areas.

Allowing EVREC to develop the Wind Project in these additional areas has multiple benefits for both the project as well as the local stakeholders. Those benefits come from the Project's plan to develop the additional areas, and not pursue the LTWP, Northern Arm areas and less turbines/increase setback to the New Bay Pond cabins of the Botwood Wind Site.

18.2.1 Benefits for the Project

1. Reduced CAPEX through optimized layout
2. A more homogeneous wind park, with the area between the two sites connecting to create an overall project layout
3. Improved energy output (wind resource and land losses in additional areas is better than alternative sites)
4. Improved energy output through reduced wake losses thanks to ability to further distance turbines from each other
5. Improved energy output through reduced electrical losses
6. Habitat suitability for flora is expected to be comparable, with a mix of forestry activity (silviculture and Domestic Harvest Areas) across all lands.
7. More compact future area to manage during operation phase and limits interaction with communities.

18.2.2 Benefits for the Communities

1. Reduced or no disturbance (noise, dust, traffic) around the New Bay Pond cabins during construction
2. Reduce visual impact on the cabin owners around the New Bay Pond throughout the life of the project
3. No traffic impact on the communities to the north around the Leading Tickles Wind Site
4. No turbines, traffic and disturbance for the communities around and including Northern Arm
5. The proposed additional lands and adjusted turbine layout indicate a positive change for the Project as it relates to interactions with individual cabin owners
6. Reduce overall site plan impact for all neighboring areas.
7. Limits entry and access to area.
8. Limits disturbance to one contiguous area

18.3 Mitigation Summary

EVREC is requesting mitigation lands to form the PMPA, as noted above, for several reasons including:

- Increased setbacks to cabin owners (remote-titled) especially those around New Bay Pond

- Proposed removal of turbines and associated infrastructure from LTWPA.
- Removal of turbines and associated infrastructure from the Northern Arm-Phillips Head-Point of Bay portion of the BWPA.
- Regulatory setbacks and other setbacks/land use limitations due to environmental assessment conclusions, resulting in a significantly reduced footprint of available lands within the EIS PA (Table 18.2.1)

It is important to note that public feedback is the primary driver for this proposed mitigation strategy. EVREC has heard from the public and stakeholders at engagement sessions that they prefer the turbines to be placed farther away from residences and cabins (remote-titled), and generally farther away from human occupancy and high use areas for recreation.

18.3.1 Residual Effects Preliminary Conclusions for PMPA and Adjusted Turbine Layout

EVREC, through the EIS process, has evaluated residual impact across valued components for the WPA within the EIS PA, with residual effects summaries presented in Section 16.0. With the implementation of this proposed mitigation strategy and potential adoption of the PMPA, there will be an expected reduction in adverse effect to select valued components for wind. Some valued components may experience an increase in adverse effect, and it is also possible that changes in adverse effect cannot be quantified, due to lack of field data collection and analysis areas across the PMPA.

As described above, the proposed additional lands and adjusted turbine layout indicate a positive change for the Project as it relates to interactions with individual cabin owners. There are fewer residential receptors or cabins (remote-titled) within the additional land packages, and the adjusted turbine layout will allow for a commitment to a 550 m setback to all remote-titled cabins as well as a commitment to a 1000 m setback to cabins around New Bay Pond. There are potential new considerations with remote-titled cabins within the additional lands which will have to be evaluated through engagement efforts with these cabin owners, but there are far fewer receptors in general within 2 km within the PWPA than the EIS PA. Table 18.3.1 demonstrates total number of receptors (residential or remote-titled) within or up to 2km of the EIS PA, and then within or up to 2 km of the PMPA. It is acknowledged that there are remote-untitled receptors within 2 km and possibly within the PWPA, but they have not been evaluated at this time.

Table 18.3.1: Remote-Title Receptors Comparison

Project Area	Number of Residential or Remote-Title Receptors	
	Within PA	Within 2 km of PA
EIS PA	127	935
Proposed Mitigation PA	151	399

There is an additional NL Snowmobile Federation Crown Title overlapping with the northwestern portion of the PMPA (north of Twin Lakes). EVREC commits to on-going engagement with this stakeholder group given the interaction with trails within the BWPA and this additional trail north of Twin Lakes within the mitigation lands.

EVREC, through the EIS process, has evaluated residual impact across valued components for the WPA within the EIS PA, with residual effects summaries presented in Section 16.0. With the implementation of this proposed mitigation strategy and potential adoption of the PMPA, there will be an expected reduction in adverse effect to select valued components for wind. Some valued components may experience an increase in adverse effect, and it is also possible that changes in adverse effect cannot be quantified, due to lack of field data collection and analysis areas across the PMPA.

As described above, the proposed additional lands and adjusted turbine layout indicate a positive change for the Project as it relates to interactions with individual cabin owners. There are fewer residential receptors or cabins (remote-titled) within the additional land packages, and the adjusted turbine layout will allow for a commitment to a 550 m setback to all remote-titled cabins as well as a commitment to a 1000 m setback to cabins around New Bay Pond. There are potential new considerations with remote-titled cabins within the additional lands which will have to be evaluated through engagement efforts with these cabin owners, but there are far fewer receptors in general within 2 km within the PWPA than the EIS PA. Table 17.3 demonstrates total number of receptors (residential or remote-titled) within or up to 2km of the EIS PA, and then within or up to 2 km of the PMPA. It is acknowledged that there are remote-untitled receptors within 2 km and possibly within the PWPA, but they have not been evaluated at this time.

To the north of the SLWPA, there is a third additional outfitter, Oceanside Lodge, whose outfitter buffer zone L06278 (2,452 ha) does not overlap with the current EIS PA, but will overlap with the PMPA. This total overlap is 890 ha and 36.3% of the buffer zone area. EVREC commits to completing additional engagement with this outfitter to understand where the outfitter operates within their buffer and what mitigation measures may be necessary to limit land use conflicts. A fourth outfitter, also belonging to Hideaway Lodge, is located just south of the SLWPA and their outfitter buffer zone L124265 does not overlap with the EIS PA or the PMPA. Thus, no direct land use conflict is expected. However, on-going engagement will continue with this outfitter given their proximity to the Project.

The PMPA is generally located within the LSAs for terrestrial VCs for the Project EIS PA, and thus, conclusions relating to the terrestrial environment presented in the EIS at a macro level will remain generally consistent given the close proximity of the mitigation lands to the current PA. Habitat quality within the EIS PA and the additional lands is generally consistent, with a mix of forestry activity (silviculture and Domestic Harvest Areas) across all lands, with the PWPA showing the most extensive road network and impact from forestry activities. The EIS PA and PMPA overlap with the Hodges Hill caribou herd home range. Bat activity was shown during the EIS to be highest nearest the coastline in the LTWPA. The PMPA would remove the Leading Tickles area from the Project, which would be a potential improvement for bats. However, it is important to note that Strum has not evaluated the mitigation lands for bats, so the overall conclusion relating to change in impacts to bats from the EIS PA to the PMPA cannot be quantified at this time. Removing turbines from the coastal area near Leading

Tickles would also reduce potential interactions with shoreline birds. However, the same comment is noted that field surveys and other technologies to identify bird usage within the mitigation lands have not been completed. The turbine layout will be more spread out, resulting in increased fragmentation due to an expanded road network. The area surrounding TLWPA where EVREC wants to develop is heavily forested and has a lower baseline road density than other parts of the PA.

However, the change at a micro level within the mitigation lands have not been evaluated and thus, detailed specific commentary relating to potential impact to rare plants, lichens, bats, birds, archaeology and habitat communities for the mitigation lands cannot be provided herein given the fact that Strum has not surveyed these additional lands and/or completed field surveys through the use of trail cameras, ARUs, habitat predictive mapping and other technologies.

With the proposed change to the PMPA, there are additional archaeological considerations that may require consideration. It was reported in the EVREC EAR (Strum Consulting, 2024) that

“Shanawdithit and her family were captured by local trappers at the bottom of Wild Bight in 1823 [located adjacent and north of the PMPA]. There are also four archaeological sites at the bottom of the bight, three at the bottom of the bight, and another on Gull Island, 5k from the bottom of the bight. Buchan shows Beothuk wigwams in this area in 1811, and Shanawdithit's own drawings show travel routes along South and North Twin Lakes, (even near Rocky Pond).”

There are also three registered archaeological sites, two on the east shore of North Twin Lake that are believed to be associated with the 20th-c logging, while the third site, located on Rocky Pond, between the south end of both Twin Lakes is a pre-contact Indigenous site, likely Beothuk. These archaeological sites in Wild Bight and Rocky Pond are likely along the coastline, in very close proximity to the PMPA.

Roads, collector lines, and transmission line lengths are expected to increase with the adjusted turbine layout proposed within the PMPA from original lengths proposed in the PA and turbine layout presented in the EIS. Table 18.3.2 shows the summary of this change.

Table 18.3.2: Infrastructure Comparison

Infrastructure	EIS Wind Layout	Proposed Mitigation Wind Layout
Number of Turbine	534	463
Length of Roads (km)	540	546
Length of Collector Lines (km)	467	567
HV Transmission Line Length (km)	76	125

These adjustments are inclusive of the removal of the collector lines and road to Leading Tickles and the increase in roads and collector lines needed to provide a less congested turbine layout across a larger area (PMPA). These adjustments do also increase the length of

the required transmission line. This additional disturbance footprint area will increase impact to habitat and associated flora and fauna, and increases potential for impacts to species at risk, fish and fish habitat, and archaeological considerations through additional area for consideration. Rare plant surveys, watercourse crossing surveys and HRIA will be completed prior to construction across the final turbine layout.

Other VCs have less potential for adjustment in residual effects conclusions. For example, at a micro level, the groundwater VC identifies potential impact to groundwater during blasting of foundations for turbines, road construction and quarry development. Regardless of turbine, road or quarry location within the PA or the PMPA, this residual conclusion remains consistent and standard mitigation measures as described within the groundwater VC chapter remain relevant. Surface water and fisheries micro impacts are similar to groundwater in that residual impacts to surface water from a wind farm generally relate to potential adjustments in hydrology due to the presence of a new network of roads (assuming as is within this document that turbines, quarries, accommodations camps etc. are all placed to avoid direct impacts to surface water and fish/fish habitat) and concerns relating to sedimentation of streams and rivers during construction. Adjusting the location of roads, quarries and camps from the current proposed layout to the adjusted layout within the PMPA will not change this residual conclusion, nor will it require adjustments to mitigation measures and proposed monitoring outlined within VC chapters.

Macro impacts to groundwater and surface water resources would result from an overlap in the mitigation lands with groundwater and surface water resource management areas. Strum has confirmed that the mitigation lands do not overlap with any additional resource management areas, and with the potential removal of the LTWPA, an overlap with a resource management area in that location would be removed, resulting in a net positive change.

Impact to economy, employment and community services will largely be unaffected by this proposed change in lands to support the Project. There is one additional municipal planning area that is located 4km northwest of the PMPA called Robert's Arm Municipal Planning Area that should be considered by EVREC during ongoing regulatory and stakeholder engagement.

Table 18.3.3 provides a summary of expected changes per valued component for the wind component of the Project (please note, this summary is qualitative only, as data collection for the PMPA and adjusted turbine layout has not been completed). Some regional studies that have been completed can, and have, informed these qualitative conclusions where possible, given the spatial overlap of these additional lands and the associated LSAs for the EIS.

Table 18.3.3: Summary of expected changes per valued component for the wind project description

Valued Component (Wind Project)	Summary of expected adverse effect in comparison to EIS Project Description	Adverse Effect Summary of Change from EIS Project Description	Additional Proposed Mitigation Measures and Commitments
Air Quality	Turbines would be sited farther away from cabins (remote-titled) and known cabin communities (New Bay Pond) resulting in improved air quality near these cabins. There are fewer cabins (titled and non-titled) within the mitigation lands but overall, more cabins within the PMPA as the area is larger.	Positive	Commitment to meet 550m setbacks for all titled cabins. Meet 1000m setback for cabins at New Bay Pond
Greenhouse Gases	Turbine layout is expected to be less congested and more spread out and road, collector and transmission infrastructure increases in length. Minor increase in GHGs during construction expected as a result	Slightly negative	Commitment to update inventory once turbine layout is confirmed
Sound/Noise	Turbines would be sited farther away from cabins (remote-titled) and known cabin communities (New Bay Pond) resulting in reduced noise levels near these cabins. There are fewer cabins (titled and non-titled) within the mitigation lands but overall, more cabins within the PMPA as the area is larger.	Positive	Commitment to meet 550 m setbacks for all titled cabins. Meet 1000 m setback for cabins at New Bay Pond Commitment to meet noise compliance setbacks as described in EIS
Shadow Flicker	Turbines would be sited farther away from cabins (remote-titled) and known cabin communities (New Bay Pond) resulting in lower levels of expected shadow flicker near these cabins. There are fewer cabins (titled and non-titled) within the mitigation lands but overall, more cabins within the PMPA as the area is larger.	Positive	Commitment to meet 550m setbacks for all titled cabins. Meet 1000m setback for cabins at New Bay Pond Commitment to meet shadow flicker recommended setbacks as described in EIS

Valued Component (Wind Project)	Summary of expected adverse effect in comparison to EIS Project Description	Adverse Effect Summary of Change from EIS Project Description	Additional Proposed Mitigation Measures and Commitments
Groundwater	Interaction with groundwater is limited and turbine pad specific. No new interaction with water resource areas within PMPA.	Neutral	No additional mitigation measures proposed
Surface Water	Interactions with surface water are generally limited to road crossings and quarries. All water crossings will be designed to limit changes in water flow path and quarries will be micro-sited to avoid direct impacts to surface water. No new interaction with water resource areas within PMPA.	Neutral	Commitment to identify all water crossings and watercourse locations pre construction. Provincial permitting as required
Fish and Fish Habitat	Interactions with fish and fish habitat are generally limited to road crossings and quarries (turbines will be sited to avoid direct impact to watercourses and waterbodies). All water crossings will be designed to limit changes in water quality or quantity and allow for fish passage. Quarries will be micro-sited to avoid direct impacts to fish and fish habitat.	Neutral	DFO and provincial permitting as required
Vegetation and Wetlands	Impacts to lichen SAR and SOCC in the LTWPA will be avoided. Habitat suitability for flora SAR (e.g., red pine, blue felt lichen) within the current PA and the PMPA is expected to be comparable, with a mix of forestry activity (silviculture and Domestic Harvest Areas) across all lands. Habitat fragmentation and edge habitat will increase. The turbine layout will be micro-sited to avoid species at risk and wetlands as is practicable	Neutral	Commitment to preconstruction rare plant surveys and waterbodies permitting

Valued Component (Wind Project)	Summary of expected adverse effect in comparison to EIS Project Description	Adverse Effect Summary of Change from EIS Project Description	Additional Proposed Mitigation Measures and Commitments
Terrestrial Fauna	The LTWPA had a high proportion of suitable habitat for American marten, moose, and muskrat relative to the other WPAs. The turbine layout will be more spread out, resulting in increased fragmentation due to an expanded road network. The area surrounding TLWPA where EVREC wants to develop is heavily forested and has a lower baseline road density than other parts of the PA.	Neutral/Negative	Commitment to required preconstruction species surveys
Bats	The LTWPA had the highest number of bat calls during monitoring of the assessed PAs. The quality of the bat habitat within the mitigation lands is unknown but is expected to be comparable to the adjacent areas that have been studied.	Neutral	Commitment to preconstruction acoustic monitoring within the PMPA to confirm bat presence and to support monitoring program design.
Caribou	Caribou home range (Hodges Hill Herd) overlaps with the PA and the PMPA. The Seabrights Lake and Twin Lakes areas show quality calving habitat. The addition of the mitigation lands increases potential habitat loss and barriers for caribou movement north/south within the home range for caribou, although removal of LTWPA reduced overall impact through the northern portion of the home range. Operational usage of these roads will be minimal (occasional maintenance of turbines only).	Negative	Commitment to preconstruction wildlife camera deployment to confirm caribou density within the PMPA. Commitment to collar monitoring program.

Valued Component (Wind Project)	Summary of expected adverse effect in comparison to EIS Project Description	Adverse Effect Summary of Change from EIS Project Description	Additional Proposed Mitigation Measures and Commitments
Avifauna	The LTWPA had the highest number of biological targets in the rotor swept area. The turbine layout would be sited farther away from the coastline, which is generally known to support bird migration and daily movements. The suitability of habitat for avifauna SAR in the PMPA is unknown but is expected to be comparable to the adjacent areas that have been studied. Habitat fragmentation is likely to increase.	Neutral	Commitment to preconstruction breeding and migratory bird surveys to confirm bird species and numbers within the PMPA.
Land and Resource Use	The turbine layout will adjust into an expanded area west and north of the current layout and reduce the number of turbines in or near populated areas (New Bay Cabins, Northern Arm) and shoreline areas (Leading Tickles). Additional titled cabins do exist within the mitigation lands and the total number of cabins increases with the PMPA due to its larger size. The PMPA increases distances between key communities and turbines (New Bay Pond, Leading Tickles, Northern Arm). The outfitters will have greater overlap between their buffer zones and the Project within the PMPA.	Neutral	No additional mitigation measures proposed
Heritage and Cultural Resources	The HRIA would be completed for the adjusted turbine layout within the PMPA to ensure no interaction with confirmed archaeological resources. Assessment of known archaeological resources near Twin Lakes and Wild Bight may require evaluation due to their proximity to the PMPA.	Neutral	Commitment to complete preconstruction HRIA on the final turbine layout, once confirmed.
Economy, Employment, and Business	The PMPA will result in no significant changes to the expected employment (direct and indirect) and taxes generated by the Project	Neutral	No additional mitigation measures proposed

Valued Component (Wind Project)	Summary of expected adverse effect in comparison to EIS Project Description	Adverse Effect Summary of Change from EIS Project Description	Additional Proposed Mitigation Measures and Commitments
Infrastructure and Community Services	The PMPA will result in no significant change to requirements for, and impacts to, local services and infrastructure	Neutral	No additional mitigation measures proposed

EVREC is confident that adverse effects from the Project with an adjusted turbine layout within the PMPA, as proposed in this mitigation strategy, can generally be managed through existing proposed mitigation measures and monitoring programs/follow up as described within this EIS. Where this is not possible, EVREC commits to updating mitigation measures as needed during the pre-construction phase when final turbine layout is confirmed, and necessary follow up surveys as described in Table 18.3.3 will be completed and results shared with the province. Should the Project adjust to the proposed turbine layout proposed with the PMPA, EVREC will commit to a caribou collar monitoring program as an additional mitigation measure

19.0 ASSESSMENT SUMMARY & CONCLUSIONS

In accordance with the provincial Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects in Newfoundland and Labrador (NLECCC, 2023a) and the EIS Guidelines issued for the Project, the technical studies and analysis, VC evaluations, effects determination, mitigation measures and residual effects described within this EIS report have been considered both singularly and cumulatively, for all components (wind, industrial and solar) and phases of the Project.

The results of this assessment indicate that in consideration of the Project's mitigative and protection measures, as well as proposed monitoring, follow up programs and recommended adaptive management strategies, adverse residual effects are anticipated to be not significant.

EVREC is confident that adverse effects from the Project with an adjusted turbine layout within the PMPA as proposed in Chapter 17 can generally be managed through existing proposed mitigation measures and monitoring programs/follow up as described within this EIS. Where this is not possible, EVREC commits to updating mitigation measures as needed during the pre-construction phase when final turbine layout is confirmed, and necessary follow up surveys will be completed and results shared with the province. Should the Project adjust to the proposed turbine layout proposed with the PMPA, EVREC will commit to a caribou collar monitoring program as an additional mitigation measure.

20.0 CLOSURE

This EIS report was completed by Strum Consulting, an independent, multi-disciplinary team of consultants with extensive experience with submission of EAs for undertakings within Atlantic Canada.

21.0 STATEMENT OF QUALIFICATIONS & LIMITATIONS

This Report (the “Report”) has been prepared by Strum Consulting (“Consultant”) for the benefit of Exploits Valley Renewable Energy Corporation (EVREC) (“Client”) in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the “Agreement”).

The information, data, recommendations, and conclusions contained in the Report (collectively, the “Information”):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the “Limitations”)
- represents Consultant’s professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to Consultant which has not been independently verified
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued
- must be read as a whole and sections thereof should not be read out of such context
- was prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental, or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

Consultant shall be entitled to rely upon the accuracy and completeness of information that was provided and has no obligation to update such information. Consultant accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental, or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

Consultant agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but Consultant makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

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- for use by governmental reviewing agencies

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