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TRANSMISSION LINE 148L ENVIRONMENTAL ASSESSMENT REGISTRATION
Newfoundland Power
Boyd's Cove to Lewisporte, NL

June 18, 2025

EXECUTIVE SUMMARY

Newfoundland Power is proposing to build a new Transmission Line (148L) between the Boyd's Cove (BOY) Substation and the Lewisporte (LEW) Substation in central Newfoundland (the Project). Transmission Line 148L would be constructed as a part of a system reconfiguration to address aging infrastructure along other lines in the region and an identified undervoltage condition which could affect Newfoundland Power's ability to provide safe and reliable service to customers in the area.

The Project will span three years, with pre-construction starting in 2025 and construction taking place between 2025 and 2027. The Project crosses multiple watercourses and is within the 200 m buffer of a scheduled salmon river. Additionally, the Project is in proximity to several municipalities and passes through residential areas of Lewisporte.

An assessment to determine appropriate valued components (VCs) and a resulting evaluation of potential effects from the Project on each VC was completed. With the implementation of various mitigation measures, the Project is not expected to have any significant impacts on the region's environment.

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
ATV	All-Terrain Vehicle
BOY	Boyd's Cove (Substation)
CH4	Methane
CO2	Carbon Dioxide
COSWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
ELC	Ecological Land Classification
GHG	Green House Gas
HADD	harmful alteration, disruption or destruction
LEW	Lewisporte (Substation)
MBR	Migratory Bird Regulations
N2O	Nitrous Oxide
NL	Newfoundland and Labrador
NL ESA	Newfoundland and Labrador Endangered Species Act
NLFFA	Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture
PAO	Provincial Archeology Office
ROW	Right of Way
SAR	Species at Risk
SARA	Species at Risk Act
SOCC	Species of Conservation Concern
VC	Valued Component

1.0 INTRODUCTION

1.1 Proponent Information

Newfoundland Power Inc. (the Proponent) operates an integrated electricity generation, transmission, and distribution system throughout the island portion of the province of Newfoundland and Labrador. As the primary distributor of electricity on the island, the Proponent provides electricity to over 276,000 customers (87% of all customers in the province), operates 11,500 km of transmission and distribution lines, and 131 substations.

The Proponent proposes to build a new 51.8 km Transmission Line [Transmission Line 148L (148L)] in central Newfoundland. The line will span between the Proponent's Boyd's Cove (BOY) Substation located next to Highway 331, east of the community of Boyd's Cove and their Lewisporte (LEW) Substation, located within the town on Lewisporte. Transmission Line 148L would be constructed as a part of a system reconfiguration to address aging infrastructure and an identified undervoltage condition which could affect Newfoundland Power's ability to provide safe and reliable service to customers in the area.

The Proponent retained Strum Consulting (Strum, the "Consultant") to support the development and submission of an Environmental Assessment (EA) Registration Document under the Newfoundland and Labrador *Environmental Protection Act* (NL EPA, S.N.L 2002, c.14.2). Strum is an independent multi-disciplinary team with extensive experience with submission of EA Registrations within Atlantic Canada. The EA Registration is being led by Strum's team based in St. John's, Newfoundland and Labrador.

Proponent and Consultant contact information is provided in Table 1.1 and Table 1.2.

Table 1.1: Proponent Information

Proponent	
Name	Newfoundland Power Inc.
Address	55 Kenmount Road, PO Box 8910 St. John's, NL A1B 4P2
President and CEO	Gary Murray
Website	https://www.newfoundlandpower.com
Principal Proponent Contact	
Name	Adam Scott
Title	Manager, T&D Engineering
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Table 1.2: Environmental Consultant Contact

Environmental Consultant Contact		
Name	Jim Slade	Nicole Thomas
Title	Vice-President	Project Manager
Address	#E120 – 120 Torbay Road St. John's, Newfoundland A1A 2G8	#E120 – 120 Torbay Road St. John's, Newfoundland A1A 2G8
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2.0 PROJECT INFORMATION

2.1 Overview of the Undertaking

The Proponent proposes to build 148L, a 51.8 km transmission line that passes from the BOY substation located to the east of Boyd's Cove in the region of Central Newfoundland to the Proponent's LEW substation, located within the municipality of Lewisporte (Drawing 1, Appendix A). The Project footprint will cover an area of 1.5 km^2.

The Project will require the clearing of a new 30 m wide, 48.1 km long, Right of Way (ROW), with a footprint of 1.5 km^2, between the BOY substation and a juncture with another NF Power transmission line south of Lewisporte. The planned route for the ROW departs from the BOY substation, travelling west adjacent Highway 331. At the terminus of Highway 331 and juncture with Highway 340, the planned ROW continues southwest along the coast, on the inland side of Highway 340, passing the communities of Birchy Bay, Baytona, Loon Bay, and Campbellton, where it crosses Campbellton River (also called Indian Arm Brook), a scheduled salmon river. From a location southwest of Campbellton, it continues overland, loosely following and crossing forestry and service roads, as well as Newfoundland and Labrador Snowmobile Federation maintained trails.

After crossing Southwest Brook, south of Lewisporte, the new ROW ends and 148L joins Transmission Line 147L. For the remaining 3.7 km it will follow the pre-existing ROW for Transmission Line 147L, with wire strung on the existing poles, travelling along the western edge of the town of Lewisporte to the LEW Substation.

Transmission Line 148L is planned as a 138kV H-Frame transmission line. The line will be constructed primarily with treated wood poles, however in areas where the use of treated wood poles is prohibited, steel, composite, or untreated poles will be used. The poles will be located on average, 150 m apart, with their specific locations varying based on topography and topology.

2.2 Rational for the Undertaking

Newfoundland Power is proposing to construct Transmission Line 148L running between the Proponent's Lewisporte (LEW) Substation and Boyd's Cove (BOY) Substation (Drawing 1, Appendix A). This new line would mitigate several issues with the Proponent's current aging infrastructure in Central Newfoundland which were identified in the Gander – Twillingate Transmission System Planning Study: June 2024. The building of 148L will resolve current under-voltage issues identified in the report, as well as be part of a long-term plan to restructure and increase the resilience of the regional electrical grid. Other transmission lines and substation equipment in the region have deteriorated to the point where they require replacement as much of the area's electrical infrastructure was built in the 1960's. The construction of 148L would not only provide an alternative route to ensure that power continues to be delivered to customers during those rebuilds but increase resilience in the electrical grid by allowing power to be rerouted if a substation is out of commission. This will increase reliability to customers on New World Island, South Twillingate Island, Change Island, Fogo Island, and the surrounding region.

2.2.1 Alternatives to the Undertaking

The Gander – Twillingate Transmission System Planning Study: June 2024, a part of Newfoundland Power's 2025 Capital Budget Application, also assessed possible alternatives to the proposed undertaking. The study is included as Appendix B. Each alternative has its own economic and technical considerations that were evaluated and identified the current proposal as the most viable option (Appendix B).

2.3 Regulatory Framework

The Project is required to be registered with the Newfoundland and Labrador Department of Environment and Climate Change (NLECC) pursuant to the NL EPA (2002) and its associated EA Regulations (2003). Part 34 of the EA Regulations indicates that an EA Registration is required for electric power transmission lines located more than 500 m from an existing ROW.

An EA Registration is a formal document required to initiate an environmental review process for a proposed project. It typically serves as the first step for ensuring that potential environmental impacts are properly considered before a project proceeds.

In addition to the EA Registration, there are several federal and provincial environmental permits/authorizations that may be required. These permits and authorizations are listed in Table 2.1. All regulatory requirements will be adhered to for the execution of the Project.

Table 2.1: Permits and Authorizations Required for the Project

Permit	Responsible Authority
Release of the Undertaking under the Environmental Assessment Regulations	NLECC

Crown Lands Application (for new Right of Way)	NL Department of Fisheries, Forestry, and Agriculture (NLFFA)
Cutting and Burning Permits	NLFFA
Operating Permit	NLFFA
Alteration to Water Body	NLFFA
Historical Resources Impact Assessment	NL Department of Tourism, Culture, Arts and Recreation
Request for Review	Fisheries and Oceans Canada (DFO)

3.0 PROPOSED UNDERTAKING

3.1 Geographical Location

The planned route for the ROW departs from the BOY substation, travelling west adjacent Highway 331. At the terminus of Highway 331 and juncture with Highway 340, the planned ROW continues southwest along the coast, on the inland side of Highway 340, passing the communities of Birchy Bay, Baytona, Loon Bay, and Campbellton, where it crosses Campbellton River (also known as Indian Arm Brook), a scheduled salmon river. From a location southwest of Campbellton, it continues overland to the southwest until reaching Southwest Brook. After crossing Southwest Brook, south of Lewisporte, the new ROW ends and 148L joins Transmission Line 147L. For the remaining 3.7 km it will follow the pre-existing ROW for Transmission Line 147L, travelling along the western edge of the town of Lewisporte to the LEW Substation.

3.2 Physical Environment

3.2.1 Ecozone and Ecoregions

The Project is in the Boreal Shield Ecozone, which covers much of Canada, including Newfoundland, and is characterized by stands of coniferous trees and wetlands. The stands of coniferous trees are dominated by black spruce (*Picea mariana),* white spruce (*Picea glauca),* jack pine (*Pinus banksiana)*, and balsam fir (*Abies balsamea).* Within the Boreal Sheild Ecozone, the Project intersects two Newfoundland ecoregions – the North Shore Forest Ecoregion and the Central Newfoundland Forest Ecoregion.

Most of the Project lies within the North Shore Forest Ecoregion. This ecoregion is coastal, within 20 km of the ocean, and has distinguishing topographic features of small rolling hills and an elevation below 130 m. Habitat types within this ecoregion are primarily forest and some barrens in exposed areas. Tree growth is limited due to coastal high winds. The ecoregion has relatively warm summers with limited precipitation, rendering it the driest ecoregion in Newfoundland. Consequently, forest fires are frequent, where fires in stands of black spruce are especially common. In areas without recent fire disturbance, balsam fir forest with sheep laurel (*Kalmia angustifolia*) understories are common (Government of Newfoundland and Labrador, 2000b).

The inland segment of the proposed transmission line extends into the North-Central subregion of the Central Newfoundland Forest Ecoregion; Newfoundland's second largest ecoregion. Due to the continental effect, the Central Newfoundland Forest Ecoregion has the island's highest summer and lowest winter temperatures and the least fog and wind. The region's location relative to the long-range mountains makes the area drier compared to other parts of the island. The dry conditions and hot summers mean that forest fires are common in stands of black spruce or white birch. In disturbed sites, vegetation is dominated by dwarf shrub heath, or stands of black spruce, white birch (*Betula papyrifera*), or trembling aspen (*Populus tremuloides)* (Government of Newfoundland and Labrador, 2000a).

3.2.2 Communities

The Project is found in the Notre Dame Bay – Lewisporte census division with a population of 33,940 people in the 2021 census. The Project terminates at the LEW substation found within the municipal boundary and planning areas of the town of Lewisporte (3,288 people). The Project also passes through the municipal boundary and planning areas of the communities of Campbellton and Birchy Bay and circumnavigates around the edge of the communities of Loon Bay and Baytona.

3.3 Site Considerations

In selecting the transmission line route, current data on Newfoundland's forests, wildlife, water resources, wetlands, Crown lands, protected areas, and other constraints was reviewed to ensure the Project avoids and/or minimally impacts environmentally sensitive areas.

Numerous route options were discussed with three alternative routes being designed before the current iteration. The alternate routes were rejected in favor of the current route which included the following considerations in its design (Drawing 2, Appendix A):

- Reduce the length of the ROW to reduce cost and overall area of the footprint disturbance.
- Reduce the impact of habitat fragmentation by following pre-existing roads, trails and transmission lines ROW when feasible.
- Bypass and circumnavigate wetlands when possible.
- Reduce the number of stream crossings.
- Select a location for the scheduled salmon river crossing that has minimal impact to the river.
- Minimize impact on human dwellings by routing around the edges of towns and private land when possible.

As a result of the preliminary review of the proposed route and its potential impact on the surrounding region, several Valued Components (VC) were identified for further review. The current project footprint (Drawing 1, Appendix A) has been designed to minimize the environmental impact.

3.4 Physical Components

The Project has two components:

1. A 3.7 km section of transmission line along the existing 147L. Utilizing the existing ROW and not requiring the installation of new poles.
2. A 48.1 km transmission line (148L) requiring a new ROW, pole installation, and access routes.

3.5 Project Phases

3.5.1 Construction Activities

Construction and brush clearing will primarily be completed by certified contractors.

Newfoundland Power crews will assist with roadway or existing electrical line crossings and substation connections. A Newfoundland Power site supervisor will monitor the site throughout clearing and construction activities.

Construction of the new line will be completed over the course of two years, beginning in 2026, following the completion of the brush clearing, final engineering designs, and material procurement. Construction will involve the installation of poles and anchors, cribbing, framing of structures, conductor stringing and sagging, as well as the installation of vibration dampers on applicable sections. Construction will start at the BOY Substation in 2026, with approximately half of line being constructed in 2026, and the remainder being constructed in 2027.

3.5.1.1 Construction Equipment

Construction will be completed by both line truck/pickups, tension stringers, excavators, pickup trucks, Nodwell (flatdeck), Nodwell (boom), rock buster, stringing equipment, and muskeg, tractor/trailer/flatbed. The types of equipment using the access trails for this Project are mainly tracked, slow moving machines, such as excavators, Nodwells, argos, and muskegs, along with some pick-up trucks to move workers each day.

3.5.1.2 Site Preparation

Brush clearing is scheduled to begin in 2025, upon release from EA and after ensuring all recommendations from the EA review are met. Brush clearing will continue into 2026 until the new ROW is completed. Prior to site preparation and construction activities, surveyors will clearly mark the perimeter of all areas to be developed. The ROW will be cleared to a maximum of 30 m.

3.5.1.3 Access Roads and Trails

Access to ROW

The new transmission line, and associated ROW, is accessible at multiple locations using existing public and resource roads. For a large portion of the ROW, transmission line 148L runs alongside Highway 331 and Highway 340, and in other areas access can be achieved using public, resource roads, and designated snowmobile trails. Therefore, no new access roads are anticipated to be needed to access the ROW (Drawing 3, Appendix A).

While not anticipated, if new access roads, or updates to existing infrastructure (ie. bridges, culverts, etc.) are required, the contractor will be required to follow all legislation and permitting requirements before construction.

Access within the ROW

Once within the ROW, new access trails will be constructed to facilitate movement between poles during construction. Any new trails built would be located within the new ROW. The precise route through the ROW will be determined after brush clearing and surveying has been complete. Fill needed for the trails will be gathered from within the ROW footprint. While not anticipated, if any new quarries are required for project construction the contractor will follow all legislation and permitting requirements.

The amount of construction activity required for the access trail would vary depending on topography but to minimize environmental impact the following best practices would be adhered to:

- Placing additional material on the current trails as to provide construction equipment with the ability to access the transmission corridor with minimal ground disturbance.
- Avoiding travel over bogs or wetland areas if possible but if needed, bog or mats corduroy would be used to help traverse those areas.
- Trail width would be minimized with turn around or laydown areas being located on the ROW to avoid the need to further expand the footprint of existing access trails to allow for two-way traffic.
- The types of equipment that would be using the access trails for this project are mainly tracked, slow moving machines, such as excavators, nodwells, argos and muskegs, along with some pick-up trucks to move workers each day.
- Due to the short usage windows for these trails by Newfoundland Power's construction equipment, significant upgrades to the existing trails would not be required.

3.5.1.4 Transmission Line Construction

Surveying and staking of the structure locations and other key points along the transmission line route will be conducted prior to construction. The survey data will be returned to the engineer to confirm final elevations and structure locations. The survey crew will work intermittently in sections following the tree clearing contractors.

For probing, excavation, and rock anchor installation, presence of rock will be confirmed using a tracked drill or excavator. If suitable rock is present, it will be excavated to depth and backfilled with native materials and any rock anchors will be installed. If suitable rock is not present an alternate location will be selected.

Pole setting crews will work in a linear fashion following the rock excavation crews. The crews will excavate the pole holes to depth, install the poles, and backfill using native materials. Structure framing crews will work in a linear fashion following the pole-setting crews. The crews will install cross arms and braces, install hardware, and hang insulators and travelers.

Once poles have been erected and the necessary framing (i.e., insulators, cross arms, and bracing) has been installed, conductors will be strung by pulling conductor off a stationary wire spool located at the start of each line segment and connecting the connector to insulators. Appropriate tension is applied to adjust the line sag and to bring the conductor to the design specifications once conductors are in place.

3.5.2 Operations & Maintenance

Following the construction phase, Transmission Line 148L will become operational in 2027.

The anticipated life expectancy of the Project is 58 years, based on the expected useful life of a treated wood pole. Regular inspection and maintenance of the Transmission Lines will occur annually. Vegetation management will be completed as required using a combination of manual or mechanical cutting or herbicide and following the guidelines and requirements of a Vegetation Management Plan. The Transmission Line will adhere to CSA standards for limiting radio interference (CAN3-C108.3.1-M84) during operations.

3.5.3 Decommissioning

Decommissioning of the line will not be included as part of this undertaking. Newfoundland Power will implement a separate project specific Environmental Protection Plan (EPP) prior to decommissioning activities, including an erosion and sedimentation control plan, wildlife management plan, fish and fish habitat protection plan, noise management plan, air quality management plan, spill prevention plan, and contingency plan (as necessary).

The future of the line beyond its expected useful service life will depend on a review of the infrastructure and the energy needs of the population which it services. The proposed transmission line has operating lifespan of 58 years but, with prudent maintenance and investment, this could be extended if necessary to serve the province’s future electrical needs.

Decommissioning activities will primarily be completed by contractors, with Newfoundland Power crews assisting with distribution crossings and substation connections. A Newfoundland Power site representative will be available but will not be present on site during all Contractor decommissioning activities.

Current best practice for line decommissioning consists of the following activities:

- Dismantling: Using heavy equipment, the conductor wires, insulators, guy wires, and all other hardware will be removed from the transmission lines.
- Removal: Support structures (i.e., poles, anchors, and concrete pilings) will be removed completely. In the event where full removal is not feasible due to field constraints, the structure will be cut at the ground level with the anchor left in the ground. Following the removal of support structures, all holes will be backfilled with appropriate fill and cover material.
- Disposal: All the transmission line components will be disposed of by the contractor following best practices at that time, with the exception of the insulators and conductors which are to be returned to Newfoundland Power for reuse or recycling.

Following the completion of decommissioning activities, the areas adversely affected by this Project will be restored to a state that resembles natural conditions.

3.6 Project Human Resources

3.6.1 Occupations

The project has been estimated to require a maximum of 35 crew members on site at any given time, including both contractors and Newfoundland Power Employees. Construction of the Project will require the following occupations (Table 3.1) from both Newfoundland Power and Contractor staff:

Table 3.1: Occupation and associated NOC

Occupation	Estimated Number	NOC Code
Newfoundland Power - Engineering		
Civil Engineer	2	2131
Electrical Technologist	1	2241
Land Survey Technologist	1	2254
Supervisor, electrical trades and telecommunications occupations	1	7202
supervisor, heavy equipment operators	1	7302
Brush Clearing Contractor		
Heavy Equipment operator	2	7521
Logging Machinery Operator	2	8241
Foreman	1	8211
Chain Saw Operator	6	8421
Labourer	2	7611
Land Surveying Contractor		
Land Surveyor	2	2254
Construction Contractor		
Construction Project Manager	1	711
Heavy Equipment operator	6	7521
supervisor, heavy equipment operators	1	7302
Supervisor, electrical trades and telecommunications	1	7202

occupations		
Heavy-Duty Equipment Mechanic	1	7312
Lineman	4	7244
Safety/Environmental Officer	1	2263
Labourers	4	7611
Office Clerk	1	1411
Newfoundland Power - Support		
Safety Officer	1	2263
Environmental Analyst	1	2263
Accounting Clerk	1	1431
Lineman	3	7244

Construction and brush clearing will primarily be completed by contractors, with Newfoundland Power crews to assist with distribution crossings and substation connections.

3.6.2 Diversity and Inclusion

Newfoundland Power is committed to ensuring a supportive, inclusive and diverse culture where everyone feels safe and valued for who they are. Together, we strive to create an environment which is free of discriminatory barriers, where everyone is treated respectfully and equitably so they can thrive and bring their whole selves to work.

Newfoundland Powers is committed to Diversity and Inclusion through:

- Fostering a diverse, equitable and inclusive environment where everybody feels welcomed, valued for their individualism, and comfortable to bring their whole selves to work.
- Building a workplace culture that allows everybody to fully contribute and be engaged in the business objectives and social goals.
- Recognizing, preventing and eliminating disadvantage or discrimination across the Company. Ensure equal employment opportunities for all, building a workforce that is representative of the diverse population and communities we serve.
- Developing partnerships with groups in the communities where we work and live who value DEI.
- Complying with DEI-related legislation and standards.
- Regularly review all employment practices to ensure they foster DEI.
- Engaging employee champions to help develop, promote and support DEI initiatives.
- Providing education, resources and support on DEI, and empowering everyone to report concerns and seek appropriate assistance.

Newfoundland Power's vendors and contractors are also required to offer equal opportunities and rights to their employees through its vendor code of conduct policy.

3.7 Project Schedule

Table 3.2 summarizes the Project schedule from the EA Registration through to decommissioning activities.

Table 3.2: Proposed project schedule

Project Activity	Timeline
EA Registration	Q1 2025
EA Release	Q2 2025
Site Preparation	Q2 2025 - 2026
Construction Phase	2026 - 2027
Commissioning	2027
Operations/Maintenance	2027 – 2085*
Decommissioning	2085*

*Anticipated end of life of transmission line

3.8 Project Capital Costs

The project is 100% funded by Newfoundland Power through its capital investment program. Newfoundland Power has been approved to spend $20.7 million on the construction of this transmission line by the public utilities board. See table 3.3 for capital cost breakdown by year and project category.

Table 3.3: Transmission Line 148L Capital Costs

	2025	2026	2027
Newfoundland Power Support Labour	$ 53,434.75	$ 110,075.59	$ 113,281.67
Construction Contrator Labour	$ -	$ 5,060,617.76	$ 5,208,014.40
Engineering Labour	$ 241,981.11	$ 83,080.18	$ 85,499.99
Materials	$ -	$ 3,482,607.37	$ 3,584,042.53
Brush Clearing/ Permitting/Freight/ Survey/Misc.	$ 1,590,703.23	$ 546,141.44	$ 562,048.47
Total	**$ 1,886,119.09**	**$ 9,282,522.34**	**$ 9,552,887.06**

4.0 PROJECT SCOPE AND ASSESSMENT METHODOLOGY

4.1 Assessment Scope & Approach

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 VCs, which are specific components of the biophysical and human environments that, if altered by the Project, may be of concern to the regulators, stakeholders, and/or the public. The scope of the EA 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 effects that could occur from the interaction.
- Identify mitigation measures to reduce or eliminate those effects.
- Evaluate the significance of the 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.

4.2 Identification of Valued Components

The following VCs were identified based on the experience of the Project Team and through engagement with regulators:

- Atmospheric Environment
  - Greenhouse Gases
  - Noise
- Aquatic Environment
  - Waterbodies, Watercourses, and Wetlands
  - Fish and Fish Habitat
- Terrestrial Environment
  - Habitat and Rare Plants
  - Terrestrial Fauna
- Socioeconomic Environment
  - Land and Resource Use
  - Heritage and Cultural Resources

4.3 Spatial and Temporal Boundaries

4.3.1 Spatial Boundaries

Spatial boundaries are considered separately for each VC 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 - the physical footprint of the Project, where the direct physical disturbance is expected to occur. For the Transmission lines this includes the 15 m buffer from the center of the Transmission Lines (30 m total) associated with the ROWs (e.g., Transmission Lines, access roads and associated buffers) (Drawing 1, Appendix A).
- Local Assessment Area (LAA) – the area where Project-related effects can be predicted or measured for assessment. The LAA is VC-specific and defined in each VC chapter.

4.3.2 Temporal Boundaries

The temporal boundaries in Table 4.1 apply to all VCs unless otherwise stated in the individual chapters.

Table 4.1: Temporal Boundaries

Project Phase	Temporal Boundary
Site Preparation and Construction	18 to 48 months
Operation and Maintenance	50 years
Decommissioning	+50 years

4.4 Potential Project-Valued Component Interactions

The potential interactions between the Project and the VCs, by phase, are presented in the individual VC chapters (Section 5), following a description of existing conditions. Where an adverse effect on a VC is identified, strategies for avoidance, mitigation, or compensation are proposed. Where possible, mitigation measures are incorporated into the Project design to eliminate or reduce potential adverse effects.

4.5 Effects Assessment Criteria

The significance of the effects after mitigation is determined using defined criteria. Most criteria will be consistent across VCs (Table 4.2); however, the magnitude criteria are VC-specific and are provided in the individual chapters.

Table 4.2: 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	Project Area – residual effects are restricted to the Project Area LAA – residual effects extend into the local assessment area
Timing Considers when the residual effect is expected to occur	Not applicable – seasonal aspects are unlikely to affect the VC Applicable – seasonal aspects may affect the VC

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 the decommissioning 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

If, based on the criteria in Table 4.2, a residual effect is identified, its significance is then evaluated based on the criteria in Table 4.3.

Table 4.3: Definition of Significant Residual Environmental Effect

Significance Level	Definition
Significant	The potential effect could threaten sustainability of a resource or result in a moderate to high change in baseline levels within the LAA. The effect is anticipated to last for a medium to long-term duration and will occur on a continuous basis.
Not Significant	The potential effect may result in a negligible to low change in a resource or condition in the LAA but should return to baseline levels within the short-term and occur only once or on an intermittent basis.

4.6 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 are presented, as necessary, in individual VC chapters.

5.0 ENVIRONMENT

5.1 Atmospheric Environment

5.1.1 Greenhouse Gases

5.1.1.1 Overview

The greenhouse gas assessment was completed through desktop assessment to achieve the following objectives:

- Evaluate the levels and emissions of greenhouse gases that occur within the Project Area.
- Determining and estimating the emission of the various greenhouse gases from natural and anthropogenic sources in the Project Area.
- Evaluate the potential for Project interactions and pathways of effects.
- Apply mitigation, construction and operational management practices to minimize effects of greenhouse gas.

5.1.1.2 Regulatory Context

The following pieces of provincial legislation apply to greenhouse gas emissions:

- *Management of Greenhouse Gas Act* (MGGA) (SNL 2016, c M-1.001)

5.1.1.3 Baseline Assessment Methodology

The assessment of GHGs is based on published literature. The objective of this assessment is to establish the sources of GHG contributions in the Project Area. Information was obtained from the following sources:

- Canadian System of Environmental–Economic Accounts: Energy use and greenhouse gas emissions, 2020.

5.1.1.4 Baseline Assessment Results

Carbon Dioxide

The primary sources of atmospheric CO_2 are burning carbon-containing fossil fuels during the construction phase of the Project, as well as deforestation/land clearing activities, which release stored carbon.

Methane

CH_4 is produced when fossil fuels are burned with insufficient oxygen to complete combustion (ECCC, 2019).

Nitrous Oxides

The primary sources of nitrous oxide (N_2O) 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 N_2O into the atmosphere during the combustion of fossil fuels and biomass (e.g., trees or wood-based fuels) and from some industrial sources (ECCC, 2024).

Halocarbons

Halocarbons are a group of synthetic chemicals containing a halogen group (e.g., fluorine, chlorine, and bromine) and carbon (ECCC, 2024). They are typically used in refrigerants, fire-extinguishing agents, and solvents (ECCC, 2003). There are various industrial sources, but the main contributor is aluminum production (US EPA, 2024).

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 about 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., variances in weather patterns).

As climate warming gases (i.e., CO_2, CH_4, N_2O) increase in the atmosphere, the rise in temperature 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, 2019).

With an estimated 5 tonnes of CO_2 equivalent (tCO_2e) generated per person in Newfoundland and Labrador (Stats Canada, 2020) and a population 33,940 in the Lewisporte census division (2021) the total tCO_2e for the census division, conservatively, is 169,700 tCO_2e per year.

5.1.1.5 Effects Assessment

Table 5.1: Potential Project-Greenhouse Gases Interactions

Valued Components	Construction			Operation		Decommissioning		Accidents and Malfunctions
	Clearing and Grubbing	Access Roads, Laydown Yards	Transmission lines Installation and Commissioning	Transmission Line Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation	
Atmospheric Environment Greenhouse Gases	X	X	X		X	X	X	X

Assessment Boundary

For the greenhouse gas VC, the LAA was defined as the PA.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for Project-related GHG contributions. The VC-specific definition for magnitude is as follows:

Negligible – no changes are expected to GHG emissions.

Low – GHG emissions but are not anticipated to exceed 15,000 tCO_2e
High – GHG emissions are anticipated to meet or exceed 15,000 tCO_2e

Effects

Potential effects of the Project on the environment have been identified, along with the associated effects pathway, based on the interactions between the Project and greenhouse gases (Table 5.2).

Table 5.2: Effects Assessment Pathway Greenhouse Gases

Potential Environmental Effect	Effect Pathway
Increased GHG emissions	• Use of heavy machinery, construction equipment, light duty vehicles • Air conditioning unit coolant release • Cement and steel production • Release of fire retardant chemicals in case of fire

The project is anticipated to generate low GHG emissions during the construction phase and negligible emissions during the operation and maintenance phases. Site preparation will include several activities that are likely to produce CO_2, including, but not limited to:

- Use of heavy equipment (excavators, dozers, cranes, etc.).
- Use of light-duty vehicles and equipment (pick-up trucks, light plants, generators, etc.).
- Land clearing, including burning or the decay of cut foliage (which releases CO_2 slowly).
- Steel production results in chemical reactions which release CO_2 (IEA, 2023)

The Project's construction phase requires different heavy- and light-duty equipment, contributing to methane and N_2O, emissions. The primary source of halocarbon emissions from the Project will be 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.

Shaw and Coughlin (2021) estimated GHG emissions for construction of an 8.5 km 115 kV double circuit transmission line at 2.465 tons of CO_2 equivalent (tCO_2e) Thus, the anticipated Project GHG emissions, when adjusted for a 52.4 km transmission line, are 15,196 tCO_2e. The construction of this transmission line is anticipated to take 2 years; therefore, the per annum GHG emissions for the Project are expected to be 7,598 tCO_2e per year.

The Newfoundland *Management of Greenhouse Gas Act* (MGGA) (SNL 2016, c M-1.001) stipulates that facilities that emit more than 15,000 tCO_2e annually are regulated under the *Act*. Since the construction-related GHG emissions are anticipated to be below the 15,000 tCO_2e per year GHG emissions parameter, these emissions are considered low magnitude.

During the operations phase, methane, N_2O, and halocarbon emissions will be limited to maintenance activities (i.e., transportation and materials). Where these activities are intermittent and short-term, the GHG contributions from operations are negligible and are not considered further.

Project activities contributing to GHG emissions are not anticipated to impact water vapour concentrations in the atmosphere.

Mitigation

Mitigation measures to reduce the Project's contributions to GHG emissions, reducing the overall impact of climate change are outlined in Table 5.3.

Table 5.3: Mitigation Measures to Reduce Impacts to Greenhouse Gases

Environmental Effect	Mitigation
Increase in GHG	Transportation • Use of locally sourced materials, where possible, to reduce CO_2, CH_4, and NO_x emissions associated with transport. • Incorporate the shortest construction/transport routes where possible to minimize the use of fossil fuels during construction. • Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations. • Ensure trucks removing waste from or bringing materials to the Project 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. Disposal and Recycling • Recover and recycle construction and demolition waste. • Use recycled or repurposed materials, where possible, to reduce GHG emissions associated with embodied energy (i.e., the energy associated with manufacturing a product or service). • Train Project personnel (as appropriate) in the proper disposal of halocarbon-containing substances. • Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements. Inspection/Maintenance • Require that equipment containing coolant (i.e., air conditioning units) undergoes preventative maintenance and inspections (i.e., leak testing). • Require that Project equipment meets all applicable provincial and air quality regulations and emissions standards.

Environmental Effect	Mitigation
	• Require that engine and exhaust systems are maintained according to the manufacturer's specifications and applicable maintenance schedule. • Remove from service malfunctioning equipment or equipment generating excess amounts of smoke, odour, or noise until an assessment and necessary repairs can be completed. • Ensure construction equipment with an improperly functioning emission control system is not operated. • Require that regular equipment maintenance is undertaken to maintain good operations and fuel efficiency.

Monitoring
No monitoring programs are recommended.

Conclusion
After mitigations, residual effects on climate change are characterized as follows: while *Project GHG emissions will extend beyond the LAA, the emissions created will be short in duration*, and the residual effects will decline once the construction phase is completed. The effects will occur continuously through the construction phase, intermittently in the operations and maintenance phase, and continuously in the decommissioning phase and they will be irreversible. However, they are considered low magnitude, as predicted Project GHG emissions are expected to be below the 15,000 tCO_2e threshold as outlined in the MGGA and therefore not significant.

5.1.2 Noise

5.1.2.1 Overview
The noise assessment was completed through desktop assessment to achieve the following objectives:

- Evaluate the levels of noise that occur within the Project Area.
- Determine and estimate the potential noise sources and levels currently in the Project Area, and those potentially associated with the development of the Project.
- Evaluate the potential for Project interactions and pathways of effects.
- Apply mitigation, construction and operational management practices to minimize effects of noise.

5.1.2.2 Regulatory Context
Changes to the acoustic environment during construction and operational activities could result in displacement, annoyance, and interference of communication, sleep, and/or working efficiency. As such, sound levels are regulated at the various government levels.

Table 5.4: Summary of Sound Level Regulations and Guidelines

Regulated By	Regulation/Guidance	Sound Level (dBA)	Hours / Duration
For Residential Receptors			
Town of Lewisporte	Town of Lewisporte Nuisance Bylaw	No machinery or equipment which may disturb the peace.	10:00 pm – 6 am
For Occupational Safety			
Workplace Health and Safety Regulations & Canadian Centre for Occupational Health and Safety (CCOHS)	Noise – Occupational Exposure Limits in Canada (Workplace Health and Safety Regulations & CCOHS, 2022)	85	8-hour maximum

5.1.2.3 Baseline Assessment Methodology

The assessment of sound is based on desktop studies and addresses noise effects on human receptors. The objective is to:

- Establish the baseline sound levels within the Project Area.
- Review the potential sources of Project related noise.
- Identify the potential noise level ranges of potential sources of Project related noise.

5.1.2.4 Baseline Assessment Results

During construction activities, noise will predominantly be generated through the operation of construction equipment and heavy machinery such as excavators, rock hammers, and stringing equipment. A summary of sources and anticipated volumes of sound produced during the Project's construction activities is provided in Table 5.5.

Table 5.5: Decibel Limits of Construction Equipment Required for the Project

Equipment	Average Noise Level Ranges (in dBA)
Access Road and Transmission Line Development	
Backhoe	85-104[1]
Dozer	89-103[1]
Dump Truck	84-88[1]
Excavator	97-106[3]
Concrete Truck/Pump	103-108[3]
ATV	97[4]
Pickup Trucks	95[4]
Harvesting Equipment (log truck, manual faller, etc.)	85-103[5]
Loaders	88[5]
Tracked Drilling Units	91-107[6]
Tracked Dump Truck/Decks	91[7]
Tracked Man Lift/Bucket Machines	85[7]
Stringing (Implosion Sleeve)	110[8]
Rock Hammer	121[9]

Equipment	Average Noise Level Ranges (in dBA)
Tracked Radial Boom Derricks/Cranes	93-98[3/7]

Sources: [1](WorkSafe BC, 2019)
[2](IHSAO, 2022)
[3](Transport Scotland, 2018)
[4](Oregon State Parks, n.d.)
[5](WorkSafe BC, 2016)
[6](The Driller, 2005)
[7](SCE, 2015)
[8](Stantec, 2015)
[9](Transport Scotland, 2018)
[10] (US FAA, 2012)

5.1.2.5 Effects Assessment

Interactions

Project activities will interact with the acoustic environment during all phases of the Project except general transmission line operation.

Table 5.6: Potential Project-Noise Interactions

Valued Components	Construction			Operation		Decommissioning		Accidents and Malfunctions
	Clearing and Grubbing	Access Roads, Laydown Yards	Transmission lines Installation and Commissioning	Transmission Line Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation	
Atmospheric Environment Noise	X	X	X		X	X	X	X

Assessment Boundary

For the noise VC, the LAA was defined as the Project Area.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for sound. The VC-specific definition for magnitude is provided for construction and operational sound as follows:

- Negligible – sound levels from Project activities are expected to be ≤55 dBA at residential and sensitive receptor locations.
- Low – sound levels from Project activities may measure between 55 and 65 dBA at residential and sensitive receptor locations.
- Moderate – sound levels from Project activities may exceed 65 dBA at residential and sensitive receptor locations, but only during high-impact activities (intermittently).

- High – sound levels from Project activities are expected to exceed 65 dBA at residential and sensitive receptor locations during multiple activities (continuously).

Effects

Potential effects of the Project on the environment have been identified, along with the associated effects pathway, based on the interactions between the Project and sound levels (Table 5.7).

Table 5.7: Effects Assessment Pathway - Noise

Potential Environmental Effect	Effect Pathway
Increased Noise	Heavy equipment and construction machinery

The noise levels outlined in Table 5.5 are measured within 15 m of the source. Noise generated by some equipment used in construction or decommissioning exceeds the decibel guidelines. During operations and maintenance, noise will be generally related to maintenance vehicles and activities and is not considered significant.

Sound attenuates with respect to distance and can be further attenuated through physical obstructions such as trees or buildings. The Project Area is primarily surrounded by undeveloped forested lands, which will likely create further attenuation to project-related noise.

Most of the Project Area (76%) is forested with a portion of the transmission line running through the municipality of Lewisporte. Decibel levels in the forested areas would range between 10 and 20, whereas within the municipalities, decibel levels would range between 40 and 120 depending on the time of day and activities occurring at the time of measurement.

Mitigation

Mitigation measures to minimize construction sound are outlined in Table 5.8.

Table 5.8: Mitigation Measure to Reduce Impacts of Noise

Environmental Effect	Mitigation
Increase in Noise	Timing/notification • Conduct construction activities within the recommended daytime hours of 6:00 am to 10:00 pm. • Notify nearby landowners before any disruptive activities take place. Suppression • Use noise suppressants (e.g., mufflers) on vehicles/equipment. • Limit vehicle idling. • Ensure equipment is well-maintained and in good working order as the manufacturer recommends. • Include mitigation and monitoring for blasting in the Project's blasting plan, if geotechnical investigations determine it is required.

Monitoring

No monitoring programs are recommended.

Conclusion

After mitigations, residual effects on noise are characterized as Low magnitude as Project construction or operational-related noise is not expected to disturb the peace of a neighbourhood after normal daytime hours. The *Project noise will not extend beyond the LAA* and will be short duration, as the residual effects will decline once the construction phase is completed. It will occur intermittently through the construction phase and continuously and intermittently during the operational phase and effects will be reversible as the noise will significantly decrease after the construction phase and cease once the project is decommissioned. The effects of noise can be concluded to be not significant.

5.2 Aquatic Environment

5.2.1 Waterbodies, Watercourses, and Wetlands

5.2.1.1 Overview

The waterbodies, watercourses, and wetlands assessment was completed through desktop assessment to achieve the following objectives:

- Identify and characterize the watercourses and waterbodies that intersect the Project Area.
- Delineate wetlands using surface hydrology waterflow and wetlands models and datasets.
- Determine the spatial extent of these features within the Project Area.
- Evaluate potential for Project interactions and pathways of effects.
- Apply mitigation, construction, and operational management practices to minimize effects to waterbodies, watercourses, and wetlands.

5.2.1.2 Regulatory Context

Waterbodies (including watercourses and wetlands) are protected provincially under the *Waters Resource Act* (SNL 2002 cW-4.011), which is overseen by the Water Resources Management Division of the NLECC (NLECC, 2001; *Water Resource Act*, 2002). Section 48 of this *Act* provides protection to waterbodies through means such as permitting, where any alteration to waterbodies or development-related effects (direct or indirect) to water quantity, water quality, hydrologic characteristics or functions, and terrestrial and aquatic habitats are prohibited unless approved by the Minister of Environment and Climate Change.

5.2.1.3 Baseline Assessment Methodology

A desktop review consulted the following resources and databases to identify and characterize watersheds, waterbodies, watercourses, and wetlands within the Project Area:

- CanVec Database – Hydrographic Features (NRCan, 2023)
- The Newfoundland and Labrador Water Resource Portal (Government of Newfoundland and Labrador, 2024b)
- FFA - Land Cover – Newfoundland (Government of NL 2024)
- Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Map (DFO, 2024b)
- Atlantic Canada Conservation Data Centre (ACCDC) report (ACCDC, 2024)
- Federal Medium Resolution Digital Elevation Model (MRDEM; NRCan 2024a)
- Canadian Wetland Inventory Map Version 3A (NR Canada, 2024)
- Government documents cited herein.

Waterbodies and watercourses intersecting the Project Area were identified using the federal CanVec 50k Hydrographic Features database and supplemented with additional watercourse features identified in the FFA Land Cover database. Waterbodies that occur within 20 m of the Project Area were also identified to evaluate any erosion risk related to land disturbance, as per DFO best practices guidelines (DFO, 2022b). Watersheds and stream order calculations, which require more hydrological information, were completed using the Federal MRDEM (NRCan 2024a).

5.2.1.4 Baseline Assessment Results

Waterbodies

Waterbodies (Drawing 4) and watersheds (Drawing 5) are located in Appendix A. The Project Area intersects 31 watersheds greater than 0.65 km^2 (Drawing 5, Appendix A). Watersheds smaller than 0.65 km^2 which intersect the Project Area were not delineated as they are too small to have identifiable water outflows. The largest watershed area is 369.6 km^2 and intersects the eastern part of the Project Area, near Boyd's Cove and contains the BOY substation.

Additionally, intersecting the Project Area and an additional 20 m buffer are four unnamed waterbodies (Table 5.9; Drawing 4, Appendix A). However, for one of the waterbodies (a 0.37 km^2 lake), the Project uses the pre-existing poles of transmission line 147-L. For two of the other waterbodies (a 0.082 km^2 lake and a 0.28 km^2 lake), the Project follows a pre-existing road which travels between the two waterbodies. Only the fourth lake (a 0.002 km^2 lake), which is part of a longer watercourse – CANVEC watercourse Feature ID 48153d3acab8404dba5d8dc37d4601f1 – will the transmission line require the new ROW to be cleared adjacent to the waterbody. However, given the small size of the waterbody, from a construction perspective, the requirements of the crossing will not be different from that of other watercourse crossings in the Project Area and it is included in the subsequent crossing list under the CANVEC watercourse Feature ID 48153d3acab8404dba5d8dc37d4601f1.

Table 5.9: Waterbodies within 20 m from the Project Area

CANVEC Feature ID	Waterbody name	Type	Area (km^2)	Permanency
37e337c25d35403a889c34c06a512fee	-	Lake	0.37	Permanent
154c29d028fd498c879a5b056b87e9df	-	Lake	0.082	Permanent
adabf682766a4b8c9d5a540f035ee5a6	-	Lake	0.28	Permanent
722f6a28d04848dc90a72a2f0d6870d9	-	Lake	0.002	Permanent

Watercourses

Watercourse analyses revealed that the Project Area intersects 22 watercourses (Drawing 4; Table 5.10). On average, the watercourses are 2.5 km long (1.2 ± 3.7 km; median ± sd). Of these watercourses, only three were named in the databases, Campbellton River/ Indian Arm Brook (more commonly referred to as Campbellton River and hereafter is referred to as Campbellton River in this document), Southwest Brook, and Jumper Brook. Campbellton River is the widest crossing, spanning approximately 53 m at the proposed Project crossing. Campbellton River and tributaries are also a scheduled salmon river (class 4; DFO 2023). Jumper Brook, estimated 13.4 km long, is the longest watercourse that the Project is proposed to cross. Southwest Brook, draining into the southern end of Lewisporte Harbour, is estimated to be 7.44 km in length.

Table 5.10: Watercourses that Intersect the Project Area

WC ID	CANVEC Feature ID	Watercourse name	Length (km)	Permanency	Outflow (drainage basin)
1	ed8b3fad6c8a4835b77fa8939500d594	Campbellton River (also known as Indian Arm Brook)	7.56	Permanent	Indian Arm
2	3c8e53f937bc4aa095b346e3ca9f90ba	NA	1.18	Permanent	Birchy Bay
3	661bb853ea5749b2bb97f47fe4e98a8c	NA	1.33	Permanent	Birchy Bay
4	fef8899c7d87473aa180ab0388097d89	Jumper Brook	13.42	Permanent	Birchy Bay
5	c6f130d5a77b49eb88f1c39b4cc5b226	NA	0.46	Permanent	Lewisporte Harbour
6	e6dfe077434a48d0afb43cb011f859a6	Southwest Brook	7.44	Permanent	Lewisporte Harbour
7	aa87971e7bc54895898616c2f7c7afcd	NA	0.91	Permanent	Flows into waterbody (Feature ID adabf682766a4b8c9d5a540f035ee5a6) then into Lewisporte Harbour

WC ID	CANVEC Feature ID	Watercourse name	Length (km)	Permanency	Outflow (drainage basin)
8	be43f12624a9492bb308f02cc78f21ca	NA	0.51	Permanent	Flows into waterbody (FID be43f12624a9492bb308f02cc78f21ca) then into Lewisporte Harbour
9	e3706ed6ba984f0194204be4dc555d65	NA	0.78	Permanent	Loon Harbour
10	95c20a85d8834914aa990f000928e2e5	NA	1.21	Permanent	Loon Harbour
11	b9084503330c4c839d7f20c9e5a50df0	NA	2.12	Permanent	Loon Harbour
12	917a33fe976d4c2ebeffb858efb95c9c	NA	0.57	Permanent	The Reach
13	242e5ed020b34182b19788f5475a68d9	NA	1.00	Permanent	The Reach
14	3ce0653db7e04e0d80957b371b64e97c	NA	1.26	Permanent	The Reach
15	a56aa0726ee24c86a0972b148562e463	NA	1.24	Permanent	Flows into waterbody (Feature ID b4f5a57146ce41cfb1a3f5f997ecaa11) then into The Reach
16	48153d3acab8404dba5d8dc37d4601f1	NA	0.06	Permanent	Flows into waterbody (Feature ID 6b95ca09d2d348fbaeb6954ac9e14898)
Newfoundland and Labrador Provincial Data					
WC ID	**Object ID**	**Watercourse name**	**Length (km)**	**Permanency**	**Outflow (drainage basin)**
17	671804	NA	0.99	Intermittent	The Reach
18	671113	NA	0.50	Indeterminate	The Reach
19	670361	NA	0.58	Indeterminate	The Reach
20	670138	NA	0.13	Indeterminate	The Reach
21	669871	NA	0.83	Indeterminate	Flows into watercourse 670138 and then into The Reach
22	672180	NA	1.69	Permanent	Flows into waterbody (Feature ID b4f5a57146ce41cfb1a3f5f997ecaa11) then into The Reach

Wetlands

A review of wetlands within the Project Area was completed using the Canadian Wetland Inventory Map (NR Canada, 2024), a 10 m wetland map of Canada which was created using multi-year (2016-2020), multi-source imagery (Sentinel-1, Sentinel-2, ALOS PALSAR-2, and SRTM) Earth Observation data as well as environmental features. The average overall accuracy of the model is 90.5%.

Wetlands are an important part of Newfoundland's landscape, providing habitat for wildlife, improving water quality, controlling floods, storing carbon, and supporting biodiversity. The Canadian Wetland Inventory Map identified 0.13 km^2 of wetlands within the Project Area. This covers 5.2% of the Project Area in the new ROW and 23.8% of the Project Area in the pre-existing ROW.

Bog

Bogs are defined by several components. The surface of most bogs is above or level with the surrounding landscape and therefore they receive water from localized precipitation rather than the water table. Bogs feature a thick layer of peat which acts as a sponge, retaining the precipitation and releasing it slowly into the surrounding environment. The stagnation of water in bogs makes both their soil and water acidic. The lack of water circulation and nutrients means that vegetation is often dominated by sphagnum mosses, and other plants adapted to nutrient-poor and acidic conditions.

Fen

According to the Canadian Wetland Classification Study (National Wetlands Working Group 1997), fens can be distinguished from bogs by the presence of moving surface water on the landscape. The moving water facilitates nutrient transportation through the landscape. As a result, fens are less acidic and more nutrient-rich than bogs. Higher nutrient levels and a more alkaline or near-neutral pH is conducive to a more diverse plant community. Vegetation in fens is varied and includes grasses, sedges, mosses, and occasionally shrubs and stunted trees.

Swamp

Swamps can be defined by the dominance of woody vegetation, such as trees and shrubs, which distinguish them from other wetland types like marshes. Swamps typically have standing or gently flowing water that can vary in depth throughout the year. The soils in swamps are usually mineral soils with a significant organic layer, resulting from the accumulation of leaf litter, twigs, and other woody debris, which contributes to a nutrient-rich environment. This availability of nutrients supports a diverse range of fauna and flora species. Swamps can be found in a variety of settings, including along rivers and lakes, in floodplains, and in low-lying areas where water can accumulate.

Marsh

Marshes are dominated by herbaceous flora including sedges, grasses, rushes, and reeds, and shallow, standing, or slow-moving water. Marsh soils are mineral based with a high organic content and typically waterlogged, which results in the accumulation of decomposed plant material and anaerobic conditions. Marshes are also known for their nutrient richness, supporting a high diversity of plant and animal species, due to the regular input of water and nutrients from surface or groundwater sources. They can be found in a variety of settings, including along the edges of lakes and rivers, in depressions, and in coastal areas influenced by tides.

Shallow Water

Shallow water wetlands are characterized by the presence of standing or gently flowing water that is less than 2 m deep (National Wetlands Working Group 1997). Shallow water wetlands often have open water with little to no vegetation although they may have submerged, floating, or emergent aquatic flora. These wetlands are frequently part of ponds and found along the edge of rivers. Water in this type of wetland can be permanent or intermittent and their soils are usually mineral based, with some accumulation of organic material. Shallow water wetlands provide a habitat for a variety of aquatic organisms, including fish, amphibians, and invertebrates, as well as birds and other wildlife.

Baseline Assessment Results

The pre-existing ROW was separated from the new ROW as the construction methodology differs and therefore the project will have different effects in that area. The pre-existing ROW falls entirely within the Central Newfoundland Forest Ecoregion with wetland types as outlined in Table 5.11.

Table 5.11: Overview of Wetlands within the Project Area

Wetland type	Total Area of wetlands within Ecoregion (km^2)	Percentage of ecoregion classed wetland	Total Area within ROW (km^2)	Percentage of ROW classed wetlands	Percentage of ecoregion wetlands within project area
North Forest Shore Ecoregion - New ROW					
Bog	376.361	6.85%	0.016	0.96%	0.004%
Fen	73.538	1.34%	0.026	1.45%	0.035%
Swamp	32.325	0.59%	0.024	1.34%	0.073%
Marsh	31.910	0.58%	0.021	1.21%	0.067%
Water	397.704	7.24%	0.000	0.00%	0.000%
Central Newfoundland Forest Ecoregion - New ROW					
Bog	2303.526	8.02%	0.005	2.30%	0.000%
Fen	1198.003	4.17%	0.008	3.64%	0.001%
Swamp	351.165	1.22%	0.002	0.99%	0.001%
Marsh	68.232	0.24%	0.002	0.80%	0.003%
Water	2703.068	9.41%	0.000	0.00%	0.000%
Central Newfoundland Forest Ecoregion - Pre-existing ROW					
Bog	2303.526	8.02%	0.004	3.32%	0.000%
Fen	1198.003	4.17%	0.009	8.07%	0.001%
Swamp	351.165	1.22%	0.006	5.31%	0.002%
Marsh	68.232	0.24%	0.008	7.04%	0.012%
Water	2703.068	9.41%	0.000	0.00%	0.000%

Overall, the percentage of wetlands in the sections of the Project Area located in the North Forest Shore Ecoregion were larger than those in the Central Newfoundland Forest Ecoregion as a result of it being the smaller ecoregion and because a larger area of the Project Area is found within it. For the new ROW located in the Central Forest Ecoregion, the percentage of the ecoregion's bogs, fens, swamps, marshes, and water which falls inside the ROW is less than 0.01%.

For the sections of the new ROW which fall inside the North Shore Forest Ecoregion the primary wetland type identified in the Project Area were fens (0.03 km^2) which make up 0.04% of the fens within the North Shore Forest Ecoregion. In addition to the fens, 0.07% of the North Shore Forest Ecoregion swamps and 0.06% of marshes fall within the boundaries of the new ROW. For the North Shore Forest bogs and water, <0.01% fall within the boundary.

5.2.1.5 Effects Assessment

Interactions

Interactions between the Project and waterbodies, watercourses and wetlands will primarily occur during construction via clearing, grubbing, construction of access roads, laydown yard and temporary works. The project design follows pre-existing roads and trails, therefore impacts to waterbodies, watercourses and wetlands are projected to be minimal.

Table 5.12: Potential Project Interactions with the Watercourse, Waterbody, and Wetlands

Valued Components		Construction			Operation		Decommissioning		Accidents and Malfunctions
		Clearing and Grubbing	Access Roads, Laydown Yards	Transmission lines Installation and Commissioning	Transmission Line Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation	
Aquatic Environment	Waterbodies and watercourses	X	X		X		X	X	X
	Wetlands	X	X	X	X		X	X	X

Assessment Boundary

For waterbodies, watercourses, LAA was defined as the Project Area with an additional 20 m buffer. For wetlands, the LAA is the Project Area.

Assessment Criteria

Assessment criteria provided in Section 4.5 also apply to watercourses. The VC-specific definition for magnitude is as follows:

- Negligible – no loss of aquatic habitat. No expectation for altered hydrology.
- Low – no loss of aquatic habitat, with minimal potential for altered hydrology.
- Moderate – loss of aquatic habitat. Altered hydrology expected but can be managed with routine measures.
- High – loss of aquatic habitat. Altered hydrology expected that would be challenging to manage with routine measures.

Effects

Potential effects of the Project on the environment have been identified, along with the associated effects pathway based on the interactions between the Project and waterbodies, watercourses, and wetlands (Table 5.13).

Table 5.13: Effects Assessment Pathway - Waterbodies, Watercourses, and Wetlands

Potential Environmental Effect	Effect Pathway
Direct Effects	
Wetland loss	• Removal of trees and other taller vegetation from swamps • Pole construction overlaying wetland • Increased flooding
Indirect Effects	
Physical alteration	• Altered flow patterns • Increased sedimentation • Changes in surface water quantity
Water quality impacts	• Removal of overhanging vegetation • Change in water turbidity from increased sedimentation
Water quantity impacts	• In-filling*

* Pending detailed Project design

The Project has potential to interact with waterbodies, watercourses, and wetlands directly and indirectly during construction via clearing and grubbing, construction of access roads, laydown yard, temporary works, transmission line installation, and commissioning. During operation, interactions can occur during inspection and maintenance, and decommissioning activities such as infrastructure removal and site reclamation as well as through accidents and malfunctions. These potential interactions could affect waterbodies, watercourses, and wetlands through direct alteration in cases where avoidance is not feasible, or indirect impacts to function (e.g., hydrology, habitat, and vegetation integrity; Table 5.13).

Access to the ROW will use pre-existing roads and trails and therefore any infrastructure needed for a watercourse or wetland crossing (bridges, culverts, etc.) is assumed to be already in place. .

Within the ROW, 22 locations were identified where ROW crosses a watercourse. However, most of these watercourses are accessible from access points on either side of the watercourse and therefore do not need to be crossed except during wire stringing. This will keep fording incidences to a minimum. Two of the water crossings -Campbellton River and Southwest Brook – have been identified as likely being too wide and deep to be forded and therefore pilot ropes will be passed across the river by hand or by boat, which are then hung on the new structures on land and attached to the conductor to string it out along the new line

Wetlands and watercourses will be avoided as much as is practicable during pole placement. Therefore, all potential Project-related effects on waterbodies, watercourses, and wetlands are anticipated to be indirect, where the primary mechanism by which the Project is likely to affect this VC is by altering the hydrology and water quality. Risk of impact to water quality is low, except through potential for accidental release. Similarly potential impacts to hydrology are anticipated to be low (Table 5.13).

Mitigation

Mitigation measures to minimize the effects of the Project on waterbodies, watercourses and wetlands are presented in Table 5.14

Table 5.14: Mitigation measures to reduce impacts to Waterbodies, Watercourses, and Wetlands

Environmental Effect	Mitigation
Erosion and Sedimentation	• Develop site-specific erosion and sedimentation plans to minimize disturbance to banks and adjacent land, and address the type of control structures, proper installation techniques, grading, maintenance and inspection, timing of installation, and revegetation. • Minimize fording, limit it to periods of low water levels and implement temporary crossing structures if repeated fording is required. • Restore fording locations to their original condition once decommissioning activities are complete • Apply sediment control measures such as silt fencing or temporary instream sediment controls (i.e., outlet blocking) for low flow sites whenever there is risk of sediment resuspension. • Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover). • Apply erosion control measures such as a vegetated buffer between the work site and the stream whenever possible. • Cover and/or stabilize exposed soils and stockpiles that can produce sediment laden-runoff • Leave riparian vegetation as intact as Project developments will allow. • Rehabilitation along the water edge and above the ordinary high-water mark to facilitate the stabilization of the area.

Environmental Effect	Mitigation
	• Enforce site speed limits to minimize dust generation. • Ensure aquatic habitat (e.g., wetland) delineation tape is in place and visible to avoid unnecessary compaction within wetlands. Then remove all delineation tape once construction is completed.
Wetland Loss	• Conduct vegetation cutting and clearing in or near wetlands in accordance with applicable guidelines and maintain wetland vegetation wherever practicable. • Mitigate risk of soil disturbance (e.g., rutting) by using mitigations such as swamp mats, limiting the use of machinery within wetlands, and avoiding work in wetlands in highly saturated conditions (e.g., consider seasonality), as is practicable. • Implement erosion and sediment control structures and regularly inspect and repair control structures. • Direct construction and/or operational runoff through natural upland vegetation, wherever possible. • Maintain or construct appropriate cross-drainage on existing and new access roads. • Employ measures to reduce the risk of spread of invasive species (particularly by inspecting and cleaning equipment prior to travel within the site) into wetlands and retain habitat integrity (e.g., revegetate exposed soil surfaces with native vegetation, include invasive species monitoring in the wetland monitoring program).
Changes in Surface Water Quality and Contamination	• Ensure surface run-off containing suspended materials or other harmful substances is minimized. • Direct run-off from construction activities away from aquatic habitats. • Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff. • Revegetate overhanging vegetation along the water edge and above the ordinary high-water mark to facilitate temperature regulation. • If the use of timber is necessary, use composite, untreated timber, or steel in these areas. Poles are not typically placed below the high-water mark. • If the use of rock is necessary, use rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life. • Avoid storing fuel on the site and only complete refueling in designated areas, >30 m from wetlands and watercourses. • Ensure a complete oil spill clean-up kit is always on site when gasoline or fuel powered equipment is being used or refueled
Changes in Surface Water Quantity and Flow	• Avoid impacts to watercourses, waterbodies, and wetlands to the extent possible (including alteration, compaction, or otherwise). • Avoid placement of poles in wetlands as practicable. • Select fording sites located at shallow water sections of the channel,

Environmental Effect	Mitigation
	where bank grades are low and with stable channel substrate • If travel through aquatic habitat is required, use geotextile matting or time work to occur during frozen ground conditions. • Minimize riparian vegetation removal. • Design any necessary alterations in a way that maintains the natural grade of a watercourse, to ensure the hydroperiod remains as it was pre-alteration. • Integrate water management systems including diversion and collection ditches, and roadside drainage channels as necessary. • Ensure structures are maintained and inspected regularly with particular emphasis before and after forecasted heavy rain events, and with consideration of the timing and types of activities involved • Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff. • Integrate outlet protection features to dissipate flow velocities and decrease erosion at the outflow.

Monitoring

No monitoring program s are recommended.

Conclusion

Following mitigations, residual effects to watercourses, waterbodies and wetlands are expected to be of low magnitude such that there will be no loss of aquatic habitat and altered hydrology is expected to be managed following best management practices for culvert installation where necessary and permitting. Timing and seasonality of effects is expected to be applicable, with a potential for the effects to be exacerbated by high precipitation events in the spring and fall. Effects will be restricted to the LAA, be a short-term single event, and reversible. Therefore, effects to watercourses and wetlands will not be significant.

5.2.2 Fish and Fish Habitat

5.2.2.1 Overview

The fish and fish habitat assessment was completed through desktop assessment to achieve the following objectives:

- Identify fish species richness and associated habitat requirements within the PA.
- Identify fish species, including highlighting Species at Risk (SAR) and Species of Conservation Concern (SOCC) that occur in the region and therefore potentially occur within the Project Area.
- Identify fisheries and aquaculture activities in or near the Project Area.
- Evaluate potential for Project interactions and pathways of effects.
- Apply mitigation, construction, and operational management practices to minimize effects to fish and fish habitat.

5.2.2.2 Regulatory Context

Fish and their habitat are regulated under the federal *Fisheries Act* (R.S.C., 1985, c. F-14), overseen by DFO. Section 34.4(1) of the *Fisheries Act* states that no person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish. Section 35(1) prohibits any work, undertaking, or activity that results in the harmful alteration, disruption, or destruction (HADD) of fish or fish habitat. Hence, the *Fisheries Act* provides protection to fish and fish habitat through means such as permitting, licensing, regulations, habitat restoration, marine refuge, and fish stocks.

SAR and their habitat are further protected under federal *Species at Risk Act* (SARA, S.C. 2002, c. 29) and provincially under the NL *Endangered Species Act* (ESA, O.C. 2002-274). In this document, SAR are defined as:

- Species listed under SARA as "Endangered", "Threatened", or "Special Concern" (SARA, S.C. 2002, c. 29).
- Species listed under the NL ESA as "Endangered", "Threatened" or "Vulnerable" (ESA, SNL 2001 cE-10.1).

SOCC consists of species that are not listed as SAR but have been deemed to be at risk of becoming endangered or threatened (SARA, S.C. 2002, c. 29). In this document, SOCC are defined as:

- Species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but not SARA as "Endangered", "Threatened", or "Special Concern" (Government of Canada, 2022a).
- Species having a subnational (provincial) rank (S-Rank) of "S1"or "S2", (ACCDC, 2024), or some combination thereof, where "S1" refers to species that are critically imperiled with five or less occurrences and "S2" refers to species that are imperiled with 20 or fewer occurrences.

5.2.2.3 Baseline Assessment Methodology

The desktop review consulted the following resources and databases to identify potential species in the region, including SAR and SOCC, fish barriers, and fish habitat in the Project Area:

- Aquatic Species at Risk Map (DFO, 2024b)
- Newfoundland and Labrador Land Use Atlas (Government of Newfoundland and Labrador, 2023)
- Government of Newfoundland and Labrador Fisheries, Forestry, and Agriculture (NLFFA) GeoHub Aquaculture Licenses dataset (NLFFA, 2023)
- Canadian aquatic barrier database (Canadian Wildlife Federation, 2024)
- Atlantic Canada Conservation Data Centre (ACCDC) Data Report
- Literature and government documents (cited herein)

5.2.2.4 Baseline Assessment Results

Freshwater Fish and Fish Habitat

Three species of SAR were identified as potentially occurring in the Project Area (Table 5.15) identified through the ACCDC report. American eel (*Anguilla rostrata*), banded killifish (*Fundulus diaphanus*), and mummichog (*Fundulus heteroclitus*) are listed as SAR under the NL ESA.

The ACCDC database or the COSEWIC reports did not identify any additional fish species considered to be SOCC within the Project Area.

Table 5.15: List of Fish Species at Risk Potentially Occurring in the Project Area

Species	Common name	Species Status		
		SARA	NL ESA	COSEWIC
Freshwater and Anadromous Species				
Anguilla rostrata	American eel	-	Vulnerable[1]	Threatened (2012)[2]
Fundulus diaphanus	Banded killifish	-	Vulnerable[1]	Special Concern (2003, 2014)[3]
Fundulus heteroclitus	Mummichog	-	Vulnerable[1]	-

1. (Endangered Species Act, O.C. 2002-274)
2. (COSEWIC, 2012)
3. (COSEWIC, 2014)

American Eel

American eel is a catadromous species, meaning individuals spawn in the ocean and mature in saltwater bays, estuaries, or freshwater rivers and lakes (Government of Newfoundland and Labrador, 2011; Scott & Scott, 1988). Juvenile American eels, referred to as “glass eels”, are long, slender, and clear in appearance. As glass eels grow, they become pigmented and mature into elvers for 3 to 12 months, then develop into yellow eels for up to 30 years, and fully mature (i.e., silver eels) for 9 to18 years. American eels are panmictic, meaning all spawners are from a single breeding population in the south Atlantic. Furthermore, individuals only spawn once and fast during their spawning migration, leaving individuals with a finite energy reserve to migrate and reproduce.

Marine habitat preferences include protected shallow waters containing submerged vegetation (e.g., eelgrass) and woody debris (COSEWIC, 2012). Freshwater habitat preferences include rivers and lakes with mud, sand, fine gravel, or cobble substrate for burrowing and woody debris. A recent laboratory experiment determined that American eels have a 26˚C upper thermal tolerance limit (indicated by heightened mortality rates) and the optimal temperatures for rearing ranged between 18 to 22˚C (Blakeslee et al., 2018). American eels are known to move over obstacles, through small creeks, or through wet grass (Government of Newfoundland and Labrador, 2011).Declines in American eel populations have been attributed to migration barriers, such as dams that inhibit access to habitat upstream, and hydroelectric development that increases mortality rates during seaward migration (Government of Newfoundland and Labrador 2011). American eels are a socio-economically valuable species, targeted by commercial, recreational, and First Nation's fisheries (Blakeslee et al., 2018; Government of Newfoundland and Labrador, 2011). However, the Newfoundland and Labrador Government ceased distributing new American eel licenses, leaving few active licenses in the province. Strum did not find any record of American eel fisheries in the Project Area.

Banded Killifish

Banded killifish are a euryhaline species that inhabit freshwater streams and lakes but can tolerate more saline environments. Their habitat preferences include clear, shallow slow-moving water with mud, sand, or gravel substrate and aquatic vegetation (DFO, 2022a). Banded killifish live for 3 to 4 years, reaching 7 to 9 cm in length at maturity and act as an important prey for other fish species, including Atlantic salmon, brook trout, and American eel. Spawning occurs in the summer (July to August) when water temperatures are between 19 and 24°C (Chippett, 2004). Currently there are only 10 known populations of banded killifish in Newfoundland, only one occurs in northeast Newfoundland and it is outside the Project Area (DFO, 2022a).

Mummichog

Mummichog are from the same genus as the banded killifish (i.e., *Fundulus*). Like the banded killifish, mummichog are a euryhaline species, but are thought to be a more brackish-water species compared to the banded killifish (Sargent et al., 2021; Scott & Scott, 1988). Mummichog are often found in brackish water ponds, are known to tolerant to low oxygen conditions and stagnant water, and have been recorded to overwinter in tidal streams and mud (Scott & Scott, 1988). Landlocked populations may also exist. Adult mummichog are typically 5 to10 cm in length, where females are normally larger than males (Species Status Advisory Committee, 2016). Spawning typically occurs between April and August in coastal and brackish water, and is thought to be influenced by water temperature and the lunar cycle (Scott & Scott, 1988; Species Status Advisory Committee, 2016). Mummichog are surface feeders, but they are also known to consume crustaceans, polychaetas, insects, larvae, larvae, roe, and vegetation. In turn, mummichog act as prey for other fish species. In 2016, mummichog distribution on the island was thought to be restricted to the southwest coast of the island, and have only recently been documented in central Newfoundland (Species Status Advisory Committee, 2016).

Mummichog can be easily mistaken for banded killifish (Sargent et al., 2021), where the most robust distinguishing feature between the two species lies in the different number of scale rows along the lateral line (24 to 55 for Banded killifish; 32 to 39 for mummichog). Another, more obvious distinguishing feature, is that the caudal peduncle is wider in the mummichog than the banded killifish; however, this can be challenging to identify without having both species side-by-side. Both species have been documented schooling together (Species Status Advisory Committee, 2016) and may occasionally hybridize (Sargent et al., 2021), challenging species identification further. Therefore, it is not uncommon that specimens can only be identified in the field as *Fondulus sp*. (Sargent et al., 2021).

Barriers to Fish Passage

The review of fish barriers identified an unused dam situated approximately 225 m downstream from the Project Area (Canadian Wildlife Federation, 2024; Hidden Newfoundland, 2021; Higgins, 2007). The dam was part of the Horwood Lumber Company pulp mill and hydro facility, which operated for one year before the dam failed in 1915. To our knowledge, there is no available data examining the effects of the dam on fish passage. However, inspection of satellite imagery on Google Earth indicates that fish passage is possible, therefore, fish are assumed to be able to access the Project's proposed crossing location for the Campbellton River. No other fish barriers or aquaculture facilities were detected in the Project Area (Canadian Wildlife Federation, 2024; NLFFA, 2023).

Recreational Fisheries

There is an inland recreational angling fishery for Atlantic salmon, Arctic char, and trout (including brook trout, brown trout, rainbow trout, and ouananiche) in the Project Area (Government of Canada, 2024). Coastal marine recreational fishing also includes a groundfish fishery, where fishers are limited to five fish per day.

Atlantic Salmon

The Project Area intersects a scheduled salmon river (Campbellton River) and tributaries, including Neyles Brook and Indian Arm River and tributary streams. There are 15 Atlantic salmon management areas in Newfoundland and Labrador, and the Project Area falls under the Salmon Fishing Area 4. The Atlantic Salmon recreational fishery is open from June 15 until September 15. There are, however, some landlocked populations as well (locally known as ouananiche), which fall under the same fishing regulations as trout. In 2018, over 28,000 (~$192,000 CAD) recreational Atlantic salmon licenses were sold (DFO, 2020). In 2024, 91 Atlantic salmon were caught by recreational anglers in the Campbellton River (DFO, 2024a). Preliminary fence and fishway counts for the Campbellton River detected 1,466 migrating Atlantic salmon individuals (up to September 15, 2024), which amounts to 53% of the average detections between 2018 and 2023 (DFO, 2024c). The most recent Canadian Science Advisory Secretariat report recorded declines in total returns by approximately 30% across all Atlantic salmon populations, where mortality is hypothesized to be driven by low marine survival (DFO, 2024d). Notably, however, smolt production in the Campbellton River was 39% greater in 2022 compared to the previous generation and Campbellton River stock is rated as one of the few healthy stocks in Newfoundland. Though it is also worth noting that the stock count in 2022 is considered partial for Campbellton River Atlantic salmon.

Atlantic salmon are an anadromous species, meaning individuals reside in saltwater but spawn in freshwater. Atlantic salmon undergo their homing migration from May to September and spawn in the Fall (October–November) (Porter, 1975; Scott & Scott, 1988). This homing behaviour has created genetically distinct populations. Atlantic salmon spawning typically occurs in tributaries or main river headwaters, where there are riffles, and the stream bed is composed of gravel substrate (2 to 8 cm) with limited silt. Parr reside in freshwater for 2 to 4 years before migrating offshore. While in freshwater, parr feed on insects and insect larvae.

Salmonids (i.e., Atlantic salmon, Arctic char, and trout species) have low thermal tolerance thresholds compared to other fish species. The critical maximum temperature for Atlantic salmon aged 2+ is 24°C (i.e., low survival rates after 10 minutes at 25°C, Breau 2012; DFO 2012). Juveniles have a higher thermal tolerance threshold than mature fish, with a thermal optimum between 16 and 20°C and a critical temperature threshold at 30°C (i.e., low survival rates after 10 minutes exposure).

5.2.2.5 Effects Assessment

Interactions

Interactions between the Project and fish and fish habitat will primarily occur during construction via clearing, grubbing, construction of access roads, laydown yard and temporary works. The project design follows pre-existing roads and trails, therefore impacts to fish and fish habitat is projected to be minimal.

Table 5.16: Potential Project - Fish and Fish Habitat Interactions

Valued Components	Construction			Operation		Decommissioning		Accidents and Malfunctions
	Clearing and Grubbing	Access Roads, Laydown Yards	Transmission lines Installation and Commissioning	Transmission Line Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation	
Aquatic Environment Fish and Fish Habitat	X	X		X	X	X	X	X

Assessment Boundary

For fish and fish habitat, LAA was defined as the Project Area with an additional 20 m buffer.

Assessment Criteria

Assessment criteria provided in Section 4.6 apply for fish and fish habitat. The VC-specific definition for magnitude is as follows:

- Negligible – no loss of fish habitat or impact to fish behaviour expected.
- Low – small loss of fish habitat or impact to fish behaviour.
- Moderate – moderate loss of fish habitat or impacts to fish behaviour, but these impacts will only be experienced by individuals rather than entire populations and can be managed with routine measures.

- High – high loss of fish habitat and impacts to fish behaviour that will be experienced by entire populations and cannot be managed with routine measures; the population's life history is permanently altered.

Effects

Potential effects of the Project on the environment have been identified, along with the associated effects pathway based on the interactions between the Project and fish and fish habitat (Table 5.17).

Table 5.17: Effects Assessment Pathway - Fish and Fish Habitat

Potential Environmental Effect	Effect Pathway
Direct Effects	
Fish injury or mortality	• Disease or contamination • Physiological disturbance (or asphyxiation in severe cases) caused by suspended sediment damaging gills or thermal stress
Indirect Effects	
Habitat quality	• Bank erosion • Removal of overhanging or instream vegetation • Loss of fish passage • Change in sediment composition due to change in hydrology • Changes in channel components (i.e., pool, riffle, run sequences) • Change in water quality (e.g., dissolved oxygen) • Change in in-stream three-dimensional structure
Fish behaviour	• Change in thermal regimes • Changes in fish habitat use • Change in predator/prey interactions

Interactions between the Project and fish and fish habitat are most likely during construction (but also during inspection and maintenance) and are likely to be indirect with short term changes to temperature, cover, siltation, etc. associated with construction activities in proximity to waterbodies, watercourses, and wetlands (Table 5.16). However, work near water may affect the fish community by altering fish habitat or by creating disturbances that affect fish behaviour (e.g., noise). Currently instances of water crossing will be limited to fording events or, in one to two instances where a boat may be used to pass the pilot ropes across the river(s), both representing low likelihood of impact. If there is an instance where avoiding wetlands is not feasible or infilling is required, there may be direct impacts to fish as wetland loss may result in fish habitat loss. This will be addressed with the appropriate regulatory agency if detailed design and pre-construction surveys identify any areas where avoidance is not possible.

Mitigation

Pre-construction surveys and mitigation measures to minimize the effects of the Project on

Fish and Fish Habitat are presented in Table 5.18.

Table 5.18: Mitigation Measures to Reduce Impacts to Fish and Fish Habitat

Environmental Effect	Mitigation
Direct fish mortality	• Limit work along streambanks. • Adhere to DFO timing windows for in-water work for Labrador (DFO, 2019b; https://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/index-eng.html). Specifically, no in-water work shall be carried out: o in estuaries and main stems of scheduled salmon rivers from May 1 to September 30 (migrating period). o No hunting/fishing by project personnel.
Fish habitat loss/reduced habitat quality	• Assess fish habitat that has the potential to be impacted, prior to work and avoid any unnecessary. • Plan construction activities to align with low flow periods as practicable. • Ensure watercourses and wetlands are clearly marked and minimize impacts to the area and adjacent riparian habitat. • Ensure all crossings are installed and designed to avoid any permanent diversion, restriction, or blockage of natural flow, such that the hydrologic function and fish passage of the watercourse is maintained. • Rehabilitate disturbed areas along the watercourse edge and above the ordinary high-water mark to facilitate the stabilization of the area and restore fish habitat.
Fish behaviour	• Clean and inspect work vehicles and other equipment prior to use to prevent the introduction of invasive/non-native species.

Monitoring

No monitoring programs are recommended.

Conclusion

The magnitude of effects to fish and fish habitat are expected to be low, such that there may be a small loss of fish habitat or impact to fish behaviour that can be minimized through the implementation of effect-specific active management and mitigation measures. Timing and seasonality of effects is expected to be applicable, with a potential for the indirect effects to be exasperated by high precipitation events in the spring and fall. Indirect effects will be restricted to the LAA, occurring as a short-term, single event during the construction phase, and are reversible. Therefore, effects to fish and fish habitat are not significant.

5.3 Terrestrial

5.3.1 Habitat and Rare Plants

5.3.1.1 Overview

The objective of the habitat and rare plants assessment is to identify the habitat types and rare plants that do or could potentially occur within the Project Area. This information will be utilized to determine potential effects pathways as well as determine appropriate mitigation measures. This was achieved by:

- Reviewing publicly available resources to identify habitat types and flora within the Project Area.
- Identifying listed SAR or SOCC flora that may occur in the Project Area.
- Evaluating the potential for Project interactions and pathways of effects
- Applying mitigation, construction, and operational management practices to minimize effects to habitat and rare plants

5.3.1.2 Regulatory Context

Flora SAR and their habitat are protected under the federal SARA (SARA, S.C. 2002, c. 29) and provincially under the NL ESA (ESA, O.C. 2002-274). In this document, SAR are defined as:

- Species listed under SARA as “Endangered”, “Threatened”, or “Special Concern” (SARA, S.C. 2002, c. 29).
- Species listed under the NL ESA as “Endangered”, “Threatened” or “Vulnerable” (ESA, SNL 2001 cE-10.1).

SOCC consists of species that are not listed as SAR but have been deemed to be at risk of becoming endangered or threatened (SARA, S.C. 2002, c. 29). In this document, SOCC are defined as:

- Species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but not SARA as “Endangered”, “Threatened”, or “Special Concern” (Government of Canada, 2022a).
  Species having a subnational (provincial) rank (S-Rank) of “S1” or “S2” (ACCDC, 2024), or some combination thereof, where “S1” refers to species that are critically imperiled with five or less occurrences and “S2” refers to species that are imperiled with 20 or fewer occurrences.

5.3.1.3 Baseline Assessment Methodology

A desktop review consulted the following resources and databases to identify and characterize habitat and flora within the Project Area:

- Government of Newfoundland and Labrador - NLFFA Land Cover Database
- ACCDC Data Report
- Government and other documents cited herein.

An ecological land classification model (ELC) was derived from the NLFFA Land Cover database. The ACCDC report was used to identify known SAR and SOCC within 5 km of the Project Area.

5.3.1.4 Baseline Assessment Results

Habitat Classification within the Project Area

The Project Area can be divided into two sections: the 3.7 km of upgraded line travelling from the LEW substation to a juncture south of Lewisporte and the remaining 48.1 km of transmission line through to the BOY substation along which a new 30 m wide ROW will be cleared. For the existing ROW, the most common land class according to the ELC is mixed forest, covering approximately 37% of the total Project Area. Other common ELC land classes are anthropogenic (about 25%), wetlands (16%), softwood (13%), and coniferous scrub (5%). The rest of the terrain within the existing ROW is either classed as waterbodies or regenerating forest.

For the Project Area where the new ROW will be created, the most common land class according to the ELC model is softwood forest (46%). Other land classes are mixed forest (28%), coniferous scrub (12%) and wetlands (6%). The rest of the Project Area in the new ROW is comprised of anthropogenic land, deciduous scrub, hardwood forest, regenerating forest, and waterbodies. None of these remaining land classes make up more than 2% of the total area.

Table 5.19: FRI derived Ecological Land Classification

Land Classification	Percentage Cover in New ROW (%)	Area Cover in New ROW (km^2)	Percentage Cover in Preexisting ROW (%)	Area Cover in Preexisting ROW (km^2)
Anthropogenic	0.47%	0.007	24.68%	0.028
Coniferous Scrub	8.47%	0.126	5.13%	0.005
Deciduous Scrub	0.945%	0.013	N/A	N/A
Hardwoods	1.05%	0.015	N/A	N/A
Mixed Forest	28.21%	0.408	37.28%	0.042
Regenerating	0.94%	0.014	1.83%	0.002
Softwood	46.30%	0.669	12.62%	0.014
Waterbody	0.24%	0.003	1.97%	0.002
Mixed scrub	8.98%	0.130	0.97%	0.001
Wetlands	4.40%	0.064	15.52%	0.017

Flora SAR

One SAR, Red pine (*Pinus resinosa*), has been identified approximately 3 km from the Project Area based on the FFA FRI. Red pine occurs in shallow, sandy soils, and gravels across a limited distribution in Newfoundland. Red pine reproduces through seed dispersal with most seeds falling within 12 m of the tree. While present within the larger region, based on its limited distribution and distance of identified stand from the Project, there is a low likelihood of individuals being present within the Project Area.

Felt lichen presence coincides with cool and moist environments, with habitat consisting of northerly facing mature forested slopes. In Newfoundland, protocol for the identification of potential felt lichen habitat includes identifying the distribution of large trees, typically having a diameter at breast height of greater than 25 cm. For *Erioderma* species this habitat assessment is based on the distribution of large balsam fir (*Abies balsamea*), while for *Degelia plumbea* the assessment is based on the distribution of large hardwood species such as yellow birch (*Betula alleghaniensis*), red maple (Acer rubrum), or trembling aspen (*Populus tremuloides*) (T. Leonard, Wildlife Division, personal communication, February 28, 2025).

Within the Project Area, there is 0.41 km^2 of forest identified in the ELC as containing balsam fir or some balsam fir and an additional 0.03 km^2 containing some red maple and trembling aspen. No yellow birch was identified in the Project Area. Of those areas identified as containing balsam fir, red maple, and trembling aspen, 84% (0.37 km^2) of the area has tree stands which are identified as being under 9.5 m high, the remaining 16% (0.07 km^2) has trees between 9.5 m and 15.5 m high. While the relationship between tree diameter and height does not directly correlate and involves additional environmental factors, studies by Wood et al. (2015) and Burgar (1961) would suggest that given the height of trees, while possible, it is unlikely that tree diameters greater than 25 cm would be found within the Project Area. Based on this assessment, there is a low likelihood of the indicated lichen species being present within the Project Area.

SOCC within 5 km of the Project Area

Table 5.20 lists the SOCC that have been recorded within 5 km of the Project Area.

Table 5.20: Flora Species of Conservation Concern within 5 km of the Project

Common Name	Scientific Name	S-Rank	Habitat Type
Pale Corydalis	*Capnoides sempervirens*	S2S3	Rocky woodland/disturbed habitat
Sea-Lavender	*Limonium carolinianum*	S2S3	Tidal marshes
Bushy Naiad	*Najas flexilis*	S2	Freshwater bodies
Hudson's knotweed	*Polygonum fowleri ssp. hudsonianum*	S2S3	Beaches
White-Stem Pondweed	*Potamogeton praelongus*	S2S4	Lakes and rivers
Triangular-valve Dock	*Rumex triangulivalvis*	S2	Poorly drained soils
Seaside goldenrod	*Solidago sempervirens ssp. sempervirens*	S2S3	Coastal marshes and dunes
Saltwater Cordgrass	*Sporobolus alterniflorus*	S2	Salt marshes and coastal beaches
American Sea-Blite	*Suaeda calceoliformis*	S1S2	Salt flats, beaches, high salinity weltands
Lance-Leaf Violet	*Viola lanceolata*	S2S3	Wetlands, meadows, edges of lakes, ponds, and streams

Eight of the SOCC identified by the ACCDC report occupy habitat such as wetlands, coastal areas, riparian habitat, and coastal aquatic environments. Of these habitats only wetlands and riparian habitat are likely to occur within the Project Area. Wetlands expected to be impacted will require a permit or they shall be buffered as indicated by the *Water Resources Act* (2002). Two SOCC identified have potential to occur within the Project Area: Pale corydalis, and Triangle-Valve Dock. Pale corydalis is a species found in disturbed sites which can be considered either anthropogenic or regenerating according to the ELC. Triangular valve dock occupies habitat such as roadsides, fields or ditches which would be classified as Anthropogenic according to the ELC. Within the new ROW only 0.01 km^2 is Anthropogenic and 0.01 km^2 is regeneration, therefore species occurrence is of low likelihood.

5.3.1.5 Effects Assessment

Interactions

Interactions between the Project, habitat and rare plants will primarily occur during construction via clearing, grubbing, construction of access roads, laydown yard and temporary works. The project design follows pre-existing roads and trails, therefore additional habitat loss and alteration is projected to be minimal.

Table 5.21: Potential Project-Habitat and Rare Plant Interactions

Valued Components		Construction			Operation		Decommissioning		Accidents and Malfunctions
		Clearing and Grubbing	Access Roads, Laydown Yards	Transmission lines Installation and Commissioning	Transmission Line Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation	
Terrestrial Environment	Habitat	X	X			X	X	X	X
	Rare Plants	X	X			X	X	X	X

Assessment Boundary

For the habitat and rare plants VC, the LAA was defined as the Project Area.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for terrestrial habitat. The VC-specific definition for magnitude is as follows:

- Negligible – no loss of terrestrial flora SAR/SOCC individuals or alteration to habitat supporting terrestrial flora SAR/SOCC expected.

- Low – small loss of habitat supporting terrestrial flora SAR/SOCC, but no terrestrial flora SAR/SOCC individuals lost.
- Moderate – small loss of terrestrial flora SAR/SOCC individuals (and associated habitat), but their populations remain largely intact.
- High – high loss of the habitat that supports terrestrial flora SAR/SOCC and/or loss of an entire population of terrestrial flora SAR/SOCC.

Effects

Potential effects of the Project on the environment have been identified, along with the associated effects pathway based on the interactions between the Project and habitat and rare plants (Table 5.22).

Table 5.22: Effects Assessment Pathway - Habitat and Rare Plants

Potential Environmental Effect	Effect Pathway
Direct Effects	
Habitat loss or alteration	Removal of habitat for ROW construction/ ROW widening and maintenance
Loss of SOCC	Loss of SOCC during clearing and grubbing operations
Indirect Effects	
Changes in flora species composition	Loss of forest or other habitat types due to creation of ROW prevents some species from persisting and can reduce overall percent cover of species while allowing other species/habitat types to increase distribution/ percent cover

The dominant land classes for the Project Area are mixed forests or coniferous forests. Given the widespread nature of similar stands within the ecoregion (Section 3.2.1) the Project is not expected to significantly reduce overall habitat availability within the LAA. Clearing of habitat in the new ROW and the creation of additional forest edge habitat within the Project Area may affect flora SOCC, such as Triangular-Valve dock, which prefers edge/disturbed habitats.

Construction activities, particularly those that result in ground disturbance, could interact with, and affect, flora SOCC. Ground disturbance and removal of vegetation may result in the removal of SOCC, if present, within the new proposed ROW. Indirect effects to rare plants may occur as well as edge habitat may impact flora species composition within the ROW and into the forests edge (Eldegard et al. 2015).

Within the existing ROW, and for future operating activities, vegetation clearing beyond what is required to maintain the existing ROW will not be required. Therefore, construction activities in the existing ROW and future maintenance activities are not anticipated to impact SOCC. Activities associated with operations and maintenance will be limited to light traffic and removal of vegetation regrowing in the ROW. The effects of this will be short-term and localized. Comparisons of habitats for SAR and SOCC to habitats which are expected to be directly impacted by the Project suggest a low likelihood of SAR/SOCC presence. As such, the potential for direct or indirect loss of SAR and SOCC caused by this Project is anticipated to be low.

Mitigations

Pre-construction surveys and mitigation measures to minimize the effects of the Project on terrestrial habitats and rare plants are presented in Table 5.23.

Table 5.23: Mitigation Measures to Reduce Impacts to Habitat and Rare Plants

Environmental Effect	Mitigation
Habitat Loss or Alteration	• Sensitive habitats will be identified and avoided through pre-construction surveys. • Minimize disturbance to natural habitat. • Disturbance to ground-level vegetation, e.g., herbs, shrubs, and lichens, will be minimized. • Any identified sensitive habitats, e.g., mineral licks, unique habitat features, will be avoided and provided with a buffer zone. • Site remediation activities shall be executed to promote natural vegetation by recovering and distributing overburden and organic material and decompacting soils. • Use rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to wildlife.
Mortality of Rare Plants	• Minimize disturbance to natural habitat and avoid disturbance to rare habitats (e.g. fens, limestone barrens). • Incorporate native vegetation species into vegetation management plans. • Work vehicles and other equipment will be regularly cleaned and inspected prior to use to prevent the introduction of weed, invasive, or non-native species. • Use quarried, crushed materials for road construction to reduce the introduction of invasive vascular plant species. • Contact the Wildlife Division for direction if rare plants are encountered during pre-construction surveys or during construction. • Be familiar with the Wildlife regulations under the *Wildlife Act* (Government of Newfoundland and Labrador 2020) which covers regulations regarding different types of wildlife and aspects of management that may not be covered in SARA or the NL ESA.

Monitoring

No monitoring programs are recommended.

Conclusion

Effects to terrestrial flora associated with the Project have been assessed, including loss of SAR/SOCC and habitat loss. Based on this assessment and through the implementation of proposed mitigation strategies, effects to terrestrial flora expected to occur within the LAA are of low magnitude, although a small loss of habitat that supports terrestrial flora SOCC may occur. Residual effects may occur as a single-event, short term with seasonal aspects applicable; however, effects are expected to be reversible upon decommissioning of the Project and are not significant.

5.3.2 Terrestrial Fauna

5.3.2.1 Overview

The objective of the terrestrial fauna assessment is to identify the species and habitat requirements within the Project Area. This was achieved by:

- Reviewing publicly available resources to identify species within the Project Area.
- Identifying listed SAR or SOCC fauna that may occur in the Project Area.
- Evaluating the presence of habitat for relevant species within the LAA.
- Evaluating the potential for Project interactions and pathways of effects
- Applying mitigation, construction, and operational management practices to minimize effects to terrestrial fauna.

5.3.2.2 Regulatory Context

SAR and their habitat are protected under the federal SARA (SARA, S.C. 2002, c. 29) and provincially under the NL ESA (ESA, O.C. 2002-274). In this document, SAR are defined as:

- Species listed under SARA as “Endangered”, “Threatened”, or “Special Concern” (SARA, S.C. 2002, c. 29).
- Species listed under the NL ESA as “Endangered”, “Threatened” or “Vulnerable” (ESA, SNL 2001 cE-10.1).

SOCC consists of species that are not listed as SAR but have been deemed to be at risk of becoming endangered or threatened (SARA, S.C. 2002, c. 29). In this document, SOCC are defined as:

- Species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but not SARA as “Endangered”, “Threatened”, or “Special Concern” (Government of Canada, 2022a).

Species having a subnational (provincial) rank (S-Rank) are defined as “S1”or “S2”, (ACCDC, 2024), or some combination thereof, where “S1” refers to species that are critically imperiled with five or less occurrences and “S2” refers to species that are imperiled with 20 or fewer occurrences.

The Migratory Birds Regulations, 2022 (MBR), a pursuant of subsection 12(1) of the *Migratory Bird Convention Act, 1994,* applies to any project that could interact with migratory birds. Section 5(1) the MBR prohibits the capturing, killing, injuring, harassing, or disturbing of migratory birds, their eggs, or nests, unless authorized under a permit. Exceptions to 5(1) are listed in section 5(2) of the MBR (Government of Canada, 2022).

5.3.2.3 Baseline Assessment Methodology

A desktop review consulted the following resources and databases to identify and characterize fauna within the Project Area:

- ACCDC Data Report
- Government and other documents cited herein.

5.3.2.4 Baseline Assessment Results

Avifauna

The North Shore Forest Ecoregion is home to large seabird colonies including the Leach's storm petrel (*Hydrobates leucorhous*) (Government of Newfoundland and Labrador, 2000b), a species listed as Threatened under the NL ESA and SARA. Other seabirds breed in this region such as herring gull (*Larus argentatus*), ring-billed gull (*Larus delawarensis)*, common tern (*Sterna hirundo*), arctic tern (*Sterna paradisaea*), black-legged kittiwakes (*Rissa tridactyla*) and Atlantic puffins (*Fratercula arctica*) which rely on the coastline and islands of the region for nesting habitat. Songbirds and the boreal owl (*Aegolius funereus*) also frequent the North Shore Forest Ecoregion.

Avian species that are typical for forest habitat in Newfoundland and occur in the North-Central subregion, include the Canada jay (*Perisoreus canadensis*), grouse (*Canachites canadensis*), chickadees (*Poecile sp.*) and various warblers. Common waterfowl found in the ecoregion are green-winged teal (*Anas carolinensis*), ring-necked duck (*Aythya collaris*), American black duck (*Anas rubripes*), and Canada goose (*Branta canadensis*) (Government of Newfoundland and Labrador, 2000a).

The ACCDC data report identified five avifauna SAR/SOCC that have been recorded within 5 km of the Project Area (Table 5.24).

Table 5.24: Avifauna SAR and SOCC within 5 km of the Project as Identified by the ACCDC

Common Name	Scientific Name	SARA	COSEWIC	NL ESA	General Status	S-Rank
Avifauna						
American Kestrel	*Falco sparverius*		Candidate (Group 3, Low Priority)		Undetermined	S2B,SUM
Evening grosbeak	*Coccothraustes vespertinus*	Special Concern	Special Concern	Vulnerable	Secure	S4
Red crossbill	*Loxia curvirostra*	Threatened	Threatened	Threatened	At Risk	S1S2
Red knot	*Calidris canutus*	Endangered	Endangered	Endangered	At risk	S2M
Rusty blackbird	*Euphagus carolinus*	Special Concern	Special Concern	Vulnerable	Secure	S2S3B,SUM

Rusty Blackbird

The rusty blackbird *(Euphagus carolinus*) is listed as 'vulnerable' under the NL ESA and 'special concern' under SARA. This species resides in forest wetland habitats and can occur in damp woodland and fields during the winter. Rusty blackbirds breed in forested wetlands. They build their nests in stands of dense spruce or other conifer trees on the edge of wet areas. They use the wet areas to forage for insects on the ground and water's edge, and nest in nearby trees. Rusty blackbird habitat is present in the Project Area. The ELC indicates 0.272 km^2 of the Project Area is scrub habitat (Coniferous/deciduous and mixed) which is preferred foraging habitat during the breeding season. Wetlands account for 0.213 km^2 of the Project Area and are known habitats for breeding Rusty Blackbirds, primarily edges of wetland habitats as that is where they are likely to build their nests.

Red Knot

Red knot (*Calidris canutus rufa*) has been previously identified within 5 km of the Project Area and the species is listed as 'endangered' under the NL ESA and SARA. This shorebird relies on coastal habitats including mudflats and salt marshes in Newfoundland and Labrador during their fall migration. Known threats to red knot include disturbance to their wintering ground in Canada's central Arctic and to their spring stopover areas, neither of which fall within the Project Area. The ELC indicates that no impacts either directly or indirectly will occur within red knot habitat as neither mudflats nor salt marshes were identified within the ELC.

Evening Grosbeak

The evening grosbeak (*Coccothraustes vespertinus*) is listed as 'vulnerable' under the NL ESA and 'special concern' under SARA. This species is found throughout forests in Canada and are year-round residents in Newfoundland and Labrador. Evening grosbeak breeding habitat consists of open, mature softwood forests with either balsam fir or white spruce dominant. As it is a resident species, it's non-breeding habitat consists of areas with abundant seed crops from coniferous trees such as firs and spruces. They are also known to occupy residential areas where feeders are found as they are stocked with seeds.

The evening grosbeak is often associated with densities of spruce budworm as it is considered a major predator to the insect. For this reason, evening grosbeaks are a helpful species in the management of this pest which the most widespread and damaging species to coniferous trees such as balsam fir and white spruce. The species prefers to nest in mature softwood forests. (Government of Canada, 2022b). The ELC indicates that of the Project Area, 0.683 km^2 is comprised of softwood forests while is 0.45 km^2 mixed wood, both known habitats for the evening grosbeak as they consist of coniferous species however softwood forests are preferred. For this reason, the likelihood of occurrence within the Project Area is higher yet the surrounding ecoregion is abundant in soft and mixed wood forests therefore the impact on habitat loss is low.

Red Crossbill

Red crossbill, percna subspecies (*Loxia curvirostra percna),* is listed as 'threatened' under the NL ESA and SARA. This subspecies is only found in eastern Canada and evidence shows it is likely that they are primarily present on the island of Newfoundland. Red crossbills breed in mature softwood forests and do not migrate but are nomadic throughout the year. They can be found wherever there are abundant conifer cone crops and can breed nearly year-round if there are enough cones (Government of Newfoundland and Labrador, n.d.). The ELC comprises of 0.683km^2 softwood forest which is habitat for red crossbill, however the red crossbill prefers old growth forests which are not abundant in the Project Area. As the ecozone the Project Area falls within is softwood dominant, habitat loss to the red crossbill is expected to be low.

Mammals

Desktop analysis highlighted 26 species of mammals present in Newfoundland. Of these 26 species, 14 are listed as native with the remaining 12 listed as introduced. Game species can be subdivided into three main groups: big game, furbearers, and small game. Non-game species consist primarily of members of *Rodentia* and *Chiroptera* and include individuals such as mice, voles, chipmunks, and bats.

Big Game

Three big game species are potentially occurring within the Project Area: moose (*Alces alces*), caribou (*Rangifer tarandus*), and black bear (*Ursus americanus*). Of these three species, moose and black bear populations are widely distributed across the province and populations are managed based on their respective hunting zones, referred to as management areas. The Project Area is within Moose Management/Bear Management Area 22, which was last surveyed for moose in 2017. Population density targets at that time were determined to be on target with a recruitment of 57 calves per 100 cows and with a management objective of “status quo”, indicating a low level of concern with population trends in the region. No recent estimate for black bears has been conducted for the management area.

The Newfoundland population of caribou is a SAR, designated as Special Concern under federal SARA. The nearest caribou herd, the Mount Peyton Herd, is located approximately 15 km south of Lewisporte with the north side of the management area (Caribou Management Area 68) being bounded by the Trans-Canada Highway. The desktop analysis did not identify the presence of caribou within the Project Area, with home range data received from Wildlife Division showing the northern limit of the Mount Peyton herd ending at the Trans-Canada Highway. Based on these findings there is a low probability of caribou presence within the Project Area.

Furbearers and Small Game

There are 10 species of furbearers and mammalian small game species in Newfoundland. Of these 10 species, beaver (Castor canadensis), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), and otter (*Lutra canadensis*) have habitat preferences associated waterbodies and wetlands, resulting in a low likelihood of occurrence within the Project Area. Desktop analysis of Arctic hare (*Lepus arcticus bangsii*) and pine marten (*Martes americana atrata*), a SAR designated under SARA and NL ESA, also suggests a low likelihood of presence within the Project Area of either species given their current known distribution and arctic hare’s habitat preferences of arctic-alpine areas. Other furbearer and small game species such as fox (*Vulpes vulpes*), ermine (*Mustela ermina*), lynx (*Lynx canadensis*), and snowshoe hare (*Lepus Americanus*) are broadly distributed across Newfoundland and may be present within the Project Area.

Bats

Five species of bat are present in Newfoundland and Labrador: the little brown bat (*Myotis lucifugus*), the northern long-eared bat [*Myotis keenii (septentrionalis*)], the hoary bat (*Lasiurus cinereus*), the Eastern red bat (Lasiurus borealis), and the sliver-haired bat (*Lasionycteris noctivagans*). These species are listed SAR under SARA and the NL ESA. The little brown bat and the northern long-eared bat are resident species in Newfoundland and may be present within the Project Area, whereas the hoary bat, Eastern red bat, and silver-haired bat are migratory species. Sightings of the migratory bats in Newfoundland are limited, likely due to exploratory migration (Tessa McBurney 2018). Within Newfoundland, critical habitat for the little brown bat and northern long-eared bat has been delineated and is not located within or near the Project Area (Government of Canada 2018).

The ACCDC data report did not indicate any species of bat within 5 km of the Project Area. However, the project falls within the range and preferred habitat making their presence possible.

Hymenoptera and Coleoptera

There have been 47 species of bees recorded in Newfoundland (Hicks 2009), of which three species are designated as SAR. Additionally, there is one species of lady beetle designated as SAR under NL ESA.

Table 5.25: Insect Species Designated as SAR on the Island of Newfoundland

Common Name	Scientific Name	SARA	COSEWIC	NL ESA
Hymenoptera				
Gypsy Cuckoo Bumble Bee	*Bombus bohemicus*	Endangered	Endangered	Endangered
Suckleys Cuckoo Bumble Bee	*Bombus suckleyi*	Not Listed	Threatened	Threatened
Yellow-banded Bumble Bee	*Bombus terricola*	Special Concern	Special Concern	Vulnerable
Coleoptera				
Transverse Lady Beetle	*Coccinella transversoguttata*	Special Concern	Special Concern	Vulnerable

All three species of bumble bees and the transverse lady beetle occur in similar diverse habitats ranging from meadows, farmlands, urban area, mixed woodlands, and boreal forests. Little information is available regarding the presence and distribution of these species in Newfoundland. The limited availability of information makes it difficult to assess the potential likelihood of these species occurring within the Project Area.

5.3.2.5 Effects Assessment

Project-Terrestrial Fauna Interactions

Project activities, primarily during the construction phase, have the potential to impact terrestrial habitat and fauna as these activities may result in habitat removal, fragmentation, or alteration. Interaction between the Project and terrestrial fauna are most likely during construction and are likely to be indirect with short term disturbance during vegetation clearing, pole, and line installation (Table 5.26).

Table 5.26: Potential Project-Terrestrial Fauna Interactions

Valued Components		Construction			Operation		Decommissioning		Accidents and Malfunctions
		Clearing and Grubbing	Access Roads, Laydown Yards	Transmission lines Installation and Commissioning	Transmission Line Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation	
Terrestrial Environment	Avifauna	X	X			X	X	X	X
	Bats	X	X	X		X	X	X	X

Assessment Boundaries

For the purposes of this assessment the LAA was defined as the Project Area.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for terrestrial fauna. The VC-specific definition for magnitude is as follows:

- Negligible – no loss of fauna habitat or impact to fauna behaviours expected.
- Low – small loss of habitat supporting fauna, but no impacts to fauna behaviours expected.
- Moderate – moderate loss of fauna habitat or moderate impacts to fauna behaviours, but these impacts will only be experienced by individuals rather than entire populations.
- High – high loss of fauna habitat or high impact to fauna behaviours on a population scale.

Effects

Habitat Loss and Fragmentation

Habitat loss and fragmentation is expected to occur as a result of Project activities associated with the new ROW construction. However, fragmentation has been minimized where possible, by following pre-existing roads. Habitat included for consideration includes habitat for flora and fauna SOCI, priority habitats and unfragmented, undisturbed areas. Habitats within the Project

Area are widespread throughout the ecoregion therefore there will be no significant loss due to the Project. There are no known protected areas or critical habitat within the Project Area therefore habitat loss to these habitats will be low to negligible.

Fragmentation will be caused by the new ROW being constructed, fragmentation can create many pathways for effects such as edge effects and barriers. Some level of disturbance is already present in the Project Area therefore fragmentation effects are expected to be low.

Vegetation clearing required for construction can result in the removal of bat habitat or disrupt corridors between important habitat features (foraging grounds, birthing areas, etc.) (Segers & Broders, 2014).

Edge Effects

The introduction of open areas such as ROW's can increase predation which can increase predation into the existing ecosystem as many birds prefer to forage and nest in edge habitats (Banks-Leite et al. 2010). Edge effects all influence species composition and distribution as some bird communities prefer to remain within the forest interior and others along the open edge. Edge effects are the main drivers of area effects in fragmented landscapes. The introduction of cleared areas and edges can influence bird species and communities as it may introduce species which prefer open/anthropogenic habitats into communities with forest birds therefore creating competition (Zurita G. et al 2011).

Sensory Disturbance

Noise will be generated during all phases of the Project. No work will take place outside daylight hours during any phase of the Project. During construction, decommissioning, and reclamation, noise will be generated by heavy equipment. During construction and reclamation, noise will typically occur during daylight hours, therefore sensory disturbance should be limited to roosting bats. Project related effects will be associated with noise conditions that exceed those levels, whether they be cumulative or independent.

For bats, echolocation calls are in the ultrasonic range beyond the upper frequency limits of construction noise (California Department of Transportation, 2016) meaning there is effectively no echolocation masking effect from construction noise. Additionally, the usual lack of construction activity during the active bat period (30 minutes before sunset to 30 minutes after sunrise) further limits any potential masking effects in the ultrasonic ranges.

Sensory disturbance associated with noise during the construction, operation, and decommissioning phases of the Project may also impact bat behaviour. During construction and decommissioning, noise will be a temporary source of sensory disturbance. The impacts of necessary noise associated with the Project on bat behaviour and movements are anticipated to be low based on the morphological adaptations and behavioural patterns of bats as well as the anticipated timing of activities that have potential to cause sensory disturbances.

Light sensory disturbance that can impact birds includes behavioural effects such as disorientation, avoidance, or attraction (Longcore and Rich, 2004). In turn, these behavioural changes can affect the success of foraging, reproduction, and communication of wildlife (Longcore and Rich, 2004) and can disrupt habitat connectivity (Bliss-Ketchum et al., 2016). Another potential form of sensory disturbance to birds is noise levels caused by Project activities. Some bird species may not be impacted by sensory disturbances. A study of the impact of logging truck traffic on bird reports 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 through decreasing nest predation (Francis et al., 2009).

Collisions

The Project will result in increased road traffic within the Project Area. Both small and large terrestrial mammals are known to use the roadways within the LAA. Considering the pre-existing traffic load and the minimal traffic to be associated with the Project, road traffic is expected to have a negligible to low effect on terrestrial mammals and birds in the LAA. Collisions between local fauna and traffic can be reduced using proper lighting and reduction of speed.

Potential effects of the Project on the environment have been identified, along with the associated effects pathways based on the interactions between the Project terrestrial fauna (Table 5.27).

Table 5.27: Effects Assessment Pathway Terrestrial Fauna

Potential Environmental Effect	Effect Pathway
Direct Effects	
Habitat loss or alteration	• Removal of habitat for ROW construction and maintenance
Collisions	• An increase in road traffic will increase the chances of collision and mortality for those animals/birds using the roadways.
Sensory disturbances	• Sensory disruptions may result from sound or excess light. • Project-related noise may impact habitat use, patterns of activity
Loss of nest/roost sites	• Removal of vegetation containing nests/roost
Indirect Effects	
Reduction of species productivity in Project Area	• Reduced breeding habitat • Increased competition for food resources among species (e.g. cone crops from removal of cone producing species) • Potential negative impacts due to increased edge habitat such as increased nest predation near edges

Potential Environmental Effect	Effect Pathway
Species behavior	• Increase in edge habitat can change foraging behavior for species like bats. • Decrease in breeding activity for avifauna species in open habitats created by clearing activities.
Habitat Fragmentation	• The loss or conversion of undisturbed habitat to construct access along, transmission line corridors can impact the terrestrial habitat. • Fragmentation can cause change in migration routes of some migratory species

Mitigation

Pre-construction surveys and mitigation measures to minimize the effects of the Project on terrestrial fauna are presented in Table 5.28.

Table 5.28: Mitigation Measures to Reduce Impacts to Terrestrial Fauna

Environmental Effect	Mitigation
Changes to Avifauna Species Composition or Productivity	• If vegetation clearing is required, it will be completed outside of the breeding bird season from April 15 to August 15. • Should vegetation clearing be required during breeding season, searches for migratory bird nests will be undertaken (in consultation with Environment & Climate Change Canada – Canadian Wildlife Service (ECCC-CWS), and all identified nests will be flagged and avoided until young have fledged. • No vegetation clearing will be undertaken within 5 m of a flagged migratory bird nest. • No vegetation clearing will occur within 800 m of a bald eagle or osprey nest during the nesting season (April 15 to August 15). • No vegetation clearing will occur within 200 m of any raptor nest at any time of the year. • The location of any raptor nest will be reported to the NLFFA, Wildlife Division. • Any active nests identified at any time of the year will be flagged. • Project personnel will not approach concentrations of seabirds, sea ducks or shorebirds. • All stockpiles of materials will be covered and sloped to less than 70 degrees during breeding season (April 15 to Aug 15) to deter nesting.
Changes to Bat Species Abundance or Productivity	• Any identified roosts or hibernacula will be reported to the NLFFA, Wildlife Division and avoided.
Changes in any Wildlife Species Behaviour	• All Project participants will be prohibited from hunting at the Project site. • Wildlife will not be fed, and all measures will be taken to avoid inadvertent feeding. • Wildlife shall not be chased, caught, diverted, followed, or otherwise

Environmental Effect	Mitigation
	harassed by Project personnel. • Equipment and vehicles will be maintained in good working order to minimize noise and air pollution. • Recreational use of all-terrain vehicles and snowmobiles will be strictly prohibited on site. • Use of personal vehicles on site will be prohibited. • Project personnel will always yield right of way to wildlife.
Mortality of Wildlife	• All wildlife encounters will be reported to designated Project personnel and communicated with NLFFA, Wildlife Division. • Any observations of Species at Risk will be reported to the NLFFA, Wildlife Division and ECCC CWS.

Monitoring
Any evidence of SAR (e.g. observations of SAR or key habitat features) within the Project Area will be reported the NLFFA (Wildlife Division), who will provide guidance on mitigating impacts.

Conclusion
While effects to terrestrial fauna species differ, the residual effects considered to be of greatest concern include direct mortality, habitat loss and fragmentation. Based on this assessment and through the implementation of proposed mitigation activities, effects to terrestrial fauna are expected to be of low magnitude, within the LAA, of medium duration, intermittent, reversible, and not significant.

5.4 Socio-economic

5.4.1 Land, and Resource Use

5.4.1.1 Overview
The objective of the socio-economic assessment is to identify and current and historical land use within the Project Area. This was achieved by:

- Identifying land use patterns in the Project Area.

5.4.1.2 Baseline Assessment Methodology
A desktop review of the following resources was conducted to identify the sociological and economic environment of the Project Area:

- Newfoundland and Labrador Snowmobile Federation Website
- Newfoundland and Labrador Land Use Atlas
- Google Earth Satellite Imagery

5.4.1.3 Baseline Assessment Results

Current Land Use

The proposed route for the 148L Transmission Line has been designed to have minimal impact on private landowners. The majority of the line is located on crown lands. Newfoundland Power has applied via crown lands division to obtain a legal easement for 148L. This application is currently with crown lands for review.

The already cleared 3.7 km section of ROW which passes Lewisporte traverses municipal land with different zoned uses including industrial, commercial, residential and park. The proposed route passes over some Bowater land in the region of Lewisporte.

The proposed route intersects 33 crown land titles, of which 17 are owned by individuals and the other 16 are owned by Newfoundland Power (4), the Town of Lewisporte (5), the Newfoundland and Labrador Snowmobile Federation (1) and other corporations or religious institutions (5). For the 17 titles owned by individuals, all the crown land titles are located in areas where the proposed transmission line runs adjacent to the highway and the crown land titles abut or cross the highway. Any private lands that will be impacted will be addressed by obtaining easements from the landowner.

There are also some agricultural uses on the adjacent landscape. One region is zoned agriculture, and other small areas are visible in satellite imagery although a desktop review did not identify any within the proposed Project Area.

The Newfoundland and Labrador Water Resource Portal shows that the Project Area intersects the Indian Arm Brook (SA-0112), the Southeast Pond (SA-0440) and Dog Bay Pond Brook (SA-0744) Protected Surface water legal boundaries (Government of Newfoundland and Labrador, 2024b).

The are no protected areas within the Project Area. There is a proposed ecological reserve, Indian Arm Brook Ecological Reserve, which if created, would be located 5 km south of Campbellton and less than one km south of the Project Area. The proposed reserve would be representative of the Central Newfoundland Forest Ecoregion, encompasses most of the Campbellton River watershed and includes a Sensitive Wildlife Area for waterfowl habitat (Government of Newfoundland and Labrador, 2024a).

Other uses of the landscape include traditional Newfoundland activities such as hunting, domestic wood harvesting, fishing, berry picking, snowmobiling and all-terrain vehicle (ATV) use.

The Newfoundland and Labrador Snowmobile Federation manages a network of marked and groomed trails across the island. The proposed transmission line traverses their trails at eight points.

Public Consultations
Newfoundland Power has had two formal information sessions with Provincial and Municipal representatives of the communities near the location of the proposed Transmission Line 148L project. In April 2025, Newfoundland Power had virtual and in person meetings with Derek Bennett, MHA Lewisporte-Twillingate, as well as numerous Mayors, Town Managers and Town Counsellors from the towns of Lewisporte, Campbellton, Birchy Bay, Baytona and the Local Service Districts of Loon Bay and Boyd's Cove.

During these meetings, representatives from Newfoundland Power including the Vice President - Engineering and Energy Supply, Director – Operations, and Manager – Transmission and Distribution Engineering, provided an overview and history of the electrical system in this area of the province and discussed why the Transmission Line 148L project was required. Additionally, specific details about the project including the transmission lines proposed footprint and routing, construction methodology, materials, and schedule, as well as the projects potential environmental impacts and proposed mitigations (as outlined in this document) were discussed. The representatives from the area had the opportunity to ask questions about the project and discuss how the project may impact their individual communities. Following the meeting, the representatives were given contact information from the project team from Newfoundland Power to ensure they could seek further clarification on the information presented or ask additional questions.

5.4.1.4 Effects Assessment

Interactions
Interactions between the Project and human populations will primarily occur during the construction and operations phase. Noise and heavy equipment used during construction may temporarily deter people from accessing a particular area. The new transmission line will provide for improved power distribution and power security for residents and businesses in the region.

Assessment Boundaries
The LAA for Land and Resource, was defined as the Lewisporte – Twillingate Electoral District.

Assessment Criteria
Assessment criteria provided in Section 4.5 apply for land use. The VC-specific definition for magnitude is as follows:

- Negligible – no change in surrounding land use, use can largely continue as is.
- Low – minor limitations to surrounding land use.
- Moderate –. moderate limitations to surrounding land use.
- High –widespread limitation to surrounding land use.

Effects
Potential effects of the Project on the environment have been identified, along with the associated effects pathway based on the interactions between the Project and land and

resource use (Table 5.29).

Table 5.29: Effects Assessment Pathway - Land and Resource Use

Potential Environmental Effect	Effect Pathway
Changes to land and resource use patterns	Construction of ROW through land used for other activities
Changes to landowner properties	Registered easements and removal of trees adjacent to properties
Interference with other land use activities	Vegetation management along the ROW

Mitigation

The Project has been designed to minimize potential effects to land use and value through siting considerations and engagement with stakeholders. The Project has a spatial and topographic separation from most dwellings which will avoid other nuisance interactions such as construction related noise. Engagement with landowners prior to easement registration or vegetation removal will occur and vegetation management will be applied outside winter months to avoid interaction with snowmobile activity. No specific mitigation related to land use and value is recommended.

Monitoring

A specific land use monitoring program is not recommended.

Conclusions

While the effects to land and resource uses differ, the residual effects related to changes in land use patterns are anticipated to be minor. Based on this assessment and through the implementation of proposed mitigation activities, effects to land and resource use are expected to be of low magnitude, within the LAA, of medium duration, continuous, reversible, and not significant.

5.4.2 Heritage and Cultural Resources

5.4.2.1 Overview

This component study consists of a desktop review to:

- Determine the presence or absence of archaeological and/or ethnographic resources within the Project Area.
- If archaeological and/or ethnographic resources are present within the Project Area, determine mitigative measures to address such resources.

5.4.2.2 Regulatory Context

The Arts and Heritage Division of the Department of Tourism, Culture, Arts, and Recreation with the Government of Newfoundland and Labrador is responsible for supporting the preservation and management of arts and heritage across the province, including the operation of the Provincial Archaeology Office (PAO). The Division is guided by the *Historic Resources Act,* RSNL 1990, c H-4, with a mandate to protect historic resources and paleontological resources. A permit is required for any archaeological or paleontological investigations. The PAO reviews the need for historic resources impact assessments through the review of land use referrals submitted by government agencies and the private sector, including the Environmental Assessment Division.

5.4.2.3 Baseline Assessment Methodology

In preparation for writing this report, all available literature on archaeological research in the Project Area was reviewed. The PAO was consulted, and a series of maps were prepared by the PAO, locating all known archaeological and ethnographic sites near the Project Area. Associated Archaeological Site Record forms were also provided by the PAO.

5.4.2.4 Baseline Assessment Results

Archaeological and historical research over the past 60 years indicated that the focus of human habitation for much of the year was along the coast and on the numerous offshore islands, where people hunted and gathered the rich marine resources. It is suspected that during the coldest months these groups moved to the near interior to escape the harsh winter, to hunt caribou, fur bearing animals, and avian species. Even in the historic period, European settlers followed this same pattern of transhumance, retreating to their winter houses deep in the bays, or just a short distance into the forest where they also hunted terrestrial animals and cut wood for boat building and fuel.

Archaeological surveys and intensive excavation projects within 20 or so km of the Project Area suggest that the route proposed for the new transmission corridor has a high archaeological potential. The density, age, and variation of archaeological sites in the region suggests it has a rich and diverse cultural history spanning over 4000 years. The 1000-year-old Boyd’s Cove-1 Beothuk base camp, along with numerous resource exploitation camp sites on the shoreline and nearby islands attests to the importance of this area for the ancient Indigenous populations. European and Mi’kmaq exploitation and permanent settlement began in the eighteenth century.

5.4.2.5 Effects Assessment

Interactions

Interactions between the Project and cultural and heritage uses will occur mainly during construction. Construction may require earth works at locations identified as having potential historical resources. Any area where earth works will occur that coincide with area identified as having potential historical resources could alter a heritage resource site, if present.

Table 5.30: Potential Project - Heritage and Cultural Resources Interactions

Valued Components		Construction			Operation		Decommissioning		Accidents and Malfunctions
		Clearing and Grubbing	Access Roads, Laydown Yards	Transmission lines Installation and Commissioning	Transmission Line Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation	
Socioeconomic Environment	Heritage and Cultural Resources	X	X						X

Assessment Boundaries

The LAA for the heritage and cultural resources was defined as the Project Area.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for archaeological resources. The VC-specific definition for magnitude is as follows:

- Negligible – activities have no potential for encountering archaeological resources during ground disturbance.
- Low – activities have a low potential for encountering archaeological resources during ground disturbance.
- Moderate – activities have a moderate potential for encountering archaeological resources during ground disturbance.
- High – activities have a high potential for encountering archaeological resources during ground disturbance.

Effects

Potential effects of the Project on the environment have been identified, along with the associated effects pathway based on the interactions between the Project and heritage and cultural resources (Table 5.31)

Table 5.31: Effects Assessment Pathway – Heritage and Cultural Resources

Potential Environmental Effect	Effect Pathway
Impacts to previously unknown archeological resources	Ground disturbance associated with construction activities

Interactions between the Project and Archeological resources would occur during construction activities. Earth works could expose or destroy previously undocumented archeological sites.

An archaeological research permit will be requested from the PAO and an archaeological investigation conducted to help identify any specific high potential areas for archaeological resources prior to construction. Specific requirements for the archaeological investigation will be reviewed with the PAO.

All activities implemented in the archaeological investigation will adhere to the guidelines and requirements of the Archaeological Investigation Permit Regulations and *Historic Resources Act*.

Mitigation

Pre-construction surveys and mitigation measures to minimize the effects of the Project on heritage and cultural resources are presented in Table 5.32.

Table 5.32: Mitigation Measures to Reduce Impacts to Heritage and Cultural Resources

Environmental Effect	Mitigation
Impacts on previously unknown archaeological resources	• Conduct additional archaeological assessment during the detailed design phase prior to construction. • Maintain avoidance of sites of high and moderate potential for archaeological sites where possible in detail design. • Minimize the potential for ground disturbance during site preparation in areas of potential archaeological resources by using hand tools. • Conduct shovel testing when sites of potential archaeological resources cannot be avoided. • Develop a chance find procedure related to the potential unexpected discovery of archaeological items or sites during construction. This would include halting any work immediately upon discovery of suspected resources and contacting the PAO.

Monitoring

No monitoring programs are recommended.

Conclusions

With the implementation of the above mitigation measures, the potential for disturbing archaeological resources is negligible to low. Effects would occur once, be short-term, restricted to the Project Area and be irreversible (to be confirmed based on any identified resources, as applicable). Effects are considered not significant.

6.0 RESIDUAL EFFECTS

Each potential residual effect is assessed in Table 6.1 according to the rating criteria defined in Table 6.1. Residual effects are evaluated under the assumption that all mitigation measures are applied and in the absence of accidents or malfunctions. Mitigation and remediation measures for accidental events are outlined in the Environmental Emergency Response Plan and the Environmental Protection Plan.

Table 6.1: Effects of the Undertaking on the Environment

VC	Rating Criteria						Rating
	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	
Atmospheric							
GHG Emissions	Low	LAA	Seasonal	Short-term	Intermittent	Irreversible	Not significant
Noise	Low	LAA	Seasonal	Short - term	Intermittent	Reversible	Not Significant
Aquatic							
Waterbodies, Watercourses, and Wetlands	Low	LAA	Seasonal	Short term	Single Event	Reversible	Not significant
Fish and Fish Habitat	Low	PA	Seasonal	Short-term	Single event	Reversible	Not significant
Terrestrial							
Habitat and Rare Plants	Low	LAA	Seasonal	Medium-term	Intermittent	Reversible	Not significant
Terrestrial Fauna	Low.	LAA	Seasonal	Long-term	Single event	Irreversible	Not significant
Socio-economic							
Community, Land, and Resource Use	Low	LAA	Seasonal	Medium-term	Continuous	Reversible	Not significant
Heritage and Cultural Resources	Low	PA	NA	Short-term	Single event	Irreversible	Not significant

7.0 ASSESSMENT SUMMARY AND CONCLUSION

The proposed 51.8 km TL148 transmission Line from Boyd’s Cove to Lewisporte will provide power security for communities in central Newfoundland. While the Project has the potential to affect the Atmospheric, Aquatic, Terrestrial, and Socio-economic VCs, the applied mitigations will minimize disturbance and the residual environmental effects are expected to be not significant.

8.0 STATEMENT OF QUALIFICATIONS AND LIMITATIONS

This Report (the "Report") has been prepared by Strum Consulting ("Consultant") for the benefit of Newfoundland Power Inc. ("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.

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- as agreed in writing by Consultant and Client
- as required by law
- for use by governmental reviewing agencies

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This Statement of Qualifications and Limitations forms part of the Report and any use of the Report is subject to the terms hereof.

Should additional information become available, Strum requests that this information be brought to our attention immediately so that we can re-assess the conclusions presented in this report. This report was prepared by senior scientists Diedre Park and Casidhe Dyke, and was reviewed by Nicole Thomas, Manager Environmental Assessment & Approvals.

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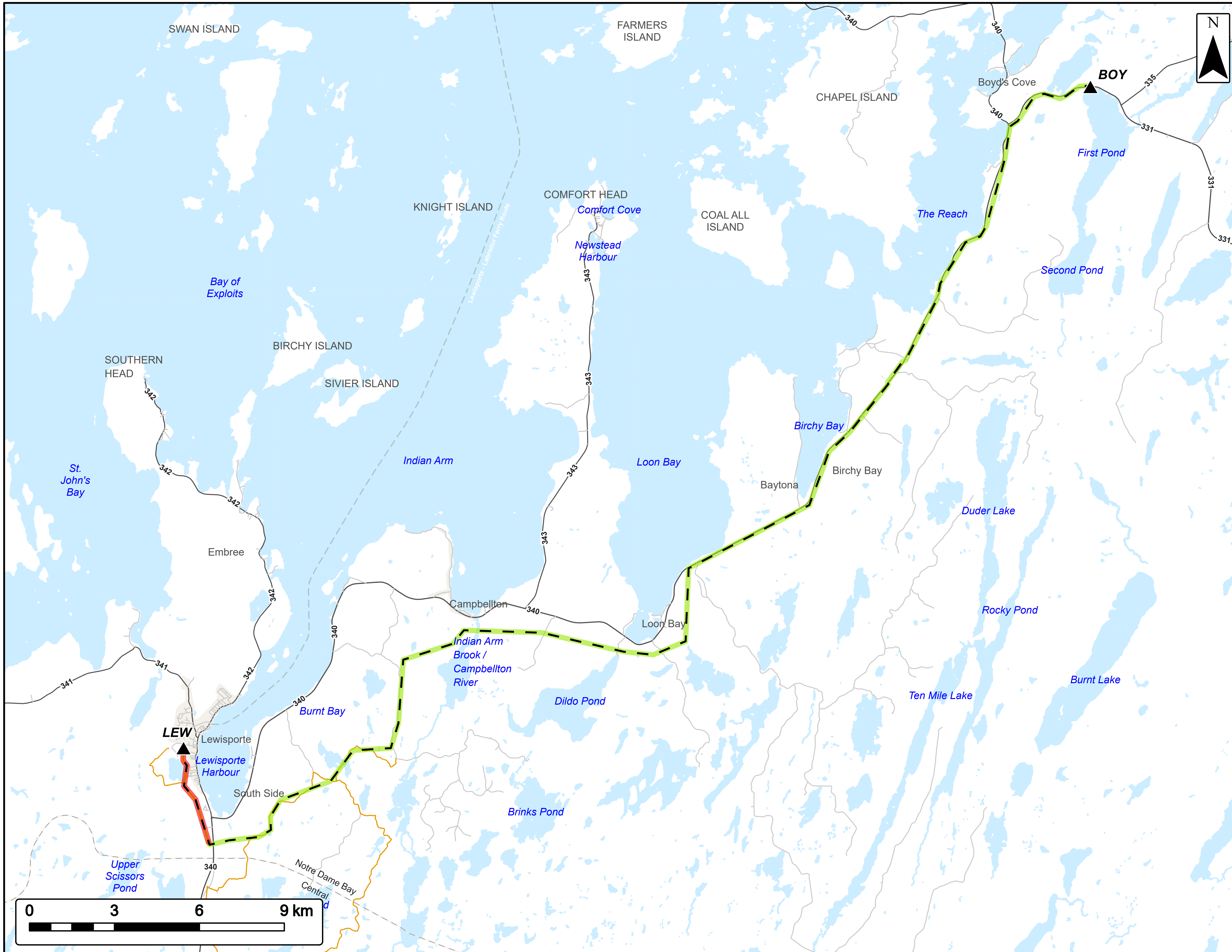
Appendix A
Drawings



Project Overview

Transmission Line 148-L

Newfoundland Power

Legend	
Substation	▲
Snowmobile Trail (Newfoundland and Labrador Snowmobile Federation Inc.)	
Secondary Road	
Primary Road	
Transmission Line	
Pre Existing ROW	
New ROW	

Coordinate System: NAD 1983 CSRS UTM Zone 21N

Sources: ESRI Basemaps, GeoNOVA, NSTD, HERE, Garmin, USGS, NRCan, NFLD Gov. Depts

Date: March 2025	Project #: 24-11039
Scale: 1:130,000	Drawing #: 1
Drawn By: M. Trotman	
Checked By: B. Spencer	

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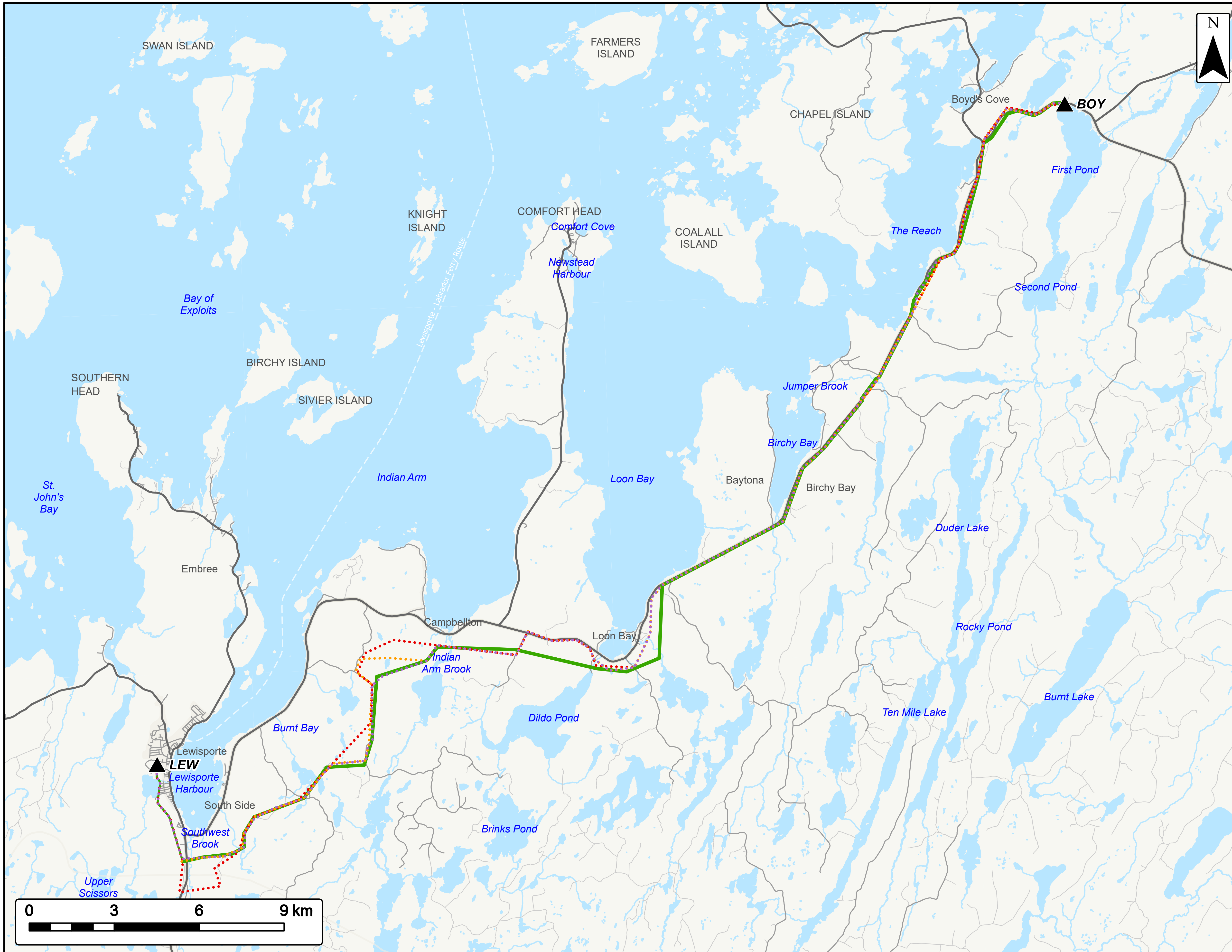
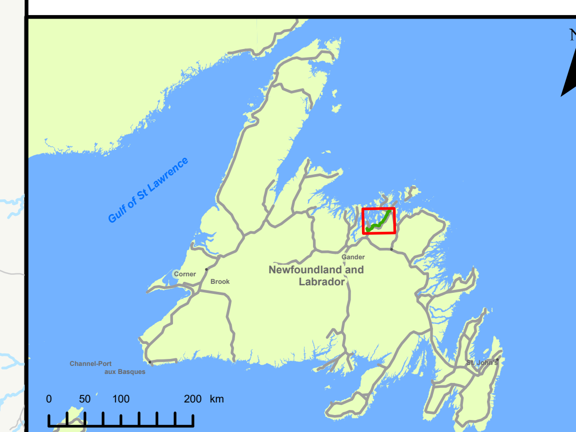


Alternate Routes

Transmission Line 148-L

Newfoundland Power

Legend	
Substation	▲
Alternate Route 1	red dotted line
Alternate Route 2	orange dotted line
Alternate Route 3	purple dotted line
Primary Road	dark grey line
Secondary Road	grey line
Resource Road	light line
Project Area (30m ROW)	green



Coordinate System: NAD83 UTM Zone 20N

Sources: ESRI Basemaps, GeoNOVA, NSTD, HERE, Garmin, USGS, NRCan, NFLD Gov. Depts

Date: May 2025	Project #: 24-11039
Scale: 1:130,000	Drawing #: 2
Drawn By: B. Spencer	
Checked By: N. Thomas	

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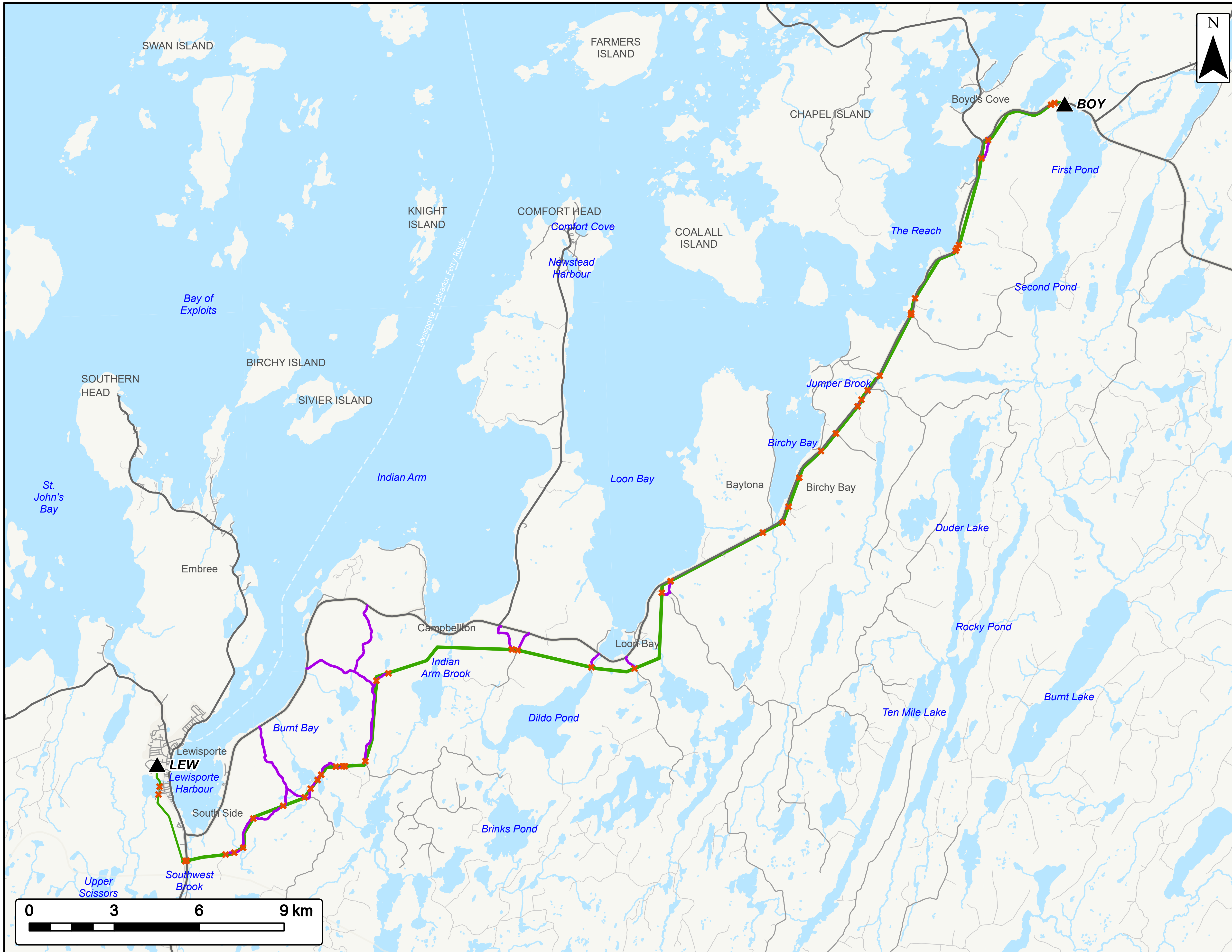
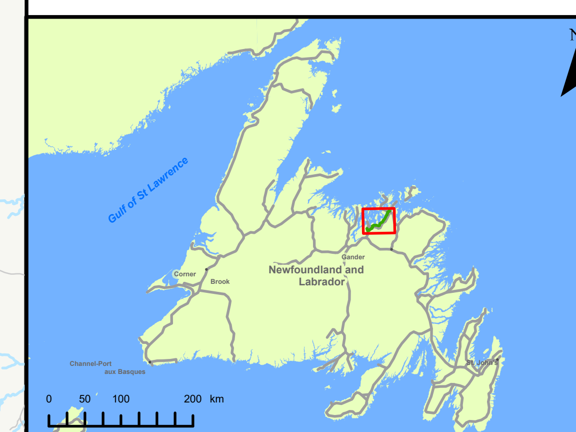


Right of Way Access Routes

Transmission Line 148-L

Newfoundland Power

Legend	
ROW Access Location	✖
Substation	▲
Exisitng Access Route	
Primary Road	
Secondary Road	
Resource Road	
Project Area (30m ROW)	



Coordinate System: NAD 1983 CSRS UTM Zone 21N

Sources: ESRI Basemaps, GeoNOVA, NSTD, HERE, Garmin, USGS, NRCan, NFLD Gov. Depts

Date: May 2025	Project #: 24-11039
Scale: 1:130,000	Drawing #: 3
Drawn By: B. Spencer	
Checked By: N. Thomas	

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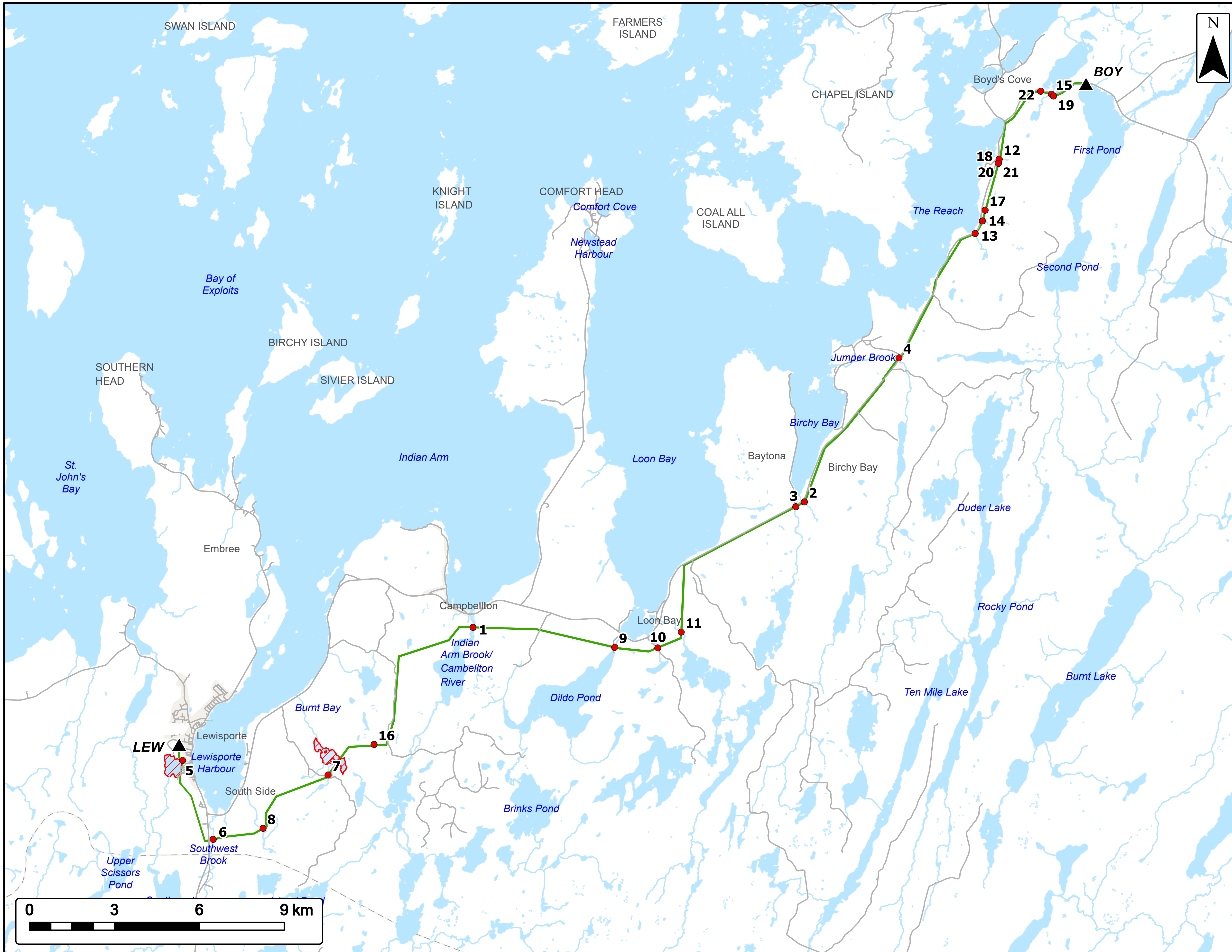

Watercourse Crossings

Transmission Line 148-L

Newfoundland Power

Legend	
Substation	▲
Watercourse Crossing	●
Road	
Watercourse	
Waterbody Within 20m of Project Area	
Waterbody	
Project Area (30m ROW)	

Coordinate System: NAD 1983 CSRS UTM Zone 21N

Sources: ESRI Basemaps, GeoNOVA, NSTD, HERE, Garmin, USGS, NRCan, NFLD Gov. Depts

Date: March 2025	Project #: 24-11039
Scale: 1:130,000	Drawing #: 4
Drawn By: M. Trotman	
Checked By: B. Spencer	

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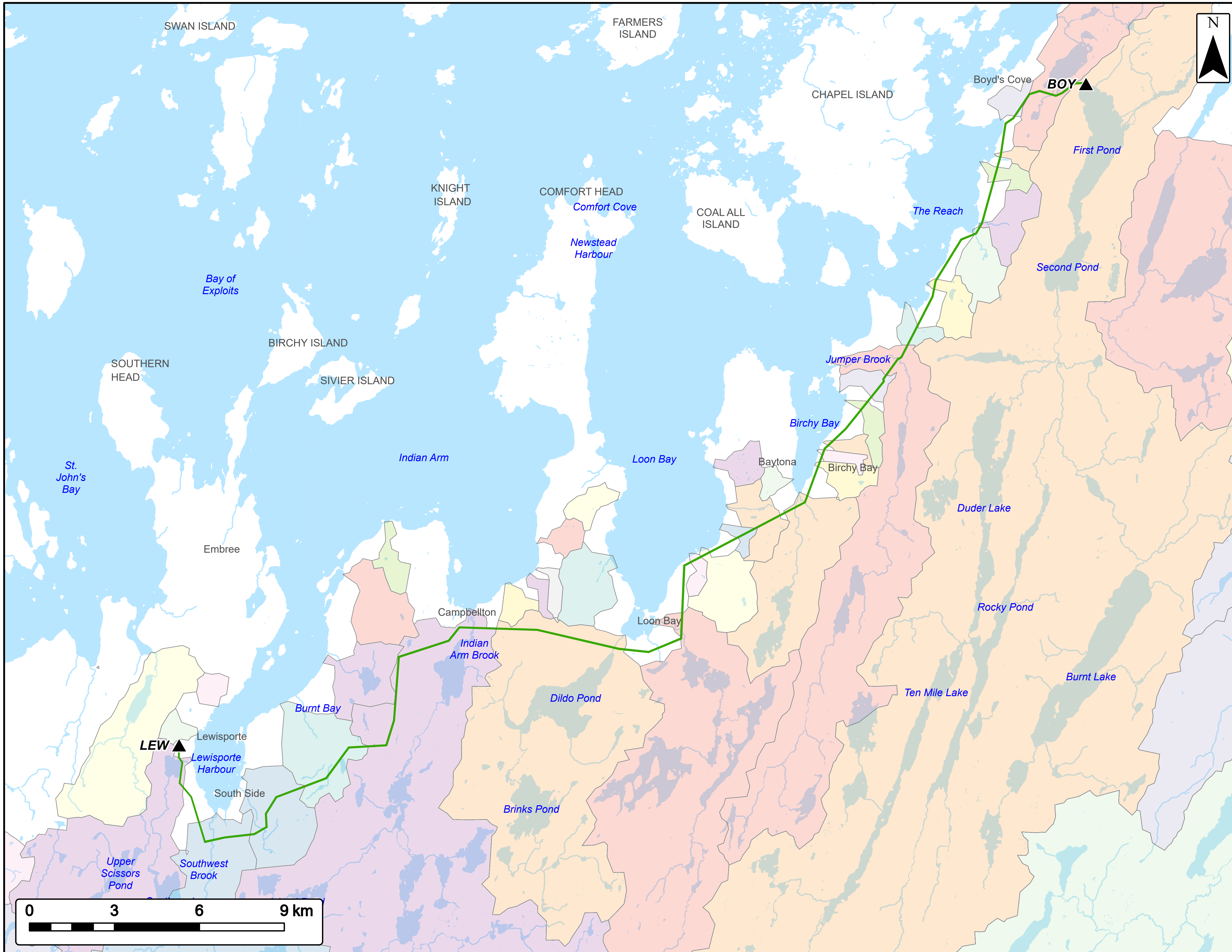

Watersheds

Transmission Line 148-L

Newfoundland Power

Substation	▲
Watercourse	
Watershed	
Waterbody	
Project Area (30m ROW)	

Coordinate System: NAD 1983 CSRS UTM Zone 21N

Sources: ESRI Basemaps, GeoNOVA, NSTD, HERE, Garmin, USGS, NRCan, NFLD Gov. Depts

Date:	March 2025	Project #:	24-11039
Scale:	1:130,000	Drawing #:	5
Drawn By:	M. Trotman		
Checked By:	B. Spencer		

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APPENDIX B
THE GANDER – TWILLINGATE TRANSMISSION SYSTEM PLANNING STUDY: JUNE 2024

NEWFOUNDLAND POWER
A FORTIS COMPANY

3.1 Gander - Twillingate Transmission System Planning Study

June 2024

Prepared by: Tony Jones, P.Eng

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TABLE OF CONTENTS

Page

1.0 INTRODUCTION

This system planning study was initiated as a result of three critical issues that have been identified on the 66 kV transmission network that supplies customers in the Gander - Twillingate area: (i) a transmission-level undervoltage condition; (ii) Transmission Line 108L requiring replacement; and (iii) Gander ("GAN") Substation system power transformer GAN-T2 requiring replacement.

Transmission Line 108L is 59 years old and is among the oldest in Newfoundland Power Inc.'s ("Newfoundland Power" or the "Company") service territory. Recent inspections have indicated that a significant number of structures on Transmission Line 108L have deteriorated to the point where they require replacement. Similarly, GAN-T2 is 57 years old, and a condition assessment of the transformer shows that it is deteriorating and requires replacement.

Due to the high capital costs associated with rebuilding Transmission Line 108L and replacing GAN-T2, other transmission reconfiguration alternatives were examined to address their replacement and determine a solution that could mitigate the undervoltage condition. This study identifies the capital projects required to provide safe, reliable, least-cost electrical service to the Gander - Twillingate area (the "Study Area").

2.0 BACKGROUND

The 66 kV transmission network supplying the Study Area is supplied from 138/66 kV system power transformers at Cobb's Pond ("COB") and GAN substations. Both COB and GAN substations are part of the Central Newfoundland 138 kV network, which receives supply from Newfoundland and Labrador Hydro's ("Hydro") Stony Brook ("STY") and Sunnyside ("SUN") terminal stations. The 138 kV network spanning Central Newfoundland was built throughout the 1970's and 1980's following the construction of the Bay D'Espoir hydroelectrical development in 1967.

Prior to the development of the 138 kV transmission network in Central Newfoundland, Newfoundland Power operated several 66 kV transmission lines in the area that provided power to customers, including transmission lines 101L and 102L, which were largely retired as part of Newfoundland Power's *2019 Capital Budget Application, Central Newfoundland System Planning Study.* [1]

The 66 kV transmission network supplying the Study Area serves 6,513 Newfoundland Power customers through the following substations: Gander Bay ("GBY"); Summerford ("SUM"); Twillingate ("TWG"); Jonathan's Pond ("JON"); and Roycefield ("RFD"). In addition, the 66 kV transmission network supplies approximately 1,800 Hydro customers on Fogo Island and Change Islands, through Hydro's Farewell Head ("FHD") Terminal Station. Supply to FHD Terminal Station is through Hydro's 66 kV Transmission Line TL-254 and is wheeled through Newfoundland Power's 66 kV transmission network at Boyd's Cove ("BOY") Substation.

1 The retirement of Transmission Line 102L excluded a 23-kilometre section of the original line, which remains in-service today.

Table 1 provides customer counts for each of the substations within the Study Area.

Table 1
Gander – Twillingate Area
Customer Counts

Substation	Customer Count
GBY	2,317
SUM	2,421
TWG	1,769
FHD (Hydro)	1,800
JON	5
RFD	1
Total	8,313

2.1 Gander - Twillingate 66 kV Transmission Configuration

The Gander - Twillingate 66 kV transmission network is supplied by two radial transmission lines during normal conditions: (i) Transmission Line 142L, which originates from COB Substation; and (ii) Transmission Line 108L, which originates from GAN Substation.

Transmission Line 142L was built in 1978 and is supplied from COB Substation system power transformer COB-T2 and connects to Transmission Line 114L in back country approximately 1.7 kilometres from GBY Substation, in an area known as Clarke's Head. Transmission Line 114L was built in 1972 and extends from Clarke's Head and travels north to BOY Substation. From there, Transmission Line 114L continues on to SUM Substation, and Transmission Line 140L connects TWG Substation to SUM Substation.

Together, transmission lines 142L and 114L form the primary source of supply to all customers downstream of BOY Substation, including SUM and TWG substations and FHD Terminal Station.[2]

Transmission Line 108L is supplied from GAN Substation system power transformer GAN-T2 and travels north, providing the primary source of supply to JON and GBY substations.

2 There are no customers supplied directly from BOY Substation; rather, BOY Substation serves as a 66 kV switching yard.

A normally-open switch at GBY Substation permits Transmission Line 108L to connect to transmission lines 142L and 114L for emergency backup purposes.[3]

An area map is provided in Figure 1 and a simplified single-line diagram of the existing 66 kV configuration is provided in Figure 2.

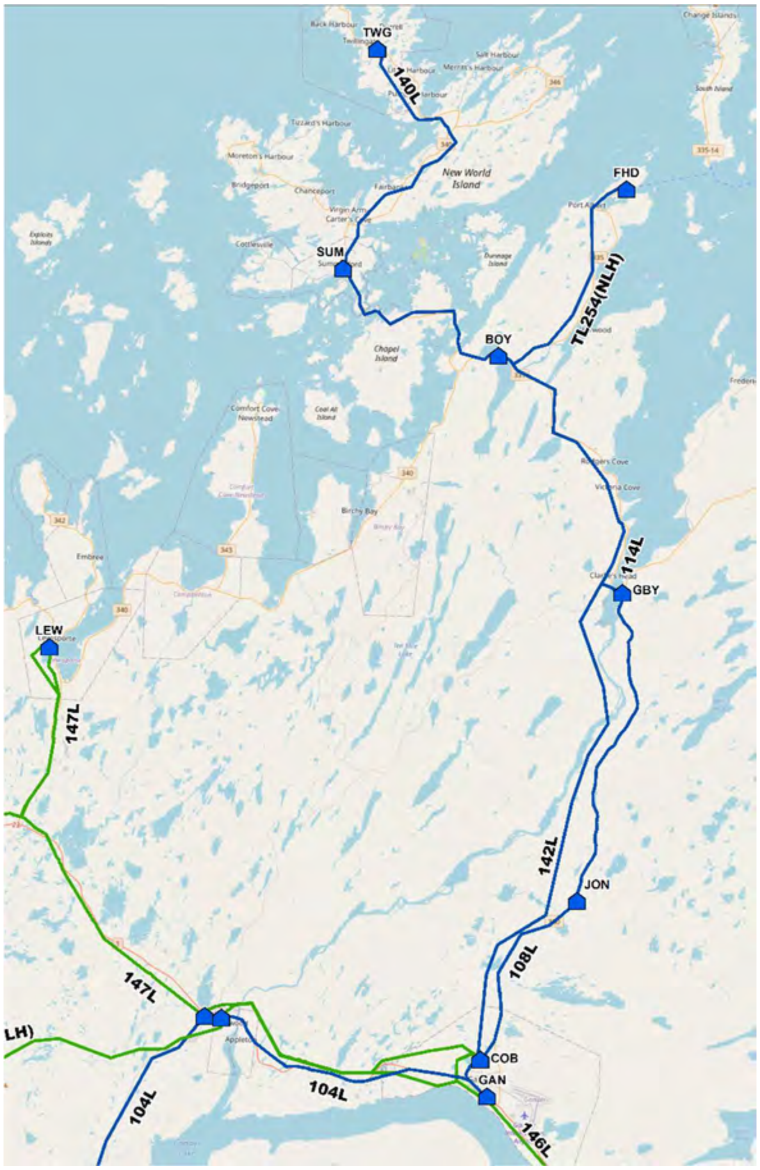


Figure 1: Map of Existing Gander – Twillingate Area Transmission Configuration

3 The primary function of the normally-open switch is to reduce the risk of customer outages, while also avoiding a voltage collapse and potential overloads under contingency scenarios. When closed, a fault on the 66 kV system at JON or GBY substations would result in an outage to approximately 6,000 customers supplied by SUM, TWG and FHD. Furthermore, if closed, a fault on the transmission lines 142L and 114L network would result in a widespread undervoltage condition to the remaining section, as well as an overload to GAN-T2 under peak conditions.

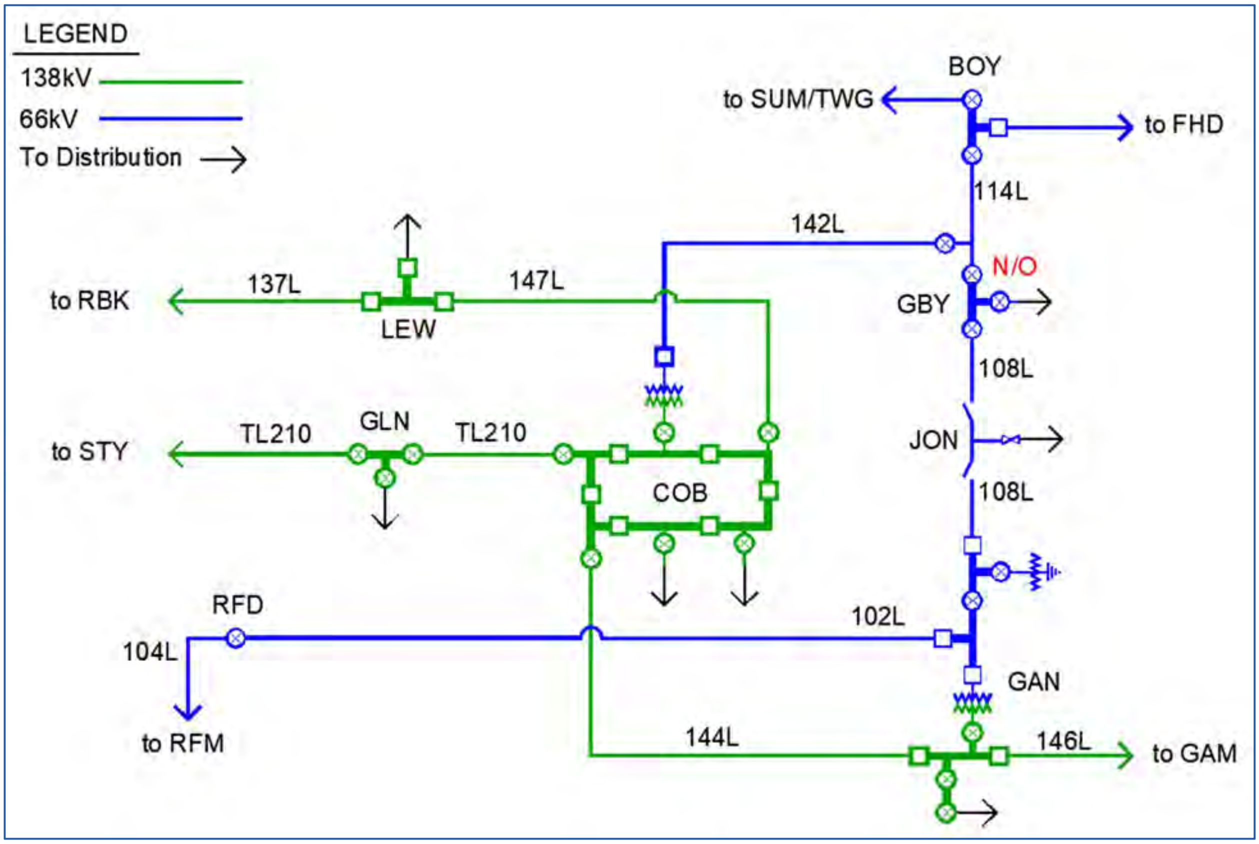


Figure 2: Single Line Drawing of Existing Gander – Twillingate Area Transmission Configuration

To facilitate maintenance and emergency outages, the normally-open switch at GBY Substation can be closed. With Transmission Line 108L out of service, transmission lines 142L and 114L can supply approximately 90% of the peak demand at GBY, SUM and TWG substations as well as FHD Terminal Station. Conversely, with Transmission Line 142L out of service, Transmission Line 108L can supply approximately 65% of the peak demand observed at JON, GBY, SUM, TWG substations and FHD Terminal Station.

2.2 Risk Assessment of Existing 66 kV Transmission System

Four areas of risk have been identified pertaining to the existing 66 kV transmission network serving the Study Area: (i) a system planning voltage violation; (ii) Transmission Line 108L requiring replacement; (iii) system power transformer GAN-T2 requiring replacement; and (iv) the results of a system power transformer contingency assessment, which indicates the potential for substantial customer outages following the loss of system power transformer COB-T2. Each area of risk is described further in this section.

Due to the severity of each of the risks identified, up to 8,313 Newfoundland Power and Hydro customers are at significant risk of extended outages unless transmission system upgrades are pursued.

System Planning Voltage Violation

Table 2 provides Newfoundland Power's system planning criteria with respect to permissible transmission line voltages in per-unit ("pu").

Table 2
Newfoundland Power's
Transmission Voltage Criteria

Operating Condition	Minimum Voltage (pu)	Maximum Voltage (pu)
Normal	0.95	1.05
Emergency	0.90	1.06

Due to the relatively large area supplied by the 138 kV transmission network in Central Newfoundland, the transmission network is relatively weak compared to other transmission networks on the island.[4] In particular, areas furthest from the infeed supply points at SUN and STY terminal stations, which include the Study Area, are prone to relatively lower voltage conditions under high load.

During the 2022 to 2023 and 2023 to 2024 winter seasons, the average per-unit 138 kV voltage at GAN Substation was 0.98 pu, and voltages were below 0.95 pu for roughly 140 hours. Due to on-load tap changers ("OLTC") on distribution power transformers in the area, Newfoundland Power's distribution feeders at GAN Substation and nearby distribution feeders at COB Substation were able to operate within normal voltage limits.

System power transformers at GAN and COB substations supply the downstream 66 kV networks that serve the Study Area. Specifically, GAN-T2 supplies Transmission Line 108L, which serves GBY and JON substations, while COB-T2 supplies transmission lines 142L and 114L, which serve SUM and TWG substations and FHD Terminal Station through BOY Substation.

The 66 kV transmission voltages downstream of BOY Substation are the lowest in the Company's service territory. This is partly due to the relatively low 138 kV infeed voltages at COB and GAN substations, but primarily a result of the combined length and overall load served through the 66 kV Gander - Twillingate area network.[5]

4 The "strength" of a power system can be quantified by short-circuit levels. Short-circuit levels at the GAN 138 kV bus are 680 MVA. In comparison, short circuit levels at the SUN 138 kV bus are approximately 1,500 MVA. In the St. John's 66 kV network, short-circuit levels are as high as 2,200 MVA.

5 Large loads supplied by longer transmission lines will result in larger voltage drops across the line in comparison to large loads supplied by shorter transmission lines.

Table 3 shows a summary of various 66 kV transmission networks with respect to their five-year forecast peak demand versus total length of the supplying transmission lines.

Table 3
Overview of Radial 66 kV Transmission Supply Networks

Transmission Network	Peak Demand (MVA)	Length (Kilometres)
Gander - Twillingate Area	31.7	167.7
142L/114L[6]	24.1	123.8
108L	7.6	43.9
Other Areas		
59L	43.9	8.8
50L/55L	20.6	43.3
94L/95L	8.1	87.0
353L	5.7	24.6
358L	7.1	22.9

As shown in Table 3, the total length of the Gander - Twillingate 66 kV transmission network is substantially longer than other 66 kV networks, and the relatively high load served by this network contributes to the poor voltages observed. Other larger 66 kV networks in the Company's service territory either have additional sources of generation that provide material voltage support, such as in the Wesleyville and Port-Aux-Basques areas, or are sufficiently interconnected through looped configurations near infeed points, such as the St. John's 66 kV network.

The 66 kV transmission voltages at and downstream of BOY Substation are consistently lower than Newfoundland Power's planning criteria for transmission voltages.

6 Includes lengths of transmission lines 140L and TL254.

Figures 3 and 4 show the most recently available transmission voltage profiles for BOY and TWG substations, respectively.[7]

Figure 3
BOY Substation 66 kV Voltages
(per-unit)

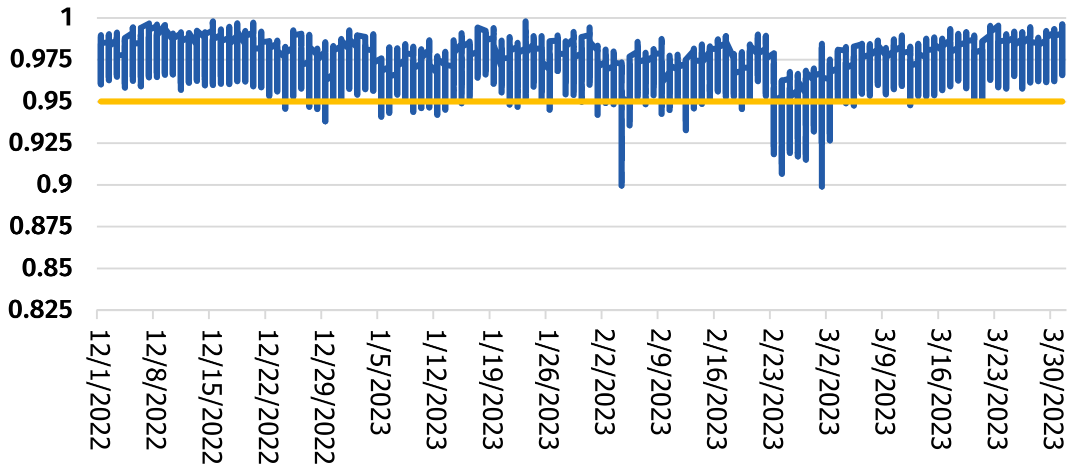
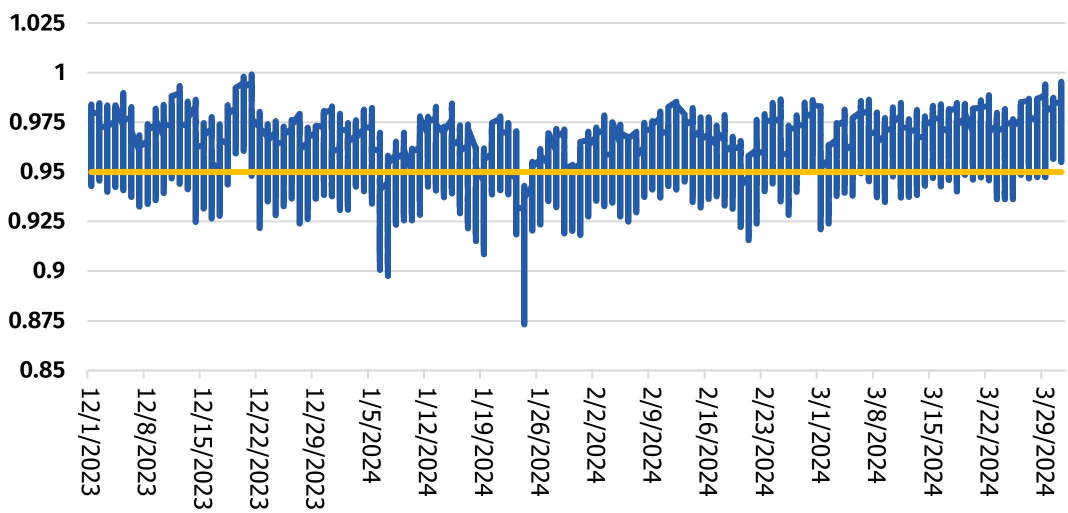


Figure 4
TWG Substation 66 kV Voltages
(per-unit)



7 Due to metering issues, per-unit voltage data from BOY Substation for the 2023 to 2024 winter season are unavailable. As a result, the most recent available data for BOY Substation is from the 2022 to 2023 period. Power system modeling indicates that BOY substation voltages for the 2023 to 2024 winter season are lower than those observed during the 2022 to 2023 winter season.

Over the course of the most recent 2023 to 2024 winter season, the incoming 66 kV transmission voltage at TWG Substation has been below 0.95 pu for approximately 31% of the entire period. Furthermore, this voltage was below the emergency limit of 0.90 pu for 6.5 hours during the winter period, with a record low of 0.873 pu observed on the most recent seasonal peak day of January 24th, 2024.[8]

In addition to the observed voltage violations, the Company uses power system modeling software to model the transmission network under forecast load conditions. The latest transmission models indicate that any additional load growth associated with electrification will further result in unacceptable transmission voltages at and downstream of BOY Substation. As a result, a voltage mitigation project is recommended to ensure the provision of reliable electricity to the Gander - Twillingate area.

Transmission Line 108L Condition and Reliability Assessment

Transmission Line 108L was constructed in 1965 and is approximately 44 kilometres in length. The line consists of 396 Single Wood Pole structures with 2/0 ACSR which is no longer standard conductor for the Company's transmission lines.[9] The conductor is roughly 60 years old and is approaching the end of the typical useful service life for transmission line conductor.[10]

Transmission Line 108L was not designed to meet current standards for the design of overhead lines. The Canadian Standards Association ("CSA") establishes standards for the construction of overhead systems based on local climatic conditions. At the time of construction in 1965, Transmission Line 108L was designed to withstand sustained winds of 90 km/hour. Current CSA standards require that overhead lines be constructed based on actual historical climate data.[11] Based on this parameter and the actual historical wind speed data which is provided in the standard, Transmission Line 108L should be designed to withstand winds of upwards of 120 km/hour. The substandard design of Transmission Line 108L means it is not built to withstand local climatic conditions, which increases the probability of failure.

Transmission Line 108L has been inspected annually over the last decade. Annual inspections are conducted by experienced Planners that follow the Company's *Transmission Line Inspection and Maintenance Practices*. In conducting annual inspections, Planners create work requests to correct identified deficiencies. Work requests are categorized as Emergency, TD1, TD2 or TD4.[12]

TD4 work requests represent deficiencies to be addressed as part of Newfoundland Power's longer-term capital planning process. The Company monitors these work requests to inform its future capital investment priorities.

---

8 A per unit value of 0.873 on a 66 kV system is 57.6 kV; on a 120 V system, it is 104.8 V.

9 ACSR is a bare overhead conductor with aluminum outer strands and a steel core.

10 The typical useful service life of transmission overhead conductor is 63 years.

11 CSA Standard C22.3 - Overhead Systems states: "*it is mandatory in the standard to consider a maximum wind-only weather load case in the design of overhead lines. The magnitude of this wind is required, as a minimum value, to be that which can be predicted to occur at least once in every 50-year period.*"

12 The highest priority for Planners inspecting transmission lines is to identify deficiencies categorized as Emergencies, TD1 or TD2. These deficiencies require action over the near term to address or avoid failure of transmission assets. Work requests for Emergency deficiencies must be addressed immediately. Work requests for TD1 deficiencies must be addressed within seven days and those for TD2 deficiencies must be addressed within one month.

Since 2009, 515 TD4 deficiencies have been identified by Planners completing inspections across Transmission Line 108L. Due to the large number of known deficiencies on the line, Newfoundland Power initiated an engineering assessment of Transmission Line 108L in 2024.

The engineering assessment included a detailed ground inspection. The inspection determined that 238 of the structures across the line contain wood poles which are deteriorated to the point where they require replacement. On a single pole transmission line, the wood pole is the main component of each structure. It provides the primary support for the structure; all other components are inherently dependent upon the wood pole for support. Having a large percentage of wood poles across the line in deteriorated condition increases the risk of a failure to the line.

Many of the poles on Transmission Line 108L have significant shell separation. Shell separation occurs when the pole shrinks over time and the outer shell separates from the core of the pole. This creates a safety risk for employees climbing the poles to perform maintenance as the deteriorated shell is unable to support the weight of the climber and the climber's spikes can tear out of the pole. It also leaves the core of a pole exposed to moisture and fungus, which accelerates wood rot, compromising its strength over time and increasing the probability of failure.

The original poles installed on the line are Class 4 and 5, which are no longer used by Newfoundland Power to construct transmission lines. Additionally, considerable narrowing has occurred at the top of many poles along the line. This level of deterioration makes it susceptible for hardware to disconnect from the pole.

The poles comprising Transmission Line 108L are also experiencing severe splits and woodpecker holes. Similar to shell separation, deep splits and woodpecker holes can undermine the strength of a pole and introduce avenues for internal decay. Sounding tests also determined that many of these poles are exhibiting hollowness, meaning their strength has already been compromised.[13]

Additionally, the assessment determined that other structure components across the line were deteriorated. A total of 108 structures were identified as having other deficiencies such as damaged or deteriorated crossarms, missing timber cribs, cracked insulators, missing or damaged hardware and damaged conductor.

Appendix A provides additional photos of the deterioration present on Transmission Line 108L.

[13] A sounding test is conducted using a flat faced hammer to sound the pole surface at regular intervals. If a hollow sound is detected, it indicates that decay is present. Poles that have been in service more than 35 years require a sounding test during each inspection. If a sounding test indicates a potential problem, a core sampling test can be completed by drilling through the centerline of the pole to observe the decay.

Insulators

Transmission Line 108L has a number of structures containing porcelain insulators manufactured by Canadian Ohio Brass, which were installed when the line was originally constructed. Failure of these porcelain insulators due to cement growth and radial cracking is a known problem. The presence of these Canadian Ohio Brass insulators on the line increases the risk of a failure occurring due to their known deterioration issues.

Conductor

The 2/0 ACSR conductor used in the original construction of Transmission Line 108L is particularly susceptible to corrosion between the inner steel core and the outer aluminum strands. In October 2023, a failure of this conductor resulted in an extended outage to customers in the Study Area, and a subsequent de-rating of the ampacity of the line was recommended based on its condition.

Timber Cribs

Timber cribs are installed in areas where structures are located in bog or other areas with unsuitable soil conditions to adequately support the wood pole. Timber Cribs along Transmission Line 108L have been identified as being rotted, missing, or without sufficient rock fill to support the pole. This compromises the overall strength of the cribbed structures, as they were designed to have adequate rock fill to support the loads imposed on the structure.

Reliability

Due to their criticality in serving customers, Newfoundland Power's transmission lines must be maintained to operate to a high standard of reliability. All transmission lines, including Transmission Line 108L, are maintained in accordance with the Company's *Transmission Inspection and Maintenance Practices*.[14]

The historical reliability performance of Transmission Line 108L has been poor, and the line has experienced a number of outages in recent years due to a variety of factors.

[14] Over the last 10 years, approximately $262,000 has been spent on completing corrective and preventative maintenance of Transmission Line 108L.

Table 4 provides planned and unplanned outage statistics for Transmission Line 108L from 2017 to 2023.

Table 4
Transmission Line 108L Outage Events and Durations
(2017-2023)

Date	Planned/ Unplanned	Outage Cause	Duration (Hours)
June 2017	Unplanned	Equipment Damage	21.0
April 2018	Unplanned	Equipment Damage	1.4
August 2018	Planned	Preventative Maintenance	48.9
November 2018	Unplanned	Unknown	0.1
November 2018	Unplanned	Severe Weather	2.1
March 2019	Planned	Preventative Maintenance	4.8
June 2019	Unplanned	Equipment Damage	358.7
November 2019	Unplanned	Unknown	0.1
May 2020	Planned	Preventative Maintenance	8.5
November 2020	Unplanned	Severe Weather	17.0
July 2021	Planned	Preventative Maintenance	3.2
October – December 2021	Planned	Preventative Maintenance	1,015.4
November 2022	Planned	Preventative Maintenance	1.9
May 2023	Unplanned	Unknown	0.1
October 2023	Unplanned	Equipment Damage	9.4

Due to the deteriorated condition of the transmission line, the number of known deficiencies, the age of its components, and sub-standard original design when compared to today's design standards, it is anticipated that unplanned outages due to failures on the line will continue and become more frequent in the future. This will contribute to further reliability detriments to customers served by Transmission Line 108L, who already experience high levels of transmission-related supply interruptions.

GAN-T2 Condition Assessment

System power transformer GAN-T2 was installed in 1967 and is 57 years old. Recent inspections have indicated that GAN-T2 is deteriorating and requires replacement.

A detailed condition assessment of system power transformer GAN-T2, along with an overview of outage impacts, is provided in Newfoundland Power's *2025 Capital Budget Application*, report *2.2 Substation Power Transformer Replacements,* Appendix B.

System Transformer Contingency Assessment

Newfoundland Power operates twelve 138/66 kV system power transformers. These transformers typically serve as sources of supply for numerous distribution transformers, and can provide power to substantial amounts of customers. As a result, customer impacts associated with unexpected outages to system power transformers was considered, and an unexpected loss of COB-T2 would result in substantially more customer outages than any other system power transformer within the Company's service territory.[15]

Each of the alternatives presented in section 3.0 would result in decreases to the customer impacts associated with an outage of COB-T2, which are further quantified in section 4.3.

3.0 DEVELOPMENT OF ALTERNATIVES

This section provides an overview of the development of alternatives that satisfy the following criteria:

1. Transmission supply voltages at BOY, SUM, TWG Substations must operate between 0.95-1.05 during normal operating conditions.
2. Transmission Line 108L must either be retired or replaced, while ensuring reliable supply to customers in the Study Area.
3. System power transformer GAN-T2 must either be replaced or relocated, while ensuring reliable supply to customers in the Study Area.
4. Customer risks associated with an outage of COB-T2 cannot increase.
5. Existing levels of transmission backup capabilities within the Study Area cannot be reduced.

3.1 Viable Alternatives

Three alternatives were deemed technically viable and were assessed further:

1. Alternative 1 involves rebuilding Transmission Line 108L, replacing GAN-T2, and relocating COB-T2 to BOY Substation.
2. Alternative 2 involves building a new 138 kV Transmission Line from LEW Substation to BOY Substation, retiring 41.5 kilometres of Transmission Line 108L, and installing the GAN-T2 replacement at BOY Substation.
3. Alternative 3 involves rebuilding Transmission Line 108L, replacing GAN-T2, and installing a utility-scale battery system at SUM Substation for on-peak voltage support.

[15] A loss of COB-T2 during peak conditions would result in a loss of supply to approximately 4,190 customers.

Alternative 1

Alternative 1 would involve the rebuild of 66 kV Transmission Line 108L to address the deteriorated conditions described in section 2.2 of this report. To mitigate the observed voltage violation in the Study Area, COB-T2 would be relocated to BOY Substation. This would also require the conversion of Transmission Line 142L to 138 kV, as well as the construction of a new 138 kV transmission line extension from Clarke's Head to BOY Substation.

A simplified single line diagram illustrating the proposed final transmission configuration of Alternative 1 is provided in Figure 5.

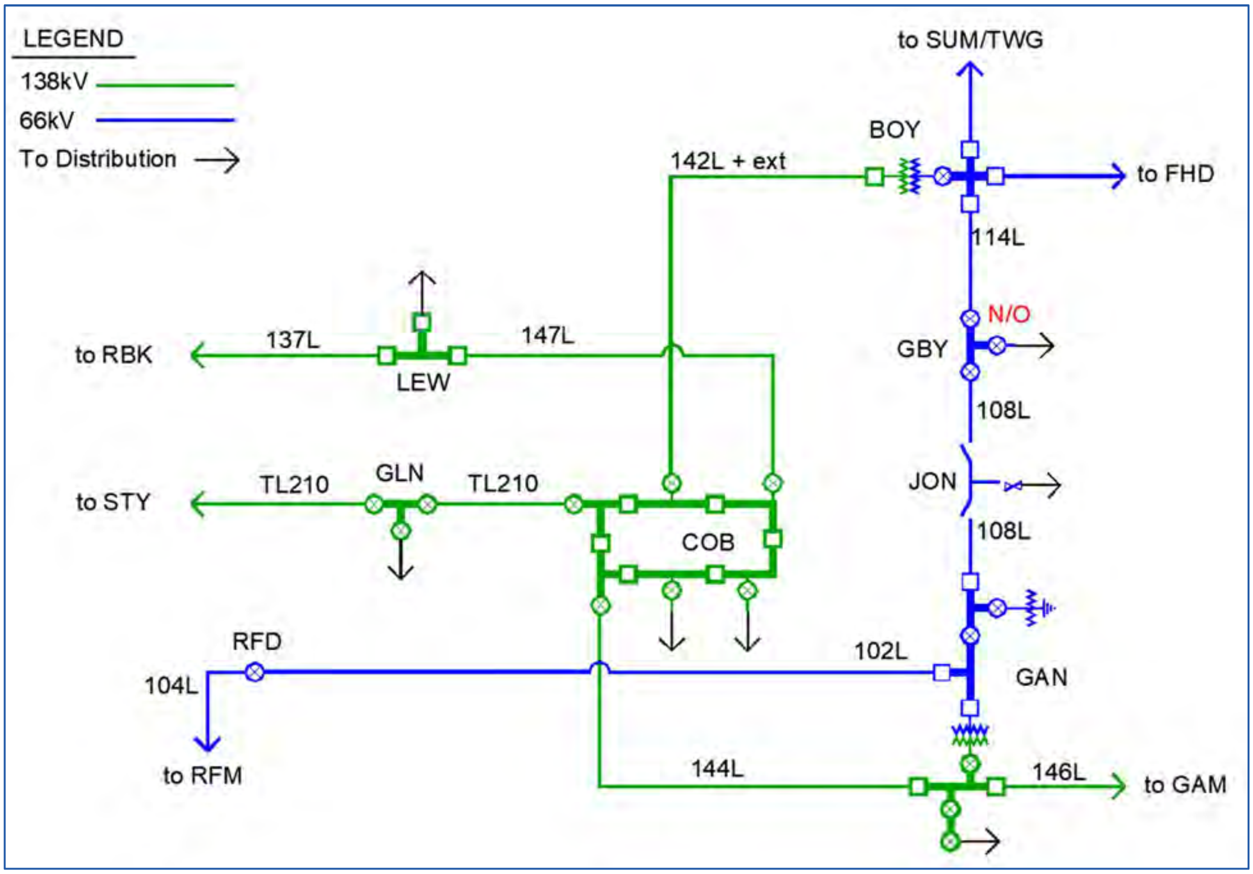


Figure 5: Proposed Single Line Diagram for Alternative 1

Table 5 shows capital costs associated with Alternative 1.

Table 5 Alternative 1 2025–2027 Capital Costs ($ Millions)					
Activity	2025	2026	2027	2030-2036	Total
Rebuild Transmission Line 108L	2.2	8.2	8.1	-	18.5
Replace GAN-T2	0.02	3.9	0.3	-	4.2
Convert Transmission Line 142L to 138 kV and Extend to BOY	-	-	8.8	-	8.8
Relocate COB-T2 to BOY and Upgrade BOY to 138 kV	-	0.5	4.5	-	5.0
Project Total (2025-2027)	2.2	12.6	21.7	-	36.5
Future Rebuilds (2030-2036)	-	-	-	25.4[16]	25.4

It is recognized that transmission lines 142L and 114L are aging assets and will be considered for rebuild in the 2030 to 2036 timeframe under Alternative 1. Similarly, Alternative 1 would involve the continued operation of JON Substation. JON-T1 is 61 years old, and is also expected to be replaced in the 2030 to 2036 timeframe. The impact of these future capital costs is considered further in net-present value ("NPV") analyses of customer revenue requirements, which are provided in section 4.2 of this report.

Following completion of Alternative 1 activities, Newfoundland Power customers in the Study Area would be supplied by combination of 66 kV and 138 kV transmission lines. The impact of the marginal energy and capacity costs associated with modeled losses of this configuration is also considered within the NPV analyses of customer revenue requirements in section 4.2 of this report.

In terms of backup capability, Alternative 1 would involve rebuilding Transmission Line 108L to 559.5 AASC conductor. This would permit Transmission Line 108L to supply approximately 75% of winter demand to the system downstream of GBY, in comparison to approximately 65% of winter peak demand that it can supply today.

[16] Includes costs to rebuild Transmission Line 142L ($16.6M) and 22 kilometres of Transmission Line 114L between GBY and BOY substations ($7.2M), as well as refurbishing JON Substation ($1.6M).

Alternative 2

Alternative 2 would involve the construction of a new 138 kV transmission line from Lewisporte ("LEW") Substation to BOY Substation to resolve the observed voltage violation. This would also permit the primary supply to GBY Substation to be transferred from GAN Substation to BOY Substation through Transmission Line 114L, thereby permitting the majority of Transmission Line 108L to be retired, with approximately 2.5-kilometres remaining in-service to supply Transmission Line 102L, RFD Substation, and Transmission Line 104L.[17] This would facilitate future optimizations of transmission line rebuilds in the 2030 to 2036 timeframe when Transmission Line 142L is expected to reach end-of-life. Presently, Transmission Line 142L runs primarily through back-country, whereas Transmission Line 108L runs primarily roadside.[18] Following the retirement of Transmission Line 108L, Transmission Line 142L could be rebuilt between COB and GBY substations while utilizing the existing Transmission Line 108L right-of-way.

Alternative 2 would effectively result in a 138/66 kV system power transformer no longer being required at GAN Substation. As a result, the newly proposed GAN-T2 transformer replacement outlined in report *2.2 Substation Power Transformer Replacement* would be purchased and installed directly at BOY Substation.

After the installation of the new transformer at BOY Substation, GBY Substation would be supplied by Transmission Line 114L from BOY Substation with a backup supply from Transmission Line 142L from COB Substation. As part of this alternative, a 1.7-kilometre double-circuit extension of transmission lines 142L and 114L would be built from Clarke's Head to GBY Substation. Similarly, a 0.6-kilometre extension between Transmission Line 142L and the remaining section of Transmission Line 108L could be constructed to maintain supply to RFD Substation, if required.

To maintain a ground source at GAN Substation following the relocation of GAN-T2, a 138 kV grounding transformer would be installed at GAN Substation.

Following the eventual retirement of Transmission Line 108L, customers currently supplied by JON Substation would be supplied by a single-phase extension of distribution feeder COB-02. This would also effectively result in the retirement of JON Substation and a reduction of substation assets to be maintained and refurbished in the future.

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17 See Newfoundland Power's *2019 Capital Budget Application, Central Newfoundland System Planning Study* which recommended the deferral of reconfiguring a 23-kilometre section of Transmission Line 102L to a future year, due to uncertainties surrounding the continued operation of the mine served by RFD Substation.

18 Transmission lines that run along the roadside typically have lower maintenance costs due to improved access. They also tend to have reduced outage times as patrols and outage maintenance can be performed in a timelier manner.

The proposed configuration is presented in Figure 6.

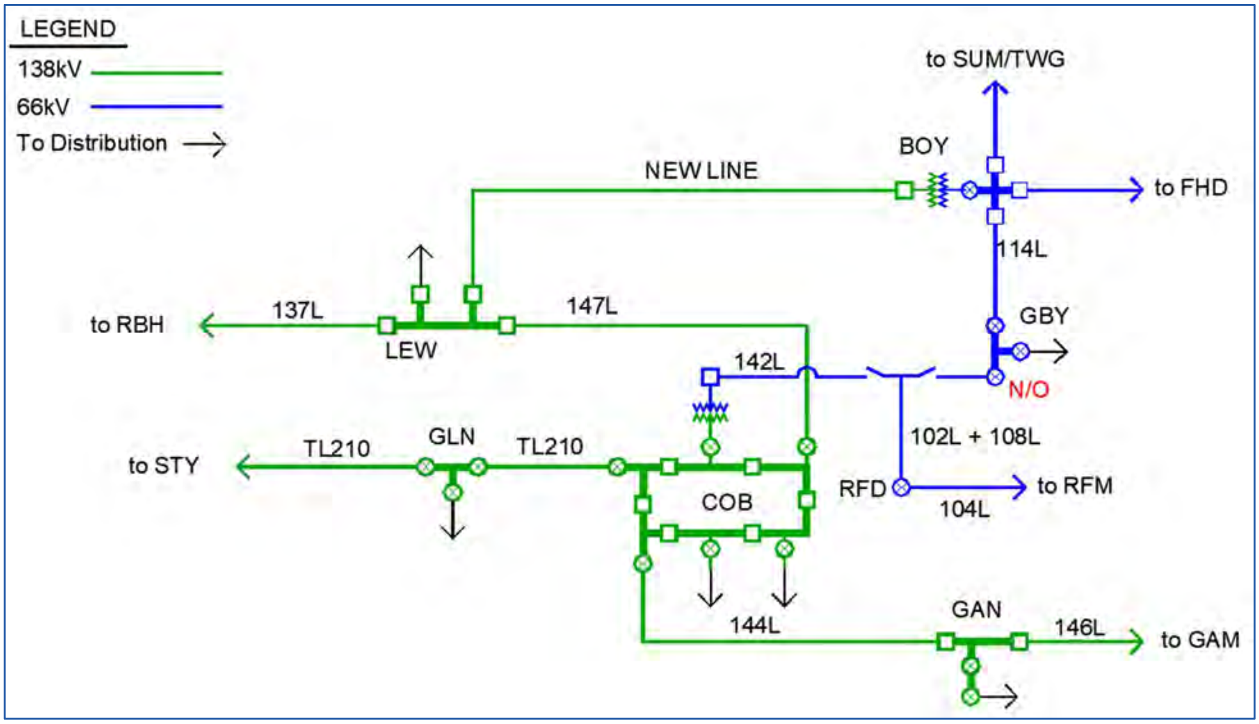

Figure 6: Proposed Single Line Diagram for Alternative 2 (2025-2027)

Table 6 provides capital costs associated with Alternative 2.

Table 6
Alternative 2
2025–2027 Capital Costs ($ Millions)

Activity	2025	2026	2027	2030-2036	Total
Build new transmission line from LEW to BOY substations	1.9	9.3	9.6	-	20.8
Purchase GAN-T2 Replacement for BOY Substation	0.02	3.9	0.3	-	4.2
Convert BOY Substation to 138 kV	-	0.4	4.1	-	4.5
LEW Substation Upgrades (138 kV termination)	-	0.1	1.5	-	1.6
Extension of COB-02 for JON Substation	-	-	1.2	-	1.2
Extension of Transmission Line 142L for GBY and Transmission Line 104L	-	-	1.5	-	1.5
New 138 kV Grounding Transformer for GAN Substation	-	0.02	2.0	-	2.0
Project Total (2025-2027)	1.9	13.7	20.2	-	35.8
Future Rebuilds	-	-	-	23.3[19]	23.3

Under Alternative 2, JON Substation would be retired, and the proposed configuration would also permit Transmission Line 142L to be relocated and rebuilt utilizing the old Transmission Line 108L right-of-way in the 2030 to 2036 timeframe. The impact of these future capital costs is considered further in NPV analyses of customer revenue requirements, which are provided in section 4.2 of this report.

Following completion of Alternative 2 activities, customers in the Study Area would be supplied by a combination of 66 kV and 138 kV transmission lines. The impact of the marginal energy and capacity costs associated with modeled losses of this configuration is also considered within the NPV analyses of customer revenue requirements in section 4.2 of this report.

Following the retirement of the majority of Transmission Line 108L in the 2025 to 2027 timeframe, and the proposed rebuild of Transmission Line 142L in the 2030 to 2036 timeframe, supply to GBY Substation would be from Transmission Line 114L from BOY Substation and backup supply from Transmission Line 142L from COB Substation. The new transmission line from COB Substation would be shorter in length than Transmission Line 108L, and would permit emergency voltage limits to be maintained at 100% peak demand even with the new

[19] Includes costs associated with rebuilding Transmission Line 142L ($16.6M), and rebuilding 20 kilometres of 114L between Clarke's Head and BOY Substation ($6.7M).

transmission line from LEW to BOY substations out of service. As a result, Alternative 2 would facilitate full backup supply of the system.

Furthermore, as Transmission Line 142L is primarily through back country and would be permitted to be rebuilt in the 2030 to 2036 timeframe under Alternative 2, transmission line routes associated with this alternative would consist of more road-side routes in comparison to Alternative 1. This is expected to provide increased operational efficiencies associated with transmission line maintenance as well as improved outage response times.

Alternative 3

A non-wires alternative ("NWA") was also considered as a means to resolve the voltage violation. Power system modeling results indicate that a load reduction downstream of BOY Substation on the order of 10 MW can effectively reduce the voltage drop on transmission lines 142L and 114L such that normal voltage limits can be maintained. To accomplish this, a 40 MWh battery system was considered. Latest utility-scale battery bank cost projections by Cole et al. project capital costs of approximately $23.0 million for such a battery system.

This alternative would also involve maintaining the existing 66 kV network in the Gander area, through the replacement of Transmission Line 108L.

Capital costs associated with this alternative are presented in Table 7.

Table 7
Alternative 3
2025–2027 Capital Costs ($ Millions)

Activity	2025	2026	2027	2030-2036	Total
Rebuild Transmission Line 108L	2.2	8.2	8.1	-	18.5
Replace GAN-T2	0.02	3.9	0.3	-	4.2
New 40 MWh Battery System at SUM Substation	-	-	23.0	-	23.0
Project Total (2025-2027)	2.2	12.1	31.4	-	45.7
Future Rebuilds	-	-	-	25.4[20]	25.4

20 Includes costs to rebuild Transmission Line 142L ($16.6M) and 22 kilometres of Transmission Line 114L between GBY and BOY substations ($7.2M), as well as refurbishing JON Substation ($1.6M).

Following completion of Alternative 3 activities, Newfoundland Power customers in the Study Area would be supplied by solely by 66 kV transmission lines. The impact of the marginal energy and capacity costs associated with modeled losses of this configuration is also considered within the NPV analyses of customer revenue requirements in section 4.2 of this report.

In terms of backup capability, Alternative 3 would involve rebuilding Transmission Line 108L to 559.5 AASC conductor. This would permit Transmission Line 108L to be able to supply approximately 75% of winter demand of the entire Gander - Twillingate 66 kV transmission network. Considering an additional 10 MW on-peak load reduction provided by the battery system, Transmission Line 108L could potentially supply up to 100% of the winter peak demand for up to 4 hours, compared to approximately 65% of winter peak demand that it can supply today.

3.2 Excluded Alternatives

As part of the development of alternatives, several alternatives were considered but were excluded from further consideration due to them not being technically viable, or due to them being cost prohibitive.

Transmission-level capacitor banks were considered as a method to improve system voltages in the Study Area. However, these were deemed to be non-viable, in part, due to the large number of step-sizes required resulting from the low short-circuit levels in the area.[21] Aside from capacitors, the installation of continuous reactive power support devices, such as synchronous condensers, was also considered. However, regardless of their higher costs in comparison to capacitors, such solutions would still require additional transmission line construction or rebuilds to ensure reliability to the area. For this reason, these devices were also excluded from further consideration.

Retiring Transmission Line 108L and GBY Substation was also considered, which would involve supplying GBY Substation customers from other distribution feeders. This was found to be non-viable due to the inability to maintain normal distribution feeder voltages resulting from the long feeder extensions that would be required from SUM and Wesleyville ("WES") substations.

Similarly, retiring Transmission Line 108L and supplying GBY Substation customers directly from BOY Substation through Transmission Line 114L was also considered. This would require COB-T2 to be relocated to BOY Substation to maintain transmission voltages, and would result in all customers from GBY, SUM, and TWG Substations and FHD Terminal Station to be supplied radially from BOY Substation, with no backup capabilities. As per the system power transformer contingency assessment, an outage to COB-T2 results in the greatest risk to customer outages across all system power transformers. This alternative would result in even more customers being supplied by this transformer, thereby resulting in an unacceptable increase in customer risk. Therefore, this option was not considered further.

[21] According to the Institute of Electrical and Electronics Engineers ("IEEE") standard 1543-2022, switching on a capacitor bank on buses greater than 35 kV should be limited to be no more than 2.5% of the short-circuit levels at that particular bus.

Due to the "partial loop" configuration resulting from the normally-open point between Transmission Line 108L and transmission lines 142L and 114L, in conjunction with the observed undervoltage condition, numerous full 138 kV loops were also considered, which would involve the conversion of GBY Substation to 138 kV. However, due to physical limitations at the GBY Substation, the installation of 138 kV infrastructure is not viable. To facilitate the conversion, GBY Substation would have to be relocated, which would incur substantial costs. Therefore, full 138 kV loop alternatives were excluded from further consideration at this time.

4.0 EVALUATION OF ALTERNATIVES

4.1 Evaluation of Transmission Voltages

Power system modeling software was used to simulate transmission voltages over a range of acceptable 138 kV infeed voltages. The Study Area, which includes GBY, BOY, SUM, and TWG substations and FHD Terminal Station, receives its infeed transmission supply from either COB or GAN substations in each alternative described in section 3.1 of this report. Since both Newfoundland Power and Hydro's system planning criteria permit transmission lines to operate as low as 0.95 pu under normal conditions, transmission voltages within the Study Area were modeled with COB and GAN voltages between 0.95 and 1.0 pu.

As shown in Table 8, normal transmission voltages are unable to be maintained during peak conditions within the existing configuration. However, each of the technically viable alternatives described in the previous section result in acceptable transmission voltages, with Alternative 2 having the highest voltage levels.

Table 8
Evaluation of Transmission Voltages
(pu)

COB & GAN Infeed	BOY	SUM	TWG
Existing System			
0.950	0.900	0.876	0.863
0.975	0.914	0.891	0.879
1.000	0.924	0.901	0.889
Alternative 1			
0.950	1.035	1.016	1.006
0.975	1.038	1.019	1.010
1.000	1.040	1.021	1.011
Alternative 2			
0.950	1.037	1.018	1.009
0.975	1.039	1.020	1.010
1.000	1.042	1.023	1.014
Alternative 3			
0.950	0.972	0.960	0.960
0.975	0.977	0.965	0.964
1.000	0.984	0.972	0.972

4.2 Economic Analyses of Alternatives

An NPV analysis of the viable alternatives presented in section 3.1 was completed to determine customer revenue requirements associated with each alternative over the life cycle of the required capital assets. The NPV analysis includes consideration of the value of losses with respect to the latest projection of marginal energy and capacity costs, as well as the potential rebuilds of transmission lines 142L and 114L in the 2030 to 2036 timeframe. Where applicable, JON Substation refurbishment costs were also considered.

Table 9 provides the results of the NPV analysis.

Table 9
NPV Analyses of Viable Alternatives
(2025–2036 Expenditures)
($ Millions)

Alternative #	NPV
1	63.4
2	60.7
3	90.6

Sensitivity Analyses

Three sensitivity analyses were completed that considered impacts to the NPV of customer revenue requirements: (i) the impact of the value of transmission line losses associated with varying marginal energy and capacity costs; (ii) varying estimates by asset class; and (iii) the timing of the transmission lines 142L and 114L rebuild.

For the varying marginal cost analysis, high- and low-marginal cost scenarios were considered. Specifically, under the high-marginal cost scenario, projected marginal energy and capacity costs have been increased by 50%; under the low-marginal cost scenario, projected marginal energy and capacity costs have been decreased by 50%.

Table 10 shows the NPV customer revenue requirement across alternatives with the value of transmission line losses included, based on varying marginal cost scenarios.

Table 10
NPV Sensitivity Analyses
Varying Marginal Costs
($ Millions)

Alternative #	Low Marginal Costs	High Marginal Costs
1	61.0	65.8
2	58.5	62.9
3	88.2	93.0

To analyze the impact of varying estimates by asset class, transmission and distribution-related estimates were increased by 10%, and substation-related estimates were decreased by 10%. Conversely, transmission and distribution-related estimates were decreased by 10%, while substation-related estimates were increased by 10%.

Table 11 shows the impact of varying estimates by asset class on the NPV of customer revenue requirement across alternatives.

Table 11
NPV Sensitivity Analyses
Varying Estimates by Asset Class
($ Millions)

Alternative #	T&D +10% Sub -10%	T&D -10% Sub +10%
1	67.1	59.7
2	63.7	57.6
3	89.8	91.4

Finally, the impact of the timing of the transmission lines 142L and 114L rebuild were also considered. For the base case presented in Table 9 it was assumed that transmission lines 142L and 114L would be rebuilt in 2033.

Table 12 shows the impact of rebuilding transmission lines 142L and 114L in 2030 or 2036 on the NPV of customer revenue requirement across alternatives.

Table 12
NPV Sensitivity Analyses
Timing of 142/114L Rebuild
($ Millions)

Alternative #	2030	2036
1	66.5	60.8
2	63.5	58.2
3	93.7	87.9

Across each of the sensitivities considered, Alternative 2 is the least-cost solution.

4.3 Risk and Reliability Assessment of Alternatives

The system power transformer contingency assessment referenced in section 2.2 illustrated that an unplanned outage to COB-T2 posed the greatest risk to Newfoundland Power across all system power transformer outages in terms of the number of customer outages.

In the current transmission configuration that supplies the study area, a loss of COB-T2 would result in an outage to 4,190 customers. The system power transformer contingency assessment has been expanded to consider the impacts following a loss of COB-T2 for each of the viable alternatives.

Table 13 shows Alternative 2 results in the lowest risk of customer outages following an unexpected loss of COB-T2.

Table 13
Customer Outages Following Unplanned
Loss of COB-T2

Alternative #	Customer Outages
Existing	4,190
1	766
2	0
3	766[22]

22 The battery bank solution proposed in Alternative 3 could supply approximately 2,700 customers for four hours following the loss of COB-T2 during peak conditions. After this time, there would be 766 customer outages.

Furthermore, the alternatives examined in section 3.1 each consist of varying combinations of transmission lines that run primarily through back-country or roadside. For each of the viable alternatives in section 3.1, the right-of-way for Transmission Line 114L between GBY and BOY substations, as well as the right-of-way between COB and GBY substations are anticipated to remain largely unchanged in the long-term. Across alternatives, the primary difference in the proposed transmission reconfigurations involve either maintaining the existing Transmission Line 142L right-of-way, or constructing a new line between LEW and BOY substations.

A comparison of the average distance to the nearest road, as well as the number of off-road vehicle access points per kilometre of transmission line, for each of the supply alternatives to BOY Substation, is provided in Table 14.

Table 14
Overview of Transmission Line Accessibility

Alternative #	Supply to BOY	Average Distance to Road (m)	Access Points per kilometre
Existing	142L	1,126	0.3
1	142L	1,126	0.3
2	New Line from LEW to BOY	378	0.8
3	142L	1,126	0.3

As shown in Table 14, Transmission Line 142L is predominately in back-country, with few access points for off-road vehicles. Conversely, the newly proposed line between LEW and BOY substations would be closer to the road in general, and would also benefit from additional roads that serve as access points for Newfoundland Power field personnel. Therefore, Alternative 2 results in a more accessible transmission right-of-way overall.

Due to Alternative 2 being associated with both a decreased risk resulting from an outage to COB-T2, as well as a more easily accessible transmission line for maintenance and outage response purposes, Alternative 2 is expected to provide the most reliable configuration.

5.0 RECOMMENDATION

The economic evaluation performed in section 4.2 indicates that Alternative 2 is the least cost alternative that meets all of the required technical criteria. An analysis of modeled transmission level voltages in the Study Area demonstrates that Alternative 2 is associated with the greatest level of voltage improvement over the existing configuration. Alternative 2 is also associated with the lowest risk of customer outages, and will also maximize operational efficiencies by having the transmission system in the Gander - Twillingate area closer to the road.

As a result, Alternative 2 is recommended as the best alternative to meet the long-term electrical transmission system requirements of the Gander - Twillingate area at the lowest possible cost consistent with safe and reliable service.

Table 15 shows the multi-year project description and estimated costs for the recommended alternative.

Table 15 Recommended Capital Project Costs ($ Millions)					
Activity	2025	2026	2027	2030-2036	Total
Build new 138 kV TL from LEW to BOY	1.9	9.3	9.6	-	20.8
Purchase GAN-T2 Replacement for BOY	0.02	3.9	0.3	-	4.2
Convert BOY to 138 kV	-	0.4	4.1	-	4.5
LEW Upgrades (138 kV termination)	-	0.1	1.5	-	1.6
Extension of COB-02 for JON	-	-	1.2		1.2
Extension of 142L for GBY and 104L	-	-	1.5	-	1.5
New 138 kV Grounding Transformer for GAN	-	0.02	2.0		2.0
Project Total (2025-2027)	1.9	13.7	20.2	-	35.8
Future Rebuilds	-	-	-	23.3[23]	23.3

[23] Includes costs associated with rebuilding Transmission Line 142L ($16.6M), and rebuilding 20 kilometres of Transmission Line 114L between Clarke's Head and BOY Substation ($6.7M).

Figure 7 shows the proposed route for the new 138 kV transmission line between LEW and BOY substations to be completed from 2025 to 2027.

Figure 7: New 138 kV Transmission Line from LEW – BOY Substations

Appendix A:

Photographs of Transmission Line 108L

Figure A-1: Deep Splits Through Hollow Pole

Figure A-2: Hollow Pole, Large Splits

Figure A-3: Deep Splits, Hollow Pole

Figure A-4: Large Split Through Cross-arm Hardware

Figure A-5: Large Split, Hollow Pole (Shared Transmission/Distribution Structure)

Figure A-6: Pole Top Splits Through Hardware; Narrowing of Pole Top

Figure A-7: Deep Splits Through Pole

Figure A-8: Deteriorated and Narrowed Pole Top

Figure A-9: Missing Timber Crib and Splits in Pole

Figure A-10: Leaning Structure (Double Circuit Structure)

Figure A-11: Twisted Cross Arm Supporting Insulator

Figure A-12: Twisted Cross Arms (Double Circuit Structure)

Figure A-13: Conductor bird-caging