



* Visual simulation of the Project

ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Upper Afton Wind Project

Prepared for: Upper Afton Wind Ltd.



February 2026

**Upper Afton Wind Ltd. c/o
EverWind**

2102, 1969 Upper Water St.
Halifax, NS B3J 3R7

February 27, 2026

Meghan Rafferty
Nova Scotia Environment & Climate Change
Environmental Assessment Branch
#2085 - 1903 Barrington Street
PO Box 442
Halifax, NS B3J 2P8

Dear Ms. Rafferty,

**Re: Environmental Assessment Registration Document
Upper Afton Wind Project**

Please find enclosed the Environmental Assessment Registration Document for the Upper Afton Wind Project.

The undersigned approves and accepts the contents, as submitted to Nova Scotia Environment & Climate Change, Environmental Assessment Branch.

Sincerely,



Trent Vichie
Founder and CEO
EverWind

EXECUTIVE SUMMARY

Upper Afton Wind Ltd., comprised of EverWind NS Holdings Ltd. (EverWind) and Membertou Development Corporation (together as the “Proponent”), is proposing to construct and operate the Upper Afton Wind Project (the “Project”), an onshore wind farm with up to 28 wind turbines.

The Project is located near the communities of Upper Afton, Merland, and New France in the Municipality of the County of Antigonish; and Upper Big Tracadie, South Merland, and Rear Monastery in the Municipality of the District of Guysborough, Nova Scotia. The approximate center of the Project is 45.550643°N, 61.661264°W. The Study Area consists of Crown, municipal, and private land.

The Proponent’s overall vision is to develop an Atlantic Canada green energy hub in Point Tupper, Nova Scotia. The Project aims to utilize renewable energy sources, such as wind energy, to produce green hydrogen and ammonia for both local use and export. This Project is the fourth wind project in EverWind’s Phase 1 Portfolio, which will all use the existing Nova Scotia Power Inc. grid to transmit renewable energy to EverWind’s Point Tupper Green Hydrogen and Ammonia Production Facility.

The Project has been carefully designed and went through multiple layout iterations to reduce potential effects on the environment. The final design maintains compliance with regulated setbacks and separation distances and prioritizes the use of existing roads, with 77% of access roads following previously established roads. The layout has also been refined based on input received from members of the public and the Mi’kmaq of Nova Scotia, and this feedback has been incorporated where feasible to further reduce potential impacts and improve the Project.

The Project is considered a Class I Undertaking under Schedule A of the Nova Scotia Environmental Assessment Regulations, N.S. Reg. 26/95, and therefore, requires the registration of an Environmental Assessment Registration Document. The Environmental Assessment Registration Document has been completed in accordance with the requirements outlined in A Proponent’s Guide to Environmental Assessment (NSECC, 2025a), the Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025d), and the Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c).

The following valued components were identified and evaluated as part of this environmental assessment based on provincial guidance, desktop analysis, and subsequent field studies:

- Atmosphere and air quality
- Climate change
- Sound
- Shadow Flicker
- Geophysical environment
- Surface water and fish & fish habitat
- Wetlands

- Terrestrial vegetation communities and flora
- Terrestrial fauna
- Bats
- Avifauna
- Economy
- Land use and value
- Recreation and tourism
- Archaeological resources

The results of the assessment indicated that the Project, with the implementation of mitigation and monitoring measures, will not result in significant adverse residual effects.

The Project is being developed to support the production of Certified Green hydrogen and ammonia, supporting the reduction of greenhouse gas emissions (i.e., production of renewable energy) and contributing to the economic prosperity within Nova Scotia.

The Proponent has engaged and collaborated (and will continue to do so) with local communities, the Mi'kmaq of Nova Scotia, and government representatives to ensure that any potential concerns identified in association with the Project are addressed and mitigated.

TABLE OF CONTENTS

	<i>page</i>
1.0 PROPONENT DESCRIPTION	1
2.0 PROJECT INFORMATION	2
2.1 Project Introduction.....	2
2.2 Purpose & Need for the Undertaking	3
2.3 Regulatory Framework	4
2.3.1 Federal	4
2.3.2 Provincial	5
2.3.3 Municipal	6
2.4 Funding.....	7
3.0 DESCRIPTION OF THE UNDERTAKING	7
3.1 Geographical Location	7
3.2 Areas of Study	7
3.3 Siting Considerations	8
3.4 Project Proximity to Other Areas	11
3.4.1 Towns or Cities.....	11
3.4.2 Mi'kmaq Communities	11
3.4.3 Other Known Wind Developments	11
3.4.4 Protected Watersheds and Water Areas.....	11
3.4.5 Parks and Protected Areas	11
3.4.6 Important Bird Areas.....	12
3.5 Physical Components.....	12
3.5.1 Turbines.....	12
3.5.2 Road Layout	12
3.5.3 Substation and Power Collection Systems.....	13
3.5.4 Operations and Maintenance Building	13
3.5.5 Meteorological Towers	13
3.5.6 Concrete Batch Plant.....	13
3.5.7 Temporary Laydown Yards	13
3.5.8 Borrow Pits	13
3.6 Project Phases	14
3.6.1 Site Preparation and Construction	14
3.6.2 Operations	19
3.6.3 Decommissioning	19
3.7 Project Schedule	22
4.0 ASSESSMENT SCOPE & METHODOLOGY	22
4.1 Assessment Scope & Approach.....	23
4.1.1 Identification of Valued Components.....	23
4.1.2 Spatial & Temporal Boundaries.....	24
4.1.2.1 Spatial Boundaries	24
4.1.2.2 Temporal Boundaries	24
4.1.3 Species at Risk.....	25

4.1.4	Biophysical Assessment Components and Timing	25
4.1.5	Approach to Receptors	26
4.2	Potential Project-Valued Component Interactions	28
4.3	Effects Assessment Criteria	28
4.4	Monitoring & Follow-up	29
5.0	MI'KMAQ OF NOVA SCOTIA	29
5.1	Engagement	30
5.1.1	Review of Concerns	32
5.1.2	Ongoing Engagement	32
5.2	MEKS	33
5.3	Mi'kmaq Partnerships	33
5.4	Commitments to the Mi'kmaq of Nova Scotia	34
6.0	GOVERNMENT AND PUBLIC ENGAGEMENT	34
6.1	Engagement with Government Departments, Agencies, and Regulators	34
6.1.1	Regulatory Engagement	34
6.1.2	Review of Government Concerns	42
6.2	Public and Stakeholder Engagement	42
6.2.1	Digital Communications	49
6.2.2	Eastern Nova Scotia Exhibition	49
6.2.3	Door-to-Door Outreach	49
6.2.4	Public Open House Events	49
6.2.4.1	2021 and 2022 Open Houses	50
6.2.4.2	January 2026 Open Houses	50
6.2.5	Office	51
6.2.6	Community Liaison Committee	52
6.2.7	Review of Concerns	52
6.2.8	Ongoing Engagement	54
7.0	ATMOSPHERIC ENVIRONMENT	54
7.1	Atmosphere and Air Quality	54
7.1.1	Overview	54
7.1.2	Regulatory Context	54
7.1.3	Assessment Methodology	54
7.1.4	Assessment Results	55
7.1.5	Effects Assessment	58
7.2	Climate Change	62
7.2.1	Overview	62
7.2.2	Regulatory Context	63
7.2.3	Assessment Methodology	63
7.2.4	Assessment Results	64
7.2.5	Effects Assessment	71
7.3	Sound	75
7.3.1	Overview	75
7.3.2	Regulatory Context	75
7.3.3	Assessment Methodology	76

7.3.4	Sound Assessment Results	77
7.3.5	Effects Assessment	77
7.4	Shadow Flicker	80
7.4.1	Overview	80
7.4.2	Regulatory Context	81
7.4.3	Assessment Methodology	81
7.4.4	Assessment Results	82
7.4.5	Effects Assessment	82
8.0	GEOPHYSICAL ENVIRONMENT	84
8.1	Overview	84
8.2	Regulatory Context	84
8.3	Assessment Methodology	85
8.4	Assessment Results	85
8.4.1	Topography	85
8.4.2	Surficial Geology	85
8.4.3	Bedrock Geology	87
8.4.4	Groundwater Quality and Quantity	88
8.4.4.1	Groundwater Wells	88
8.5	Effects Assessment	90
9.0	AQUATIC ENVIRONMENT	93
9.1	Surface Water & Fish and Fish Habitat	93
9.1.1	Overview	93
9.1.2	Regulatory Context	94
9.1.3	Desktop Review	95
9.1.4	Field Assessment	98
9.1.4.1	Field Assessment Methodology	98
9.1.4.2	Field Assessment Results	101
9.1.5	Effects Assessment	118
9.2	Wetlands	126
9.2.1	Overview	126
9.2.2	Regulatory Context	127
9.2.3	Desktop Review	127
9.2.4	Field Assessment	128
9.2.4.1	Field Assessment Methodology	128
9.2.4.2	Field Assessment Results	133
9.2.5	Effects Assessment	146
10.0	TERRESTRIAL ENVIRONMENT	156
10.1	Terrestrial Vegetation Communities and Flora	156
10.1.1	Overview	156
10.1.2	Regulatory Context	157
10.1.3	Desktop Review	157
10.1.4	Field Assessment	162
10.1.4.1	Field Assessment Methodology	162
10.1.4.2	Field Assessment Results	164

10.1.5	Effects Assessment	176
10.2	Terrestrial Fauna	185
10.2.1	Overview	185
10.2.2	Regulatory Context	185
10.2.3	Desktop Review	186
10.2.4	Field Assessment	188
10.2.4.1	Field Assessment Methodology	188
10.2.4.2	Field Assessment Results	191
10.2.5	Effects Assessment	195
10.3	Bats	202
10.3.1	Overview	202
10.3.2	Regulatory Context	202
10.3.3	Desktop Review	203
10.3.4	Field Assessment	205
10.3.4.1	Field Assessment Methodology	205
10.3.4.2	Field Assessment Results	206
10.3.5	Effects Assessment	211
10.4	Avifauna	218
10.4.1	Overview	218
10.4.2	Regulatory Context	219
10.4.3	Desktop Review	219
10.4.4	Field Assessment	223
10.4.4.1	Field Assessment Methodology	223
10.4.4.2	Field Assessment Results	228
10.4.4.3	Habitat Trends with Avian Abundance and Species Diversity	236
10.4.5	Avian Species at Risk Potential Habitat Modelling	237
10.4.5.1	Avian SAR Habitat Modelling Methods	237
10.4.5.2	Avian SAR Habitat Modelling Results	242
10.4.6	Remote Sensing	244
10.4.6.1	Avian Radar Monitoring	244
10.4.6.2	Acoustic Monitoring	245
10.4.7	Effects Assessment	248
11.0	SOCIO-ECONOMIC ENVIRONMENT	259
11.1	Economy	259
11.1.1	Overview and Assessment Methodology	259
11.1.2	Existing Environment	259
11.1.3	Effects Assessment	263
11.2	Land Use and Value	268
11.2.1	Overview and Assessment Methodology	268
11.2.2	Existing Environment	268
11.2.3	Effects Assessment	269
11.3	Recreation and Tourism	273
11.3.1	Overview and Assessment Methodology	273
11.3.2	Existing Environment	274

11.3.2.1	Outdoor Recreation	274
11.3.2.2	Cultural Attractions	274
11.3.2.3	Recreation and Tourism Trends	275
11.3.3	Effects Assessment	275
12.0	ARCHAEOLOGICAL RESOURCES	279
12.1	Overview	279
12.2	Regulatory Context	279
12.3	Assessment Methodology	279
12.4	Assessment Results	280
12.5	Effects Assessment	281
13.0	EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT	283
13.1	Summary of Effects of the Undertaking on the Environment	283
14.0	EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING	290
14.1	Climate Change	290
14.1.1	Increased Air Temperature	290
14.1.2	Changes in Precipitation	291
14.1.3	Sea Level Rise	291
14.2	Natural Hazards	292
14.2.1	Severe Weather Events	292
14.2.2	Wildfire	292
14.2.3	Turbine Icing	293
14.3	Summary of Effects	294
15.0	ACCIDENTS AND MALFUNCTIONS	294
15.1	Erosion and Sediment Control Failures	295
15.2	Fires	295
15.3	General Hazardous Material Spills	296
15.4	Transportation-related Incidents	297
15.5	Structural Damage	298
16.0	CUMULATIVE EFFECTS	299
16.1	Overview	299
16.2	Cumulative Effects Assessment Methodology	299
16.3	Selection of VCs for Evaluation in the CEA	300
16.4	Selection of Spatial and Temporal Boundaries	301
16.5	Other Undertaking in the Area	301
16.6	Cumulative Effects Assessment	304
16.6.1	Terrestrial Effects	304
16.6.2	Avian Mortality	306
16.7	Cumulative Effects Assessment Summary	307
17.0	CONCLUSION	308
18.0	CLOSURE	308
19.0	REFERENCES	310

LIST OF FIGURES

Figure 6.1: Open House 3 (Guysborough Intervale) and 4 (Paqtnkek Mi'kmaq Nation)	51
Figure 6.2: Open House 5 (Heatherton) and 6 (Upper Big Tracadie)	51
Figure 7.1: Windrose Plot for Tracadie Meteorological Station (CXTD) – January 1, 2016, through December 31, 2025 (ISU, 2025)	56
Figure 10.1: Bat Activity per Month	208
Figure 10.2: Bat Activity per Hour	209

LIST OF TABLES

Table 1.1: Proponent and Consultant Contact Information	2
Table 2.2: Provincial Regulatory Requirements	6
Table 2.3: Municipal Requirements	7
Table 3.1: Areas of Study	8
Table 3.2: Summary of Minimum Setbacks and Separation Distances	9
Table 3.3: Turbine Technical Specifications	12
Table 3.4: Project Schedule	22
Table 4.1: Temporal Boundaries	24
Table 4.2: Biophysical Assessment Components and Timing	25
Table 4.3: Assessed Areas	26
Table 4.4: Effects Assessment Criteria	28
Table 4.5: Definition of Significant Residual Environmental Effect	29
Table 5.1: Engagement with the Mi'kmaq of Nova Scotia	31
Table 6.1: Government Meetings and Events	35
Table 6.2: Stakeholder Meetings and Events	43
Table 6.3: Summary of Open Houses	50
Table 6.4: Comments Received from the Public	52
Table 7.1: Climate Data from the Collegeville MET Stations (1996 to 2025)	55
Table 7.2: Wind Data from the Tracadie Meteorological Station (2016 to 2025)	56
Table 7.3: Summary of Regulations Pertaining to Ambient Air Quality in Nova Scotia	57
Table 7.4: Maximum Ambient Air Quality Conditions Observed at Port Hawkesbury (2020 to 2024)	58
Table 7.5: Potential Project-Atmospheric Interactions	59
Table 7.6: Atmosphere and Air Quality Residual Effects	62
Table 7.7: Electricity Fuel Source Emission Factors	67
Table 7.8: Baseline Quantification Summary	67
Table 7.9: Concrete Manufacturing and Transportation Emission Factors	68
Table 7.10: Wind Turbine Transportation Distances	70
Table 7.11: Wind Turbine Transportation Emission Factors	71
Table 7.12: Potential Project-GHG Interactions	71
Table 7.13: Project GHG Emission Summary	72
Table 7.14: Climate Change Residual Effects	75
Table 7.15: Summary of Sound Level Regulations and Guidelines	76
Table 7.16: Potential Project-Sound Interactions	78

Table 7.17: Sound Residual Effects	80
Table 7.18: Potential Project-Shadow Flicker Interactions	82
Table 7.19: Shadow Flicker Residual Effects	84
Table 8.1: Characteristics of Bedrock Geology Underlying the Study Area	87
Table 8.2: Summary of Water Well Records within 2 km of the Study Area	89
Table 8.3: Potential Project-Geophysical Interactions	90
Table 8.4: Geophysical Environment Residual Effects	93
Table 9.1: Named Watercourses and Waterbodies Within the Study Area and a 5 km Buffer	96
Table 9.2: Watercourse Types	99
Table 9.3: Watercourse Characteristics within the Assessment Area	102
Table 9.4: Electrofishing Survey Results	110
Table 9.5: Trapping Survey Results	112
Table 9.6: In-Situ Water Quality Results	116
Table 9.7: Potential Project-Surface Water and Fish and Fish Habitat Interactions	118
Table 9.8: Direct Effect Summary	120
Table 9.9: Surface Water and Fish and Fish Habitat Residual Effects	126
Table 9.10: Classification of Wetland-Associated Plant Species	129
Table 9.11: Indicators of Wetland Hydrology	130
Table 9.12: WESP-AC Version 2 Function Parameters	131
Table 9.13: WESP-AC Version 3.4 Function Parameters	131
Table 9.14: Summary of WESP-AC Assessments Using Version 2.0 for Wetlands within the Assessment Area	136
Table 9.15: Summary of WESP-AC Assessments Using Version 3.4 for Wetlands within the Assessment Area	141
Table 9.16: Summary of Field-Identified Potential WSS, as Determined by the Presence of SAR	145
Table 9.17: Potential Project-Wetland Interactions	146
Table 9.18: Habitat Alteration Potential for Field-Delineated Wetlands	147
Table 9.19: Wetland Resources Residual Effects	156
Table 10.1: Predicted Land Cover Types within the Study Area	159
Table 10.2: ACCDC Flora SAR and SOCI in the Study Area	161
Table 10.3: Vegetation Communities Observed in Study Area	164
Table 10.4: Results of Old-Growth Forest Assessments	168
Table 10.5: Flora SAR and SOCI Observed in the Study Area and Assessment Area	171
Table 10.6: Potential Project Interactions with Terrestrial Vegetation Communities and Flora	176
Table 10.7: Land Cover Types within the Clearing Footprint as a Percentage of the Amount Available within the LAA and RAA	178
Table 10.8: Terrestrial Vegetation Communities and Flora Residual Effects	184
Table 10.9: Moose Habitat Suitability Weighting Scheme	188
Table 10.10: Mammal Assessment Survey Information	189
Table 10.11: Summary Results of the Mammal Field Assessments	191
Table 10.12: Habitat Description for Wood Turtle Transects	192
Table 10.13: Potential Project-Terrestrial Fauna Interactions	195
Table 10.14: Terrestrial Fauna Residual Effects	202
Table 10.15: Known Bat Hibernacula within 100 km of the Study Area	203

Table 10.16: Abandoned Mine Openings with Potential to Support Overwintering.....	204
Table 10.17: Monitoring Periods for Detectors (2023 and 2024).....	206
Table 10.18: Results of the Passive Acoustic Bat Survey (2023 and 2024)	207
Table 10.19: Potential Project Interactions with Bats	212
Table 10.20: Bats and Bat Habitat Residual Effects.....	218
Table 10.21: Avian SAR Recorded within 5 km of Study Area	221
Table 10.22: Avian SAR Recorded within MBBA Squares 20TPR04 and 20TNR94	222
Table 10.23: Avian Surveys Completed for the Project	224
Table 10.24: Potential Avian SAR Habitat within Various Spatial Boundaries	242
Table 10.25: Potential Project Interactions with Avifauna	248
Table 10.26: Project-Avifauna Residual Effects.....	258
Table 11.1: Population Characteristics in 2016 and 2021 for Nova Scotia, MODG, and Antigonish, Subdivision B	260
Table 11.2: Age Distribution in 2021 in Nova Scotia, MODG, and Antigonish Subdivision B	260
Table 11.3: Housing Costs (2021) and Median Individual Income (2020) for Canada, Nova Scotia, MODG, and Antigonish Subdivision B	261
Table 11.4: Employment Statistics for Canada, Nova Scotia, MODG, and Antigonish Subdivision B.....	262
Table 11.5: Top Industries for the Employed Labour Force in 2017 in MODG and Antigonish Subdivision B Compared to the Province of Nova Scotia.....	262
Table 11.6: Local Businesses and Proximity to the Project.....	263
Table 11.7: Potential Project-Economy Interactions.....	263
Table 11.8: Economy Residual Effects	268
Table 11.9: Potential Project-Land Use and Value Interactions	269
Table 11.10: Potential Project-Recreation and Tourism Interactions	276
Table 11.11: Land Use and Value Effect Assessment	278
Table 12.1: Potential Project-Archaeological Resources Interactions.....	281
Table 12.2: Archaeological Resources Residual Effects	283
Table 13.1: Effects of the Undertaking on the Environment Summary	284
Table 16.1: Potential for Cumulative Effects on Identified VCs	300
Table 16.2: Nearby Industrial Activities and Developments	303

LIST OF ACRONYMS

%	Percent
µg/m ³	Micrograms per cubic meter
µm	Micrometres
µS/cm	Microsiemens per centimeter
AAQMS	Ambient air quality monitoring station
AAQS	Ambient air quality standards
ACCDC	Atlantic Canada Conservation Data Centre
AMO	Abandoned mine opening
AQHI	Air quality health index
ARD	Acid rock drainage

ARIA	Archaeological Resource Impact Assessment
ARS	Avian radar system
ARU	Acoustic recording unit
ATV	All-terrain vehicle
BMP	Best management practices
CBA	Community benefits agreement
CCME	Canadian Council of Ministers of the Environment
CEA	Cumulative effects assessment
CEPA	<i>Canadian Environmental Protection Act</i> (Canada, 1999)
CH ₄	Methane
CLC	Community Liaison Committee
CNWI	Canadian Wetland Inventory
CO	Carbon monoxide
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	Catch per unit effort
CWS	Canadian Wildlife Service
dBA	A-weighted decibels
DBH	Diameter at breast height
DEM	Digital elevation model
DFO	Fisheries and Oceans Canada
DO	Dissolved oxygen
DWC	Diurnal watch count
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EMI	Electromagnetic interference
EP	Eel pot
ERT	Emergency Response Team
ESA	<i>Endangered Species Act</i> (Nova Scotia, 1998)
FAC	Facultative
FACW	Facultative Wetland
FEC	Forest ecosystem classification
FN	Fyke net
FP	Floodplain
FTE	Full-time equivalent
FWAL	Freshwater aquatic life
GCDWQ	Guidelines of Canadian Drinking Water Quality
GDP	Gross domestic product
GHG	Greenhouse gas
GIS	Geographic information system

GPS	Global positioning system
GW	Gigawatt
H ₂ S	Hydrogen sulphide
ha	Hectares
HADD	Harmful alteration, disruption, or destruction
HPA	High potential area
HSI	Habitat suitability index
Hz	Hertz
IBA	Important Bird Area
ID	Identification
IH	Intolerant hardwood
IPCC	Intergovernmental Panel on Climate Change
IRAP	Industrial Research Assistance Program
kHZ	Kilohertz
km/h	Kilometres per hour
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
kV	kilovolt
kWh/year	Kilowatt-hours per year
LAA	Local assessment area
LABO	Eastern red bat
LACI	Hoary bat
LANO	Silver-haired bat
LCA	Life cycle assessment
LFN	Low frequency noise
LiDAR	Light detection and ranging
LIT	Long-lived intermediate tolerant
LT	Late-successional
m/s	Metres per second
m ²	Square metres
m ³	Cubic metres
MBBA	Maritime Breeding Bird Atlas
masl	Metres above sea level
MBA	Mi'kmaq Benefits Agreement
MBCA	<i>Migratory Bird Convention Act</i> (Canada, 1994)
MBS	Migratory Bird Sanctuaries
MEKS	Mi'kmaq Ecological Knowledge Study
MET	Meteorological
MLA	Member of the Legislative Assembly
MP	Member of Parliament
MPRR	Minimum Planning Requirements Regulations
MPS	Municipal Planning Strategy

MOCA	Municipality of the County of Antigonish
MODG	Municipality of the District of Guysborough
MOU	Memorandum of Understanding
MT	Minnow trap
MW	Megawatt
MW	Mixedwood
MWh/year	Megawatt hours per year
MYOT	<i>Myotis</i> species
N ₂ O	Nitrous oxide
NI	Non indicator status
NL	Plants that are not listed
NO	Nitric oxide
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
NSAQR	Nova Scotia Air Quality Regulations
NSCCTH	Nova Scotia Communities, Culture, Tourism and Heritage
NSECC	Nova Scotia Environment and Climate Change
NSCC	Nova Scotia Community College
NSNR	Nova Scotia Natural Resources
NSPI	Nova Scotia Power Incorporated
NSPW	Nova Scotia Public Works
O&M	Operations and maintenance
O ₃	Ozone
OBL	Obligate
OF	Oldfield
OGPI	Old-growth potential index
OHV	Off-highway vehicle
OLA	Nova Scotia Office of L'nu Affairs
PC	Point count
PESU	Tri-colored bat
pH	Potential of hydrogen
PID	Property identifications
PM	Particulate matter
PM ₁₀	Particulate matter 10 micrometres or less in diameter
PM _{2.5}	Particulate matter 2.5 micrometres or less in diameter
ppb	Parts per billion
PPE	Personal protective equipment
PWA	Protected Water Area
RAA	Regional assessment area
ROW	Right-of-way
SAR	Species at risk

SARA	<i>Species at Risk Act</i> (Canada, 2002)
SCADA	Supervisory control and data acquisition
SGI	Sipekne'katik Governance Initiative
SH	Spruce hemlock
SMP	Special management practice
SO ₂	Sulphur dioxide
SOCI	Species of conservation interest
S-Rank	Subnational rank
SUV	Sports utility vehicle
tCO ₂ e	Tonnes of carbon dioxide equivalent
TDS	Total dissolved solids
TH	Tolerant hardwood
TRS	Total reduced sulphur
TSP	Total suspended particulate
UBTDA	Upper Big Tracadie Development Association
UNHI	Unknown high frequency bats
UNKW	Unknown
UNLO	Unknown low frequency bats
UPL	Upland
UTM	Universal Transverse Mercator
VC	Valued components
WAM	Wet areas mapping
WC	Wet coniferous
WD	Wet deciduous
WESP-AC	Wetland Ecosystems Services Protocol – Atlantic Canada
WM	Wet mixedwood
WSS	Wetland of Special Significance

LIST OF DRAWINGS

Drawing 2.1	Site Overview
Drawing 3.1	Project Infrastructure
Drawing 3.2	Previously Assessed Areas
Drawing 3.3	Regional Overview
Drawing 7.1	Ecodistricts and Ecoregions
Drawing 7.2	Atmospheric LAA
Drawing 8.1	Geomorphology
Drawing 8.2	Surficial Geology
Drawing 8.3	Bedrock Geology
Drawing 8.4	Karst Risk
Drawing 8.5	Arsenic Risk
Drawing 8.6	Manganese Risk
Drawing 8.7	Uranium Risk

Drawing 8.8	Groundwater Wells
Drawing 8.9	Geophysical LAA
Drawing 9.1	Desktop Freshwater
Drawing 9.2	Wet Area Modelling
Drawing 9.3	Fish Survey Locations
Drawing 9.4	Aquatic LAA
Drawing 9.5	Predicted Wetlands
Drawing 9.6	Field Results
Drawing 10.1	Predicted Land Cover and Vegetation Community Assessment Points
Drawing 10.2	Desktop Vegetation Communities, Flora and Fauna Results
Drawing 10.3	Old Growth Assessments
Drawing 10.4	Flora and Fauna Field Results
Drawing 10.5	Flora and Fauna LAA
Drawing 10.6	Moose Habitat Suitability
Drawing 10.7	Fauna Methodology
Drawing 10.8	Abandoned Mine Openings
Drawing 10.9	Avifauna Desktop Review
Drawing 10.10	Avifauna Field Surveys
Drawing 10.11	Potential Barn Swallow Habitat
Drawing 10.12	Potential Bobolink Breeding Habitat
Drawing 10.13	Potential Canada Warbler Breeding Habitat
Drawing 10.14	Potential Chimney Swift Breeding Habitat
Drawing 10.15	Potential Common Nighthawk Breeding Habitat
Drawing 10.16	Potential Eastern Wood-Pee-wee Breeding Habitat
Drawing 10.17	Potential Evening Grosbeak Breeding Habitat
Drawing 10.18	Potential Olive-Sided Flycatcher Breeding Habitat
Drawing 10.19	Potential Rusty Blackbird Breeding Habitat
Drawing 10.20	Avian Radar and Acoustic Monitor Locations
Drawing 12.1	Archaeological Assessment Area
Drawing 16.1	Cumulative Effects

LIST OF APPENDICES

Appendix A: Project PIDs
Appendix B: Engagement
Appendix C: WSP Electromagnetic Interference
Appendix D: GHG Calculations
Appendix E: WSP Noise Assessment
Appendix F: WSP Shadow Flicker Assessment
Appendix G: Groundwater Wells
Appendix H: ACCDC Report
Appendix I: Surface Water and Fish Photograph Log
Appendix J: Wetland Characteristics and Photograph Log
Appendix K: Old Growth Assessment Photograph Log
Appendix L: Complete Plant List
Appendix M: Terrestrial Fauna Photograph Log

Appendix N: Avifauna

Appendix O: Ausenco Spring 2023 Radar Monitoring

Appendix P: Avian Radar and Acoustic Technical Report

Appendix Q: WSP Visual Simulations

Appendix R: NSCCTH Heritage Research Permit

Appendix S: Strum Project Team CVs

1.0 PROPONENT DESCRIPTION

Upper Afton Wind Ltd., comprised of EverWind NS Holdings Ltd. (EverWind) and Membertou Development Corporation (together as the “Proponent”), is proposing to construct and operate the Upper Afton Wind Project (the “Project”), an onshore wind farm with up to 28 wind turbines. The Project is being developed to support the production of Certified Green hydrogen and ammonia in Nova Scotia.

EverWind is a Nova Scotia-based private developer of green hydrogen and ammonia production that has extensive energy storage facilities and associated transportation assets. The EverWind team includes experienced Canadian wind farm developers, constructors, and operators who have designed, financed, constructed, and operated wind and solar energy projects in Nova Scotia, Atlantic Canada, Western Canada, and across North America over the past 20 years.

Membertou is a Mi'kmaw community located on Unama'ki-Cape Breton Island. Just 3 km from downtown Sydney, Membertou's urban location and prioritization of community development has enabled it to grow into one of Canada's most economically flourishing Indigenous communities. With nearly 1,800 total members, Membertou's approach to business and community starts with its people. Chief Terry Paul, who is the elected Chief in Membertou for the last 41 years, often remarks that, “at the forefront of everything we do, is who we do it for; the people of Membertou.”

Membertou Development Corporation was established in 1989 and over the last three decades has grown into a thriving organization that focuses on real estate, fisheries, gaming, trade and convention, retail development, and renewable energy. Through strategic acquisitions, Membertou has become not only a business leader, but an example of economic reconciliation. Membertou is a ‘Canada's Best Managed Company’ and has ownership in companies such as Clearwater Seafoods and NewDock-St. John's Dockyard. Membertou holds strong partnerships in projects with Novaport, EverWind Fuels, and others. With a goal to provide opportunities, employment, and prosperity for the community, Membertou's Chief and Council are keen to see continued growth, while always using the lens of environmental and cultural stewardship.

The Proponent retained Strum Consulting to undertake required technical studies and regulatory consultation to support the preparation of the Project's Environmental Assessment (EA) Registration Document. Strum is an independent, multi-disciplinary team of consultants with extensive experience undertaking EAs throughout Atlantic Canada.

Contact information for the Proponent and their consultant is included in Table 1.1.

Table 1.1: Proponent and Consultant Contact Information

Proponent Information	
Project Name	Upper Afton Wind Project
Proponent Name	Upper Afton Wind Ltd.
Chief Executive Officer(s) / Principal(s)	Trent Vichie – Chief Executive Office and Founder EverWind Fuels
Proponent Contact Information for the EA Registration	Jeff Bonazza, Director, Environment and Permitting, EverWind Fuels 902-292-7010 jeff.bonazza@everwindfuels.com
Mailing and Street Address	1969 Upper Water Street – Suite 2101 Purdy's Wharf II Halifax, NS B3J 2V1
Consultant Information	
Name of Consultant	Strum Consulting
Mailing and Street Address	211 Horseshoe Lake Road, Unit #210 Halifax, NS B3S 0B9
EA Contact	Melanie Smith, Vice President 902-835-5560 msmith@strum.com

2.0 PROJECT INFORMATION

2.1 Project Introduction

The Proponent's overall vision is to develop an Atlantic Canada green energy hub in Point Tupper, Nova Scotia. The Project aims to utilize renewable energy sources, such as wind energy, to produce green hydrogen and ammonia for both local use and export. The portfolio of projects is divided into two phases in Nova Scotia:

- Phase 1 includes the construction of the Point Tupper Hydrogen and Ammonia Production Facility (the "Facility"), powered by onshore wind and solar energy that will generate approximately 650 megawatts (MW) of clean energy. EA Approvals have been received for the Facility and three wind projects (Bear Lake, Kmt nuk, and Windy Ridge Wind Projects). The Upper Afton Wind Project is the fourth wind project in the Phase 1 portfolio. Phase 1 wind projects use the existing Nova Scotia Power Inc. (NSPI) grid to transmit renewable energy to the Facility.
- Phase 2 includes the development of approximately 2 gigawatts (GW) of clean energy from up to three additional onshore wind projects (including Setapuktuk Wind Project, which received EA approval in 2025), the associated transmission line, and the portion of the transmission line that crosses the Strait of Canso to provide a connection directly to the Facility (EA approval received in 2025). Phase 2 wind projects will transmit renewable energy to the Facility via EverWind constructed, owned, and operated transmission lines.

This Project is the fourth Phase 1 onshore wind project, with up to 28 turbine locations. The Project nameplate capacity will be up to 176 MW. It is anticipated that 22, 8.0 MW turbines will be constructed, with six of the 28 turbines locations considered alternates. The final number of turbine locations will depend on the selected turbine model. Therefore, the 28 turbine locations presented represents the most conservative Project Footprint being considered.

The Project is located near the communities of Upper Afton, Merland, and New France in the Municipality of the County of Antigonish (MOCA), and Upper Big Tracadie, South Merland, and Rear Monastery in the Municipality of the District of Guysborough (MODG), Nova Scotia (Drawing 2.1). The approximate center of the Project is 45.550643°N, 61.661264°W. The Study Area consists of Crown, municipal, and private land.

The Goldwind GWH182-8.0 wind turbine generator was selected for the visual simulations, noise, and shadow flicker modelling as well as the electromagnetic interference (EMI) study conducted for this EA. The planned Project infrastructure also includes access roads, medium-voltage collector lines, a collector substation and transmission interconnection point, laydown areas, and an Operations and Maintenance (O&M) building.

Upon approval of the EA, site preparation and construction activities are proposed to begin in late 2026 (lasting approximately 3 years). Initial site preparation activities will include vegetation removal, with civil construction anticipated to start in 2027. The Project is expected to be operational for a minimum of 35 years.

2.2 Purpose & Need for the Undertaking

As part of the Clean Power Plan released in fall 2023, the Government of Nova Scotia set targets for producing 80% renewable energy by 2030 and cutting greenhouse gas (GHG) emissions produced from electricity by 90%. The development of wind energy is expected to be a significant part of achieving these goals. The Project is being proposed in support of this renewable energy target. Dependence on fossil fuels increases the vulnerability of Nova Scotians to rising international energy prices, weakens energy security, and takes valuable revenue out of the province, further leading Nova Scotia towards a preference for renewable energy (Nova Scotia, 2015). Negative impacts on human health (particularly in developing countries) and the environment, mainly in the form of climate change, are among the widely cited challenges associated with fossil fuel consumption around the world.

In its assessment report, Climate Change 2022 - Impacts, Adaptation and Vulnerability, the United Nations Intergovernmental Panel on Climate Change (IPCC) provides a detailed synopsis of the impacts associated with climate change on both global and regional scales. Evidence from all continents indicates that many biological systems and habitats are currently being affected by regional climate change. Ecological changes include changes to the thermal dynamics and quality of aquatic habitats, shifts in migratory timing and ranges of fauna and flora, changes in fish abundance, increased risk of extinction, and loss of forest habitat (IPCC, 2022). In North America specifically, the increase in ground, water, and atmospheric temperatures has resulted in direct mortality and redistribution of flora and fauna species. In

addition, coastal flooding along with an increase in the frequency and intensity of extreme weather events will continue to impact the socioeconomic environment through displacement and/or damage to communities and economies (IPCC, 2022). Impacts of climate change are, and will increasingly be felt across environmental, social, human health, and economic sectors (IPCC, 2022).

Canadian climate experts acknowledge that the debate has largely evolved from questions about the reality and causes of climate change, to what actions can be taken to adapt to the realities of a changing climate. As the second most important and fastest growing source of electricity in Canada (along with solar) (NRCan, 2024), wind energy is a critical component of Canada's renewable energy strategy. Wind energy is emission-free; with every megawatt of wind energy generated, GHG emissions are reduced in comparison to previous levels associated with coal-related production (NSNR, n.d.-b). Numerous benefits can be expected from the transition to renewable energy, including:

- Long-term stability in energy prices.
- Long-term security in locally sourced energy supply and decreased dependence on international markets.
- Creation of jobs and economic opportunities throughout the province.
- Community investment and economic return.
- Protection of human health and the environment.
- Educational opportunities for youth and the broader community about renewable energy technology, its benefits, and the role it will play in Nova Scotia's energy future.

The Proponent is committed to sharing economic opportunities with the local community throughout the development and lifespan of the Project via the use of local skills and labour where possible, municipal tax revenue, and ongoing energy literacy/education. Engagement with local groups has been ongoing to support both community and Project development.

2.3 Regulatory Framework

2.3.1 Federal

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

Federal approval, permit, notification, and compliance requirements for the Project are provided in Table 2.1. EMI and radio communication stakeholders have been contacted. The EMI consultation process and status is described further in Section 6.

Table 2.1: Federal Regulatory Requirements for the Project

Requirement	Regulatory Body	Status/Comments
<i>Fisheries Act</i> (Canada, 1985)	Fisheries and Oceans Canada (DFO)	Compliance legislation - there is currently no expectation that an authorization under the <i>Fisheries Act</i> will be required. If, during the detail design phase, the Project is determined to have potential to cause a harmful alteration, disruption or destruction of fish habitat or accidental death of fish, the Proponent will submit a Request for Project Review to DFO. All fish surveys were conducted under DFO Scientific Licences #SG-RHQ-24-072, SG-RHQ-23-001A, and 341208.
<i>Species at Risk Act</i> (SARA) (Canada, 2002)	Environment and Climate Change Canada (ECCC), and DFO	No SARA permits were acquired for field assessments and none are expected based on Project design.
<i>Migratory Bird Convention Act</i> (MBCA) (Canada, 1994)	ECCC	Compliance legislation – the requirement to obtain a MBCA permit is not anticipated.

2.3.2 Provincial

The Project is subject to a Class I EA as defined by the Environmental Assessment Regulations (Nova Scotia, 1995c) under the *Environment Act* (Nova Scotia, 1995b). As such, this submission has been prepared in accordance with:

- A Proponent's Guide to Environmental Assessment (NSECC, 2025a).
- Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025c).
- Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025b)
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a).

Other potentially applicable regulatory requirements including provincial approvals, permits, notification, and compliance for the Project along with their status are provided in Table 2.2.

Table 2.2: Provincial Regulatory Requirements

Requirement	Regulatory Body	Status/Comments
Watercourse Alteration Permit Wetland Alteration Permit	Nova Scotia Environment and Climate Change (NSECC)	Alteration applications will be submitted to NSECC in accordance with the Activities Designation Regulations following EA approval. Locations requiring alteration are described in Section 9.
<i>Endangered Species Act</i> (ESA) (Nova Scotia, 1998)	Nova Scotia Natural Resources (NSNR)	Compliance legislation – the requirement to obtain an ESA permit is not anticipated.
Use of Crown lands	NSNR	Crown land lease and easement applications submitted December 22, 2025.
Notification of blasting (if required)	NSECC, Nova Scotia Health and Safety	To be confirmed following the geotechnical investigations.
Overweight/Special move permit Access permit Work within highway right-of-way (ROW)	Nova Scotia Public Works (NSPW)	Permits to be applied for before mobilizing oversize vehicles on public roads or commencing within a highway ROW.
Elevator lift license	Nova Scotia Labour Skills and Immigration	Application to be filed prior to erection of the wind turbines.
Archaeology Field Research Permit	Nova Scotia Communities, Culture, Tourism and Heritage (NSCCTH)	NSCCTH Permit A2024NS187 obtained to complete the 2024 archaeology assessment. NSCCTH Permit A2025NS127 obtained to complete the 2025 archaeology assessment (Section 12).
Nova Scotia Temporary Workplace Traffic Control Manual	NSPW	Compliance for the use of provincial roads during the construction, operation, and decommissioning phases of the Project.

2.3.3 Municipal

Municipal approval, permit, notification, and compliance requirements for the Project are provided in Table 2.3.

Table 2.3: Municipal Requirements

Requirement	Regulatory Body	Status/Comments
Development Permits and Building Permits	MOCA	Development Permit and rezoning applications will be submitted following EA registration.
	MODG	Building Permit applications will be submitted at a later date.
Noise Control By-Law	MOCA MODG	Compliance with schedule restrictions for construction activities.

2.4 Funding

The Proponent is arranging equity and debt project financing for the Project. Leading investment banks are engaged to lead the financing of the Project. Commercial banks have been approached to participate in the Project as a lender, and various financing support letters have been received for the funding.

3.0 DESCRIPTION OF THE UNDERTAKING

3.1 Geographical Location

The Project is located near the communities of Upper Afton, Merland, and New France in the MODA, and Upper Big Tracadie, South Merland, and Rear Monastery the MODG (Drawing 2.1). The approximate centre of the Project is 45.550643°N, 61.661264°W.

3.2 Areas of Study

Several areas of study were established for the purpose of field data collection and to describe the area containing Project infrastructure.

- Study Area: A Study Area was established based primarily on land parcels (i.e., PIDs) that encompass the development area (Drawing 2.1). The intent of the Study Area was to assess a large area at a high-level to allow flexibility in the design to move infrastructure and minimize effects to valued components (VCs; described further in Section 4.1). Based on the resulting Study Area analyses, an Assessment Area was established for more detailed field investigations.
- Assessment Area: An Assessment Area (Drawing 3.1A to 3.1K) was established for more detailed field assessment planning. The Assessment Area represents the area within which direct physical disturbance is expected to occur (i.e., the Project Footprint) plus a buffer to allow design flexibility. The Assessment Area buffer generally includes a 150 m radial area around each turbine and a 25 m to 40 m buffer on either side of the centreline for roads and collector lines. The Assessment Area also includes temporary laydown areas and the substation/O&M building location. Note that not all PIDs included in the Assessment Area contain or are expected to contain Project infrastructure, as detailed in Appendix A.

As field studies progressed, further Project design changes were made to avoid sensitive features and reduce potential adverse effects on VCs, which in some instances changed the noted assessment buffers.

- **Clearing Footprint:** A Clearing Footprint (Drawing 3.1A to 3.1K) was established, which includes the areas where vegetation clearing may be required to facilitate construction activities, including temporary laydown areas, collector line corridors, and access roads. Many of these areas will be allowed to revegetate during operations. The Clearing Footprint includes the full width of the Assessment Area along roads and collector lines, substation yard, laydown areas, as well as a 130 m by 130 m area surrounding turbine locations.

The Clearing Footprint is a conservative estimate of the footprint where vegetation clearing will take place during construction and includes existing roads and previously cleared areas. The final area requiring vegetation clearing is expected to be less than the Clearing Footprint presented in this document.

- **Project Footprint:** The Project Footprint (Drawing 3.1A to 3.1K) includes the physical footprint where direct disturbance is expected to occur. The Project Footprint includes a conservative estimate of 30 m wide corridors for road construction and upgrades and collector line installation, the substation yard and O&M building areas, and a 100 m by 100 m area surrounding turbine locations.

The areas for the areas of study are provided in Table 3.1.

Table 3.1: Areas of Study

Area of Study	Area (ha)
Study Area	4,961
Assessment Area	710
Clearing Footprint ⁽¹⁾	596
Project Footprint ⁽²⁾	219

⁽¹⁾ Area is a conservative estimate of the footprint where vegetation clearing will take place during construction.

⁽²⁾ Area is a conservative estimate of the permanent footprint of the Project. Temporary Project Footprint components are shown on Drawing 3.1A to 3.1K but not included in this calculation. Following the detailed design, the area will be refined.

3.3 Siting Considerations

Project siting was completed using a multi-phased approach, including a detailed constraints analysis primarily consisting of a geographic information system (GIS) exercise after considering land ownership, grid capacity and proximity, setbacks, and wind speed to develop a preliminary layout. Siting considerations included:

- Siting turbines at locations for efficient capture of wind energy and proximity to the NSPI grid.
- Utilizing existing disturbed areas to the greatest extent practical.
- Complying with regulated setbacks and separation distances (Table 3.2).

- Minimizing potential interference with telecommunication and radar systems.
- Avoiding known protected areas; field identified archaeological, cultural, and heritage resources, significant habitats; and wildlife sites, provincial parks, or reserves.

The constraints analysis was updated with the results of Project-specific technical studies completed in 2023, which included: field investigations, wind resource assessments, potential environmental effects analysis, as well as information collected through engagement with the Mi'kmaq of Nova Scotia, government agencies, stakeholders, and local communities. Additional field surveys and technical studies were completed in 2024 and 2025. Through this process, several iterations of the Project layout were considered (Drawing 3.2) for development before a Project Footprint was finalized for the purposes of this EA.

The current Project layout incorporates the following information:

- Results of desktop and field-verified wetlands and watercourses to minimize interactions to the extent possible.
- Results of topographic mapping, aerial imagery search, and field-verification of potential receptors.
- Locations of known species at risk (SAR) or quality SAR habitat, sensitive habitat, and old-growth forest to maximize avoidance, where possible.
- Areas known to have been previously disturbed by forestry, road construction, or other uses to minimize new areas of disturbance.
- Locations of known protected areas, field identified archaeological, cultural, and heritage resources, significant habitats, and wildlife sites, provincial parks, and reserves to maximize avoidance.
- Compliance with regulated setbacks and separation distances (Table 3.2).

Table 3.2: Summary of Minimum Setbacks and Separation Distances

Setback Category	Distance	Relevant Regulators / Stakeholders
Watercourses	30 m from watercourses, where possible or otherwise where authorized by NSECC	NSECC
	60 m from turbine centre	MOCA
Wetlands	30 m from wetlands, where possible or otherwise where authorized by NSECC	NSECC, NSNR
Wetlands of Special Significance (WSS)	30 m from WSS, to be determined in consultation with NSECC	NSECC, NSNR
Old-Growth Forests	100 m limited development buffer where possible on Crown land	NSNR
Protected Areas	To be determined in consultation with NSECC and NSNR, as appropriate	NSECC, NSNR
Rare Plants and Lichens	Species-specific (Section 10.1)	NSNR

Setback Category	Distance	Relevant Regulators / Stakeholders
Residential dwellings (non-participating)	4.0 x Turbine Height	Nova Scotia Municipal Affairs
Camps (non-participating)	350 m	Proponent Commitment
External Property Boundaries	1.0 x Turbine Height	MODG
	Blade diameter + 10 m ⁽¹⁾	MOCA
Public Roads	As per municipal requirements (minimum 1.0 x turbine height)	Proponent Commitment
Powerlines	1.0 x Turbine Height from non-Project-related powerlines	Proponent Commitment
Shadow Flicker	As necessary to meet shadow flicker guidelines based on shadow flicker modelling	NSECC
Sound/Noise	As necessary to meet sound / noise guidance based on sound modelling	NSECC

⁽¹⁾Blade diameter + 10 m for the Goldwind GWH182-8.0 is 193.4 m.

The Tracadie River Wilderness Area exists along the southern Study Area boundary. The Proponent respects the integrity and importance of protected areas and has engaged with the Nova Scotia Environment and Climate Change (NSECC) Protected Areas and Ecosystems Branch regarding appropriate precautions for the wilderness area (Section 6). The nearest turbine (T28) is located more than 200 m from the wilderness area (Drawing 2.1 and 3.3).

The Project Footprint also offers considerable development opportunities that were incorporated into the Project design to minimize potential effects to surrounding land uses, local residents, and environmental features. Project development opportunities include the following:

- Use of Crown and private land which has been subject to previous and ongoing disturbance from forestry activities, that includes road use (including recreational traffic), new road construction, tree clearing, silviculture, and other recreational uses.
- Maximize the use of existing roads, and existing cleared areas to minimize habitat fragmentation and impacts to wetlands, watercourses, and their riparian buffers from new road construction and clearing of mature vegetation stands.
- Avoidance of known SAR locations, and associated buffers where possible.

The constraints analysis was updated with the results of Project-specific technical studies which included: field investigations, environmental resource/potential effects modeling, as well as information collected through engagement with the Mi'kmaq of Nova Scotia, government agencies, stakeholders, and local communities. Through this process several iterations of the Project layout were considered for development before a Project layout was finalized for the purposes of this EA.

3.4 Project Proximity to Other Areas

3.4.1 Towns or Cities

The Project is located near the communities of Upper Afton, Merland, South Merland (all within the Study Area), Upper Big Tracadie (bordering the Study Area boundary), New France (0.7 km), and North Intervale (3.3 km). The Study Area is approximately 22.6 km southeast of the Town of Antigonish, and 16.8 km northwest of the community of Guysborough (Drawing 3.3).

3.4.2 Mi'kmaq Communities

The nearest Mi'kmaq communities are Paqtnkek-Niktuek Indian Reserve No. 23 (Paq'tnkek) which is 2.0 km northwest of the Study Area, and Welnek Indian Reserve No. 38 which is 4.9 km northeast of the Study Area (Drawing 3.3). Refer to Section 5 for additional details on the Mi'kmaq of Nova Scotia.

3.4.3 Other Known Wind Developments

Other developments within proximity to the Project include the Mulgrave Community Wind Power Project (13 km), Fairmont Wind Farm (24.5 km), and Maryvale Wind Project (32.3 km). Other nearby wind projects under construction include the Goose Harbour Lake Wind Farm (7 km) and Weavers Mountain Wind Energy Project (37.5 km). Nearby wind projects that have applied for or received EA approvals but are not yet under construction include the Setapuktuk Wind Project (15 km) [EA approval in November 2025 (NSECC, 2025e; Strum Consulting, 2025)], and the Aulds Cove Wind Project (11 km). Refer to Section 16 for additional information on other developments.

3.4.4 Protected Watersheds and Water Areas

The James River Watershed Protected Water Area (PWA) is the nearest PWA to the Project. It is located approximately 32.3 km northwest of the Study Area (Drawing 3.3).

3.4.5 Parks and Protected Areas

Several public protected lands and parks are also located in the vicinity (Drawing 3.3), including:

- Tracadie River Wilderness Area, directly adjacent to the southern border of the Study Area.
- Hurlburt Brook Nature Reserve, approximately 7 km east of the Study Area, designation pending approval.
- Bayfield Beach Provincial Park, approximately 12 km northwest of the Study Area.
- Pomquet Island Conservation Lands, approximately 13 km northwest of the Study Area.
- Roman Valley Nature Reserve, approximately 11 km south of the Study Area.
- Ogden Round Lake Wilderness Area, approximately 13 km south of the Study Area.
- Boylston Provincial Park, approximately 17 km southeast of the Study Area.

Cape Breton Highlands National Park, the nearest national park, is approximately 129 km of the Study Area.

3.4.6 Important Bird Areas

The nearest Important Bird Area (IBA), Pomquet Beach Region (NS009), is 8.4 km northwest of the Project on the Northumberland shore of Antigonish County, Nova Scotia (Drawing 3.3).

3.5 Physical Components

3.5.1 Turbines

The Proponent is proposing to construct and operate up to 28 wind turbines. Six of the 28 possible turbine locations are considered alternate locations as noted in Section 2.1 (Drawing 3.1A to 3.1K). The turbine model for the Project has not been finalized. However, for the purposes of the EA, the Proponent has selected the Goldwind GWH182-8.0 wind turbine generator as it is representative of the operating specifications of models being considered for the Project. Each turbine location, when constructed, will be comprised of a foundation, tower, rotor and blades, nacelle (including the rotor shaft and brake and gearbox system), and a cleared pad surrounding the turbine for construction and maintenance purposes. Table 3.3 shows the turbine characteristics of the Goldwind GWH182-8.0.

Table 3.3: Turbine Technical Specifications

Turbine Component	Turbine Specifications for Goldwind GWH182-8.0
Rated capacity	8.0 MW
Rotor diameter	183.4 m
Hub height	130 m
Tip height	221.7 m
Cut-out wind speed	24.0 metres per second (m/s)
Number of blades	Three
Swept area	26,417 m ²

3.5.2 Road Layout

A comprehensive road network currently exists in the Study Area and is associated with ongoing forestry and recreational activities and residential access. Highway 104 (Trans-Canada highway between Paqtnkek Mi'kmaw Nation and the community of Monastery), Highway 4, Highway 16, Afton Road, Merland Road, and Upper Big Tracadie Road are the main roads that grant access to most of the Study Area. A network of smaller spur roads and trails suited for all-terrain vehicles (ATVs) and snowmobile use is present throughout much of the Study Area.

In some cases, the construction of new roads will be required to access proposed turbine locations; however, the Proponent is planning to leverage the network of existing roads to the greatest extent feasible. The Project access roads consist of 51 km (77%) of existing roads

and 15 km (23%) of new roads (Drawing 3.1A to 3.1K). All roads will be constructed or upgraded, as required, to safely transport turbine components, provide appropriate turning radii for turbine component deliveries, and support construction activities in compliance with local and provincial guidelines/requirements. During the civil design process, consideration will be made to minimize adverse impacts to sensitive habitats, such as wetlands, watercourses, and rare species, and the disruption of existing commercial and public activities.

3.5.3 Substation and Power Collection Systems

The Project consists of a combination of new overhead and underground medium-voltage electrical cabling, and a substation to gather the produced energy (Drawing 3.1A to 3.1K).

Existing NSPI transmission lines bisect the Study Area; therefore, a new high-voltage transmission line is not required to be constructed. The point of interconnection (POI) is at the switching station, immediately adjacent to the substation (Drawing 3.1A).

3.5.4 Operations and Maintenance Building

The Project will require an O&M building, which will include an electrical room, workshop, supervisory control and data acquisition (SCADA) room, parts room, conference room, and office spaces. The O&M building is expected to occupy an area of less than 0.5 ha.

3.5.5 Meteorological Towers

A meteorological (MET) tower, operational since 2021, is located within the Study Area to monitor atmospheric conditions relevant to the Project (wind speed and direction, atmospheric pressure, relative humidity, and temperature). Additional MET towers may be required during Project operations as required by the final turbine manufacturer.

3.5.6 Concrete Batch Plant

A mobile concrete batch plant may be used during construction. Concrete batch plants allow for high output and quality concrete to be produced at site and reduce trucking costs and impacts to local communities.

3.5.7 Temporary Laydown Yards

Six temporary laydown yards, between 4 ha and 9.5 ha in size, are under consideration for the Project. These areas will be used to temporarily store equipment and assemble Project infrastructure.

3.5.8 Borrow Pits

During construction, aggregate material for road construction may be produced from borrow pits located within the Assessment Area. All borrow pits are expected to be under 4 ha in size and are expected not to require further assessment under EA. Should any borrow pit be over 2 ha, an Industrial Approval would be obtained from NSECC, as required. On-site borrow pits allow for aggregate to be sourced at the site and reduce trucking costs and impacts to local communities. If borrow pits are not utilized, aggregate will be sourced from local quarries and transported to site.

3.6 Project Phases

The Project will include three phases:

- Site preparation and construction (36 months, starting as early as Q4 2026).
- Operations (approximately 35 years, starting as early as Q1 2029).
- Decommissioning (18-month duration at end of Project life).

Activities and requirements associated with each phase are discussed in the following sections.

3.6.1 Site Preparation and Construction

Site preparation activities include:

- Completing land surveys for placement of roads, turbines, and associated infrastructure.
- Completing geotechnical investigations.
- Demarcating boundaries of environmentally sensitive features and applying appropriate buffers.
- Installing erosion and sedimentation control measures.
- Clearing of trees, grubbing, excavating, grading, and compacting local and potentially imported materials for construction.

General construction activities include:

- Access road construction.
- Laydown area and turbine pad construction.
 - Completion of foundation excavation and construction, including blasting, if required.
 - Preparation of materials and storage (e.g., aggregate crusher and storage areas).
- Transportation of turbine components, equipment, and materials.
 - Establishment of site traffic control measures.
- Turbine assembly.
- Management of site waste and dust.
- Construction and connection of collection system and Project substation.
- Removal of temporary works and site restoration.
- Commissioning.

Clearing activities are anticipated to occur between the months of October and April (i.e., outside of the bird nesting window), where possible. General construction is anticipated to occur year-round.

Access Road Construction

The total length of Project roads is approximately 66 km, of which approximately 51 km (77%) of the existing road network will be re-used as part of the Project and approximately 15 km (23%) of new road construction is required to provide direct access to the turbines. Access roads will have a 6 m to 12 m wide road surface and including ditching and grading will be 17 m to 20 m wide.

During construction, roads will be maintained with additional gravel or periodic grading. Aggregate material for road construction will be produced from borrow pits on the site or transported from quarries (within the Study Area or off site) and stored temporarily until used. Any material removed for road construction will be stored or disposed of in accordance with applicable regulations and best practices for road construction. Any material stored on-site will be managed with appropriate erosion and sedimentation control measures or re-used.

The following equipment is typically used during road upgrading and construction:

- Excavators
- Dump trucks
- Bull dozers
- Rollers
- Graders
- Crusher
- Light trucks

Laydown Area and Turbine Pad Construction

Laydown and turbine pad construction may include:

- Installation of erosion and sedimentation control measures
- Removal of vegetation and site grading
- Removal of overburden and soils
- Blasting/chipping of bedrock (to be determined, based on geotechnical conditions and foundation design)
- Pouring and curing of concrete pads (complete with reinforcing steel)
- Placement of competent soils to bring area to grade
- Compaction of soils
- Excavation for electrical conduits and fibre optic communication trenches

The turbine tower foundations will be up to 30 m diameter and extend to a depth of 3 m to 7 m below grade. Foundations will be backfilled (underground) with the exception of the concrete pedestal which will extend up to 1 m above ground to support the wind turbine tower structure.

Each turbine pad is expected to be approximately 100 m by 100 m (within a cleared area of approximately 130 m by 130 m). The exact arrangement of each turbine pad and crane pad will be designed to suit the specific requirements of the turbine and the surrounding topography during the detailed design process.

Temporary laydown areas may be up to 9.5 ha, which includes clearing limits and any overburden. There are currently six temporary laydown areas under consideration for the Project.

Construction of a typical turbine pad (from clearing to final preparation for erecting of the turbine) can take between one to four months, depending on weather, soil, and construction vehicle availability/access. The following equipment may be used for the laydown areas and turbine pad construction:

- Excavators
- Dump trucks
- Bull dozers
- Rollers
- Graders
- Crusher (not required if a local quarry can supply gravel sizes)
- Concrete trucks and pumper trucks
- Light cranes
- Light trucks

Transportation of Turbine Components, Equipment, and Materials

The center of the Project is approximately 6 km south of Highway 104. The primary road running north-south through the western portion of the Study Area is Afton Road, which begins at Highway 104 and ends where it connects with North Intervale Road and Trambles Road. North Intervale Road continues approximately north-south and ends where it intersects with Antigonish Guysborough Road, approximately 11 km south of the Project center. Secondary access to the western portion of the Study Area is also possible via New France-Afton Road which connects to Highway 104 via New France Road (Drawing 3.3).

Additional access in the eastern portion of the Study Area is possible from Highway 104 via Merland Road and Merland Church Road. Merland Road becomes New France-Afton Road where it crosses Afton Road. Merland Church Road runs northwest-southeast through the eastern portion of the Study Area, turning to South Merland Road at Trambles Road. South Merland Road ends approximately 7 km southeast of the Project center. Access to the eastern portion of the Study Area is also possible via South Merland Branch Road which is an offshoot of Upper Big Tracadie Road and Highway 16. Access in this area is also possible from Monastery Road via Highway 4.

Throughout the Study Area, existing roads are accessible by truck/sport utility vehicles (SUVs) as well as other vehicles designed for rough dirt roads and tracks. The Study Area is frequented by both commercial users, primarily related to forestry activities, as well as recreational users year-round, including snowmobiling, ATV use, and hunting.

The turbine delivery route to the Project will be determined by the selected turbine vendor who will conduct a comprehensive logistics study. The most likely access point for component delivery to the Project is via Upper Big Tracadie Road and South Merland Branch Road.

Primary access routes for other equipment and light vehicles during the construction phase and operational lifespan of the Project are expected to be via Merland Road and Afton Road.

The following permits and considerations are expected to be required for the transportation of turbine components:

- Work Within Highway Right of Way Permit [Nova Scotia Public Works (NSPW)]
 - Required if installing access to sites from the roadway, erecting structures within 100 m of the highway or removing access signs and guard rails.
- Over-Weight Moves Special Move Permit (Service Nova Scotia and Internal Services)
 - Required to transport oversized and overweight components. In some cases, due to the size and weight of the components, some may only be transported on Sundays.
- Provincial road weight restrictions will also need to be considered, especially spring weight restrictions, for heavier equipment and materials that will be transported to the Project.
- Access points will be designed with proper height and width to accommodate large trucks and will adhere to commercial stopping sight distances.

Different volumes and types of traffic will be generated throughout the Project's lifecycle. During the construction phase, trucks and other vehicles will be frequently visiting the area resulting in increased vehicular sound and air emissions (see Sections 7.1 and 7.3 for assessment and mitigation related to air quality and sound). During construction, most days will have 25 to 50 trucks per day, with a few days potentially requiring up to 100 trucks. Outside of the construction phase, the Project will require technicians to access the site to perform regular maintenance/equipment checks. Provincial road weight restrictions will be considered, especially spring weight restrictions, for heavier equipment and materials that will be transported to the Project. Decommissioning will require a similar amount of traffic to the tower component delivery and construction.

The transportation route is expected to require road modifications, including the removal of signage and guardrails. Upgrades will also be made to roads and overhead wires, branches, and signs if conflicts arise. Bridges may be upgraded to increase allowable weight limits or temporary bridges built over existing bridges. Notices will be installed in public areas to inform residents of signage removal or road infrastructure alterations, as well as notify relevant municipal government staff of construction scheduling and safety measures.

The Proponent has committed to not restricting public access to roads and trails in the area, with the exception of fencing surrounding the substation and temporary restrictions at active construction sites such as excavations or lift sites where restrictions are necessary due to safety considerations. In such circumstances, signs will be posted, and physical barriers such as cones, candle sticks, t-posts, and rope will be erected. In addition, transportation will avoid travel through urban areas, to the extent possible, during high traffic times.

Turbine Assembly

The wind turbine assembly includes tower sections, the nacelle, the hub, and three-blade rotors. The tower sections will be erected in sequence on the turbine foundation, followed by the nacelle, hub, and blades. All sections will be delivered by specialized transportation equipment, and the pieces will require a crane for removal from the vehicle at each of the prepared turbine pads or staging areas as required. Turbine erection will depend on the weather, specifically wind and lighting conditions. Typical assembly duration per turbine is expected to be between two and five days. The following equipment is expected to be used for turbine assembly:

- Main crane unit
- Assembly cranes
- Manufacturer's support vehicles

Construction and Connection of Power Collector System, Substation, and Switching Station

The Project turbines will generate power that will flow via its 34.5 kilovolt (kV) collection circuit (that primarily follows access roads) to a 34.5 kV to 230 kV Project substation. Power will be transmitted via a switching station to a 230 kV existing NSPI transmission line (i.e., the POI) (Drawing 3.1A).

The following equipment is expected to be used during the grid connection process:

- Excavators
- Backhoes
- Concrete trucks and pumper trucks
- Assembly cranes
- Bucket trucks
- Light cranes
- Light trucks

Removal of Temporary Works and Site Restoration

Once construction has been completed, all temporary works will be removed, and the site will be appropriately graded. The following equipment is expected to be used in this process:

- Excavators
- Backhoes
- Graders
- Light trucks

Commissioning

The turbines will undergo a series of tests for mechanical, electrical, and operational controls prior to unit start-up sequence. Once the start-up sequence has been initiated, another series of performance checks for safety systems will be completed. When the turbines have cleared all tests, the commissioning of the units can begin.

Commissioning includes performance testing which will be conducted in coordination with the electrical grid operator to ensure that the generated electricity meets power quality criteria. These performance tests will be completed by qualified wind turbine and electrical grid technicians. Additional testing may also be required for transformers, power lines, and substation components; all of which will be performed by qualified engineers and technical personnel.

3.6.2 Operations

Once operational, the lifespan of the Project is estimated to be a minimum of 35 years. During this time, roads will be used to access the turbines by staff and maintenance personnel. The roads will be maintained with additional gravel and grading, as required. During the winter months, roads will be plowed, sanded, and/or salted as necessary to allow for safe access to Project facilities for operations and maintenance.

A vegetation management plan will be initiated to ensure that access roads and turbine locations remain clear of vegetation. Timing of vegetation management will depend on site specific conditions and requirements by the Proponent and/or their operations and maintenance contractors. In addition to mechanical clearing (mowing, brush cutting, and trimming), selective and localized application of approved herbicides may be required to manage vegetation along the overhead power collector lines.

Due to the potential for public access to the Project, signage will be affixed and maintained on all access roads to provide essential safety information such as emergency contacts and telephone numbers, speed limits, and the hazards associated with being close to the turbines (i.e., ice shedding). These signs will be maintained during the life of the Project. No gates to restrict access to roads are proposed by the Proponent; however, fencing will be required around the substation for the safety of the public. Private landowners will maintain the ability to gate Project roads on private land, at their discretion.

Maintenance will conform to manufacturer equipment specifications, industry best management practices (BMPs), and standard operating procedures. Scheduled maintenance work will be carried out on a periodic basis. Maintenance work may require the use of a variety of cranes for brief periods of time for replacement of blades or other turbine repairs. The most common vehicle during maintenance work will be light/medium pickup trucks.

3.6.3 Decommissioning

A decommissioning bond will be established in accordance with Crown and municipal requirements, where applicable, to cover costs of decommissioning.

Prior to decommissioning, NSECC, the MOCA, and the MODG will be provided with decommissioning plans for review and compliance with the Project's EA conditions. Opportunities for repowering will be considered prior to entering the decommissioning phase.

Generally, the decommissioning phase will follow the same steps as the construction phase in the opposite order:

- Dismantling and removal of the turbines.
- Decommissioning the turbine foundations (to approximately 1 m below the surface) as per the conditions of the land lease agreement.
- Removal, recycling (where possible), and disposal of power collection system, conductor, and poles.
- Removal of all other equipment and reinstatement and stabilization of land.
- Access roads will either be removed or remain in place as per lease agreements with the landowner.

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

Decommissioning is anticipated to take 18 months to complete.

Procedures for Dismantling

If the Project is to be decommissioned and the turbines are to be removed at the end of their service life or during construction, the procedures will be similar to the construction phase, but in reverse sequence. The general dismantling procedure will proceed as follows:

- The Project will first be de-energized and isolated from all external electrical lines.
- Temporary staging areas will be created to provide sufficient area for the laydown of the disassembled wind turbine components and loading onto trucks. An area of approximately 1 ha around each wind turbine must be cleared, levelled, and made accessible. After completion of the decommissioning, temporary staging areas and any associated temporary decommissioning facilities or components used throughout the decommissioning phase will be removed. The temporary staging areas will be located within the Assessment Area used during the construction phase of the Project.
- Crane pads will be installed (estimated 30 m x 70 m) and within the temporary staging area around each wind turbine. The topsoil at the crane pad will be removed and approximately 600 millimetres (mm) of compacted crushed gravel will be added. Once the turbine disassembly has been completed, the gravel area around each turbine will be removed and the area will be restored to prior use using stockpiled topsoil.

- Wind turbines (blades, hub, nacelle and tower segments) will be removed using cranes. The components and associated equipment will be hauled off using trucks and heavy-loaders, and components will be recycled, where possible, or disposed of offsite at an approved and appropriate facility.
- The top of the concrete foundations will be removed to approximately 1 m below the surface at that time. Excavated foundation areas will be backfilled with clean fill and stockpiled topsoil to match the original elevations. These areas will also be graded, contoured, and restored to a land use similar to what was present prior to foundation installation to allow prior activities to resume.
- Overhead electrical lines are expected to be removed at the end of the Project's life. Poles will be cut to a depth of approximately 1 m below original grade or may be completely removed from the ground, where feasible.
- The substation will be located at the POI with the NSPI 230 kV transmission line. Responsibility for decommissioning substation and collecting line will be determined in consultation with NSPI.
- The substation and associated infrastructure will be dismantled and removed in accordance with the legal requirements at the time. Any concrete foundations associated with these facilities will be removed to at least 1 m below the original grade. The area will be graded, contoured, and restored to land use similar to what was present prior to foundation installation to allow prior activities to resume. All materials will be recycled, where possible, or disposed of off-site at an approved and appropriate facility.
- Removal of access roads will depend on the requirements and agreements in accordance with landowners, municipalities, and the Crown, as applicable. Impacted lands will be restored to the land use in place prior to the construction of the access road at the discretion of landowners.
- The MET Tower(s) will be removed unless otherwise requested by the municipality or stakeholders and agreed to by the Proponent and the property owner.

Restoration of Land

All affected lands will be restored once the dismantling procedures have been completed and the turbines and other ancillary facilities have been removed.

After the dismantling process has been completed, the land will be returned to previous conditions in consultation with the landowner, local municipality and NSECC. This will be accomplished by removing the foundations (or part of foundation), granular material from roadways and culverts. The natural environment will be restored by natural re-vegetation. If there is insufficient material on-site, topsoil and/or subsoil will be imported from a source acceptable to the landowner, local municipality and local NSECC office, as applicable.

Waste Generated

Waste and debris generated during the decommissioning activities will be collected and disposed of at an approved facility. All reasonable efforts will be made to minimize waste generated throughout the decommissioning phase. Materials used and generated throughout decommissioning will be recycled, as practicable.

Industry best practices for spill prevention will be employed. In the unlikely event of a minor spill, it will be cleaned up immediately and any impacted soils will be removed from the site and disposed of at an appropriate facility in accordance with the applicable regulations.

After decommissioning, vehicles and construction equipment will be removed from the site.

3.7 Project Schedule

Table 3.4 presents the Project schedule from EA registration to Project decommissioning.

Table 3.4: Project Schedule

Project Activity	Timeline
EA Registration	2026
Post-EA Environmental Monitoring Programs	Throughout the life of the Project, as required by Approval conditions.
Geotechnical Assessment	2026
Detailed Engineering Design	2026
Municipal Decision on Development Agreement	2026
Clearing	As early as Q4 2026 to 2028
Construction	As early as 2027 to 2029
Commissioning	As early as 2029
Operation	35+ years
Decommissioning	1.5 years post-operation

4.0 ASSESSMENT SCOPE & METHODOLOGY

As a Class 1 EA, this Registration Document and supporting studies have been developed to meet all requirements under Section 9(1A) of the Environmental Assessment Regulations (Nova Scotia, 1995c). As such, this submission has been prepared in accordance with:

- A Proponent's Guide to Environmental Assessment (NSECC, 2025a).
- Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025c).
- Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025b).
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a).

Over the past several years, Project team members have engaged with the following regulatory bodies to provide input and advice into the EA scope and planning for the proposed Project, as well as for several other similar proposed wind project developments in Nova Scotia:

- Environment and Climate Change Canada – Canadian Wildlife Service (ECCC-CWS).
- Fisheries and Oceans Canada (DFO)
- Nova Scotia Communities, Culture, Tourism and Heritage (NSCCTH)
- NSECC
- Nova Scotia Natural Resources (NSNR)
- Nova Scotia Office of L'nú Affairs (OLA)

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 Valued Components (VCs). VCs are specific components of the biophysical and socioeconomic environments that, if altered by the Project, may be of concern to the Mi'kmaq of Nova Scotia, regulators, stakeholders, and the public. The scope of the EA for this Project includes:

- Identify VCs that 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.

4.1.1 Identification of Valued Components

The following VCs were identified based on the experience of the Project Team and through engagement with regulators, stakeholders, the Mi'kmaq of Nova Scotia, and the public:

- Atmospheric environment
 - Weather, climate, air quality
 - GHGs
 - Sound
 - Shadow flicker
- Geophysical environment
 - Geology
 - Hydrogeology/groundwater

- Aquatic environment
 - Surface water, fish and fish habitat
 - Wetlands
- Terrestrial environment
 - Terrestrial vegetation communities and flora
 - Fauna (including mainland moose)
 - Bats
 - Avifauna
- Socioeconomic environment
 - Economy
 - Land use and value
 - Recreation, and tourism
- Archaeological resources

4.1.2 Spatial & Temporal Boundaries

4.1.2.1 *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:

- Local Assessment Area (LAA): The area that represents the maximum extent of predicted or measurable direct and/or indirect effects of the Project. The LAA is VC-specific and defined in each VC chapter.
- Regional Assessment Area (RAA): The area provides a broader context for assessing Project-specific effects. The RAA is further reaching than the extent of indirect effects, but not so wide-ranging that the effects within the LAA are not detectable. This area will be used to support the assessment of cumulative effects, accidents and malfunctions, and elsewhere as appropriate. The RAA varies between VCs and will be defined (where necessary) in each VC chapter.

Additional boundaries were also established for the purpose of field data collection and to describe the area containing Project infrastructure, as provided in Section 3.2.

4.1.2.2 *Temporal Boundaries*

The temporal boundaries of the assessment are related to the major phases of the Project and are used for assessing the anticipated duration of environmental effects. 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	36 months
Operation and Maintenance	35+ years
Decommissioning	18 months following operation and maintenance

4.1.3 Species at Risk

In evaluating the potential effects of the Project on wild species, special consideration is given to SAR, which include those species listed under the *Species at Risk Act* (SARA) (Canada, 2002) and/or the *Endangered Species Act* (ESA) (Nova Scotia, 1998). Consideration is also given to species of conservation interest (SOCI), which, for the EA Registration Document, includes species that are:

- Assessed as 'Endangered', 'Threatened', or 'Special Concern' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) that are not already listed under SARA.
- Have a subnational rank (S-Rank) of S3, S2, or S1 (or a combination thereof) from the Atlantic Canada Conservation Data Centre (ACCDC).

SAR and SOCI species and their supporting habitat are identified in individual VC chapters, as appropriate.

4.1.4 Biophysical Assessment Components and Timing

The biophysical field components of the EA were initiated in Spring 2023 and continued until October 2025. The field components and survey timing are outlined in Table 4.2.

Table 4.2: Biophysical Assessment Components and Timing

Vegetation Classification		Various (completed during, vascular plant, lichen, old-growth, and wildlife surveys)
Vascular Plant Surveys	Rare Plant Surveys	July and September 2024 June, July, October 2025
Lichen Survey		May 2023 June, July, and September 2024 July, September, and October 2025 January 2026
Old-Growth Forest Surveys		June and October 2025
Wildlife Surveys	Incidental Observations	During all biophysical surveys
	Bat Acoustic Monitoring	March to July 2023 July to November 2024
	Winter Tracking Surveys	January and February 2024
	Pellet Group Inventory Surveys	May 2023
Avian Surveys	Spring Migration	Round 1: April 11 and 12, 2023 Round 2: April 26 and 27, 2023 Round 3: May 10 to 12, 2023 Round 4: May 31, 2023 Round 5: June 9, 2023
	Breeding Bird	Round 1: June 13, 2023 Round 2: June 12 to 14, 2024 Round 3: June 27 and 28, 2024

	Nightjar	Round 1: June 11 and 12, 2024 Round 2: June 26, 2024
	Fall Migration	Round 1: August 14 to 16, 2024 Round 2: September 6 to 11, 2024 Round 3: September 17 to 19, 2024 Round 4: October 2 to 4, 2024 Round 5: October 23 to 25, 2024
	Acoustic & Radar Monitoring	Acoustic: March to June 2023, July to November 2024 Radar: April to June 2023, July to November 2024
Wetland and Watercourse Evaluations		June 2023 September to November 2024 May to July, and October 2025 January 2026
Fish and Fish Habitat Assessment		Electrofishing: June 20, 2023, and September 4, 2024 Trapping: June 6 and 8, 2023
Species at Risk	Incidental	During all biophysical surveys

As the Project has continuously undergone design changes and refining, some portions of the Assessment Area have not yet been field-assessed or have been assessed out of season. Areas to be assessed during future surveys are primarily related to land access issues, minor shifts in road placement, as well as the addition of temporary laydown areas (Drawing 2.1). Table 4.3 provides a breakdown of the area remaining to be assessed.

Table 4.3: Assessed Areas

Area of Study	Area (ha)	Percentage (%)
Assessment Area (total)	710	-
Assessed as part of this EA	671	95
Area requiring further assessment	39	5

The Proponent commits to the completion of assessments in the remaining areas prior to the commencement of Project activities in those areas.

4.1.5 Approach to Receptors

Turbine setbacks have been applied to all residential dwellings as defined in the Minimum Planning Requirements Regulations (MPRR) (Nova Scotia, 2025), which was created to harmonize turbine setback requirements across Nova Scotia and promote wind development.

The MPRR limits municipal planning setbacks between residential dwellings and wind turbines to a **maximum** of:

- a) Four times the wind turbine height.
- b) The distance required to ensure that:
 - i. Sound levels from the wind turbine do not exceed 40 A-weighted decibels (dBA) at the exterior of a residential dwelling.

- ii. A residential dwelling receives less than 30 minutes per day or 30 hours per year of shadow flicker.

and whereas “residential dwelling” means a permanent structure used for human habitation and includes a house, condominium, apartment building, cottage, mobile home, or trailer.

The Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025b) requires:

- a) Modeling to show that operational noise at potential receptors (within 2 km) will not exceed 40 dBA.
- b) Modelling to show that shadow flicker will not exceed 30 minutes per day or 30 hours per year at any permanent or seasonal receptor within 2 km of the project.

To avoid conflict between the MPRR and the Environmental Assessment Supplemental Checklist: Wind Energy Projects, the Proponent has equated “permanent receptors” to “house, condominium, apartment buildings, mobile home, or trailer” and “seasonal receptors” to “cottage”. The Proponent does not consider “camps” as “seasonal receptors” requiring compliance with sound and shadow limits as this would conflict with the MPRR but has included all “camps” in sound and shadow flicker modelling for transparency regarding sound and shadow impacts.

In lieu of a clear definition of cottage and camp by the Province of Nova Scotia, the following definitions have been applied:

- “Cottage” means a seasonal home which is equipped to accommodate an extended period of stay of regular human occupation and living that substantially meets the following criteria:
 - a) Running water (potable) and onsite sewage disposal.
 - b) Has permanent electrical service that is connected to the provincial grid or supplied by an onsite power generation system operating to a standard typical of other residential dwellings.
 - c) Is assessed as a Residential Property by the Property Valuation Services Corporation under the *Assessment Act*, R.S.N.S. 1989, c. 23.
 - d) Is constructed to meet applicable building code and municipal bylaw requirements for residential occupancy.
- “Camp” means a recreational shelter typically used for weekend or short-term activities such as hunting, fishing, or snowmobiling, which is not intended for regular human occupation or living.

As required by NSECC, all receptors within a 2 km radius of any wind turbine are included in the sound and shadow flicker studies. Potential receptors (including sensitive receptors such as schools, daycares, and senior residences) within 2 km of the Project turbines and substation

were identified using GIS data from the Nova Scotia Topographic Database (GeoNOVA, 2025a) and aerial imagery. Consistent with the MPRR, compliance with sound and shadow thresholds are only considered a requirement for residential dwellings. Receptor identification was conducted for the Proponent by WSP Canada Inc.

4.2 Potential Project-Valued Component Interactions

The potential interactions between the Project and the VCs, by phase, are presented in the individual VC chapters (Sections 7 to 12) 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 Project design to eliminate or reduce potential adverse effects.

4.3 Effects Assessment Criteria

The significance of the effects after mitigation is determined using defined criteria. Most criteria are the same for all VCs (Table 4.4); however, the magnitude criteria are VC-specific and provided in the individual sections.

Table 4.4: 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⁽¹⁾ The geographic area in which an effect occurs.	LAA: The area where direct and/or indirect Project-related effects can be predicted or measured for assessment unless impacts are widespread. RAA: The area providing broader context for assessing Project-specific effects (if/where applicable).
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.
Duration The time required until the measurable parameter or VC returns to its existing condition, or the potential 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 and/or decommissioning phase. Medium Term: Residual effect extends through the operation, maintenance, and ends before, during, or shortly after the decommissioning phase. Long Term: Residual effect extends throughout the Project's lifecycle and beyond the decommissioning phase.
Reversibility Describes whether a measurable parameter or the VC can return to its existing condition after the activity ceases.	Reversible: The residual effect is likely to be reversed after the activity is completed. Irreversible: The residual effect is unlikely to be reversed. Partially Reversible: The residual effect is likely to be partially reversible after the activity is completed.

⁽¹⁾ Criteria used for describing context of the effect; however, these criteria do not factor directly into the significance definition.

If, based on the criteria in Table 4.4, a residual effect is identified, its significance is then evaluated based on the criteria in Table 4.5.

Table 4.5: Definition of Significant Residual Environmental Effect

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

4.4 Monitoring & Follow-up

Follow-up programs and monitoring, developed in some cases with regulator input or approval, may be recommended to verify predictions or assess the effectiveness of mitigation measures and the need to implement adaptive management. Follow-up programs and monitoring are presented, as necessary, in individual VC sections.

5.0 MI'KMAQ OF NOVA SCOTIA

The Mi'kmaq are the founding people of Nova Scotia and currently live throughout the province, including 13 Mi'kmaq communities (OLA, 2015). The Project is located within the Mi'kmaq district of Eskikewa'kik, meaning "skindresser's territory" (MDCC, 2025b). The provinces of Nova Scotia, New Brunswick, Prince Edward Island, and the Gaspé Peninsula in Quebec are founded on land historically occupied by the ancestors of the Mi'kmaq. The earliest evidence of the Mi'kmaq of Nova Scotia in the Maritimes Region indicates that the ancestors of the Mi'kmaq have existed on the land for more than 11,000 years (MDCC, 2025a).

The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights, including the right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, as well as Aboriginal rights to hunt, fish, and gather food for social and ceremonial purposes, more broadly referred to as "traditional" purposes. Mi'kmaq rights are communal rights and therefore shared amongst all members of the Mi'kmaq Nation in Nova Scotia.

The Crown has a duty to consult with the Mi'kmaq of Nova Scotia, which is achieved in accordance with the Mi'kmaq-Canada-Nova Scotia Consultation Terms of Reference. As per instruction by the Supreme Court of Canada and subsequent guidance from governments [including the Updated Guidelines for Federal Officials to Fulfill the Duty to Consult (INAC, 2011) and the Proponents' Guide: The Role of Proponents in Crown Consultation with the

Mi'kmaq of Nova Scotia (OLA, 2012)], the Crown may delegate procedural aspects of consultation to proponents. However, the duty to consult, and ultimate decision-making authority, remains with the Crown. The results of the Proponent's Mi'kmaq of Nova Scotia engagement program and EA development is expected to be considered by the provincial government in the EA decision-making process.

For the purposes of consultation, 10 of the 13 Mi'kmaq communities are represented by the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), which reports to the Assembly of Nova Scotia Mi'kmaq Chiefs. At this time, Membertou, Millbrook First Nation, and Sipekne'katik First Nation represent their own communities in consultation through their elected Chiefs and Councils.

The nearest Mi'kmaq community to the Project is the Paqtnkek Mi'kmaw Nation community on the Paqtnkek-Niktuek Reserve (No. 23). The Paqtnkek Mi'kmaw Nation has a total of 616 registered individuals, both on-reserve and off-reserve (Government of Canada, 2025). The Paqtnkek reserve is located approximately 4 km northwest of the Project. Other Mi'kmaq communities in the region include Potlotek First Nation on the Chapel Island Reserve (No. 5) (population 405; 80 km northeast of the Project), and the We'koqma'q First Nation on the Whycocomagh Reserve (No. 2) (population 870; 70 km northeast of the Project).

The nearest known Mi'kmaq placenames to the Project are Paqtnkek, which means "above the water (but at a distance from the ocean)", and Amasipukwejk, which means "long river" (T'an Weji-sqalia'tiek, n.d.). These placenames correspond to Afton, along Highway 4, and Glassburn, on Heatherton-Guysborough Road.

5.1 Engagement

As an integral component of any project development activity in Nova Scotia, the Proponent prioritized engagement with Nova Scotia Mi'kmaq communities.

The previous Project owner conducted engagement with Nova Scotia Mi'kmaq communities in 2021 and 2022, and EverWind has engaged broadly with Mi'kmaq communities and organizations on its portfolio of projects since 2023.

Consultation with OLA for the Project began in May 2023. An initial Project introduction was held with an OLA representative and the previous Project owner to discuss the Project and proposed Mi'kmaq engagement plan. The OLA representative provided the previous Project owner contact details for the First Nation communities and recommended engagement with the nearby Paqtnkek Mi'kmaw Nation. In June 2025, the Proponent met with an OLA representative to discuss updates to the Project, including layout and ownership changes.

The Proponent notified the Mi'kmaq of Nova Scotia of the Project, extended an offer to meet, and provided as much information as possible. As detailed in the Proponents' Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia (OLA, 2012), the Proponent has documented the engagement process for the Project to date (Table 5.1)

In January 2026, Project introduction letters which included an offer to meet and an invitation to the January 20 and 21, 2026, Information Sessions were provided via email to Paq'tnkek First Nation, Pictou Landing First Nation, and the KMKNO. Project introduction letters were also distributed in late January and February 2026 to Potlotek First Nation, Millbrook First Nation and Sipekne'katik First Nation.

The Proponent met with the Sipekne'katik Governance Initiative (SGI) on February 19, 2026, to discuss the Project as it relates to the SGI process.

Table 5.1: Engagement with the Mi'kmaq of Nova Scotia

First Nation / Organization	Representative(s)	Communication Details
First Nations		
Paq'tnkek First Nation	Juliana Julian	January 6, 2026 - Email sent with a Project overview, offer to meet, and invite to Upper Afton Open Houses. January 20, 2026 - Open House held at the Paq'tnkek Community Center. Community members attended as well. January 26, 2026 - Follow up email sent to Chief and offer of a detailed Project update to Chief and Council.
Pictou Landing First Nation	Chief Tamara Young	January 15, 2026 - Email sent with a Project overview, offer to meet, and invite to Upper Afton Open Houses.
Millbrook First Nation	Chief Robert Gloade Claire Marshall Gerald Gloade	January 30, 2026 - Email sent with a Project overview and offer to meet.
Potlotek First Nation	Chief Wilbert Marshall Tahirih Paul Isaiah Bernard	February 13, 2026 - Email sent with a Project overview, offer to meet, and invite to Upper Afton Open Houses.
Sipekne'katik First Nation	Chief Michelle Glasgow Councillors SGI staff	January 29, 2026 - Email sent with a Project overview and offer to meet. February 19, 2026 - Meeting held with SGI to discuss consultation with Sipekne'katik through the SGI process.
Organizations		
Maw-lukutijik Saqmaq (The Assembly of Mi'kmaw Chiefs)	The Assembly of Mi'kmaw Chiefs Tracy Menge	May 31, 2023 - The Proponent enters into a Memorandum of Agreement with the Assembly of Mi'kmaw Chiefs.
KMKNO: Benefits		July 8, 2025 - The Proponent enters into a Memorandum of Agreement and establishes the

First Nation / Organization	Representative(s)	Communication Details
		broad terms and timeframes for a Mi'kmaq Benefits Agreement. 2023 – 2026 - Meetings are ongoing with the KMKNO team to finalize a Mi'kmaq Benefits Agreement (MBA) and related appendices which the Project will form part of. A Working Group has been established to facilitate benefits from Mi'kmaq people and business as Projects move from development to construction and finally operation.
Mukk Nqa'ltutik Community Connections Symposium	Tracy Menge Noelle MacLean	May 22, 2025 - The Proponent presented with Mi'kmaq equity partner at a conference in Truro to discuss the Project and potential career and procurement opportunities.
Nova Scotia Mi'kmaq Summer Games	Chief Norman Bernard Samantha Young	August 22 and 23, 2025 - Information booth at the Nova Scotia Mi'kmaq Summer Games in Wagmatcook with staff on-site discussing the Project.
KMKNO: Engagement	Patrick Butler Twila Gaudet	January 6, 2026 - Project overview, offer to meet, and invitation to open houses provided via email.
Maritime Aboriginal Peoples Council	Christina Davis Vanessa Mitchell	January 26, 2026 - Project overview and offer to meet provided via email.
Clean Foundation	Matthew Copage	November 14, 2026 - Conducted site tour of Point Tupper facility for a group of Mi'kmaq youth to discuss the Project, address concerns and explore future opportunities.

5.1.1 Review of Concerns

No specific concerns were provided by First Nation communities or organizations related to the Project.

5.1.2 Ongoing Engagement

The Proponent is committed to on-going, meaningful engagement and economic reconciliation with the Mi'kmaq of Nova Scotia and will continue to provide regular updates and seek feedback throughout the life of the Project. Additionally, the Proponent is developing a MBA with the Assembly of First Nations and the KMKNO. A Memorandum of Understanding (MOU) was signed with the Assembly in 2023, and a binding Memorandum of Agreement was signed in 2025.

The Proponent is also committed to minimizing footprint disturbance and impacts to the Mi'kmaq of Nova Scotia while generating positive economic and environmental benefits. The Proponent will develop a Mi'kmaq Communication Plan that outlines an ongoing two-way communication process throughout the life of the Project.

5.2 MEKS

Membertou Geomatics has been retained to conduct a Mi'kmaq Ecological Knowledge Study (MEKS). A copy of the MEKS will be provided directly to the required reviewers under separate cover.

A MEKS presents a thorough and accurate understanding of Mi'kmaq land use and resources within an area. It is a report of gathered, identified, and documented ecological knowledge which is held by individual Mi'kmaq people. In addition, the MEKS report provides information on proposed Project activities that may impact the traditional land and resource use of the Mi'kmaq.

The MEKS considers the land and water areas in which the Project is proposed to identify what Mi'kmaq traditional use activities have occurred or are occurring within the "Study Area". The MEKS also identifies what Mi'kmaq ecological knowledge exists within the area. This process is done in accordance with the Mi'kmaq Ecological Knowledge Protocol, 2nd Edition (ANSMC, 2014), which was established by the Assembly of Nova Scotia Mi'kmaq Chiefs and speaks to the process, procedures, and results that are expected of a MEKS.

The MEKS consists of two major components:

- Mi'kmaq Traditional Land and Resource Use Activities
 - Considers both past and present uses of the area.
 - Uses interviews as the key source of information regarding Mi'kmaq use.
- A Mi'kmaq Significance Species Analysis
 - Identifies species in the area and considers resources that are important to Mi'kmaq use (food/sustenance resources, medicinal/ceremonial plant resources, and art/tools resources).
 - Considers resource availability/abundance in the area (along with adjacent areas or in other areas outside), their use, and their importance with regards to the Mi'kmaq.

The Mi'kmaq Significance Species Analysis was conducted on September 25 and 26, 2025. Interviews are underway by the MEKS team with Mi'kmaq knowledge holders from the First Nation communities nearest the Project and beyond. The MEKS will be provided to NSECC upon completion.

5.3 Mi'kmaq Partnerships

Upper Afton Wind Ltd. is comprised of EverWind and Membertou Development Corporation. Membertou Development Corporation is leading a Mi'kmaq nations consortium with 51% equity ownership in the Project. The Project follows an Indigenous-majority ownership model, supporting meaningful shared leadership and decision-making. The partnership enables long-term participation in the development, construction, and operation in the Project. The consortium structure reflects a commitment to economic reconciliation, local capacity building, and intergenerational benefits for participating Mi'kmaq communities.

5.4 Commitments to the Mi'kmaq of Nova Scotia

The Proponent is committed to the following mitigation measures to reduce the Project's impact on traditional practices and Mi'kmaq archaeological features (if identified), as follows:

- Provide the Mi'kmaq of Nova Scotia an opportunity to walk the site prior to clearing to document sensitive sites and harvest traditional plants.
- Halt work during construction if archaeological deposits or human remains are encountered. The Proponent will immediately contact NSCCTH and the KMKNO Archaeological Division.
- Provide a tour of the Project to the Mi'kmaq of Nova Scotia, once constructed.
- Develop a Mi'kmaq Communication Plan.
- Develop a Complaint Resolution Plan.
- Continue to work with the Assembly First Nations to develop a MBA that will enable the Mi'kmaq of Nova Scotia to actively participate in the Project through education, training, mentorship, employment, and procurement opportunities.
- Continue to engage with the Mi'kmaq of Nova Scotia for the life of the Project.

6.0 GOVERNMENT AND PUBLIC ENGAGEMENT

The Proponent is committed to meaningful engagement with government, the public, stakeholders, and the Mi'kmaq of Nova Scotia.

The previous Project owner conducted community open houses in 2021 and 2022 (virtual due to COVID pandemic). The Proponent acquired development rights to the Project in 2024 and has continued to participate in meetings, deliver presentations, and hosted four additional Open House events in Guysborough Intervale, Paqtnekek Mi'kmaw Nation, Heatherton, and Upper Big Tracadie.

Associated posters and comment cards are provided in Appendix B.

Engagement related to EMI is described in Appendix C.

6.1 Engagement with Government Departments, Agencies, and Regulators

6.1.1 Regulatory Engagement

The current and former Project Team met with government entities and officials representing federal, provincial, and municipal jurisdictions (Table 6.1) to open lines of communication about the Project and ensure all regulatory requirements are met.

Table 6.1: Government Meetings and Events

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
Federal Government		
ECCC-CWS	Stephen Zwicker Michael Hingston Paul Knaga Monique Breau	April 6, 2023 - Consultant provided proposed bird survey methodology to ECCC-CWS, for review and comment. May 17, 2023 - ECCC-CWS provided recommendations regarding survey methodology, additional consultation recommendations, and habitat and SAR/SOC considerations. ECCC-CWS also provided updated guidance for wind projects in Atlantic Canada and survey protocols for SAR bats.
Fisheries and Oceans Canada (DFO)	Laura Watkinson	June 23, 2022 - Consultant met virtually with DFO representative to discuss approach for fish surveys to support wind EAs. Proposed to complete detailed habitat assessments on any watercourses proposed to be crossed. DFO indicated that electrofishing is not necessary for the EA and more details may be required during the Request for Review process. In the EA, DFO will require enough information to understand the potential impacts to fish. DFO suggested a desktop review to understand potential fish use of the area. It was recommended to get information of fish from locals and to review the SAR and critical habitat mapping.
National Research Council Canada	Shahabebin Eslami	January 13, 2026 - Proponent conducted a site tour at Point Tupper to contextualise the scope of the Project and research opportunities.
Member of Parliament (MP)	Jaime Battiste	July 2025 - Proponent held a Project update meeting at Friends United for provincial, federal and municipal representatives. The MP spoke at the event. January 12, 2026 - Invitation to attend upcoming open house on January 20, 2026, and offer of Project update.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
Senator (Senate Human Rights and Foreign Affairs)	Mary Coyle	January 17, 2026 - Proponent invited Senator Coyle to Project information sessions and a student-led panel at St. Francis Xavier University, The Senator attended in person.
Provincial Government		
NSECC – EA Branch	Candace Quinn	May 3, 2023 - Provided a Project introduction presentation which outlined information on the proponent, the Project, site sensitivities, details related to the biophysical survey program, details related to the proposed technical studies and proposed Mi'kmaq of Nova Scotia and public engagement.
	Bridget Tutty Helen MacPhail Mark McInnis Lynda Weatherby	January 2, 2025 - EverWind informed the EA Branch that the Project has officially been acquired from EDF Renewables and requested to meet once the layout is finalized.
	Bridget Tutty Lynda Weatherby	June 12, 2025 - EverWind requested a meeting to discuss the Project in more detail. Meeting was set for June 24, 2025.
	Bridget Tutty Meghan Rafferty Lynda Weatherby	June 24, 2025 - Project update presentation provided to NSECC. Presentation provided an overview of Project status, studies in progress, public and First Nations engagement plan, and timing of EA registration.
	Bridget Tutty Anthony Haggelin	August 15, 2025 - Notified NSECC of a reduction in turbines
	Anthony Haggelin Mark McInnis	September 10, 2025 - Provided update to NSECC on EA registration timing.
	Lynda Weatherby	November 18, 2025 - Provided update to NSECC on EA registration timing.
	Bridget Tutty Lynda Weatherby	January 19, 2026 - Provided update to NSECC on EA registration timing.
	Bridget Tutty Lynda Weatherby	January 29, 2026 - Met with NSECC to discuss the identification and classification of residential receptors for the Setapuktuk Wind Project. Examples were also referenced for the Upper Afton Wind Project.
NSNR	Sarah Spencer	April 3, 2023 - Provided NSNR with Project spatial files and the ACCDC report and inquired about observations of wood

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		turtle (location sensitive) and core habitat for mainland moose, wood turtle, and black ash. April 4, 2023 - NSNR indicated that the Project overlaps with mainland moose core habitat. Within the Study Area there is known wood turtle habitat and occurrences, but no critical habitat. The closest black ash core habitat is approximately 7 km to the southeast. May 4, 2023 - Provided NSNR with the updated ACCDC report which also includes bat hibernacula or bat species occurrence as location sensitive. Requested additional details on this observation May 8, 2023 - NSNR confirmed that there is a bat occurrence approximately 4.5 km to the west of the Project. There are also bat occurrences 5.5 km and 6.5 km to the west as well as 7 km to the north and 7.5 km to the northeast. January 14, 2025 - NSNR confirmed that no Atlantic Canada Conservation Data Centre records of black ash core habitat are within the Study Area. July 8, 2025 - NSNR confirmed that no known bat hibernacula are within 5 km of the Study Area and no Atlantic Canada Conservation Data Centre records for wood turtle are within the Study Area. January 14, 2026 - NSNR confirmed that the Study Area is within an area identified as core habitat for mainland moose (these lands are not currently designated under ESA).
	Mark McGarrigle	May 3, 2023 - Provided a Project introduction presentation which outlined information on the Proponent, the Project, site sensitivities, details related to the

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		biophysical survey program, details related to the proposed technical studies and proposed First Nations and public engagement. NSNR requested that an additional wood turtle survey transects be completed in the southern portion of the Study Area, if conditions are suitable for the species. NSNR also recommended completing additional moose transects beyond the Study Area (within 2 km) that can be replicated during long term monitoring. May 5, 2023 - Provided NSNR with revised transect layouts for mainland moose surveys and wood turtle surveys, based on feedback received from May 3, 2023, meeting. NSNR noted that a wood turtle record was made within the Study Area and recommended any watercourse locations where there is a crossing planned or expected should have a habitat assessment completed to determine suitability for turtles, and surveys undertaken if it is deemed that suitable habitat exists. Ideally, transects should be conducted 200 m upstream and downstream of any crossing. May 8, 2023 - Provided NSNR with a revised wood turtle survey plan to meet the recommendations provided by NSNR.
	Mark McGarrigle Tara Crewe	June 24, 2025 - Project update presentation provided to NSNR. Presentation provided an overview of Project status, studies in progress, public and First Nations engagement plan, and timing of EA registration.
	NSECC – Protected Areas and Ecosystems Branch	June 13, 2023 - Provided NSECC information on Project ownership and the proposed Project as well as distance/direction from turbines to the
	Kermit deGooyer Oliver Maas Craig Smith Lynda Weatherby	

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		Tracadie River Wilderness Area (nearest turbine is 230 m east). NSECC stated that 500 m is the preferred setback from a protected area. Configuration is also important. The Tracadie River Wilderness Area has no current bird data but is known to support mainland moose and is a large intact portion of tolerant hardwood forest on hills or drumlins. NSECC suggested restricting access in proximity to the protected area as a mitigation and the branch is also open to restoration opportunities within the protected area. NSECC noted that additional Crown lands are being added to protected areas and Crown land south of the Tracadie River Wilderness Area may be considered candidate land. June 30, 2025 - EverWind requested a meeting with NSECC to discuss the Project as turbines are proposed to be sited within 500 m of the Tracadie River Wilderness Area. July 16, 2025 - In advance of the July 17, 2025 meeting, EverWind provided NSECC with a copy of the slide deck. July 17, 2025 - Presentation to provide to NSECC with updated information on EverWind and the Project layout including distance/direction from the Tracadie River Wilderness Area to nearest turbine. NSECC noted protected area coverage in the province is 13.7% but increasing to 20%. NSECC noted that they typically target unfragmented land near Crown land adjacent to protected areas for expansion. NSECC provided details regarding protected area designations and associated regulations and procedures. NSECC did not provide any concerns with

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		infrastructure placement in proximity to the protected area.
OLA	Gillian DesRoches	May 3, 2023 - Provided a Project introduction presentation which outlined information on the proponent, the Project, site sensitivities, details related to the biophysical survey program, details related to the proposed technical studies and proposed First Nations and public engagement.
	Candace Quinn	June 24, 2025 - Project update presentation provided to OLA. Presentation provided an overview of Project status, studies in progress, public and First Nations engagement plan, and timing of EA registration.
Member of Legislative Assembly (MLA) – Guysborough Tracadie	Greg Morrow	January 12, 2026 - Invitation to attend upcoming open house on January 20, 2026. January 20, 2026 - The Minister joined the public open house in person.
MLA - Antigonish	Michelle Thompson	January 12, 2026 - Provided a Project overview and invitation to attend upcoming open house on January 20, 2026. January 26, 2026 - Project update meeting scheduled due to storm. February 17, 2026 - Project update meeting held to provide an overview of Project status, studies in progress, public and First Nations engagement, timing of EA registration and rural economic development opportunities.
NSPW	Darcey MacBain Devon Pinks	November 19, 2025 - Discussed requirements for turbine deliveries and work within public road right of ways.
Municipal Government		
MODG	Warden Councillors Sean O'Connor Debbie Torey	September 24, 2024 - Proponent initiated discussions with Director of Economic Development to update on Project and community engagement.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		2024-2025 - Regular meetings held with economic development and planning staff from 2024 to 2025. October 15, 2025 - Proponent provide council with a Project update and responded to specific questions. October 24, 2025 - Proponent senior management met with Warden and specific project district councillors to discuss the Project. January 6, 2026 - Invited district councillors to upcoming open houses to review early Project information, ask questions directly of the Project team, hear feedback from community members in an open and collaborative setting. January 20, 2026 - Warden and Sean O'Connor attended the public open house in person.
MOCA	Warden Councillors Shirlyn Donovan Tammy Feltmate	June 10, 2025 - Proponent reached out to Chief Administrative Officer and Director of Sustainable Communities to request a meeting about the Project. July 3, 2025 - Proponent followed up to set up a meeting with Senior Manager that is overseeing the Project. January 6, 2026 - Invited district councillors to upcoming open houses to review early Project information, ask questions directly of the Project team, hear feedback from community members in an open and collaborative setting. January 21, 2026 - Warden attended the public open house in person.
Eastern District Planning Commission	John Bain	July 22, 2025 - Proponent met to discuss amendments to the Antigonish Land Use By-Law for wind turbine development. Followed up with a formal request letter.

6.1.2 Review of Government Concerns

Discussions with federal regulators focused on survey methodology. Discussions with provincial regulators focused on environmental impacts, survey approach, Mi'kmaq and public engagement, Project timelines, as well as infrastructure siting and design. Notably, regulators highlighted the importance of proactive sharing of Project information and in as much detail as possible as well as the importance of habitat coverage.

The Project Team has engaged with municipal planners and staff regarding amendments to the applicable municipal land use bylaw to ensure alignment with the Province of Nova Scotia's Municipal Planning Strategy (MPS) framework and related policy for wind energy development. The Province amended the MPRR to establish maximum allowable setbacks for wind turbines for Nova Scotia municipalities in March 2025. The Proponent has worked with municipal planners to align the MPS with municipal bylaws to the MPRR, NSECC requirements and other municipalities.

The Proponent specifically requested the following amendments to the MOCA Land Use By-Law:

1. A turbine setback distance of four (4) times the turbine height, and the distance required to ensure that:
 - a. Sound levels from the wind turbine do not exceed 40 dBA at the exterior of a residential dwelling.
2. A residential dwelling receives less than 30 minutes per day or 30 hours per year of shadow flicker setbacks. Minimum setbacks from watercourses to be 30 m from a wind turbine tower footprint, unless written approval is provided by the Province.
3. Minimum highway/public road setback to be 1.1 times the turbine height.
4. Applicants be allowed to apply for renewal of a development permit if construction has not commenced within 12 months, rather than being required to submit a new application.

Engagement with government officials will continue through development, construction, and operational phases of the Project.

6.2 Public and Stakeholder Engagement

The Project Team has been involved in formal engagement activities with the public and stakeholders to ensure the community was made aware of the Project and given ample opportunity to receive information, ask questions, and share local knowledge.

Engagement with the public and stakeholders will continue through development, construction, and operational phases of the Project. Table 6.2 summarizes engagement with stakeholders.

Table 6.2: Stakeholder Meetings and Events

Community/Stakeholder Organization	Engagement
Strait Regional School Board	October 18, 2023 - School event to discuss potential career opportunities in Guysborough County.
Nova Scotia Community Services	October 20, 2023 - Meeting with Nova Scotia Community Services Guysborough District Office and met with staff regarding employment opportunities and Project update for developments in MODG.
Strait Area Chamber of Commerce	April 11, 2024 - VISION 2024 Business Update and Trade Fair Director of Public Affairs presented on the panel with a focus on transformative industry. August 13 and 14, 2024 - Hosted two Summer Networking Socials, which included Project updates and a discussion of green hydrogen and ammonia production.
Community BBQ held outside of Guysborough office	July 11, 2024 - The Proponent held an informal BBQ outside of the new Guysborough office to talk to people coming and going from the mall regarding the projects, benefits to the communities and answer any questions. In total, the team served over 70 people, showcased the new office, talked directly about the Projects and responded to questions from the public. August 28, 2024 - Approximately 50 people served food and discussed Project information at the Guysborough office.
Local Landowners	August 29, 2024 (ongoing) - Proponent commenced discussion with local landowners in the Project region regarding participation. Meetings have occurred in private homes, public spaces online, lawyers' offices, and in the Proponents Guysborough office. The engagement with local landowners is ongoing and will continue for the life of the project.
Strait Area Education Recreation Centre	October 18, 2024 - Site tour and presentation to the Point Tupper Terminal for 32 high school students studying chemistry and physics to discuss the Project, green energy transition, and future opportunities.
Strait Regional School Board	October 18, 2023 - School event to discuss potential career opportunities in Guysborough County.
Nova Scotia Community Services	October 20, 2023 - Meeting with Nova Scotia Community Services Guysborough District Office and met with staff regarding employment opportunities and Project update for developments in MODG.

Community/Stakeholder Organization	Engagement
Strait Area Chamber of Commerce	April 11, 2024 - VISION 2024 Business Update and Trade Fair Director of Public Affairs presented on the panel with a focus on transformative industry. August 13 and 14, 2024 - Hosted two Summer Networking Socials, which included Project updates and a discussion of green hydrogen and ammonia production.
Community BBQ held outside of Guysborough office	July 11, 2024 - The Proponent held an informal BBQ outside of the new Guysborough office to talk to people coming and going from the mall regarding the projects, benefits to the communities and answer any questions. In total, the team served over 70 people, showcased the new office, talked directly about the Projects and responded to questions from the public. August 28, 2024 - Approximately 50 people served food and discussed Project information at the Guysborough office.
Local Landowners	August 29, 2024 (ongoing) - Proponent commenced discussion with local landowners in the Project region regarding participation. Meetings have occurred in private homes, public spaces online, lawyers' offices, and in the Proponents Guysborough office. The engagement with local landowners is ongoing and will continue for the life of the project.
Strait Area Education Recreation Centre	October 18, 2024 - Site tour and presentation to the Point Tupper Terminal for 32 high school students studying chemistry and physics to discuss the Project, green energy transition, and future opportunities.
Guysborough Academy	November 7, 2024 - Proponent contacted Vice Principal and guidance councillor regarding a site tour and to discuss future employment opportunities. May 7 and 8, 2025 - Presented to all grade 9 to 11 students regarding the Project, renewable energy and future opportunities. Opportunity for questions and discussion at the end. May 23, 2025 - Site tour at the Point Tupper Terminal for 45 students and staff from Guysborough Academy to discuss the Project, existing infrastructure, transition to green fuels and tour the facility.

Community/Stakeholder Organization	Engagement
Antigonish East Education Centre	October 18, 2024 - Site tour and presentation to the Point Tupper Terminal for 30 high school students to discuss the Project, green energy transition, and future opportunities.
Strait Area of Commerce	December 4, 2024 - Proponent hosted a site tour at Point Tupper Terminal, which included a 50-minute presentation, and a 20-minute question and answer/discussion period for Strait Area Chamber of Commerce and Chamber Past Presidents to discuss the Project, current operations and upcoming plans.
Dr. John Hugh Gillis Regional High School Community Career Connect Event	May 2, 2025 - Proponent presented on the Project to highlight potential career opportunities.
St. Francis Xavier University (StFX)	May 16, 2025 - Proponent presented and conducted a guided site tour in Point Tupper for chemistry and engineering students and faculty. May 22, 2025 - Proponent met with NRCAN and StFX to discuss the NRCAN Industrial Research Assistance Program (IRAP) partnership with StFX. June 24, 2025 - Natural Resources Canada approves IRAP partnership funding with StFX September 9, 2025 - Proponent met with StFX chemistry project lead and industry liaison officer to discuss the Project and explore opportunities for high-impact partnership and community integration in northern Nova Scotia. Opportunities emerged for joint research on clean technologies, academic-industry collaboration, student engagement, and participation in public-facing events. November 25, 2025 - Proponent led a site tour for fourth year Energy Systems class. January 22, 2026 - Proponent led a panel discussion on-campus event hosted by the Faculty of Business and STFX German Society focused on the global energy transition and local project development.
Community Connections Conference	May 22, 2025 - Proponent attended a conference in Truro to discuss potential career opportunities.

Community/Stakeholder Organization	Engagement
Strait Regional School Board	May 23, 2025 - Proponent presented and conducted a guided tour for high school students at Point Tupper.
Dalhousie Roundtable Community Meeting	May 27, 2025 - Proponent hosted in the Guysborough Project Office a delegation from Dalhousie University including the Dean of Science, VP of Strategic Engagement and Government Relations, Chair of Department of Chemistry, Director of the Clean Technologies Research Institute, Associate Dean Research, Department of Industrial Engineering as well as representatives from local municipalities, community organisations and business groups to discuss the Project and industry in the Strait Area.
Upper Big Tracadie Development Association (UBTDA)	August 19, 2025 - UBTDA reached out to the Proponent to request a meeting to discuss the Project and proximity to the community. The Proponent responded, expressing interest in meeting to provide an overview of the Project and discuss community involvement. August 28, 2025 - The Proponent held a community presentation at the community hall in Upper Big Tracadie to discuss the Project. The meeting focused on environmental impacts, economic benefits, and community involvement. Residents learned about plans for wind turbines and how the project could bring local revenue and long-term investment to the area. Community members asked questions and shared their concerns which included proximity to turbines, general sitting location, land lease agreements, and environmental impacts. December 15, 2025 - Correspondence between the Proponent and the UBTDA. Representative of UBTDA reached out to inquire about updates on the Community Liaison Committees (CLC) and employment opportunities. The Proponent responded, indicating that they are finalizing dates for an Open House Community Information Session and will confirm details soon. The session will discuss the formation of the CLC and employment opportunities. January 6, 2025 - The Proponent invited UBTDA representatives to upcoming open houses to review early Project information, ask questions directly of the Project team, hear feedback from community members in an open and

Community/Stakeholder Organization	Engagement
	collaborative setting. The Proponent requested UBTDA share the invitation more broadly with the community. January 26, 2026 - The Proponent invited UBTDA to have a meeting about culturally significant areas near the project, offered to set up a time and place for meeting to discuss concerns,
Eastern Nova Scotia Exhibition	August 28, 2025 - The Proponent established a booth at the annual Eastern Nova Scotia Exhibition in Antigonish to share information about the Project, discuss concerns, explain its potential benefits for the region, and answer questions from community members. Introducing the Project in this familiar public setting helped raise awareness by attracting over a hundred people to the booth and encouraged open dialogue and understanding with local residents.
Nova Scotia Community College (NSCC)	September 2, 2025 - Met with representative from NSCC to discuss scholarship and bursary option with NSCC Wind technician program, and next steps to support future students,
Chedabucto Snowmobile Club	December 19, 2025 - Proponent met with former club president, approved their request for 10 loads of gravel for trail work in the Ogdon Wilderness Area, and agreed to reconnect with the new board. Their trails run south of Upper Afton.
Ocean Riders Trail Association	December 19, 2025 - Proponent met with Ocean Riders team in New Harbour. Although they have extensive trails in Guysborough County, they have no trails in the Study Area.
Open House Invitation	January 5, 2026 - Proponent posted open house posters in Tracadie Hall, Guysborough Intervale, Guysborough post office, Mann's Independent, MLA office, Everwind office, MODG office and Paqtnkek Community Centre, Bayside Travel Centre, Paqtnkek Band Office, Heatherton and area community centre, Heatherton Post Office, Monastery Petro Canada, and KTV. As well as Antigonish Library, Antigonish MLAs office, Antigonish County Municipal Office.
Tracadie & District Volunteer Fire Department	January 30, 2026 - Update on the Project provided via email with an invitation to meet.

Community/Stakeholder Organization	Engagement
Havre Boucher & District Volunteer Fire Department	January 30, 2026 - Update on the Project provided via email with an invitation to meet.
Pomquet Fire and Emergency Services	January 30, 2026 - Update on the Project provided via email with an invitation to meet. February 20, 2026 - Fire Chief responded and presentation date set for March 9, 2026, for fire department members.
St. Andrews and District Volunteer Fire Department	January 30, 2026 - Update on the Project provided via email with an invitation to meet.

6.2.1 Digital Communications

EverWind launched its new corporate website, that includes a dedicated Upper Afton Wind Project landing page, on December 12, 2025. The Project-specific page is accessible through everwindfuels.com and via the Project-specific domain upperaftonwind.com. This landing page includes information about the Project and Proponent, Project resources, and information related to Community Open Houses held in January 2026. This publicly accessible webpage is updated on an ongoing basis as new information becomes available.

A dedicated project email inbox, info@upperaftonwind.com, was established on October 28, 2025, to support engagement related to the Project. The inbox is actively monitored by EverWind.

Members of the public are and have been encouraged to ask questions and provide feedback through the Project's email address and EverWind's social media channels, including LinkedIn and Facebook.

6.2.2 Eastern Nova Scotia Exhibition

In consultation with the Eastern Nova Scotia Exhibition, the Proponent sponsored the community event and established a booth for three days with posterboards, a model hydrogen demonstration and free materials to share information about the Project, discuss concerns, explain its potential benefits for the region, and answer questions from community members. Introducing the Project in this familiar public setting helped raise awareness by attracting over a hundred people to the booth and encouraged open dialogue and understanding with local residents.

6.2.3 Door-to-Door Outreach

As part of ongoing community engagement activities, the Proponent undertook targeted, in-person outreach within the local area. On November 18, 2025, door-to-door engagement was conducted in the community of Upper Big Tracadie, during which eight residences were visited to provide an overview of the Project, including proposed turbine locations, access road alignments, potential transportation routes for Project components, and anticipated community benefits. Land-related considerations identified through these discussions were noted for follow-up. On January 14, 2026, additional door-to-door outreach was carried out to 31 households along Afton Road, South Merland, and New France to notify residents of upcoming public open houses scheduled for January 20 and 21, 2026 and to encourage participation. These activities form part of the Proponent's commitment to proactive, transparent, and ongoing engagement with local residents.

6.2.4 Public Open House Events

In total, six open houses were held from 2021 to 2026 (Table 6.3).

Table 6.3: Summary of Open Houses

Open House Number	Open House Date	Location	Number of Public Attendees	Number of Exit Surveys Completed
1	December 15, 2021	Chedebucto Lifestyle Complex	NA ⁽¹⁾	NA
2	March 2, 2022	Virtual on Zoom	NA	NA
3	January 20, 2026	St. Patrick's Hall (Guysborough Intervale)	16	0
4	January 20, 2026	Paqtnkek Community Center	19	1
5	January 21, 2026	Heatherton & Area Community Centre	38	2
6	January 21, 2026	Tracadie Community Hall	15	1

⁽¹⁾ NA = attendees and exit surveys unknown

6.2.4.1 2021 and 2022 Open Houses

The previous Project owner, EDF Renewables, conducted an open house on December 15, 2021, at the Chedabucto Lifestyle Complex (Open House #1; Appendix B). A second open house was held virtually (Zoom), due to the COVID pandemic, on March 2, 2022 (Open House #2; Appendix B). Both open houses provided Project updates, permitting and engagement processes and timelines, community benefits, and construction and operation details.

6.2.4.2 January 2026 Open Houses

Four open houses were held on January 20 and 21, 2026, in communities surrounding the Project, including Guysborough Intervale (Open House #3), Paqtnkek Mi'kmaq Nation (Open House #4), Heatherton (Open House #5), and Upper Big Tracadie (Open House #6).

An invitation to the January 2026 Open Houses were publicly available on December 30, 2025, on the EverWind website via the Upper Afton Wind Project landing page (upperaftonwind.com). Two advertisements (Appendix B) were also published in the Guysborough Journal and Post Media's Casket on January 7, 2026, and January 14, 2026, respectively. Additionally, these notices were posted on community bulletin boards.

The objective of these sessions was to gather community feedback to inform the Projects' design. The Project Team presented 20 poster boards (Appendix B) detailing:

- Project ownership, including the Membertou-led Indigenous Consortium
- Green hydrogen and ammonia, and the Point Tupper Green Fuels Project
- Project schedule
- Project layout
- EA, studies, and monitoring

- Noise and shadow flicker modeling
- Local benefits and job creation

Project team members were in attendance to answer questions and take feedback from the local community and various stakeholders in each of the different communities where open houses were held. Sign-in sheets were available for participants to provide their contact information and enable follow up. Exit surveys were also available for participants to provide feedback.



Figure 6.1: Open House 3 (Guysborough Intervale) and 4 (Paqtnkek Mi'kmaq Nation)

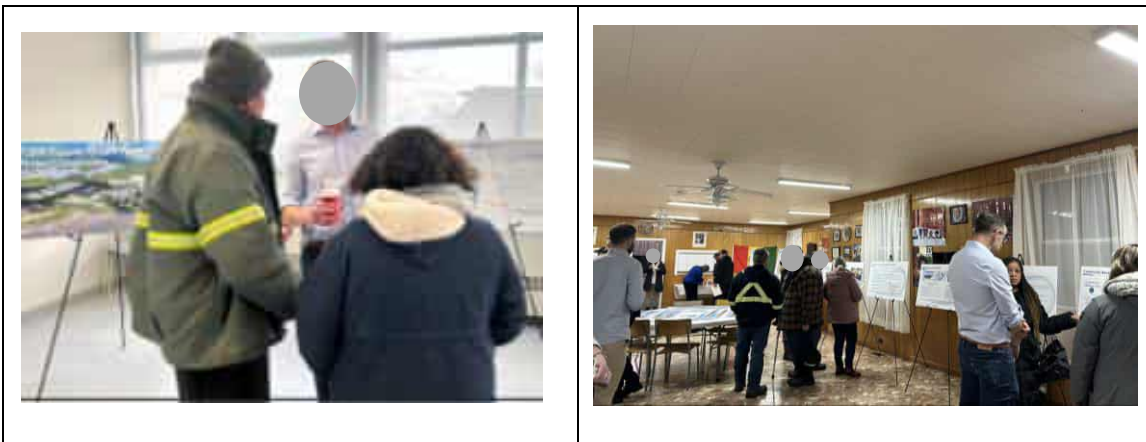


Figure 6.2: Open House 5 (Heatherton) and 6 (Upper Big Tracadie)

6.2.5 Office

A publicly accessible EverWind office is open in Guysborough. Office hours were advertised in the EverWind e-newsletter beginning in May 2024. Community members are encouraged to drop by the office to ask questions or discuss concerns with a Project representative. Standard office hours of Tuesday and Wednesday from 10:00 am until 4:00 pm have been maintained since May 2024.

6.2.6 Community Liaison Committee

The Proponent initiated a Community Liaison Committee (CLC) related to the Guysborough Wind Projects and the Point Tupper Facility to support community engagement and for the dissemination of Project related information. A standalone CLC for this Project will be developed.

6.2.7 Review of Concerns

Issues and concerns raised by the public have been grouped into broader categories and reference to the relevant section of the EA in which the concern is addressed have been noted (Table 6.4).

Table 6.4: Comments Received from the Public

Question	Proponent Response	Section of EA for Additional Information
Socio Economic Impacts		
How many jobs will the Project generate?	During construction the Project is anticipated to create 200 to 250 jobs. During operations, the Project is anticipated to maintain approximately eight part-time and full-time positions.	11.1
What are the benefits of the Project?	Project benefits include a significant investment in the area, contracting opportunities, community benefits fund (including proximity payments, vibrancy fund, and bursaries), increased local spending on goods and services, direct economic opportunities for landowners, and approximately \$1.5 million per year in municipal tax revenue.	11.1
Will road access be restricted once the Project is constructed?	The Proponent is not proposing to restrict access, however, for safety reasons temporary and localized restrictions may be required during construction. The substation will also be fenced for the safety of the public.	11.2
Will there be a job fair/opportunities for local contractors?	A job fair will be held prior to start of construction and opportunities will be available for local contractors.	11.1
What is the distribution of municipal tax revenue between Antigonish and Guysborough municipalities?	The precise distribution of municipal revenues will depend on the final locations of the 22 turbines. At this time the Proponent is expecting to construct 17 turbines in Guysborough and 5 turbines in Antigonish.	NA
Environmental Impacts		
How are you incorporating cumulative effects?	Cumulative effects are incorporated in noise and shadow flicker modelling and within the cumulative effects assessment.	7.3, 7.4, 16

Question	Proponent Response	Section of EA for Additional Information
Is shadow flicker a health concern?	Shadow flicker from wind turbines is not considered a direct health hazard by Health Canada, but it can be considered an annoyance. Shadow flicker modelling was conducted to ensure compliance with regulated thresholds.	7.4
What is the risk to birds and bats?	A full desktop review and extensive field surveys, including radar and acoustic monitoring, have been completed to identify the presence of avifauna and their associated habitat. Project infrastructure has been sited to avoid sensitive features. There is potential for interactions between avifauna and turbines, therefore, the Proponent will be required to monitor bird and bat mortalities for two years, once operational, and implement adaptive management, if required. Additionally, the Proponent has committed to the development and implementation of a Terrestrial Habitat and Wildlife Management.	10.3, 10.4
How much tree clearing is required?	The Clearing Footprint estimated for the purposes of this EA is 596 ha. The exact area of clearing will be determined once detailed design is completed.	3.2
What is done to restore laydown yards after construction?	Laydown areas are cleared of vegetation, grubbed, and levelled, and top layer of soil is moved to the boundary of the laydown area to be used during reclamation. After the construction period, natural grading is restored, soil reapplied, and the site is left to naturally revegetate.	3.6.3
General		
Why can't turbines be sited on my property?	Maintaining appropriate setback distances (e.g., from roads), compliance with noise and shadow flicker at potential receptors, and achieving appropriate spacing between turbines limits the ability to construct turbines on certain properties.	NA
What percentage of roads are new vs. existing?	51 km (77%) of Project roads are existing, that may require upgrades, and 15 km (23 %) of Project roads are new.	3.5.2

Question	Proponent Response	Section of EA for Additional Information
What is a MEKS?	A MEKS is a Mi'kmaq Ecological Knowledge Study. MEKS are conducted to understand historic, recent, and current use of the Project area by the Mi'kmaq of Nova Scotia.	5.2
How are African Nova Scotian areas of cultural significance integrated into the EA?	The Proponent has offered to meet with African Nova Scotian members of the UBTDA to identify areas of African Nova Scotian cultural significance in proximity to the Project.	NA
What is the distribution of turbines between Antigonish and Guysborough?	Of the 28 turbines being permitted, 19 are in Guysborough and the remaining 9 are in Antigonish. At this time the Proponent is expecting to construct 17 turbines in Guysborough and 5 turbines in Antigonish.	NA
Will roads be plowed in the winter?	Roads will be plowed to the extent to allow turbines to be accessed for maintenance, as required.	3.6.2

6.2.8 Ongoing Engagement

The Proponent is committed to continuing to work to address any concerns raised by stakeholders and members of the public over the duration of the Project's life.

7.0 **ATMOSPHERIC ENVIRONMENT**

7.1 **Atmosphere and Air Quality**

7.1.1 Overview

The assessment of the atmospheric environment included a review of weather, climate, and air quality data.

7.1.2 Regulatory Context

Relevant legislation includes:

- *Environment Act* (Nova Scotia, 1995b)
- Air Quality Regulations (Nova Scotia, 2020)

7.1.3 Assessment Methodology

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

- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- ECCC Weather and Climate (ECCC, 2025b)
- NSECC Ambient Air Quality Data (NSECC, n.d.)

7.1.4 Assessment Results

Weather and Climate

Nova Scotia's climate is quite varied and is largely governed by coastal influences and elevation (Davis & Browne, 1996). The majority of the Study Area is within the Mulgrave Plateau Ecodistrict (360) with the northern portion extending into the St. George's Bay (520) Ecodistrict (Drawing 7.1). These ecodistricts are typically cool and humid with strong coastal winds (Neily et al., 2017).

To assess the local climate, weather data (1995 to 2024) were obtained from the Collegeville MET stations (Climate ID 8201000 and 8201001) (Table 7.1), the stations closest to the Project, with 30 years of climate data available (approximately 28 km from the Project centre). Although the MET stations are near the Project, the data may not exactly represent the conditions observed within the Study Area.

Table 7.1: Climate Data from the Collegeville MET Stations (1996 to 2025)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (°C)													
Daily Avg.	-5.2	-5.8	-1.7	3.4	9.1	14.1	18.7	18.5	14.4	8.8	3.8	-1.6	6.4
Daily Max.	-0.6	-0.9	3.2	8.3	15.2	20.3	24.8	24.6	20.6	14.3	8.1	2.4	11.7
Daily Min.	-9.9	-10.7	-6.5	-1.6	2.9	7.9	12.5	12.4	8.1	3.3	-0.6	-5.6	1.0
Extreme Max.	15.2	15.0	26.5	29.0	32.0	34.3	36.0	35.0	33.5	29.8	23.2	30.0	28.3
Extreme Min.	-31.2	-29.9	-27.9	-22.3	-13.5	-4.4	1.0	1.0	-5.4	-8.9	-14.1	-24.0	-15.0
Precipitation (mm)													
Precipitation	94.2	85.0	86.9	81.4	76.5	97.4	86.9	97.5	102.9	131.4	137.8	113.3	1191.1

Source: (ECCC, 2025b)

Between 1996 and 2025, the mean annual temperature was 6.4°C, with a mean daily maximum of 11.7°C and a mean minimum of 31.0°C. The coldest months were January and February, with mean daily averages of -5.2°C and -5.8°C, respectively. July and August were the warmest, averaging 18.7°C and 18.5°C. Average monthly precipitation was highest in October and November (131.4 mm and 137.8 mm, respectively) (ECCC, 2025b)

Wind speed and direction data were obtained from the closer Tracadie meteorological station (7 km from the Study Area) (Table 7.2).

Table 7.2: Wind Data from the Tracadie Meteorological Station (2016 to 2025)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Hourly Speed (km/h)	100	99	104	98	78	86	97	77	136	95	96	109
Most Frequent Direction	NW	NW	NW	NW	NW	SW	SW	SW	SW	NW	NW	NW

Source: (ECCC, 2025b)

From 2016 to 2025, maximum hourly wind speeds recorded at the Tracadie meteorological station ranged from 77 km per hour (km/h) in August to 136 km/h in September. The prevailing direction of wind gusts was from the northwest from October to May and from the southwest from June to September. Note that wind originates from all directions and that wind direction during calm conditions is not recorded at the meteorological station (ECCC, 2025b).

The windrose plot of data recorded at the Tracadie meteorological station illustrates wind speeds and directions from 2016 to 2025 (Figure 7.1). Wind speeds above 12 m per second (m/s) (43.2 km/h) occurred most frequently from the southwest (ISU, 2025).

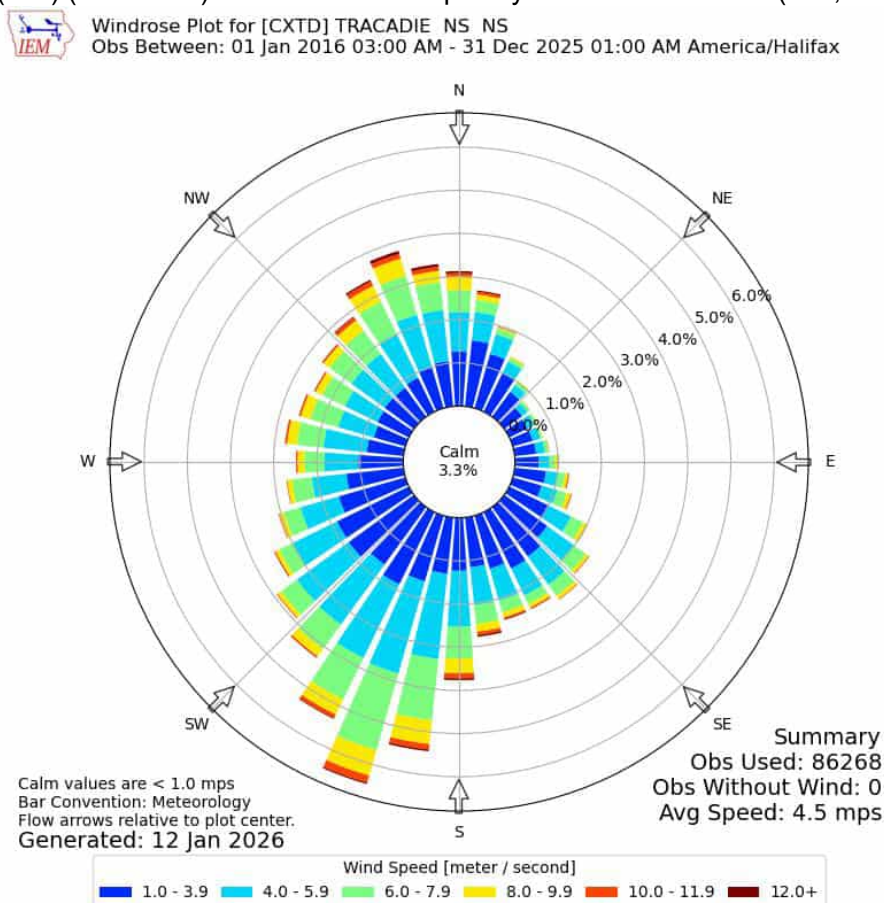


Figure 7.1: Windrose Plot for Tracadie Meteorological Station (CXTD) – January 1, 2016, through December 31, 2025 (ISU, 2025)

The Proponent has been monitoring atmospheric conditions (wind speed and direction, atmospheric pressure, relative humidity, and temperature) at one MET tower in the Study Area that has been operational since November 2021.

Air Quality

The Government of Nova Scotia has legislated Air Quality Regulations (NSAQR) (Nova Scotia, 2020) under the *Environment Act* (Nova Scotia, 1995b). The ambient air quality standards published in the NSAQR set the maximum permissible ground-level concentration limits (Table 7.3).

Table 7.3: Summary of Regulations Pertaining to Ambient Air Quality in Nova Scotia

Contaminant	Averaging Period	Regulatory Threshold [micrograms per cubic metre ($\mu\text{g}/\text{m}^3$)] ⁽¹⁾
Carbon Monoxide (CO)	1-hour	34,600
	8-hour	12,700
Hydrogen Sulphide (H ₂ S)	1-hour	42
	24-hour	8
Nitrogen Dioxide (NO ₂)	1-hour	400
	24-hour	-
	Annual	100
Ozone (O ₃)	1-hour	160
Sulphur Dioxide (SO ₂)	1-hour	900
	24-hour	300
	Annual	60
Total Suspended Particulate (TSP)	24-hour	120
	Annual	70 ⁽²⁾

⁽¹⁾ Nova Scotia Ambient Air Quality Standards (AAQS) (Air Quality Regulations, N.S. Reg. 8/2020).

⁽²⁾ Geometric mean.

Nova Scotia monitors air quality at eight ambient air quality monitoring stations (AAQMSs) throughout the province (NSECC, n.d.). Measured parameters vary by location and may include the following:

- Sulphur dioxide (SO₂)
- Carbon monoxide (CO)
- Nitrogen oxides (NO_x)
- Nitric oxide (NO)
- Fine particulate matter [particulate matter 2.5 micrometres (μm) or less in diameter; PM_{2.5}]
- Ground-level ozone (O₃)
- Total reduced sulphur (TRS)

The NO₂, O₃, and PM_{2.5} values from seven of the eight AAQMSs are used to calculate a score on the Air Quality Health Index (AQHI) (ECCC, 2025a; NSECC, n.d.). The AQHI is a scale from 1 to 10+, whereby scores represent the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+) (ECCC, 2025a).

The closest AAQMS to the Project with available data is the Port Hawkesbury station, 24.4 km northeast of the Study Area. The baseline maximum ambient air quality conditions observed at the Port Hawkesbury AAQMS from 2021 to 2025 were compared to the current NSAQR (Table 7.4).

Table 7.4: Maximum Ambient Air Quality Conditions Observed at Port Hawkesbury (2020 to 2024)

Parameter	Averaging Period	O ₃ (ppb) ⁽³⁾	SO ₂ (ppb)	NO _x (ppb)	NO (ppb)	NO ₂ (ppb)	PM _{2.5} (ug/m ³)	TSP (ug/m ³)	CO (ppb)	H ₂ S (ppb)
Port Hawkesbury AAQMS 2020 to 2024	1-hour	92.5	89.7	139.1	93.9	51	64.6	-	-	-
	24-hour	49.1	15	51.9	28.5	23.3	27.5	-	-	-
	Annual ⁽²⁾	29.4	0.7	4.5	1.8	2.6	5.4	-	-	-
Nova Scotia AAQS Schedule A ⁽¹⁾	1-hour	82	340	-	-	210	-	-	30,000	30
	24-hours	-	110	-	-	-	-	120	-	6
	Annual	-	20	-	-	50	-	70 ⁽⁴⁾	-	-
Fraction of Nova Scotia AAQS Schedule A	1-hour	113%	26%	-	-	24%	-	-	-	-
	24-hours	-	14%	-	-	-	-	-	-	-
	Annual	-	4%	-	-	5%	-	-	-	-

Source: (NSECC, n.d.)

⁽¹⁾Current Nova Scotia AAQS (Air Quality Regulations, N.S. Reg. 8/2020).

⁽²⁾Annual averages calculated based on the maximum averaged 24-hour values over a single calendar year.

⁽³⁾Parts per billion.

⁽⁴⁾Geometric mean.

Existing air quality conditions (i.e., baseline data; 2021 to 2025) indicate that most of the measured contaminants are well below their respective NSAQR Schedule A limits. The maximum hourly concentration of O₃ exceeded AAQS on three occasions (hours) during the 5-year period (113% of maximum). The reported AQHI typically scores “Low” for risk at all times of the year (ECCC, 2025a).

7.1.5 Effects Assessment

Project-Atmospheric Interactions

Project activities will interact with the atmospheric environment through fugitive dust and exhaust emissions from light- and heavy-duty equipment (Table 7.5), primarily during the construction phase. There are no air emissions associated with the operation of the wind turbines, as the generation of wind power offsets power that would otherwise be generated from fossil fuels.

Table 7.5: Potential Project-Atmospheric Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Interconnection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for the atmospheric environment is a 200 m buffer surrounding the Assessment Area (Drawing 7.2). This distance is selected as it represents the distance beyond which effects to air quality are considered sufficiently diffuse to no longer represent a potential impact to humans. The RAA for atmospheric is not applicable.

Assessment Criteria

The assessment criteria provided in Section 4.3 apply to the atmospheric environment. The VC-specific definition for magnitude is as follows:

- Low: Air quality is expected to remain less than or equal to the maximum permissible ground-level concentrations as defined by the NSAQR
- High: Air quality is expected to exceed the maximum permissible ground-level concentrations as defined by the NSAQR

Effects

Fugitive dust emissions consist of particulate matter (PM) and may be generated from open-air activities (e.g., moving earth/disturbing soil, wind erosion, increase in traffic). Fugitive dust emissions are composed mainly of soil minerals, but can also contain salt, pollen, spores, and tire particles. PM is measured as total suspended particulate (TSP) and is defined as the mass of airborne particles having a diameter of less than 44 µm. There are two forms of PM that pose the greatest concern for human health: PM with a diameter of 10 µm or less (PM₁₀) and PM_{2.5}.

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

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

- Increasing lake and stream acidity.
- Altering the nutrient balance in coastal waters and large river basins.
- Depleting soil nutrients.
- Damaging sensitive forests and farm crops.
- Altering rates of gas exchange and nutrient cycling in plant species (effect to flora described further in Section 10.1).
- Affecting ecosystem diversity.
- Contributing to acid rain effects.

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

- Soil disturbance during site preparation [i.e., clearing/grubbing, grading, blasting (if required)].
- Wind erosion from soil or rock stockpiles during grading.
- Increase in traffic on roadways from travel by Project personnel (to/from the site).
- Management of on-site materials transfers (i.e., loading/unloading).

To assess the potential effects of fugitive dust emissions, potential receptors were identified through a review of aerial imagery with manual verification (Section 4.1.5) and the potential for interactions with fugitive dust emissions was assessed. Fugitive dust travel distance is influenced by several factors, including the height at which the dust is released, wind conditions, and particle size. Under standard conditions, fugitive dust particles above 30 µm settle out within 100 m of the emission source. Other finer particles have a slower settling velocity and may travel further (US EPA, 1995). The LAA is well vegetated, which will likely help to reduce the travel distance of fugitive dust emissions from the Project Footprint (US EPA, 2014).

The closest non-participating potential receptor is approximately 350 m from a Project turbine. There are 42 potential receptors within LAA; 33 of these are directly adjacent to existing roads

and none are adjacent to new roads. The Proponent will implement construction mitigation measures (e.g., wet stockpiles or roadways), as required, to minimize potential effects to these receptors related to fugitive emissions. Fugitive dust emissions are considered short-term (construction) and intermittent.

In addition to fugitive dust, construction may increase combustion residuals and/or exhaust tailpipe emissions, primarily PM, NO_x, SO₂, and CO from vehicles (i.e., travel by Project personnel, transport/delivery activities) and heavy equipment. Exhaust emissions are primarily anticipated to be associated with road construction and upgrades within the Project Footprint. The US EPA (2014) determined that most roadway emissions are contained within the first 200 m from the emission source. Therefore, exhaust emissions are not anticipated to impact the baseline beyond the extent of the LAA, and as such, impacts to local non-participating receptors are not anticipated.

Mitigation Measures

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

- Minimize the footprint of disturbance to the extent practicable.
- Conduct grading and site preparation in phases to minimize disturbed soil areas until nearing construction activities.
- Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust and airborne particles.
- Compact and/or ridge disturbed soil to prevent dust formation.
- Wet aggregate and soil stockpiles to control dust, as required.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Wet roadways and heavy traffic areas with water or other approved dust suppressant technologies to minimize airborne emissions, as required.
- Post and maintain speed limits for on-site transportation and mobile equipment.
- Tie down, cover, and/or store loose site materials and/or products prior to inclement weather and wind events to prevent materials from becoming airborne.
- Wash down vehicles and equipment using hoses and water to remove accumulated mud/dirt on undercarriages, tracks, or wheel wells, as necessary.
- Require that Project personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) in the event of significant fugitive emissions events (i.e., windstorms, dust storms).
- Develop and implement an Erosion and Sedimentation Control Plan

General mitigation measures for exhaust emissions include:

- Require that equipment meets all applicable provincial and air quality regulations and emissions standards.

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

Monitoring

No monitoring programs are proposed.

Conclusion

The predicted residual effects of the Project on the atmosphere and ambient air quality (after mitigation) are characterized in Table 7.6.

Table 7.6: Atmosphere and Air Quality Residual Effects

Effect Detail	Fugitive and Exhaust Emissions
Magnitude of Effect	Low: Fugitive and exhaust emissions are expected to remain below the maximum permissible ground-level concentrations.
Geographic Extent of Effect	200 m buffer of the Assessment Area
Frequency of Effect	Intermittent: Effects may occur during the Project's construction, operation, and decommissioning phases, but only intermittently.
Duration of Effect	Short Term: Effects are mainly confined to the construction and decommissioning phases.
Reversibility of Effect	Reversible
Significance Level	Not Significant
<u>Effects Assessment Ratings (Refer to Table 4.4 for definitions)</u> Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible	

7.2 Climate Change

The effects of the Project on climate change are addressed in terms of GHG emissions per NSECC's A Proponent's Guide to Environmental Assessment (2025a) and the Guide to Considering Climate Change in Project Development in Nova Scotia (2011d).

7.2.1 Overview

Climate change is a long-term alteration of weather patterns and conditions strongly impacted by changes in temperature and precipitation. Climate change typically involves changes in average conditions, as well as changes in variability. The main contributor to climate change is GHGs from anthropogenic sources. Since GHGs disrupt the natural heat transfer processes

within the Earth's atmosphere, a build-up of these gases has enhanced the natural greenhouse effect. These human-induced enhancements are especially of concern since ongoing GHG emissions have the potential warm the planet to levels that have yet to be experienced (ECCC, 2019a).

The effects of the Project on climate change are described in terms of GHG emissions from wind energy produced by the Project.

The impacts of climate change on the Project are assessed separately under Section 14.1.

7.2.2 Regulatory Context

The climate change assessment considered the following Acts and Regulations:

- *Environment Act* (Nova Scotia, 1995b)
- Greenhouse Gas Emissions Regulations (Nova Scotia, 2009)
- *Environmental Goals and Sustainable Prosperity Act* (Nova Scotia, 2012)
- *Canadian Environmental Protection Act* (Canada, 1999)
 - Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations (Canada, 2010)
 - Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations (Canada, 2013)
 - Ozone-depleting Substances and Halocarbon Alternatives Regulations (Canada, 2016)

7.2.3 Assessment Methodology

The objectives of this assessment include the following:

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

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

Project-generated GHGs were quantified in accordance with the specifications described in the International Standard ISO 14064 (2019), and using published values found in the literature (sources provided in applicable sections that follow) and emission factors published in the NSECC Standards for Quantification, Reporting, and Verification of Greenhouse Gas Emissions (2018).

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

Nova Scotia energy grid is expected to decarbonize to meet its net-zero emission targets. This will involve the development of additional renewable energy or low-carbon intensity electrical generation projects (NSECC, 2022a). These renewable energy targets were not included in the baseline GHG emission calculations. All emissions, unless otherwise stated, are reported in tonnes of carbon dioxide equivalent (tCO₂e).

7.2.4 Assessment Results

Sources of Greenhouse Gas Emissions

The main GHGs of concern include:

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

GHGs may be natural or anthropogenic in origin, except halocarbons, which are human-made (ECCC, 2019a). The following subsections describe the GHGs and their contributors (sources) as anticipated during each Project phase. However, during the operations phase, GHG emissions will be limited to maintenance activities (e.g., transportation and materials). Where these activities are intermittent and short-term, the GHG contributions from operations are negligible and are not considered further.

Carbon Dioxide

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

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

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

Methane

Primary sources of anthropogenic CH₄ include landfills, sewage, and the incomplete combustion of fossil fuels with insufficient oxygen (ECCC, 2019a). The Project's construction phase requires different heavy- and light-duty equipment, contributing to CH₄ emissions. Overall, methane emissions are anticipated to be minimal and not considered further.

Nitrous Oxide

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

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

Halocarbons

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

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

Water Vapour

Water vapour is the most important naturally occurring GHG. Human activities do not directly influence the amount of water vapour in the atmosphere as it is a function of the atmosphere's temperature. The atmosphere can hold 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., CO₂, CH₄, N₂O) increase in the atmosphere, the temperature rise increases water evaporation from the Earth's surface and increases the atmospheric water vapour concentrations. This increased water vapour, in turn, amplifies the warming from the initial GHGs, causing the cycle to repeat and temperatures to keep rising (ECCC, 2019a).

Project activities contributing to GHG emissions are not anticipated to impact water vapour concentrations in the atmosphere; therefore, water vapour impacts are not assessed further.

Quantification of the Greenhouse Gas Baseline Conditions

The GHG baseline is a reference of sources, sinks (removing), and reservoirs (storing) occurring in the Project's absence and is used to compare pre- and post-Project conditions.

The baseline determines the quantity of carbon dioxide equivalent (CO_{2e}) emitted from current electricity production methods for the same electrical capacity as the Project (up to 176 MW).

The baseline sources are related to emissions generated from electricity currently produced in Nova Scotia from coal, oil, natural gas, and wind. There are no sinks or reservoirs attributed to the baseline scenario.

The Project will have a total nameplate capacity of up to 176 MW of renewable energy. Based on the wind turbine design capacity and an assumed net capacity factor for the Project, the Project will be capable of producing approximately 570,451.20 MW-hours per year (MWh/year). The lifespan of the Project is estimated at a minimum of 35 years.

Quantifying GHGs in terms of tCO_{2e} requires using current electricity-generating practices. For the third quarter of the year 2025 (latest available data), electricity generated in Nova Scotia by NSPI (the leading producer) was produced from the following fuel sources (NSPI, 2025):

- Coal (36%)
- Natural Gas (12%)
- Wind (15%)
- Renewable Imports (20%)
- Hydro (7%)
- Non-Renewable Imports (4%)
- Biomass (3%)
- Oil (2%)
- Other Renewables (1%)

A large amount of electricity generated for use in Nova Scotia comes from coal, natural gas, and oil, cumulatively accounting for 50% of the energy mix. Renewable sources (biomass, wind, renewable imports, hydro) account for 46%, and the remaining 4% consists of non-renewable imports.

For this assessment, non-renewable energy imports are distributed amongst coal (+1%), natural gas (+2%), and oil (+1%). Therefore, the fractions used for this assessment were coal at 37%, natural gas at 14%, and oil at 3%. Renewable energy (locally sourced and imported) was grouped together, and for this assessment, renewables were considered as wind energy at 46%.

Table 7.7 summarizes the GHG emission factors for the different types of electricity generated in Nova Scotia.

Table 7.7: Electricity Fuel Source Emission Factors

Electricity Fuel Source	Emission Factor (tCO ₂ e/kWh)
Coal	0.00105
Natural Gas	0.00044
Oil	0.00111
Wind	0

Source: (EIA, 2022)

Given the current electricity generation methods and the fuel source emission factors (Table 7.7), Table 7.8 summarizes the baseline GHG emissions. Baseline emissions are defined here as the quantity of CO₂e emitted from the current electrical grid for the same electrical generating capacity as the Project.

Table 7.8: Baseline Quantification Summary

Electricity Fuel Source	Electricity Generation (kWh/yr)	Emissions (tCO ₂ e)
Coal	211,066,944	221,660.60
Natural Gas	79,863,168	34,933.39
Oil	17,113,536	18,976.38
Wind	262,407,552	0
Total	570,451,200	275,570.38

The total calculated annual GHG emissions associated with electricity generation in Nova Scotia for the same electrical capacity as the Project (based on Q3 2025 data) is **275,570.38 tCO₂e**.

Detailed CO₂e calculations are provided in Table 1 (Appendix D).

Quantification of Greenhouse Gas Emissions – Construction Phase

Access Roads

Many turbines will be located adjacent to existing roadways. The construction of new roads and the upgrading of existing roads will require the removal of vegetation and overburden, which will create fugitive dust and GHG emissions. However, where fugitive dust and GHG contributions for these activities are temporary, short-term, and represent a small incremental addition compared to the overall Project emissions, they were not quantified. Section 7.1 discusses fugitive dust and air emissions as they relate to the Project.

Laydown Areas

Laydown areas (ranging from 4 to 9 ha) are intended to temporarily store equipment, the turbine pad foundation, and the crane pad. These areas will be prepared by removing vegetation and overburden and placing competent soils. Construction activities and equipment associated with the laydown areas are anticipated to create fugitive dust and GHG emissions. However, where fugitive dust and GHG contributions for these activities are temporary, short-

term, and represent a small incremental addition compared to the overall Project emissions, they were not quantified. Additionally, a vegetation management plan (as part of the Terrestrial Habitat and Wildlife Management Plan) will be initiated to recover the lost flora and reduce dust resuspension while maintaining access and clearances to the turbines.

Turbine Foundation

A concrete tower foundation and pedestal will be required for each wind turbine. As such, the Project will require a significant quantity of concrete to be produced and delivered to each wind turbine location.

The Proponent anticipates that each tower foundation is expected to require 905 cubic metres (m³) of concrete and 81 tonnes of steel (rebar), per turbine foundation. Note that these suppliers have not been procured at this stage of the Project; as such, for the purpose of this assessment, transportation distances are based on the nearest known concrete and steel suppliers, located approximately 14 km from the Study Area. The quantification of the GHG emissions requires the following inputs:

- The vehicle size and fuel type used to transport the materials.
- The distance travelled to and from the concrete/steel supplier to the wind turbine sites.
- The freight and weight associated with each trip (to and from each turbine location).
- The quantity of concrete and steel produced for the wind turbine bases.

Heavy-duty diesel concrete trucks and heavy-duty haulers will be required to transport concrete and steel to the Project. Given that the turbine locations are scattered across the Project's extent, transportation distances range from approximately 21 km to 32 km.

It is assumed that each concrete truck will carry approximately 9 m³⁽¹⁾ of concrete per delivery for a total of 101 deliveries per wind turbine foundation. Similarly, it is assumed that each heavy hauler would carry no more than 38 tonnes of steel per truck, for a total of three trucks per turbine foundation.

The cumulative one-way distance from the concrete/steel to all wind turbines is approximately 718 km. Table 7.9 summarizes the GHG emission factors for the different components used for concrete- and steel-related activities.

Table 7.9: Concrete Manufacturing and Transportation Emission Factors

Component	Emission Factor
Concrete Production	3x10 ⁻⁴ tCO ₂ e/kg
Concrete Truck (Diesel) with Freight	1.35x10 ⁻⁴ tCO ₂ e/tonne-km
Concrete Truck (Diesel) without Freight	1.106x10 ⁻³ tCO ₂ e/km
General Steel Production	1.5 tCO ₂ e/tonne

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

$$^1 905 \text{ m}^3 \div 9 \frac{\text{m}^3}{\text{truck}} = 101 \text{ trucks}$$

Given the travelling distances, the quantity of concrete and steel required for the Project, and the emission factors (Table 7.9), the CO₂e emissions for constructing all the tower foundations and pedestals are expected to be approximately **20,798.38 tCO₂e**.

Detailed CO₂e calculations are provided in Table 2 (Appendix D).

Turbine Production

For the purposes of this EA, the Proponent has selected the Goldwind GWH182-8.0 MW turbine.

Goldwind completed a life cycle assessment (LCA) of the GWH182-8.0 MW. The LCA was based on a construction scenario in Miombo, Tanzania, and included construction, transportation, and the baseline energy utility mixture from Tanzania. As such, only the upstream module of the LCA was used for this assessment, which focused on the production of the turbines within the Goldwind assembly factory, including waste material transport, recycling, and disposal.

The LCA determined that the production of the GWH182-8.0 MW turbines accounted for **2.35 gCO₂e/kWh** (EPDItaly, 2025). Based on the anticipated net production capacity of the Project, the construction emissions for the turbines are anticipated to be **46,919.61 tCO₂e²** over the Project's life. Although there are some uncertainties regarding the assumptions used for the LCA and their applicability to this Project, it is expected that the larger size of the Project, compared to the LCA scenario, would lead to a conservative estimate of GHG emissions in this assessment.

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

- The turbine transportation distances from the manufacturer to the intended wind turbine laydown.
- The vehicle size and fuel type used to transport the wind turbines.

For quantification purposes, the assessment assumed the following:

- Manufacturing Location: Goldwind, Dafeng District, Yancheng, Jiangsu Province, China
- Nearest Shipping Port: Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China
- Nearest Potential NS Shipping Port: Strait of Canso Superport, Mulgrave, NS, CA

² 570,451,200 kWh * 2.35 $\frac{\text{gCO}_2\text{e}}{\text{kWh}}$ * $\frac{1.0 \times 10^{-6} \text{ tonnes}}{\text{g}}$ * 35 years = 46,919.61 tCO₂e

The Goldwind GWH182-8.0 wind turbine consists of 13 principal components:

- Blades (3)
- Gearbox/Generator and Main Shaft (2)
- Hub (1)
- Nacelle (1)
- Tower segments (6)

Project turbines are assumed to be manufactured at the Goldwind manufacturing facility in Dafeng District, Yancheng, Jiangsu Province, China, for this assessment. The turbines will travel to the Dafeng port in Dafeng District, Yancheng, Jiangsu Province, China, by heavy diesel hauler (transport), where they will be shipped via diesel cargo vessel to the Strait of Canso Superport, Mulgrave, Nova Scotia. Table 7.10 summarizes the transportation distances from the manufacturer to the Project.

Table 7.10: Wind Turbine Transportation Distances

Originating Destination	Final Destination	Distance (km)
Manufacturing Facility Dafeng District, Yancheng, Jiangsu Province, China	Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China	63 (Land)
Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China	Strait of Canso Superport, Mulgrave, Nova Scotia	23,200 (Marine)
Strait of Canso Superport, Mulgrave, Nova Scotia	Upper Afton Wind Project	20 to 35 (Land)

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

- Each component will be individually transported via a single diesel heavy hauler.
 - 13 components per turbine to travel from the manufacturing facility in Dafeng District, Yancheng, Jiangsu Province, China, to the Dafeng Port in Dafeng.
 - 13 components per turbine to travel from the Strait of Canso Superport, Mulgrave Port, NS, to the turbine location (distance will vary from one turbine location to another).
- Each wind turbine (in its entirety) will be transported via a single diesel cargo vessel (marine)

Based on the land distance from the manufacturer to the individual wind turbine location, the total land transportation distance (not including marine transportation) is approximately **32,312 km**. The total marine transportation distance associated with getting the wind turbines from the Dafeng Port in Dafeng District, Yancheng, Jiangsu Province, China, to the Strait of Canso Superport, Mulgrave, Nova Scotia, is **649,600 km**. The distances travelled consider travel from the manufacturer to the Project Footprint only; an equivalent return distance is not considered as the hauling companies would have commitments with other clients, and those GHG emissions would not be attributable to the Project.

GHG emission factors for the different components of wind turbine transportation are provided in Table 7.11.

Table 7.11: Wind Turbine Transportation Emission Factors

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

Source: (Squared Consultants Inc, 2025)

Given the land transportation distances required to deliver the wind turbines to the Project and the emission factors (Table 7.11), the CO₂e emissions from land transportation of the wind turbines are expected to be approximately **322.13 tCO₂e**. In addition, the marine transportation distances required to deliver the wind turbines from China to Canada will contribute **9,416.60 tCO₂e**.

Detailed CO₂e calculations are provided in Table 2 (Appendix D).

Quantification of Greenhouse Gas Emissions – Operations Phase

Following the construction phase, the turbine will be operational, and the reduction of GHG emissions will begin. Based on the wind turbine design capacity, the Project will be capable of producing approximately 570,451,200 kWh/year. Therefore, the renewable energy produced will replace power production from fossil fuels and more intense generation methods described in the baseline conditions analysis.

According to Padey et al. (2012), maintenance activities are the only contributor of GHGs during the operations phase. The maintenance typically includes replacing approximately 15% of the nacelle components and one blade during the wind turbine's lifetime. According to a submission by Number Three Wind LLC (2018) to the New York State Department of Public Services, a wind turbine blade weighs 18,688 kg, while the nacelle weighs 76,204 kg. This replacement rate is equivalent to approximately 18,688 kg of blade material and 11,431 kg of nacelle material. The total emission from the replacement material for all the Project's wind turbines is **1,265.00 tCO₂e** (Appendix D).

7.2.5 Effects Assessment

Project-GHG Interactions

Project activities will emit GHGs during all phases of the Project (Table 7.12).

Table 7.12: Potential Project-GHG Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X

Project Phase	Potential for Interaction
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Interconnection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X (maintenance only)
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for GHG emissions is the province of Nova Scotia. The RAA for GHG emissions is the global environment.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for Project-related GHG contributions. The VC-specific definition for magnitude is as follows:

- Positive: Project is expected to have a net positive effect on GHG emissions.
- Negative: Project is expected to have a net negative effect on GHG emissions.

Effects

The Project is expected to have a net positive effect on the GHG environment (Table 7.13).

Table 7.13: Project GHG Emission Summary

Component	Emissions (tCO ₂ e)
Baseline	
Electricity Generated from Coal	221,660.60
Electricity Generated from Natural Gas	34,933.39
Electricity Generated from Oil	18,976.38
Electricity Generated from Wind	0
Total	275,570.38
Construction Phase	
Foundation Production and Transportation	20,798.38
Wind Turbine Manufacturing	46,919.61

Component	Emissions (tCO ₂ e)
Wind Turbine Transportation	9,738.73
Total	77,456.72
Operations Phase	
Electricity Generated from Wind	0
Wind Turbine Maintenance	1,265.00 ⁽¹⁾
Total	1,265.00

⁽¹⁾ Project lifespan emissions (single event)

The values in this table may differ from the values presented in Appendix D as a result of rounding errors; however, the rounding errors are negligible and do not change their representation.

As mentioned, the current GHG emissions for the quantity of electricity required by the Project using Nova Scotia Power's conventional generation methods contribute to **275,570.38 tCO₂e**.

The Project's construction phase will generate the most GHGs from the manufacturing and transportation of the wind turbine, as well as the production and transport of the concrete for the tower foundation and pedestal. The total GHG emission contributions from the construction phase are **77,456.72 tCO₂e**.

The operations phase will generate GHGs from the wind turbines' maintenance (i.e., part replacements) as a one-time (Project lifespan) occurrence of **1,265.00 tCO₂e**.

Following the commissioning of the Project, the annual GHG emission reduction is expected to be **275,570.38 tCO₂e**. A one-time **1,265.00 tCO₂e** may be subtracted from any annual reduction; however, the annual reduction rate will be applied for the project's lifespan (35+ years). The Project is anticipating a 0.28-year³ payback period to offset the construction-related GHG emissions. Following this period, the Project will positively offset GHG emissions that would typically be emitted from conventional production methods using prevailing generation methods in Nova Scotia.

The GHG emission reduction over the Project's lifespan (35 years) could be **9,643,698.27 tCO₂e**. Annual Project emissions reduction defaults to the same value for each year the Project is in operation (0% change in baseline and Project emissions). Emissions reductions are anticipated to change in any given year due to externalities such as changes to energy fuel sources, grid emissions factors, or others which may affect reductions resulting from the Project. The emission projections described in this assessment (annual and Project lifespan) do not consider the provincial commitment to removing coal from the energy grid by 2030 and for the provincial GHG emissions (including the grid) to be net-zero by 2050 (NSECC, 2022a). As such, this lifespan emissions reduction is an estimate of a best-case GHG reduction scenario over the lifetime of the Project.

$$^3 \frac{\text{Construction Emissions}}{\text{Offset Emissions}} = \frac{77,456.72 \text{ tCO}_2\text{e}}{275,570.38 \text{ tCO}_2\text{e/year}} = 0.28 \text{ years}$$

The assumptions considered in this assessment propose a conservative estimate of GHG emissions, which may be lower if turbine and concrete manufacturer locations are closer to the Project and manufacturing materials are less than assumed. Where assumptions may change the values provided in this assessment, the results remain constant; the Project will offset GHG emissions.

Mitigation Measures

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

- Use of locally sourced materials, where possible, to reduce CO₂, CH₄, and NO_x emissions associated with transport.
- Incorporate the shortest construction/transport routes where possible to minimize the use of fossil fuels during construction.
- Recover and recycle construction and demolition waste, where possible.
- Minimize the Project footprint to the extent practicable.
- Site infrastructure in previously disturbed areas and use existing access roads to the extent practicable.
- Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations.
- Require Project equipment to meet all applicable provincial and air quality regulations and emissions standards.
- Require that engine and exhaust systems are maintained according to the manufacturer's specifications and applicable maintenance schedule.
- Remove malfunctioning equipment or equipment generating excess amounts of smoke, odour, or noise until an assessment and necessary repairs can be completed.
- Require construction equipment with an improperly functioning emission control system to not be operated.
- Require regular equipment maintenance to be undertaken to maintain good operations and fuel efficiency.
- Require equipment containing coolant (i.e., air conditioning units) to undergo preventative maintenance and inspections (i.e., leak testing).
- Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements.
- Minimize idling to limit GHG emissions from vehicles and equipment and reduce the use of fossil fuels.

Monitoring

No monitoring programs are proposed.

Conclusion

The predicted residual effects of the Project on Climate Change (after mitigation) are characterized in Table 7.14.

Table 7.14: Climate Change Residual Effects

Effect Detail	Net Reduction of GHG Emissions
Magnitude of Effect	Positive: Net effect of the Project will be a reduction in GHG emissions.
Geographic Extent of Effect	Nova Scotia
Frequency of Effect	Continuous: Effects will occur continuously during operation.
Duration of Effect	Medium Term: Effects are expected throughout the operation phase.
Reversibility of Effect	Irreversible
Significance Level	Positive effect , significance not evaluated.
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Negligible, Low, Moderate, High, Positive Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible	

7.3 Sound

7.3.1 Overview

The assessment of sound considered both construction and operational noise generated from the Project. During construction, heavy equipment, machinery, and light vehicles will emit sound to the surrounding environment from activities associated with the development of wind turbine pads, roads, along with the subsequent assembly and commissioning of wind turbines.

During the Project's operational phase, wind turbines will emit sound to the surrounding environment from mechanical equipment operation and the turbines' interaction with the surrounding air (aerodynamic sound). Detailed sound modelling was completed to quantify the potential impacts of turbine-generated noise on nearby receptors.

The WSP noise assessment (Appendix E) includes a qualitative assessment of potential construction noise and evaluation of operational noise emissions. The WSP noise model assumes 22 of the potential 28 turbine locations are constructed and includes noise emission data from the Goldwind GWH182 8.0 MW model, as well as noise emissions from the Project substation.

7.3.2 Regulatory Context

Sound level thresholds are regulated through a variety of municipal and provincial regulatory instruments (Table 7.15).

As described in Section 3 of Appendix E, the framework for assessing noise impacts of proposed wind projects includes provincial guidance provided in the Environmental Assessment Supplemental Checklist: Wind Energy Projects [EA Guide (NSECC, 2025c)], and Guidelines for Environmental Noise Measurement and Assessment [GENMA (NSECC, 2023b)]. GENMA provides guidance on assessing low frequency noise as further described in Section 3.2 of Appendix E.

Municipal by-laws are generally established to protect the peace and tranquility of communities. For those referenced in Table 7.15, provisions are in place to permit construction activities during specific hours if a Building Permit has been issued.

Table 7.15: Summary of Sound Level Regulations and Guidelines

Regulated By	Regulation/Guidance	Permissible Sound Levels (dBA)	Hours / Duration
For Residential Receptors			
Construction Period ⁽¹⁾			
MODG	MODG Noise Control By-Law (MODG, 2011)	≤ 65	06:00 to 23:00
		≤ 55	23:00 to 06:00
Operational Period ⁽²⁾			
NSECC	Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025b)	≤ 40	During the operation of wind turbines at the exterior of a receptor
MOCA	Land Use By-Law	≤ 40	During the operation of wind turbines
For Occupational Safety			
Workplace Health and Safety Regulations & Canadian Centre for Occupational Health and Safety	Noise – Occupational Exposure Limits in Canada (CCOHS, 2024)	85	8-hour maximum

⁽¹⁾ MOCA does not have a general noise bylaw relevant to the Project.

⁽²⁾ MODG does not have specific operational noise requirements.

7.3.3 Assessment Methodology

Construction Sound

The assessment of construction sound by WSP includes a discussion of expected noise sources and a qualitative assessment of potential effects to potential receptors (Section 6.3, Appendix E).

Operational Sound

The operational sound assessment conducted by WSP was completed through a combination of desktop studies and modelling per the NSECC Guidelines:

- The model's noise sources include:
 - 22 of 28 potential turbine locations using Goldwind GWH182 8.0 MW turbines with serrated trailing edge rotor blades and pad-mounted transformers. For clarity, six of the potential turbine locations, noted as alternates (Drawing 2.1), have not been modelled for noise emissions.
 - Project substation, including one 200 MVA transformer.

- A Study Area for noise modelling was established as 2 km from all Project noise sources (Figure 1, Appendix E).
- Potential receptors within the 2 km buffer (and several beyond 2 km) were assessed for cumulative noise levels (i.e., baseline sound plus Project-related sound)
- Baseline noise levels of 35 dBA were assumed at receptors following Health Canada and NSECC Guidance (Health Canada, 2023; NSECC, 2025b).
- Cumulative noise levels were calculated using CadnaA® modelling software which uses the ISO 9613-2 standard for calculating outdoor sound propagation.
- Modelled cumulative noise levels at potential receptors were evaluated for compliance, excluding participating landowners.

Additional noise assessment methodology is described in Section 4.3 of Appendix E.

7.3.4 Sound Assessment Results

A qualitative assessment of construction related sound was conducted by WSP (Section 6.3, Appendix E). As described in the WSP report, construction noise varies by activity and is generated primarily from vehicles, heavy machinery [e.g., backhoes, cranes, blasting (if required)], smaller equipment like welding tools, and backup alarms. Noise levels at nearby receptors depend on the number, type, and proximity of sources, and decrease with greater distance from the construction activity.

A total of 63 potential receptors were identified within 2 km of the selected turbine locations and substation. An additional nine potential receptors outside of the 2 km buffer were included the modelling. Results of the sound modelling are shown on Figure 2 of Appendix E and detailed results and compliance assessment are provided in Table 6 and 7 of Appendix E. A total of 12 potential receptors with exceedances have an agreement with the Proponent waiving the requirement to comply with sound limits (i.e., participating receptors). These agreements are registered on title to the land and bind successors in title. The model predicts that noise levels at all non-participating potential receptors will be compliant with the NSECC guideline of 40 dBA.

Low frequency noise (LFN) modelling predicted no expected LFN issues following the GENMA methodology (NSECC, 2023b). Results of the LFN model are provided in Section 6.2 and Table 8 of Appendix E.

7.3.5 Effects Assessment

Project-Sound Interactions

Project activities will interact with the acoustic environment during all phases of the Project. Sound related to the decommissioning phase is not addressed separately because sound levels are expected to be comparable to construction levels (Table 7.16).

Table 7.16: Potential Project-Sound Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Interconnection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for sound includes a 2 km area around the selected turbine locations and substation (Figure 1, Appendix E). The RAA is not applicable for sound.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for sound. The VC-specific definition for magnitude is provided for construction and operational sound as follows:

Construction Sound

- Low: Project activities to be completed in accordance with relevant MODG bylaws and permitting.
- High: Continuous noise generated from Project activities is predicted to exceed relevant MODG bylaws and permitting.

Operational Sound

- Low: Measurable sound levels predicted at the exterior of a potential receptor are below the criteria in the Environmental Assessment Supplemental Checklist: Wind Energy Projects (i.e., ≤ 40 dBA).
- High: Sound levels predicted to exceed the criteria in the Environmental Assessment Supplemental Checklist: Wind Energy Projects at the exterior of a potential receptor (i.e., > 40 dBA).

Effects

During construction of the Project, decibel limits above 55 dBA at residential receptors can result in disruptions of sleep during nighttime hours, while sounds above 65 dBA may cause annoyance and disturbance during daytime hours. Sounds produced during construction can exceed these thresholds at some residential receptors located within close proximity to planned construction activities. However, construction will be kept within allowable hours, based on local noise by-laws, and is considered a temporary source of noise generated by the Project. Activities producing higher levels of sound, such as blasting (if required), or handheld air tools, will be less frequent and last for a very short duration.

Modelled sound levels (ambient and generated sound) from the normal operating conditions of the 22 selected turbine locations and substation do not exceed 40 dBA at non-participating receptors. Therefore, all potential receptors comply with the NSECC guidance for operational sound. They also comply with the MOCA Land Use By-law.

Mitigation Measures

As noted in Appendix E, the Proponent will implement the following measures to mitigate potential noise effects during Project construction, where practical:

- Conduct construction activities within acceptable timeframes per municipal bylaws.
- Advise nearby residents of noisy activities (e.g., blasting, if required) and schedule these activities to reduce disruption.
- Install appropriate and well-maintained muffler systems on engine-driven equipment.

The Project will develop and implement a Complaint Resolution Plan, which will consider complaints related to sound and outline a process to investigate complaints. Mitigation to resolve complaints, if determined to be necessary, will be completed on a case-by-case basis in consultation with the affected complainant. If necessary, noise monitoring will be included as part of this process to evaluate ambient and operational noise in areas of concern.

Modelling will be updated prior to construction if there are changes to the layout, turbine model or specifications to ensure compliance with the Environmental Assessment Supplemental Checklist: Wind Energy Projects (Nova Scotia, 2025; NSECC, 2025c).

Monitoring

No monitoring programs are proposed.

Conclusion

The predicted residual effects of the Project on construction and operational noise (after mitigation) are characterized in Table 7.17.

Table 7.17: Sound Residual Effects

Effect Detail	Construction Noise	Operational Noise
Magnitude of Effect	Low: Construction activities are anticipated to comply with municipal by-laws and permitting.	Low: Operational sound is predicted to comply with the criteria in the Environmental Assessment Supplemental Checklist: Wind Energy Projects.
Geographic Extent of Effect	2 km buffer of noise sources	2 km buffer of noise sources
Frequency of Effect	Intermittent: Effects are anticipated during both the construction and decommissioning phases, and rarely during operation.	Continuous: Effects are anticipated throughout operations, although there may be temporary lapses during calm conditions while rotors are not spinning.
Duration of Effect	Short Term: Effects are expected throughout construction and decommissioning, but generally not during operations or after decommissioning.	Medium Term: Effects are expected throughout operations but end at the start of decommissioning and not continue.
Reversibility of Effect	Reversible	Reversible
Significance Level	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible		

7.4 Shadow Flicker

7.4.1 Overview

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

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

- The sun must be shining and not be obscured by clouds/fog.
- The source turbine must be operating.
- The wind turbine must be situated between the sun and the shadow receptor.
- The wind turbine must be facing directly towards, or away from, the sun such that the rotational plane of the blades (i.e., rotor plane) is perpendicular to the azimuth of incident sun rays. For this to occur, the wind direction would have to be parallel to the azimuth of the incident sun rays throughout the day.

- The line of sight between the turbine and the shadow receptor must be clear. Light-impermeable obstacles, such as vegetation, tall structures, etc., will prevent shadow flicker from occurring at the receptor.
- The receptor must be close enough to the turbine to be in the shadow.

The assessment of shadow flicker completed by WSP considers potential shadow flicker generated from the Project and effects on nearby receptors (as defined in Section 4.1.5). The assessment (Appendix F) models 22 of the potential 28 turbine locations (alternate turbine locations not modelled as noted in Drawing 2.1) and uses the Goldwind GWH182 8.0 MW turbine model.

7.4.2 Regulatory Context

The Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025b) requires that a receptor will not exceed 30 hours of shadow flicker per year or 30 minutes of shadow flicker per day.

7.4.3 Assessment Methodology

The shadow flicker assessment was completed through modelling to achieve the following objectives:

- Identify potential receptors that may experience shadow flicker from the Project's operation (see Section 4.1.5 for approach and receptor classification).
- Quantify the expected duration and frequency of shadow flicker for all potential receptors over a calendar year and during the modelled worst day.
- Assess if applicable guidelines are expected to be met, excluding participating landowners.

Potential receptors located within 2 km of the turbine locations were identified. Additional receptors outside of the 2 km buffer were also included to assess the potential shadow flicker in the area (Figure 1, Appendix F).

As described in Section 3.4 of Appendix F, an analysis was conducted using the WindPRO v2.7 software package under "Worst-Case" modelling, which is the most conservative approach and assumes that all the criteria listed in Section 7.4.1 are always met. "Worst-Case" modelling assumes conditions that are impossible to occur in practice but provides a starting point for assessing potential shadow flicker issues.

A second modelling scenario was developed to account for more realistic conditions. The "Adjusted-Case" used the average monthly sunshine hours recorded at the closest weather station to the Study Area available in WindPRO, the Charlottetown weather station (Table 3, Appendix F), for daily sunshine hours. In addition, the "Adjusted-Case" used weather data to estimate the probability of different wind directions and therefore, turbine orientation (Table 4, Appendix F).

The “Adjusted Case” is still conservative as it assumes that turbines are always active (i.e., turbine rotors are always turning), receptors are sensitive to shadow flicker in every direction (i.e., greenhouse mode) and does not account for screening of shadow flicker by vegetation, outbuildings or other structures (Section 7.4.1). The “Adjusted-Case” cannot predict adjusted maximum daily shadow flicker amounts because it is based on monthly average sunshine data; therefore, the maximum daily shadow flicker amounts are based on “Worst-Case” modelling.

7.4.4 Assessment Results

A total of 45 potential receptors were identified within 2 km of the selected Project turbine locations. An additional 27 potential receptors identified outside of the 2 km buffer were also included in the modelling (Section 3.2, Appendix F).

Detailed results are provided in Section 4.0 of Appendix F. A total of 18 potential receptors exceed 30 hours of shadow flicker per year and/or 30 minutes of shadow flicker on the worst day under “Worst-Case” modelling (Table 5, Appendix F). Nine of the 18 potential receptors with exceedances have an agreement with the Proponent waiving the requirement to comply with shadow flicker limits (i.e., participating receptors). These agreements are registered on title to the land and bind successors in title. Seven non-participating potential receptors were found to exceed the 30 minutes per day threshold for shadow flicker exposure.

The “Adjusted-Case” was subsequently modelled using the weather data in Table 4 and 5 of Appendix F. The “Adjusted-Case” resulted all non-participating receptors complying with the guideline of 30 hours of shadow flicker per year (Table 5, Appendix F).

7.4.5 Effects Assessment

Project-Shadow Flicker Interactions

Project activities only interact with shadow flicker during wind turbine operations (Table 7.18).

Table 7.18: Potential Project-Shadow Flicker Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	-
Access Road Upgrading and Construction	-
Laydown Area and Turbine Pad Construction	-
Transportation of Turbine Components	-
Turbine Assembly	-
Interconnection	-
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X

Project Phase	Potential for Interaction
Vegetation Management	-
Decommissioning	
Infrastructure Removal	-
Site Reclamation	-

Assessment Boundaries

The LAA for shadow flicker includes a 2 km buffer of selected turbine locations (Figure 1, Appendix F). The RAA is not applicable for shadow flicker.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for shadow flicker. The VC-specific definition for magnitude is as follows:

- Low: Measurable shadow flicker levels predicted at the exterior of receptors are below the criteria in the Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025b).
- High: Measurable shadow flicker levels at receptors predicted to exceed the criteria in the Environmental Assessment Supplemental Checklist: Wind Energy Projects.

Effects

The “Adjusted-Case” predicts that all non-participating potential receptors will experience less than 30 hours of shadow flicker per year. The “Adjusted-Case” cannot predict adjusted maximum daily shadow flicker amounts because it is based on monthly average sunshine data. Seven non-participating potential receptors were found to exceed 30 minutes of shadow flicker per day when modelled under “Worst-Case” conditions.

The “Adjusted-Case” is still considered a conservative assessment because it still assumes the following:

- Wind turbines are always in operation (i.e., rotors always spinning).
 - Wind turbines do not operate at all times, as rotor movement is dependent on suitable wind speeds and other operational factors.
- A clear line of sight, with no screening by trees, outbuildings, or other local structures.
- All receptors are sensitive to shadow flicker in every direction.

Mitigation Measures

The Proponent will develop a Complaint Resolution Plan, which will consider complaints related to shadow flicker and outline an investigation process. Mitigation to resolve complaints, if determined to be necessary, will be completed on a case-by-case basis in consultation with the affected complainant. This could include implementing the curtailment schedule in Appendix F, as is determined to be necessary by the investigation and adapted to adjust for actual conditions experienced at the receptor.

Modelling will be updated if the turbine model or layout changes prior to construction to ensure compliance with the Environmental Assessment Supplemental Checklist: Wind Energy Projects (Nova Scotia, 2025; NSECC, 2025b).

Monitoring

No monitoring programs are proposed.

Conclusion

The predicted residual effects of Project-generated shadow flicker on non-participating receptors are characterized in Table 7.19.

Table 7.19: Shadow Flicker Residual Effects

Effect Detail	Shadow Flicker
Magnitude of Effect	Low: Measurable shadow flicker is expected but within regulatory compliance at non-participating receptors.
Geographic Extent of Effect	2 km buffer of turbine locations
Frequency of Effect	Intermittent: Effects may occur whenever the turbine rotors are spinning.
Duration of Effect	Medium Term: Effects are expected throughout the operational phase of the Project.
Reversibility of Effect	Reversible
Significance Level	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions)	
Magnitude: Negligible, Low, Moderate, High	
Frequency: Single Event, Intermittent, Continuous	
Duration: Short Term, Medium Term, Long Term	
Reversibility: Reversible, Irreversible, Partially Reversible	

8.0 GEOPHYSICAL ENVIRONMENT

8.1 Overview

The assessment of the geophysical environment included a review of topography, surficial geology, bedrock geology, and hydrogeology/groundwater.

8.2 Regulatory Context

Relevant legislation includes:

- *Environment Act* (Nova Scotia, 1995b)
- Sulphide Bearing Material Disposal Regulations (Nova Scotia, 1995d)

If blasting is required for construction, groundwater wells within 800 m must undergo an assessment in accordance with NSECC's Procedure for Conducting a Pre-Blast Survey (1993).

8.3 Assessment Methodology

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

- Aerial imagery and topography
- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- Nova Scotia Geoscience Atlas (NSNR, 2021f)
- Mineral Resource Land-Use Atlas (NSNR, 2021e)
- Nova Scotia Groundwater Atlas (NSNR, 2024c)
- Nova Scotia Karst Risk Map (Drage, 2019)
- Manganese in Well Water Risk Map (Kennedy, 2021)
- Well Logs Database (NSECC & NSNR, 2022)
- Nova Scotia Pumping Test Database (NSNR, 2022c)
- Nova Scotia Groundwater Observation Well Network (NSECC, 2015a)
- Potential for Radon in Indoor Air (NSNR, 2009a)

8.4 Assessment Results

8.4.1 Topography

The majority of the Study Area lies within the Mulgrave Plateau (360) Ecodistrict, with the northern portion extending into the St. George's Bay (520) Ecodistrict (Drawing 7.1) (Neily et al., 2017).

The Mulgrave Plateau (102,800 ha) is located west of the Strait of Canso and northwest of Chedabucto Bay in Antigonish and Guysborough counties. The ecodistrict consists of a till plain with gentle to moderate elevation changes, having a mean elevation of 130 m above sea level (masl). The Mulgrave Plateau is divided by the Chedabucto Fault, but both sides have similar levels of hummocky terrain, with extensive pockets of imperfectly drained soils. Steep slopes are also found within this ecodistrict along the edges of elevated plateaus (which rise to approximately 200 masl) (Neily et al., 2017). The topography within the Study Area is inclined, decreasing in gradient to the northeast.

The St. George's Bay Ecodistrict (89,400 ha) includes most of Antigonish County as well as a small portion of Inverness County (Neily et al., 2017). Elevations range from 30 to 60 masl, with a rise in elevation with increasing distance from the coast and gently rolling topography. The ecodistrict is underlain by sedimentary rock with gypsum outcrops and karst topography present in some areas.

Within the Study Area, elevations range from approximately 65 masl to 217 masl (Drawing 8.1).

8.4.2 Surficial Geology

Surficial geology of the Mulgrave Plateau consists predominantly of near-surface/exposed bedrock with thin overlying deposits of glacial till. Scattered areas of thicker till are also found within the Mulgrave Plateau Ecodistrict but are primarily associated with drumlin formations.

Within the St. George's Bay Ecodistrict, surficial geology is characterized by substantial glacial till (up to 30 m) and glaciofluvial deposits. Karst topography is found in areas where limestone or gypsum is present (Neily et al., 2017).

The surficial geology of the Study Area predominantly consists of a silty till plain (northern portion of Study Area) and bedrock overlain by a thin veneer of till (southern portion). The silty till plain is 3 m to 30 m of compact material derived from distant and local sources that was deposited at the base of melting ice sheets. Silty till plains provide moderate drainage due to stoniness and have calcareous bedrock components which provide good acid rain buffering capacity. Other surficial features present within the Study Area include (Drawing 8.2):

- Alluvial deposits
- Bedrock
- Hummocky ground moraine
- Organic deposits
- Silty drumlin
- Silty till plain
- Stony till plain

Alluvial deposits are accumulations of gravelly sand material deposited by flowing water (i.e., streams and rivers) following receding/melting glaciers. These deposits range in thickness from < 1 m to 20 m and include gently sloping/flat floodplains to sloping alluvial fans (NSNR, 2021f).

Areas of exposed bedrock and/or bedrock overlain by a thin discontinuous layer of till were formed from glacial scouring, erosion, and/or non-deposition. These features are composed of various ages and types of bedrock and result in exposed ridges of hard rock (NSNR, 2021f).

Hummocky ground moraines are deposits of loose stony and sandy till that vary in thickness between 2 m and 25 m. These deposits are formed by the melting of stagnant ice sheets and result in irregular topography characterized by local ridges and depressions (NSNR, 2021f).

Organic deposits (i.e., wetlands/peatlands) develop when topographic depressions collect and/or store surface water, and ponds/watercourses infill with vegetation. Within the Study Area, organic deposits range in depth from 1 m to 5 m (NSNR, 2021f).

Silty drumlins consist of silty till with a thickness of 4 m to 30 m that is derived from distant sources (including red clay). These features formed from material deposited at the base of melting ice sheets and provide moderate drainage due to stoniness. In addition, silty drumlins have calcareous bedrock components, which provide good acid rain buffering capacity (NSNR, 2021f).

Silty till plains are composed of silty, compact material released from the base of melting ice sheets. They provide moderate drainage and stoniness, and are 3 m to 30 m thick (NSNR, 2021f).

Stony till plains are composed of locally-derived stony, sandy material (2 m to 20 m thick) deposited at the base of receding/melting ice sheets. These surficial features have high erodibility, rapid drainage, high water tables, and are shallow/stony, which can pose limitations for construction (NSNR, 2021f).

Soils across the Study Area reflect the presence of sedimentary rocks. In the Mulgrave Plateau Ecodistrict, soils are characterized as poor-very poorly drained to rapid-imperfectly drained, and fine-medium to medium-coarse texture (Neily et al., 2017). In the St. George's Bay Ecodistrict, soils tend to be poor-very poorly drained to rapidly drained and fine to coarse texture (Neily et al., 2017).

No records of colluvial deposits, which are loosely consolidated surficial sediments deposited at the base of a slope and susceptible to rockfall, were identified.

8.4.3 Bedrock Geology

Bedrock within the Study Area is primarily comprised of the Horton Group (Keppie, 2000) (Table 8.1; Drawing 8.3). A small portion of the Study Area (approximately 1 ha) coincides with the Windsor Group.

Table 8.1: Characteristics of Bedrock Geology Underlying the Study Area

Geologic Unit	Percentage of Study Area	Composition	Period of Formation
Horton Group	99.98	Fluvial, lacustrine, pro-delta and floodplain environments, with occasional restricted marine sedimentary rocks (e.g., siltstone, sandstone, conglomerate, shale)	Devonian to early Carboniferous
Windsor Group	0.02	Marine sedimentary rocks (e.g., siltstone, sandstone, gypsum).	Early Carboniferous

One fault contact is present within the Study Area, associated with the Horton Group and Windsor Group contact. Additional faults exist in the vicinity of the Project; however, eastern Canada, has a relatively low rate/risk of earthquake activity (NSNR, 2021c).

In Nova Scotia, several bedrock formations are known to contain acid-generating rock (sulphide minerals such as pyrite and pyrrhotite) that, when disturbed, can result in acid rock drainage (ARD). ARD occurs when sulphide-bearing rocks are disrupted and exposed to air or water, producing sulphuric acid and metal oxides that are subsequently mobilized/leached through freshwater systems (NSNR, 2021a). Based on provincial mapping, there are no sulphide-bearing slates or formations recorded within the Assessment Area or the larger Study Area (NSNR, 2021e) (Drawing 8.3). The presence/absence of sulphide-bearing minerals and the likelihood of ARD will be confirmed following the results of the geotechnical evaluation.

A review of the NS Karst Risk Map (based on provincial geology maps, sinkhole occurrence data, lidar data and hydrogeological databases) indicates that the Study Area overlaps “Low” and “Medium Risk” areas for karst (NSNR, 2019) (Drawing 8.4). Karst topography is characterized by naturally occurring sinkholes, underground drainage systems, and caves formed by the dissolution of soluble bedrock (e.g., limestone). The presence of karst terrain has the potential to cause extensive damage to infrastructure and the local landscape due to the risk of sudden collapse/subsidence.

As there is no indoor air pathway for radon gas, it is not considered a risk for the Project and was therefore not evaluated.

8.4.4 Groundwater Quality and Quantity

The Study Area is underlain by sedimentary bedrock (NSNR, 2021f). Wells located in sedimentary bedrock typically have higher dissolved solids, hardness, and well water yields as groundwater can flow through the rock itself and along fractures. Naturally occurring trace metals such as iron, arsenic, and manganese can be found in all groundwater regions, but are more often associated with plutonic and metamorphic groundwater regions (NSNR, 2009b).

Groundwater risk mapping indicated that most of the Study Area is in a “High Risk” zone for arsenic in bedrock wells, with the northern portion of the Study Area categorized as “Medium Risk” or “Low Risk” (Drawing 8.5) (NSNR, 2021e). The Study Area is in a “High Risk” zone for manganese in bedrock wells, with some “Medium Risk” in the northern portion of the Study Area (Drawing 8.6) (Kennedy, 2021). The Study Area is considered a “Low Risk” for uranium in bedrock wells (Drawing 8.7) (NSNR, 2021e).

8.4.4.1 Groundwater Wells

An assessment of nearby groundwater wells was conducted using the NSECC Well Logs Database (NSECC & NSNR, 2022). This database contains records of well locations and characteristics within the province dating back to approximately 1920. The database was reviewed to identify groundwater wells proximal to the Study Area. Note that this database has significant limitations in spatial accuracy. For the purposes of this assessment, groundwater wells with a spatial uncertainty greater than 1,000 m were not considered/assessed.

A total of 51 water wells were identified within 2 km of the Study Area in the NSECC Well Logs Database (NSECC & NSNR, 2022) (Appendix G; Drawing 8.8). (Table 8.2). Note that based on the spatial resolution of the NSECC Well Logs Database, some wells will appear to overlap on the provided drawing.

Table 8.2: Summary of Water Well Records within 2 km of the Study Area

	Drilled Date (year)	Well Depth (m)	Bedrock Depth (m)	Static (m)	Yield (Lpm)	Elevation (masl)
Minimum	1965	4.6	0.9	-0.03 ⁽¹⁾	2.3	38.0
Maximum	2013	97.4	26.5	42.6	227	179.0
Average	NA	45.5	10.1	7.8	27.9	110.9

Source: (NSECC & NSNR, 2022)

⁽¹⁾ Negative values represent overflowing wells or static water level at ground level.

There are 19 drilled and one dug groundwater wells within 800 m of the Project Footprint, and 51 within the Study Area (49 drilled, 2 dug) (Drawing 8.8). Most wells are located between the northern portion of the Study Area and the Northumberland Shore, primarily near human settlements, and are for domestic or unspecified usage. If blasting is required within 800 m of a well, the Proponent will conduct pre-blast surveys as per requirements under NSECC's Procedure for Conducting a Pre-Blast Survey (1993).

The NSNR Pumping Test Database provides long term yields for select wells throughout the province. It includes details about well construction, pumping test, and interpreted hydrogeological properties. The nearest pumping test well (ID: 800063) is in Paqtnkek-Niktuek First Nations Reserve, about 400 m north of Highway 104 and 3 km north of the Study Area (within the same sedimentary groundwater region). This well was drilled for the Reserve in 1980 to a depth of 47.2 m below surface. The well has a static water level of 5.5 m and safe long-term yield of 45.4 Lpm (NSECC & NSNR, 2022).

NSECC maintains the Nova Scotia Groundwater Observation Well Network (NSECC, 2015a) to monitor groundwater level, water quality, evaluate impacts of human activities, and evaluate long-term water trends. The nearest active provincial observation well to the Study Area is Monastery (#028) located approximately 4 km northeast of the Study Area, near Monastery, NS (within the same sedimentary groundwater region). This well was drilled in 1976 to a depth of 158.4 m through the Canso Group (presently named Mabou Group) bedrock and is currently active. In 2024, the average annual water level was 12.8 masl, and the annual water level fluctuation was approximately 1.5 m (NSECC, 2015a).

The groundwater atlas also contains the Nova Scotia Chemistry Well Database (NSNR, 2024c), which identified five chemistry wells within 2 km of the Study Area. Four of the identified wells are in the sedimentary groundwater region, and one is in the evaporitic groundwater region. Three wells exceeded the aesthetic objective (AO) for iron, two exceeded the AO for manganese, and two exceeded the AO for pH, as defined in the Guidelines for Canadian Drinking Water Quality (GCDWQ). None of the five wells exceeded any of the maximum allowable concentrations from the GCDWQG (Health Canada, 2025). The Chemistry Well Database is a compilation of various federal, provincial, and municipal groundwater quality sources, including registered drinking water supplies, government buildings, and municipal potable water supply wells.

8.5 Effects Assessment

Project-Geophysical Interactions

Project activities will primarily interact with the geophysical environment during earth moving activities (Table 8.3).

Table 8.3: Potential Project-Geophysical Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Interconnection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	-
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for the geophysical environment is an 800 m buffer of the Project Footprint (Drawing 8.9). The RAA is not applicable.

Assessment Criteria

The assessment criteria provided in Section 4.3 apply to the geophysical environment. The VC-specific definition for magnitude is as follows:

- **Low:** No geologic hazards are present within the Study Area; impacts to the quality/quantity of groundwater wells are not anticipated.
- **Moderate:** Risk mapping indicates a “Moderate” or “High Risk” of a geologic hazard(s) within the Study Area (or a known occurrence is identified) but the hazard(s) is anticipated to be mitigated with routine measures; impacts to the quality/quantity of groundwater wells are possible if blasting is required (wells are located within the LAA).
- **High:** Risk mapping indicates a “Moderate” or “High Risk” of a geologic hazard(s) within the Study Area (or a known occurrence is identified) which cannot be mitigated with

routine measures; impacts to the quality/quantity of groundwater wells are anticipated if blasting is required (wells are located within the Project Footprint).

Effects

The geophysical environment will be disturbed within the Assessment Area during the site preparation and construction phase, and again during infrastructure removal and site reinstatement. During these phases, potential impacts related to the geologic environment are primarily due to the presence and subsequent disturbance of geologic hazards, including:

- Sulphide-bearing slates (i.e., acid generating rock)
- Karst topography
- Arsenic, manganese, and/or uranium containing bedrock

The review of provincial mapping revealed no sulphide-bearing slates or formations recorded within the Assessment Area or the larger Study Area (NSNR, 2021e). The presence/absence of sulphide-bearing minerals and the likelihood of ARD will be confirmed following the results of the geotechnical evaluation.

Most of the Study Area was categorized as having “Low Risk” for karst, with the northern portion identified as “Medium Risk”. Turbine pads and sites for other infrastructure will be assessed as part of geotechnical investigations; if karst topography or other constructability limitations are encountered, the geotechnical investigation will provide recommendations.

Construction activities, primarily blasting (if required), can affect the quality and quantity of the surrounding groundwater supply, depending on proximity to drinking water wells and the extent of disturbance. Disturbance of arsenic, manganese, or uranium containing bedrock can cause mobilization within groundwater and subsequently degrade nearby groundwater well quality. Risk mapping shows that the Study Area is primarily located in a region with a “High Risk” for arsenic (Drawing 8.5) and manganese (Drawing 8.6). Risk mapping for arsenic and manganese containing bedrock in the northern portion of the Study Area shows the area as being “Medium Risk” (Kennedy, 2021; NSNR, 2021e). Arsenic is considered the most prevalent naturally occurring groundwater contaminant in the province and is normally treatable using conventional treatment systems (Kennedy & Drage, 2016, 2017). Manganese exceedances in wells are common in NS, with the highest rates occurring in the metamorphic groundwater region (Kennedy, 2021). Risk of uranium was “Low” throughout the Study Area (NSNR, 2021e) (Drawing 8.7).

In addition to water quality, groundwater quantity can also potentially be impacted if blasting activities (if required) alter local hydrogeological flow regimes, resulting in groundwater draining from or flowing towards existing wells. Based on the desktop review, 19 wells are within 800 m of the Project Footprint. The requirement for blasting and pre-blast surveys will be confirmed and assessed further during geotechnical investigations and during detailed engineering design.

Potential impacts to nearby groundwater well quality because of arsenic, manganese, and uranium are not anticipated based on:

- Construction activities will primarily consist of clearing, grubbing, and grading within the surficial layer. Contact with/disturbance of groundwater is not anticipated.
- If blasting is required, a Blasting Management Plan will be developed in compliance with regulatory guidelines.

Mitigation Measures

The following mitigation measures are recommended to minimize impacts to the geologic environment:

- Limit the Project Footprint and disturbed areas to the extent practical.
- Use existing roads and site Project components in previously disturbed areas, where practicable.
- Conduct blasting, if required, in accordance with provincial legislation and subject to terms and conditions of applicable permits.
 - Conduct pre-blast surveys for wells within 800 m of blasting activities, which may include ground-truthing for nearby well locations.
 - If demonstrable changes in groundwater quantity or quality to a well are detected due to Project activities, an alternative water supply, of equal or better quantity/quality than that impacted, will be provided to the landowner.
 - Require that all blasts are conducted and monitored by certified professionals.
 - Notify landowners (within 800 m) in advance of any blasting activities.
- Assess for elevated sulphide potential in bedrock during pre-construction geotechnical surveys. If identified, develop a site-specific mitigation plan for sulphide-bearing materials in accordance with the Sulphide Bearing Material Disposal Regulations, N.S. Reg. 57/95 and in consultation with relevant regulatory departments.
- Store excavated soils temporarily next to the excavation until they are needed for backfilling, if required. Any remaining excavated material will be used on-site or removed and sent to an approved facility.
- Install, monitor, and maintain erosion and sedimentation control measures as detailed in the Project Erosion and Sediment Control Plan.

Monitoring

If blasting activities are required to construct the Project (to be confirmed during geotechnical investigations), groundwater wells within 800 m of blasting activities will be monitored as per the Procedure for Conducting a Pre-Blast Survey (NSECC, 1993).

If geologic hazards are identified within the Project Footprint (or Study Area) during geotechnical investigations, a site-specific mitigation plan will be developed.

No additional monitoring programs are proposed at this time in relation to the geophysical environment.

Conclusion

After mitigations, residual effects on the geophysical environment are characterized in Table 8.4.

Table 8.4: Geophysical Environment Residual Effects

Effect Detail	Encountered Geologic Hazard	Change to Groundwater Quality or Quantity
Magnitude of Effect	Moderate: Risk mapping shows the potential for geologic hazards in the Study Area.	Moderate: Groundwater wells located within 800 m of the Project Footprint.
Geographic Extent of Effect	800 m buffer of the Project Footprint	800 m buffer of the Project Footprint
Frequency of Effect	Continuous: If present, effects may occur continuously.	Intermittent: Effects may occur during blasting (if required).
Duration of Effect	Short Term: If present, effects limited to construction and decommissioning.	Short Term: Effects are possible throughout construction (if blasting is required).
Reversibility of Effect	Partially Reversible	Partially Reversible
Significance Level	Not Significant	Not Significant
<u>Effects Assessment Ratings (Refer to Table 4.4 for definitions)</u> Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible		

9.0 AQUATIC ENVIRONMENT

9.1 Surface Water & Fish and Fish Habitat

9.1.1 Overview

The objective of the aquatic assessment was to inform the Project's design by collecting the information needed to evaluate baseline biophysical conditions and assess potential Project impacts to surface water and fish and fish habitat. This was accomplished using the following approach:

- Identify surface water features, fish presence, and fish habitat within the Study Area through desktop-based resources (e.g., aerial imagery, mapping tools, and existing databases) (Drawing 9.1 and 9.2).
- Identify representative habitats to survey for fish (Drawing 9.3).

- Traverse the portions of the Assessment Area where access has been permitted to ground truth, delineate, and characterize surface water features (Drawings 9.3).
- Use the desktop surface water results to identify surface water features on private land where access was not permitted.
- Use the information collected to inform the Project design (e.g., avoid/minimize impacts to surface water, fish and fish habitat).
- Use the information collected to identify potential impacts and inform mitigation and management practices.

9.1.2 Regulatory Context

Under the provincial *Environment Act* (Nova Scotia, 1995b), NSECC has the authority to promote the sustainable management of water resources in Nova Scotia. More specifically, as per section 5A of the Activities Designation Regulations (Nova Scotia, 1995a), the alteration of a watercourse or the flow of water within a watercourse is an activity that requires an approval from NSECC, or a notification to NSECC if the work will be completed in accordance with the Nova Scotia Watercourse Alterations Standards (NSECC, 2015c).

The Nova Scotia *Environment Act* (Nova Scotia, 1995b, Section 3be) defines a watercourse as:

- (i) The bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not.
- (ii) All groundwater.

Using this guidance, watercourses were identified and described throughout the Assessment Area to support the description of fish habitat, and effects to regulated watercourses which may require provincial approval. While groundwater is included in the regulatory definition of a watercourse under the *Environment Act*, this section focuses on surface water features in the context of fish habitat provision. In addition to the above-mentioned definition, the watercourse parameters listed in the Guide to Altering Watercourses (NSECC, 2015b) were used to aid in determining the presence of a watercourse.

The *Fisheries Act* (Canada, 1985) is the primary federal legislation governing the conservation and protection of fish and fish habitat in Canada. The *Fisheries Act* prohibits any work, undertaking, or activity that results in harmful alteration, disruption, or destruction (HADD) of fish or fish habitat, as well as the deposit of deleterious substances into waters frequented by fish, unless such activities are authorized through appropriate regulatory approvals. Under Section 35(2) of the *Fisheries Act*, authorization may be granted for a proposed work, undertaking, or activity that may, respectively, result in the death of fish or the HADD of fish habitat.

The *Fisheries Act* defines the following:

Fish:

“(a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.”

Fish Habitat:

“waters frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas (Authorizations Concerning Fish and Fish Habitat Protection Regulations, 2019)”.

If an alteration to a watercourse or waterbody is required, or impacts to fish and fish habitat are expected, a review under the DFO Request for Review process may be required. DFO review typically occurs through the provincial watercourse alteration application process.

Finally, species that are listed as ‘Endangered’ or ‘Threatened’ receive individual protection from harm and destruction under SARA and/or ESA.

9.1.3 Desktop Review

The objective of the desktop review was to identify potential fish communities as well as watercourses and waterbodies located within the Study Area and within 5 km of its boundaries.

The desktop review included a query of the following resources and databases:

- CanVec Database – Hydrographic Features (NRCan, 2023)
- Significant Species and Habitats Database (NSNR, 2024f)
- NS Topographic Database – Water Features (GeoNOVA, 2025b)
- Wet Areas Mapping (WAM) (NSECC, 2022b)
- NS 1:10,000 Primary Watersheds (NSECC, 2011a)
- 1:10,000 Secondary and Shore Direct Watershed of Nova Scotia (NSECC, 2011b)
- Aquatic Species at Risk Map (DFO, 2025)
- Nova Scotia Freshwater Fish Species Distribution Records (NSDFA, 2025)
- Atlantic Canada Conservation Data Centre (ACCDC) Data Report (ACCDC, 2025a)

Watercourses and Waterbodies

Over 92% of the watercourses found within the Study Area are within the Tracadie River primary watershed (1DS), the other remaining 8% are within the Clam Harbour/St. Francis River primary watershed (1ER). The Study Area also overlaps six secondary watersheds: Guysborough River (1ER-5), Pomquet River (1DS-1), Afton River (1DS-2), Tracadie River (1DS-4), and two shore-direct watersheds (1DS-3 and 1DS-SD4) (Drawing 9.1).

A review of the federal CanVec Database – Hydrographic Features (NRCAN, 2023) identified 127 watercourses and 15 waterbodies within and/or adjacent the Study Area. Of these, eight watercourses and seven waterbodies are named:

- Tracadie River
- North Brook
- Monastery Brook
- Meadow Bridge Brook
- Eugenes Brook
- Black Avon River
- Afton River
- West Afton River
- Rocky Lake
- Haleys Lake
- Flynn Lake
- Donnelly's Lake
- Clancys Pond
- Carls Lake
- Boyles Lake

There were 53 waterbodies identified within 5 km of the Study Area, ten are named. An additional 195 watercourses were identified within a 5 km buffer of the Study Area, of which 14 are named (Table 9.1).

Table 9.1: Named Watercourses and Waterbodies Within the Study Area and a 5 km Buffer

Name	Secondary Watershed	Distance (km) ⁽¹⁾
Watercourses		
Randalls Brook	Afton River (1DS-2)	4.1
Leets Brook	Guysborough River (1ER-5)	3.3
North Intervale Brook	Guysborough River (1ER-5)	1.5
Shaw Brook	Guysborough River (1ER-5)	4.3
Butler Brook	Guysborough River (1ER-5)	4.3
Chisholms Brook	Shore Direct (1DS-SD5)	1.6
Brymer Brook	Shore Direct (1ER-SD11)	4.2
Brandy Brook	Shore Direct (1ER-SD12)	4.2
Atwater Brook	Tracadie River (1DS-4)	2.5
Tates Brook	Tracadie River (1DS-4)	3.4
Silvey Brook	Tracadie River (1DS-4)	0.5
Hurlburt Brook	Tracadie River (1DS-4)	4.4
East Branch Tracadie River	Tracadie River (1DS-4)	2.3
Anna Wallaces Brook	Tracadie River (1DS-4)	3.6
Waterbodies		
MacDonalds Lake	Guysborough River (1ER-5)	4.4

Name	Secondary Watershed	Distance (km) ⁽¹⁾
Maynies Lake	Guysborough River (1ER-5)	0.1
Keys Lake	Guysborough River (1ER-5)	0.3
Gavins Lakes	Guysborough River (1ER-5)	0.2
Bordens Lake	Shore Direct (1DS-3)	2.1
Rileys Pond	Shore Direct (1DS-SD5)	4.6
Brymer Lake	Shore Direct (1ER-SD11)	3.7
Shepherd Lake	Tracadie River (1DS-4)	3.5
Leets Lake	Tracadie River (1DS-4)	0.7
Guthros Lake	Tracadie River (1DS-4)	3.7

⁽¹⁾ Measurement from the nearest point of the Study Area.

The elevation within the Study Area ranges between approximately 65 masl to 217 masl (Drawing 8.1). Moderate elevation changes within the center of the Study Area have developed a watershed divide, typically driving water north [Tracadie River primary watershed (1DS)] and south [Clam Harbour/St. Francis River primary watershed (1ER)] of the Study Area.

Throughout the Assessment Area, WAM data indicates that groundwater ranges from 0 m to >10 m (Drawing 9.2). WAM results generally aligned with the locations of watercourses identified using topographic mapping and highlighted the potential for additional watercourses throughout the Assessment Area (NSECC, 2022b).

Potential Fish Community

The NSNR Significant Species and Habitat Database (NSNR, 2024f) does not contain any polygons within the Study Area or 5 km buffer pertaining to aquatic freshwater and marine species.

Furthermore, the Aquatic Species at Risk Map (DFO, 2025) identifies no aquatic SAR or critical habitat within the Study Area. The map is a federal database showing the distribution of SAR and their associated critical habitat within Canadian waters.

The Nova Scotia Freshwater Fish Species Distribution Records (NSDFA, 2025) show the following species as potentially present within the Tracadie River and Clam Harbour/St. Francis primary watersheds:

- American eel (*Anguilla rostrata*; COSEWIC 'Threatened'; S3N)
- White sucker (*Castostomus commersoni*; S5)
- Alewife (*Alosa pseudoharengus*; S3B)
- Golden shiner (*Notemigonus crysoleucas*; S4)
- Lake chub (*Couesius plumbeus*; S5)
- Creek chub (*Semotilus atromaculatus*; S5)
- Banded killifish (*Fundulus disphanus*; S5)
- White perch (*Morone americana*; S5)
- Yellow perch (*Perca flavescens*; S5)

- Ninespine stickleback (*Pungitius pungitius*; S5)
- Brook trout (*Salvelinus fontinalis*; S3)
- Brown trout (*Salmo trutta*; SNA)
- Blacknose shiner (*Notropis heterolepis*; S4)

ACCDC Records

The ACCDC database identified one fish SOCI and one aquatic invertebrate SOCI within 5 km of the Study Area (Appendix H):

- Atlantic salmon (*Salmo salar*) - Gaspé - Southern Gulf of St. Lawrence population (COSEWIC 'Special Concern', S1). This subspecies has since been redefined as the Southern Gulf of St. Lawrence and Cape Breton population)
- Eastern pearlshell (*Margaritifera margaritifera*, S2)

Additional aquatic species within 100 km of the Study Area are presented in the ACCDC report (Appendix H).

9.1.4 Field Assessment

9.1.4.1 *Field Assessment Methodology*

The results of the desktop review were used to inform Project design (e.g., avoid/minimize impacts to waterbodies and watercourses) and determine the Assessment Area. Given that the Project will avoid all waterbodies, field assessment efforts were focused on potential Project-watercourse interactions, such as intersections between access roads and watercourses where existing crossing structures may need replacement or new structures installed.

Watercourse Delineation and Fish Habitat Assessments

Watercourse delineations were completed in conjunction with wetland delineations between June and September 2023 to 2025, with additional work conducted in October 2025 and January 2026.

Desktop-identified watercourses, along with WAM data and predicted flow data, were provided to field staff to guide the identification and assessment of watercourses within the Assessment Area. Confirmed watercourses were delineated to their termination point or to the boundary of the Assessment Area. The watercourses were characterized using Strum's Baseline Delineation Form, which records the following general survey details:

- Date and time
- Flow regime (perennial, intermittent, ephemeral)
- Habitat types (riffle, pool, run, etc.)
- Flow characteristics (direction, velocity, etc.)
- Physical characteristics (width, length, depth, entrenchment)
- Substrate composition
- Cover types and compositions

- Bank stability
- Photographs and coordinates

Furthermore, each watercourse was assessed for potential Project related impacts (e.g., proposed road crossings). Where overlap with the Project Footprint indicated potential effects, a qualitative fish habitat assessment and supplementary Crossing Form were completed. These tools provide information to support future permitting and document habitat conditions beyond what is captured in the Baseline Delineation Form, with a focus on the presence and suitability of fish habitat. The assessments were conducted at a minimum of three transects, established at the crossing location and 25 m upstream and downstream, to evaluate channel morphology (e.g., wetted width, bank height) and flow characteristics (e.g., depth, velocity).

This information was collected and georeferenced using Survey123, an Environmental Systems Research Institute application for creating, sharing, and analyzing data. As a result of identified environmental constraints, including watercourses, the Project's turbine layout underwent several iterations to minimize potential interactions and limit the number of required watercourse crossings.

Watercourses were classified into four main types (Table 9.2), consistent with the definitions provided by Buttle et al. (2012).

Table 9.2: Watercourse Types

Watercourse Type	Channel Width	Channel Definition	Bed and Banks	Flow Seasonality
Large permanent	Average width approximately > 5 m	Defined channel	Defined bed and banks	Year-round flow
Small permanent	Average width approximately 2 m to 5 m	Defined channel	Defined bed and banks	Year-round flow
Intermittent	Average width approximately < 2 m	Defined channel	Defined bed and banks	Seasonal water flow
Ephemeral	No defined channel		No defined bed and banks	Seasonal water flow

In accordance with current regulatory guidelines, fish habitat was identified as any aquatic feature contiguous with a fish-bearing system, whether it is located within a watercourse, wetland, or waterbody. Where habitat was present within a channelized watercourse flowing through a wetland, it was assessed in the context of the watercourse. If habitat was located outside a defined channel, it was assessed in the context of the wetland, based on fish accessibility or the presence of open water features. No waterbodies were identified within the Assessment Area.

Electrofishing Surveys

Electrofishing is a standard fish capture technique used to collect juvenile and adult fish from watercourses and waterbodies. The method involves submerging an anode and cathode in the water and passing an electrical current through the water to attract and immobilize fish for capture.

Electrofishing surveys were conducted in summer 2023 and 2024 in the two primary watersheds that intersect the Study Area to assess fish species presence and relative abundance. All surveys were conducted under DFO Scientific Licences #SG-RHQ-24-072, SG-RHQ-23-001A, and 341208.

DFO's Interim Policy for the Use of Backpack Electrofishing Units (DFO, 2003) was reviewed and followed by all members of the electrofishing crew. This policy outlines requirements for standard equipment, safety, training, and emergency procedures. Each crew consisted of two individuals, including a qualified crew lead as defined by the Policy. The crew lead is responsible for operating the backpack electrofisher according to their training and the Policy, and for communicating safety policies and electrofishing procedures to the crew member.

Fish sampling was conducted using a Halltech Battery Backpack Electrofisher (HT-2000) with un-pulsed direct current. A crew member walked alongside the electrofisher operator to net any stunned fish using a D-frame landing net (1/8" mesh). Captured fish were held in a live well containing ambient stream water, shaded from the sun, and regularly monitoring for signs of stress. At the conclusion of each pass, fish in the live well were identified (species confirmation), photographed, and measured for length. After recuperating, all fish were released back into the watercourse. As part of the assessment, field staff made note of any fish observed but not caught, along with any points of concern such as obstructions to fish passage (e.g., elevated culverts, waterfalls, etc.).

Qualitative electrofishing surveys followed an open-site, single-pass methodology over a 100 m reach, without the use of barrier nets. This approach aligns with methods described in The Salmonid Field Protocols Handbook (D. H. Johnson et al., 2007), which cites multiple studies supporting the effectiveness of single-pass electrofishing for assessing species richness (Simonson & Lyons, 1995) and relative abundance (Kruse et al., 1998). Species abundance was estimated using Catch Per Unit Effort (CPUE) indices, standardized to 300 seconds of effort (Scruton & Gibson RJ, 1995).

Qualitative electrofishing surveys were completed in four watercourses identified during desktop review (Drawing 9.3).

- Afton River
- Black Avon River
- North Intervale Brook
- Monastery Brook

These four locations were selected based on suitability of the habitat to conduct electrofishing surveys (i.e., deep enough to submerge the anode), location within secondary watersheds that intersect the Study Area, fish habitat potential, and access considerations. All four reaches are third order (or higher) watercourses fed from first and second order watercourses located within the Study Area. This approach was reviewed with DFO in June 2022 (Table 6.1). Fish species caught within these watercourses may be assumed to be present upstream to the first- and second-order watercourses located within the Study Area, depending on the species' life cycle and habitat requirements.

Trapping Surveys

Supplemental trapping surveys were conducted between June 6 and June 8, 2023, in four locations. Two locations were in Haleys Lake and two were in Donnelly's Lake, which are both located in the western portion of the Study Area. This approach was reviewed with DFO in June 2022 (Table 6.1). Minnow traps, eel pots, and fyke nets were used to capture and record fish presence as detailed in Table 9.5. Minnow traps have a 3 cm wide opening, a diameter of 22 cm, a length of 20 cm, and a mesh size of 7 mm. Eel pots have an 8 cm wide opening, a width of 32 cm, a length of 63 cm, and a mesh size of 2.5 cm. These traps allow fish to swim inside through funnels that guide them from a large opening near the outside of the trap to a narrow opening close to the center of the trap. Fyke nets have a 40 cm wide opening, a ring diameter of 73 cm, a wing width of 73 cm, a length of 195 cm, and a mesh size of 2 cm. These traps are a hoop net that trap fish inside mesh enclosures. The mesh wings guide fish into the fyke net opening, where they pass through a series of smaller tunnels towards the back of the net. The locations of fish traps deployed within the Study Area are shown on Drawing 9.3. Minnow traps and eel pots are baited, and all three trap types are set in areas with sufficient water depths, left overnight, and collected the following day.

In-Situ Water Quality

Water quality parameters were measured in-situ during watercourse assessments and fish collection surveys by Strum personnel using a calibrated YSI Professional Plus Multi-Probe or a combination of a Myron Ultrapen DO Pen Probe and Hannah Combo pH/Conductivity/total dissolved solids (TDS) Probe at the time of the sampling event/survey. Parameters recorded include dissolved oxygen (DO; mg/L), water temperature (°C), pH, specific conductivity (SPC; µS/cm), and TDS (mg/L). Results were analysed using the Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Freshwater Aquatic Life (FWALs).

9.1.4.2 Field Assessment Results

There were 65 watercourses identified within the Assessment Area during field assessments (Drawing 9.3): perennial (27), intermittent (31), and ephemeral (7) features ranging in channel width from 0.46 m to 8.35 m (Table 9.3). Characteristics presented are limited to the extent of the watercourse contained within or overlapping the Assessment Area. Representative photographs are provided in Appendix I.

Table 9.3: Watercourse Characteristics within the Assessment Area

WC ID ⁽¹⁾	Flow ⁽²⁾	Velocity Range (m/s)	Channel Width Range (m)	Depth Range (m)	Substrate (%)	Habitat Types	Cover Types ⁽³⁾
WC2	I	<0.05	2-3	0.05-0.08	Boulder 10 Rubble 40 Cobble 20 Gravel 10 Muck/Detritus 20	Riffle-run, Pool	IN, O
WC3	I	<0.05	1.5-2	0.06-0.2	Boulder 10 Rubble 30 Cobble 20 Gravel 10 Clay/Mud 15 Muck/Detritus 15	Pool, Riffle	IN, O
WC4A ⁽⁴⁾	P	<0.05	4.0-6.0	0.25-0.5	Bedrock 30 Boulder 15 Rubble 20 Cobble 15 Gravel 10 Muck/Detritus 10	Riffle-run, Pool, Cascade	IN, O
WC4B ⁽⁴⁾	P	<0.05 – 0.25	3.5-4	0.1-0.35	Rubble 20 Cobble 30 Gravel 30 Clay/Mud 20	Riffle-run, Pool	IN, O
WC7	I	<0.05 – 0.1	1-4	0.05-0.4	Rubble 20 Cobble 30 Gravel 30 Clay/Mud 10 Muck/Detritus 10	Riffle, Pool, Riffle-run	IN, O
WC8	I	<0.05	1.6-2.4	0.04-0.05	Boulder 10 Rubble 15 Cobble 5 Gravel 10 Muck/Detritus 60	Run, Pool	AP, IN, O
WC9	P	<0.05	0.97-1.5	0.05-0.6	Rubble 10 Cobble 20 Gravel 30 Silt 5 Muck/Detritus 35	Run, Pool	AP, IN, O
WC10	E	<0.05	0.71-2.2	0.05-0.4	Rubble 20 Cobble 20 Gravel 10 Muck/Detritus 50	Run, Pool	AP, IN, O
WC11	P	0.05 - 0.25	1.1 - 2.7	0.04-0.17	Boulder 15 Rubble 20 Cobble 10 Gravel 15	Riffle-run, Step-pool	AP, IN, O

WC ID ⁽¹⁾	Flow ⁽²⁾	Velocity Range (m/s)	Channel Width Range (m)	Depth Range (m)	Substrate (%)	Habitat Types	Cover Types ⁽³⁾
					Silt 5 Muck/Detritus 35		
WC14	I	<0.05	1.85-5.3	0.06-0.18	Cobble 60 Gravel 20 Muck/Detritus 20	Flat	IN, O
WC22	I	<0.05	1-1.9	0	Boulder 5 Rubble 5 Muck/Detritus 90	Flat, Run	AP, IN, O
WC23	P	0.13 – 0.25	1.05-1.96	0.11-0.55	Muck/Detritus 100	Run, Pool	AP, IN, O
WC24	I	<0.05	1.03-3.03	0.18-0.32	Rubble 5 Cobble 5 Clay/Mud 90	Step-pool	AP, IN, O
WC25	I	<0.05	1.0-2.5	0.05-0.2	Boulder 10 Rubble 20 Cobble 20 Clay/Mud 20 Muck/Detritus 30	Riffle, Pool, No defined channel	IN, O
WC26	I	<0.05	0.32-1.5	0.12-0.23	Clay/Mud 65 Muck/Detritus 35	Step-pool	AP, IN, O
WC27	I	<0.05	2.0-4.0	0-0.03	Boulder 15 Rubble 30 Cobble 10 Gravel 20 Clay/Mud 20 Muck/Detritus 5	Riffle-run	IN, O
WC28	I	<0.05	0.77-2.6	0.08-0.14	Boulder 5 Silt 5 Clay/Mud 10 Muck/Detritus 80	Pool, Flat	AP, IN, O
WC29	I	<0.05 – 0.1	1.34-2.1	0-0.08	Boulder 5 Rubble 10 Cobble 5 Gravel 25 Sand 10 Muck/Detritus 45	Run, Riffle	AP, IN, O
WC30	E	<0.05 – 0.22	0.05-0.12	0.03-0.17	Cobble 5 Clay/Mud 95	Flat	AP, IN, O
WC31	I	<0.05 – 0.1	0.7-0.9	0-0.07	Boulder 5 Rubble 30 Cobble 20 Gravel 15 Sand 5 Muck/Detritus 25	Run, Pool	AP, IN, O

WC ID ⁽¹⁾	Flow ⁽²⁾	Velocity Range (m/s)	Channel Width Range (m)	Depth Range (m)	Substrate (%)	Habitat Types	Cover Types ⁽³⁾
WC32	P	0.13 – 0.2	0.83-1.81	0.11-0.18	Rubble 10 Cobble 5 Gravel 5 Silt 45 Muck/Detritus 35	Riffle, Run, Pool	AP, IN, O
WC33	P	<0.05 – 0.17	1.82-3.94	0.26-0.47	Boulder 10 Sand 10 Silt 20 Muck/Detritus 60	Run, Pool, Riffle	AP, IN, O
WC35	E	<0.05 – 0.25	1.38-3.01	0.04-0.14	Gravel 10 Sand 10 Muck/Detritus 60	Run	AP, IN, O
WC36	P	0.09 – 0.15	3.38-3.55	0.08-0.17	Boulder 5 Rubble 10 Cobble 60 Gravel 15 Clay/Mud 5 Muck/Detritus 5	Riffle, Pool, Run, Flat	AP, IN, O
WC37	P	0.17 – 0.34	2.6-3.3	0.05-0.28	Bedrock 30 Boulder 20 Rubble 20 Cobble 20 Gravel 10	Run, Flat, Pool, Riffle, Run, Chute/Falls/Cascade, Step-pool, Rapids	IN, O
WC41	P	<0.05 – 0.18	1.1-2.02	0.13-0.22	Boulder 10 Gravel 20 Sand 10 Muck/Detritus 60	Run, Pool, Riffle	AP, IN, O
WC42	I	<0.05	0.5-0.92	0.08-0.1	Boulder 15 Rubble 15 Cobble 20 Gravel 25 Silt 15 Muck/Detritus 10	Run, Pool, Riffle, Flat	IN, O
WC43	E	<0.05	1.09-1.5	0-0.02	Gravel 5 Sand 5 Silt 5 Clay/Mud 5 Muck/Detritus 80	Pool	IN, O
WC44	P	<0.05 – 0.15	1.64-2.74	0.1-0.19	Rubble 15 Muck/Detritus 85	Flat, Riffle	AP, IN, O
WC45	I	<0.05	1.05-1.9	0.04-0.19	Muck/Detritus 100	Flat, Riffle	AP, IN, O
WC46	P	0.05 – 0.23	1.4-2	0.05-0.09	Boulder 10 Rubble 30	Run, Flat, Pool, Riffle	IN, O

WC ID ⁽¹⁾	Flow ⁽²⁾	Velocity Range (m/s)	Channel Width Range (m)	Depth Range (m)	Substrate (%)	Habitat Types	Cover Types ⁽³⁾
					Cobble 20 Gravel 20 Silt 15 Muck/Detritus 5		
WC48	I	<0.05	0.05-0.12	0.03-0.17	Muck/Detritus 100	Run	IN, O, AP
WC50	I	<0.05 – 0.2	1.3-2	0.03-0.13	Rubble 5 Cobble 15 Gravel 30 Sand 25 Silt 5 Clay/Mud 5 Muck/Detritus 15	Run, Pool	AP, IN, O
WC51	I	<0.05 – 0.22	0.92-4.12	0.07-0.16	Silt 40 Muck/Detritus 60	Run, Riffle, Flat, Pool	IN, O
WC52	P	<0.05	0.8-1.55	0.05-0.14	Silt 30 Muck/Detritus 70	Run, Riffle	IN, O
WC53	P	<0.05	1.05-1.4	0-0.12	Bedrock 20 Boulder 30 Rubble 15 Muck/Detritus 35	Run	IN, O
WC54	I	<0.05	1.85-5.3	0.13-0.22	Cobble 5 Gravel 50 Sand 30 Silt 5 Muck/Detritus 10	Run, Pool, no defined channel	AP, IN, O
WC55	P	<0.05	0.71-2.2	0.05-0.2	Rubble 2 Cobble 3 Silt 5 Clay/Mud 5 Muck/Detritus 85	Pool, Run	AP, IN, O
WC57	I	<0.05	0.65-2	0-0.15	Boulder 10 Rubble 15 Cobble 10 Gravel 5 Muck/Detritus 60	Flat, Run	AP, IN, O
WC58	E	<0.05	0.6-2.2	0.06-0.18	Silt 20 Clay/Mud 40 Muck/Detritus 40	Flat, Run, pool	AP, IN, O
WC59	I	<0.05	1.05-1.95	0.11-0.55	Muck/Detritus 100	Run	IN, O
WC60	P	0.1 – 0.19	1.06-1.72	0-0.24	Rubble 15 Muck/Detritus 85	Run	AP, IN, O
WC61	I	0.08 – 0.25	1.6-2.4	0.08-0.28	Boulder 10 Rubble 15	Riffle-run, Pool	AP, IN, O

WC ID ⁽¹⁾	Flow ⁽²⁾	Velocity Range (m/s)	Channel Width Range (m)	Depth Range (m)	Substrate (%)	Habitat Types	Cover Types ⁽³⁾
					Cobble 10 Gravel 45 Sand 10 Silt 5		
WC63	P	<0.05	0.3-0.6	0.1-0.1	Gravel 5 Clay/Mud 5 Muck/Detritus 90	Riffle-run	AP, IN, O
WC64	P	<0.05 – 0.28	1.15-1.82	0.14-0.17	Boulder 25 Rubble 25 Cobble 10 Gravel 30 Sand 5 Silt 5	Riffle-run	AP, IN, O
WC65	E	<0.05	0.75-1	0.01-0.05	Rubble 15 Silt 30 Clay/Mud 40 Muck/Detritus 25	Flat	IN, O
WC66	E	<0.05	0.4-0.7	0.03-0.14	Rubble 5 Cobble 15 Gravel 30 Sand 10 Muck/Detritus 40	Flat	IN, O
WC67	I	<0.05 – 0.16	1.45-4.8	0.17-0.65	Boulder 5 Rubble 15 Cobble 20 Gravel 30 Muck/Detritus 35	Run, Pool	AP, IN, O
WC68	I	<0.05	0.32-1.65	0.02-0.03	Rubble 10 Cobble 20 Gravel 30 Clay/Mud 10 Muck/Detritus 30	Pool, Step-pool, Run	AP, IN, O
WC69	I	<0.05	0.5-1.7	0.01-0.22	Boulder 20 Cobble 10 Gravel 5 Silt 25 Muck/Detritus 50	Step-pool, Run	AP, IN, O
WC70	I	<0.05 – 0.13	0.65-2.05	0.07-0.12	Cobble 5 Gravel 5 Silt 25 Muck/Detritus 65	Run, Riffle, pool, step-pool	AP, IN, O
WC71	I	<0.05 – 0.2	0.2-0.4	0.2-0.5	Rubble 20 Cobble 20	Run, Pool, No defined channel	IN, O

WC ID ⁽¹⁾	Flow ⁽²⁾	Velocity Range (m/s)	Channel Width Range (m)	Depth Range (m)	Substrate (%)	Habitat Types	Cover Types ⁽³⁾
					Gravel 45 Clay/Mud 15		
WC72	P	<0.05	1.05-2.1	0.07-15	Rubble 10 Cobble 30 Gravel 40 Muck/Detritus 20	Riffle-run	AP, IN, O
WC73	P	<0.05-0.33	5.0-6.5	0.13-0.4	Boulder 20 Rubble 20 Cobble 10 Gravel 10 Sand 10 Silt 5 Clay/Mud 10 Muck/Detritus 15	Riffle-run, Pool	IN, O
WC75	I	<0.05	0.65-0.7	0.04-0.19	Rubble 5 Cobble 45 Gravel 25 Muck/Detritus 25	Run, Pools	IN, O, AP
WC76	P	<0.05	1.05-2.1	0.07-15	Rubble 10 Cobble 30 Gravel 40 Muck/Detritus 20	Riffle-run	AP, IN, O
WC77	I	<0.05-0.1	1.18-1.4	0.05-0.25	Boulder 5 Rubble 5 Cobble 5 Gravel 10 Sand 15 Muck/Detritus 60	Pool, Run, Riffle, Step pool	O
WC78	P	0.17-0.2	2.02-2.57	0.11-0.29	Bedrock 55 Rubble 5 Cobble 15 Gravel 25	Riffle, Run, Pool, Falls, Cascade	IN, O, AP
WC79	I	<0.05 – 0.07	0.40-0.50	0.1-0.2	Rubble 30 Cobble 50 Gravel 15 Sand 5	Run, Pool, Flat	O
WC80	P	<0.05 – 0.2	3.0-4.0	0.05-0.2	Bedrock 40 Boulder 5 Rubble 10 Cobble 10 Gravel 20 Clay/Mud 10 Muck/Detritus 5	Riffle-run, Pool	IN, O

WC ID ⁽¹⁾	Flow ⁽²⁾	Velocity Range (m/s)	Channel Width Range (m)	Depth Range (m)	Substrate (%)	Habitat Types	Cover Types ⁽³⁾
WC81	P	<0.05	08	0.1-0.22	Rubble 15 Cobble 20 Gravel 20 Sand 15 Silt 15 Muck 15	Run, Riffle	IN, O, AP
WC82	P	0.06-0.45	1.1-2.95	0.07-0.28	Rubble 5 Cobble 20 Gravel 60 Sand 5 Muck/Detritus 10	Run, Riffle	IN, O, AP
WC83	P	0.16-0.46	2.3-3.11	0.13-.25	Bedrock 20 Rubble 25 Cobble 30 Gravel 10 Sand 15	Run	IN, O, AP
WC84	I	<0.05	4.0-6.0	0.08-0.2	Clay/Mud 25 Muck/Detritus 75	Pool, Run	IN, O
WC85	P	<0.05-0.24	4.0-5.0	0.05-0.24	Boulder 5 Rubble 10 Cobble 50 Gravel 30 Sand 5	Flat, Pool, Run	IN, O, AP

⁽¹⁾ Due to changes in the Assessment Area some watercourses no longer intercept the Assessment Area and have since been removed from the table. This includes WC1, WC5, WC6, WC12, WC13, WC15-21, WC34, WC38-40, WC47, WC49, WC56, WC62 and WC74.

⁽²⁾ Perennial (P) – A stream that flows continuously throughout the year, Intermittent (I) – Streams that go dry during protracted rainless periods when percolation depletes all flow, Ephemeral (E) – A watercourse that flows during snowmelt and rainfall runoff periods only (Svec et al., 2005)

⁽³⁾ Cover Types: AP = aquatic plants (submergent and/or emergent); IN = instream objects/in situ cover within the streambed in the form of fallen trees, submerged logs, rocks, boulders, undercut banks, and accumulated debris; O = overhead cover from riparian vegetation overhanging the stream

⁽⁴⁾ WC4A and WC4B are along the same NSE mapped watercourse but intercept the Assessment Area in two separate locations (two field assessments were done).

Perennial, or permanent, features see flow for the vast majority, if not the entirety, of the year. Their continuous flow is often attributed to their direct connection to stable sources of water, including lakes and groundwater springs (US EPA, 2013). Small permanent features include streams, brooks, and creeks. These features are often first- and second-order streams fed by springs, groundwater, and run-off, and often act as tributaries to larger features, creating larger permanent features at their confluence. Large permanent features often exhibit lower flow path gradients, larger channel dimensions, and an increased flow (US EPA, 2013). There were 27 watercourses categorized as perennial.

Intermittent watercourse features observe variances in consistent flow throughout the year, either due to changes in their water source in other abiotic factors such as temperature or geological properties (Buttle et al., 2012). Intermittent watercourses are often first or second order streams fed by lakes, wetlands, springs, groundwater, and run-off. They are often also episodic and flow more prominently following rainfall events and snowmelt conditions. Intermittent flow can occur underground as well as above the water table, along the surface. These features also differ in that they can observe partial channelization but will often enter below the surface (Buttle et al., 2012). There were 31 watercourses categorized as intermittent.

Ephemeral features are often surface water flows and only present following snowmelt periods or rainfall events. These conditions are the sole sources of stream flow present in many of these features and as a result, their flow is always observed above the water table near the surface (Buttle et al., 2012). In Nova Scotia, and within the Assessment Area, ephemeral conditions can also be observed between and within wetlands which are sometimes referred to as “wetland corridors”. Seven watercourses were categorized as ephemeral.

Several of the identified watercourses within the Assessment Area showed evidence of previous alteration, including installed culverts for forestry activities and other land uses in the area.

Electrofishing Surveys

The results of the electrofishing surveys are provided in Table 9.4. Electrofishing reaches completed within Black Avon River, Afton River, Monastery Brook, and North Intervale Brook were located approximately 7.3 km, 2.3 km, 3.1 km, and 3.6 km from the Study Area boundary.

Table 9.4: Electrofishing Survey Results

Location	Secondary Watershed	Survey Date	Upstream Coordinates (UTM)		Downstream Coordinates (UTM)		Fish Species Collected	Scientific Name	SARA	COSEWIC	ESA	S-Rank	Catch Per Species	Total Catch	Total Effort (seconds)	CPUE (fish/ 300 seconds)
			Easting	Northing	Easting	Northing										
Afton River	Afton River (1DS-2)	June 20, 2023	599140	5049869	599163	5049771	Atlantic salmon – Southern Gulf of St. Lawrence and Cape Breton	<i>Salmo salar</i>	-	Endangered	-	S1	8	17	1,241.0	4.11
							Brook trout	<i>Salvelinus fontinalus</i>	-	-	-	S3	3			
							American eel	<i>Anguilla rostrata</i>	-	Threatened	-	S3N	6			
Black Avon River	Pomquet River (1DS-1)	June 20, 2023	593278	5048921	593191	5048977	Brown trout	<i>Salmo trutta</i>	-	-	-	SNA	4	8	1,080.2	2.22
							Threespine stickleback	<i>Gasterosteus aculeatus</i>	-	-	-	S5	2			
							White sucker	<i>Castostomus commersoni</i>	-	-	-	S5	2			
North Intervale Brook	Guysborough River (1ER-5)	June 20, 2023	605568	5037832	605616	5037743	Brown trout	<i>Salmo trutta</i>	-	-	-	SNA	2	3	987.2	0.91
							Alewife	<i>Alosa pseudoharengus</i>	-	-	-	S3B	1			
Monastery Brook	Shore Direct (1DS-3)	Sept 4, 2024	606478	5050695	606575	5050719	Atlantic salmon - Southern Gulf of St. Lawrence and Cape Breton	<i>Salmo salar</i>	-	Endangered	-	S1	60	64	1,138.0	16.87
							White sucker	<i>Castostomus commersoni</i>	-	-	-	S5	1			
							Brook trout	<i>Salvelinus fontinalus</i>	-	-	-	S3	2			
							American eel	<i>Anguilla rostrata</i>	-	Threatened	-	S3N	1			

Atlantic salmon were the most abundant species, accounting for 68 (73.9%) of the total catch. Monastery Brook, which is the north of the Study Area in the Shore Direct secondary watershed (1DS-3) had the highest catch per unit effort (CPUE) (16.87 fish/300 seconds). Representative photographs of fish species captured within the Study Area are provided in Appendix I.

Trapping Surveys

The locations and results of the trapping surveys are provided in Table 9.5.

Table 9.5: Trapping Survey Results

Location	Secondary Watershed	Survey Date	Trapping Location		Fish Species Common Name	Fish Species Scientific Name	SARA	COSEWIC	ESA	S-Rank	Catch Per Species	Total Catch Per Trap Type	Total Effort Per Trap Type (hours)	CPUE (per trap)	CPUE (per species)
			Easting	Northing											
Haleys Lake Group 1	Afton River (1DS-2)	June 6-7, 2023	602039	5045298	White sucker	<i>Catostomus commersonii</i>	-	-	-	S5	9	MT (2) = 120 EP (2) = 24	MT = 46.80 EP = 46.80	MT = 2.56 EP = 0.51	0.10
					Shiner spp.	N/A	-	-	-	-	42				0.45
					Yellow perch	<i>Perca flavescens</i>	-	-	-	S5	20				0.21
					Northern redbelly dace	<i>Chrosomus eos</i>	-	-	-	S5	71				0.76
					Blacknose shiner	<i>Notropis heterolepis</i>	-	-	-	S4	2				0.02
Haleys Lake Group 2	Afton River (1DS-2)	June 6-7, 2023	602135	5045291	White sucker	<i>Catostomus commersonii</i>	-	-	-	S5	24	MT (1) = 98 EP (2) = 6 FN (1) = 1	MT = 23.92 EP = 47.90 FN = 23.75	MT = 4.10 EP = 0.13 FN = 0.04	0.25
					Shiner spp.	N/A	-	-	-	-	64				0.67
					Yellow perch	<i>Perca flavescens</i>	-	-	-	S5	13				0.13
					Northern redbelly dace	<i>Chrosomus eos</i>	-	-	-	S5	1				0.01
					Banded killifish	<i>Fundulus diaphanus</i>	-	Special concern	-	S5	3				0.03
Donnellys Lake Group 1	Afton River (1DS-2)	June 7-8, 2023	602669	5044397	Blacknose shiner	<i>Notropis heterolepis</i>	-	-	-	S5	6	EP (2) = 3 MT (2) = 1,222	EP = 47.83 MT = 46.92	EP = 0.06 MT = 26.04	0.06
					Northern redbelly dace	<i>Chrosomus eos</i>	-	-	-	S5	1,215				12.80
					Banded killifish	<i>Fundulus diaphanus</i>	-	Special concern	-	S5	2				0.02
					Shiner spp.	N/A	-	-	-	-	1				0.01
					Brown trout	<i>Salmo trutta</i>	-	-	-	SNA	1				0.01
Donnellys Lake Group 2	Afton River (1DS-2)	June 7-8, 2023	602679	5044492	Blacknose shiner	<i>Notropis heterolepis</i>	-	-	-	S5	4	EP (2) = 6 MT (1) = 103 FN (1) = 1	EP = 47.93 MT = 24.00 FN = 23.75	EP = 0.13 MT = 4.29 FN = 0.04	0.04
					Northern redbelly dace	<i>Chrosomus eos</i>	-	-	-	S5	103				1.08
					Brown trout	<i>Salmo trutta</i>	-	-	-	SNA	2				0.02

MT = minnow trap
EP = eel pot
FN - fyke net

In total, the traps were set for approximately 379 hours and resulted in the capture of seven species and 1,583 individual fish between Haleys and Donnelly's lakes. Northern redbelly dace were the most abundant species, accounting for 1,390 (87.81%) of the total catch. The highest CPUE per trap type was 26.04 in minnow traps in Donnelly's Lake. The highest CPUE per species was 12.80 for northern redbelly dace, also in Donnelly's Lake. Representative photographs of fish species captured within the Study Area are provided in Appendix I.

Priority Species

The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a) was utilized to identify any priority species and habitat associated with the Project. Mobile aquatic SAR and SOCI within 100 km of the Study Area were identified from desktop resources and their respective habitat associations were compared to the habitat present within the Study Area. Priority species captured during electrofishing and trapping surveys were also included. Only those aquatic SAR or SOCI, and their respective habitats, with potential to interact with the Project have been designated as Project-specific priority species. Interactions may include removal or disturbance of a SAR or SOCI and/or their associated habitat. Priority species include:

- Alewife
- American eel
- Atlantic salmon (Southern Gulf of St. Lawrence and Cape Breton)
- Brook trout
- Eastern pearlshell

Alewife

Alewives are not listed under federal (SARA) or provincial (ESA) legislation as SAR; however, are listed as 'S3B' by ACCDC (ACCDC, 2025c). They are a small, herring-like fish, usually less than 30 cm long and 400 g in weight (Jessop, 1986). They are an anadromous species that spawns in freshwater but travels between freshwater and marine environments. In the Atlantic provinces, they are more commonly found in larger rivers (DFO, 2016). Adult alewives typically live in coastal marine waters 56 to 110 m deep (NSSA, 2005). As they are anadromous, they can adjust to a wide range of salinities and may prefer cooler water than other anadromous fish. Optimal spawning, egg, and larval habitat includes substrates with 75% silt or other soft material containing vegetation and detritus (ASMFC, n.d.).

One alewife was captured during the electrofishing survey in North Intervale Brook (Drawing 9.3). Based on connectivity to North Brook, which is a larger river that flows through the Study Area, suitable habitat for alewives is likely present within the southern portion of the Study Area. WC84, which is part of North Brook, may provide suitable alewife habitat. The substrate composition of WC84 does not support optimal spawning, egg, or larval stages due to coarse substrates; however, alewives are also known to use sand, gravel, or coarse stone dominant substrate for spawning (ASMFC, n.d.) The closest ACCDC observation of alewife is 12.8 ± 0.2 from the Study Area (ACCDC, 2025a).

American Eel

The American eel is listed as 'Threatened' under COSEWIC and 'S3N' by ACCDC (ACCDC, 2025b). American eel are a migratory species with life stages in freshwater, estuary, and marine environments (COSEWIC, 2012a). Though much is still unknown about the American eel, several studies have shown a temperature preference of around 16.7° C (Blakeslee et al., 2018). American eel spawning occurs in the marine environment at the Sargasso Sea and only once during their lifespan. American eel larvae, known as leptocephali, drift westward towards the coast, where they grow into glass eels and begin to migrate inland to freshwater habitats for maturation (COSEWIC, 2012a). Within freshwater habitats, this species of eel is typically found in rivers and lakes, and will readily burrow into mud, sand, fine gravel, cobble, and woody debris. Within marine environments, American eels are commonly associated with protected shallow waters containing submerged vegetation (e.g., eelgrass) and woody debris (COSEWIC, 2012a).

Six American eel were captured within the Afton River and one in Monastery Brook (Drawing 9.3). Based on connectivity between tributaries within the northern, western, and central portions of the Study Area and Afton River and Monastery Brook, an abundance of suitable substrate, and instream cover throughout watercourses assessed, it is likely that suitable American eel habitat is present within the Study Area. The closest ACCDC observation of American eel is 15.9 ± 0.2 km from the Study Area (ACCDC, 2025a).

Atlantic Salmon

The Atlantic salmon – Southern Gulf of St. Lawrence and Cape Breton population is listed as 'Special Concern' by COSEWIC and as "S1" by ACCDC (2025c). This population breeds in rivers that flow into the Gulf of St. Lawrence, Bra d'Or Lakes, and the Atlantic Ocean, and can be found anywhere between southern Gulf of St. Lawrence and Cape Breton (COSEWIC, 2025). This population was historically called the Gaspé Southern Gulf of St. Lawrence population, but following a recent review by COSEWIC it has since been separated into two separate populations: Southern Gulf of St. Lawrence and Cape Breton subspecies and Gaspé Peninsula subspecies.

In general, the freshwater habitat preference of Atlantic salmon includes clear, well-oxygenated waters in streams with bottoms of gravel, cobble, and boulder. Atlantic salmon prefer cool waters, with spawning typically observed in the 4.4 to 10° C range, and growth typically observed in the 5 to 19° C range (US FWS, 2022). As temperatures rise above 23° C, habitat potential decreases, and Atlantic salmon will search for cooler waters. Riffles, rapids, and pools are also necessary components for various life stages, with the preferred depth being in the 10 to 40 cm range (US FWS, 2022). Furthermore, Atlantic salmon prefer a circumneutral pH ranging from 6.5 to 7.5 (MDEP, 2022).

Atlantic salmon species undertake long feeding migrations to the ocean as older juveniles and adults and return to freshwater streams to reproduce. Atlantic salmon smolts migrate seaward from rivers during May to July and adults return to the rivers in the late fall to spawn (COSEWIC, 2011).

Eight Atlantic salmon were captured in Afton River and 60 were captured in Monastery Brook during electrofishing surveys (Drawing 9.3). Based on connectivity between tributaries within the northern, western, and central portions of the Study Area and Afton River and Monastery Brook, riffle, and pool habitat, and gravel, cobble, and boulder substrate presence, suitable Atlantic salmon habitat is likely present within the following watercourses:

- WC2
- WC3
- WC4A
- WC11
- WC36
- WC37
- WC42
- WC46
- WC61
- WC73
- WC77

The closest ACCDC observation of Atlantic salmon Gaspe Southern Gulf of St. Lawrence subspecies (which has been redefined by COSEWIC as the Southern Gulf of St. Lawrence and Cape Breton subspecies) is 10.8 ± 1.0 km from the Study Area (ACCDC, 2025a).

Brook Trout

Brook trout are not listed under federal (SARA) or provincial (ESA) legislation as a SAR; however, they are listed as 'S3' by ACCDC (2025c). This species of trout is typically found in cold, clear, and well oxygenated rivers and lakes with plenty of shade and gravel substrate (US FWS, 2009). They prefer water temperatures that do not exceed 20°C, though adult fish can tolerate temperatures of up to 25°C for short periods of time. Furthermore, despite being able to reproduce in waters with a pH as low as 4.5, they do best in a pH range of 5.0 to 7.5 (MDNR, 2012).

Brook trout are a migratory species that migrate further inland to rivers and lakes during the fall months to spawn. Sea-run brook trout may spend April to June in marine environments, but migration to marine habitat does not always occur year to year, with some brook trout never entering marine environments (DFO, 1988). In Nova Scotia, brook trout are considered the number one sportfish, with approximately 2 million trout stocked within the province on an annual basis (NSFA, 2005).

Three brook trout were captured in Afton River and two were captured in Monastery Brook during electrofishing surveys (Drawing 9.3). Based on connectivity between tributaries within the northern, western, and central portions of the Study Area and Afton River and Monastery Brook, riffle, and pool habitat, and gravel dominant substrate (>20%), suitable brook trout habitat is likely present within the following watercourses:

- WC4B
- WC7
- WC41
- WC42
- WC46
- WC61

The closest ACCDC observation of Brook trout is 100.0 ± 0.2 km from the Study Area (ACCDC, 2025a).

Eastern Pearlshell

Eastern pearlshell are not listed under federal (SARA) or provincial (ESA) legislation as a SAR; however, they are listed as 'S2' by ACCDC (ACCDC, 2025c). The eastern pearlshell is a large, long-lived freshwater mussel with a thick, enlarged, oval to slightly kidney-shaped shell that typically reaches up to 15 cm in length (Massachusetts Government, 2026). Its exterior is dark brown to black and relatively smooth, often worn in older individuals, while the interior is lined with bright silvery to white nacre. Absence and/or reduced hinge teeth helps distinguish it from many other Nova Scotian freshwater mussels. The species has a large muscular foot for burrowing and usually sits partially buried in sand or gravel. It is notable for its exceptional longevity, living up to 100 years or more. It has a parasitic larval stage that depends on salmonid fishes such as Atlantic salmon and brook trout (Massachusetts Government, 2026).

The closest ACCDC observation of eastern pearlshell is 7.3 ± 0.1 km from the Study Area (ACCDC, 2025c). Suitable eastern pearlshell habitat was not identified within the Study Area.

In-Situ Water Quality

Water quality parameters were recorded opportunistically during fish collection and fish habitat surveys. These results represent conditions at a specific moment and do not indicate any spatial or temporal trends in water quality. In-situ water quality is used only to support a general description of habitat quality in regard to suitable fish habitat.

Where applicable, water quality sampling results are measured against the CCME Guidelines for the Protection of FWAL. The results are provided in Table 9.6.

Table 9.6: In-Situ Water Quality Results

Location	Sampling Dates	Temperature (°C)	pH	DO (mg/L)	Specific Conductivity (µS/cm)	TDS (mg/L)
WC7	June 6, 2023	9.9	5.50	-	30.0	-
WC9	June 6, 2023	12.0	5.02	-	27.0	-
WC11	June 9, 2023	13.9	5.60	-	27.0	-
Afton River	June 20, 2023	13.4	6.58	11.74	36.2	-
North Intervale Brook	June 20, 2023	10.5	5.84	12.33	17.0	-
Black Avon River	June 20, 2023	12.4	6.36	12.45	43.6	-
Monastery Brook	September 4, 2024	15.8	7.49	10.7	176.6	0.1146
WC24	November 21, 2024	7.8	4.87	11.27	66.0	-

Location	Sampling Dates	Temperature (°C)	pH	DO (mg/L)	Specific Conductivity (µS/cm)	TDS (mg/L)
WC10	November 22, 2024	7.5	6.00	8.26	84.6	0.0050
WC7	November 22, 2024	8.0	6.31	12.87	70.2	-

Bolded values indicate exceedances of CCME FWAL Guidelines
- indicates that no value was recorded.

Water temperature affects the metabolic rates and biological activity of aquatic organisms, thus influencing the use of habitat by aquatic biota. There are no CCME guidelines related to temperature. Temperature preferences of fish vary between species, as well as with size, age, and season. Trout and salmon are cold-water fish species, meaning they require cold water to live and reproduce. The optimal temperature range for brook trout growth and survival is 11 to 16°C, but they can tolerate temperatures up to 20°C (Raleigh, 1982). The optimum temperature for growth of juvenile salmon is in the range of 16 to 20°C (Elliot & Elliot, 2010), but parr can thermoregulate up to 27°C (Corey et al., 2019). American eel have a broader temperature range and can tolerate temperatures from 4 to 25 °C (Fuller et al., 2019). Alewives prefer temperatures between 16 to 20°C, but can tolerate temperatures from 3 to 31°C (Fuller et al., 2021). All temperatures recorded are considered within the suitable temperature range for cold-water fish species (<20 °C).

The CCME FWAL suggests a range of pH from 6.5 to 9.0 is suitable within freshwater habitat to support aquatic health. Kalff (2002) indicates that the loss of fish populations is gradual and depends on the fish species, but decline is evident when pH is <6.5. Kalff (2002) further states that a 10 to 20% species loss is apparent when pH <5.5. Streams with a pH of 5.0 or lower will not support many species of fish and other aquatic life because it falls outside of the pH range for most species' optimal growth and reproduction. Additionally, at a pH of 5.0, most fish eggs cannot hatch, which can result in a reduction of species diversity (MacDonald et al., 2023).

Brook trout tolerate acidic conditions particularly well in comparison with other species. They have been known to reproduce in water with pH 4.5, with a preferred range of 5 to 7.5 (MDNR, 2012). American eel are also more tolerant of low pH than are many other species and can tolerate pH levels of 4.0, although densities and growth rates may be adversely affected by direct mortalities or declining abundance of prey as productivity declines at low pH (Jessop, 1995; Reynolds, 2011). Atlantic salmon tolerance for acidic conditions depends on life stage. Fry and smolt mortality occurs when pH is below 5.0 and parr mortality occurs at pH 4.6 to 4.7 (DFO, 2024). Alewives can tolerate water with a pH of 5 to 7.3 in a freshwater environment (NJDEP, n.d.).

The pH range for watercourses sampled within the Study Area was 4.87 to 7.49, with an average pH of 5.96. Eight of the 10 locations exhibited pH levels below the CCME FWAL recommended range (6.5 to 9.0) and two exhibited pH values below 5.5, which is the level at which species loss is expected (Kalff, 2002).

The CCME FWAL establishes a minimum recommended concentration of DO of 9.5 mg/L for early life stages of cold-water biota and 6.5 mg/L for other life stages. For warm-water biota, the CCME guidelines recommend 6.0 mg/L for early life stages, and 5.5 mg/L for all other life stages (CCME, 1999). Except for WC10, DO levels recorded at the time of the surveys is considered suitable for cold and warm water fish populations (9.5 mg/L). WC10 had a DO concentration of 8.26 mg/L, which is suitable for all life stages apart from the early life stages of cold-water biota. However, DO can vary daily and seasonally, as the concentration of oxygen in water is affected by several independent variables including water temperature, atmospheric and hydrostatic pressure, microbial respiration, and growth of aquatic vegetation (CCME, 1999).

Specific conductivity and TDS are often used as the baseline for detecting potential sources of pollution and changes in water quality. Significant changes in these parameters could indicate that a discharge or some other source of pollution has entered the aquatic resource. Specific conductivity and TDS levels measured within the Study Area are considered typical for Nova Scotia (NSSA, 2014).

9.1.5 Effects Assessment

Project-Surface Water and Fish and Fish Habitat Interactions

Project activities, primarily those that involve a watercourse crossing, earth moving, or vegetation removal, have the potential to impact surface water and fish and fish habitat (Table 9.7). These potential interactions could affect fish habitat and surface water features through direct alteration, such as habitat loss, or indirectly through changes to water quality or quantity.

Table 9.7: Potential Project-Surface Water and Fish and Fish Habitat Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Grid Connection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for watercourses includes the Assessment Area. The RAA includes the secondary watersheds that intersect the Study Area (Drawing 9.4).

Assessment Criteria

Assessment criteria provided in Section 4.3 also apply to surface water and fish and fish habitat. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of fish or fish habitat. No expectation for changes to water quantity or quality.
- Low: Small loss of fish or fish habitat, with minimal potential for changes to water quantity or quality or resulting impacts to fish.
- Moderate: Moderate loss of fish or fish habitat. Changes to water quantity or quality expected but can be managed with routine measures. Impacts to fish will only be experienced by individuals rather than entire populations and can be managed with routine measures.
- High: High loss of fish and fish habitat. Changes to water quantity or quality expected that would be challenging to manage with routine measures. Impacts to fish will be experienced by entire populations and cannot be managed with routine measures; the population's life history is permanently altered.

Effects

Habitat Loss

The Project design has been optimized to minimize interactions between the Project and watercourses and wetlands that may support fish and fish habitat. However, in areas where watercourse or wetland interactions are unavoidable, there is a risk of habitat loss.

Watercourse alterations may adversely impact aquatic habitat and the species it supports. The removal of overhanging vegetation from stream banks decreases shade and cover for fish, which can result in increased vulnerability to predators and stream temperatures. Likewise, the removal of instream cover, such as coarse woody debris or edge habitat (e.g., undercut banks) can have a negative effect on both fish and aquatic invertebrates (MTO, 2009). Furthermore, alterations to channel morphology, including altered substrate composition and sediment transport, can result in aquatic habitat degradation.

The Project may interact with up to 55 watercourses through either an upgrade to an existing watercourse crossing (e.g., culvert replacement) or construction of a new crossing. Some of these watercourses contain pre-existing crossings that have structurally declined. Therefore, some watercourses are expected to see improved hydrology and fish passage with upgraded crossings. An additional 10 watercourses are near turbine locations or laydown areas but will be avoided following micro-siting efforts during the detailed design phase.

A summary of the watercourses that may be directly affected by the Project is provided in Table 9.8.

Table 9.8: Direct Effect Summary

Watercourse	Existing Alteration Present?	Forecasted Alteration
WC3	None observed	Crossing to be installed with road construction.
WC4A	Yes, road crossing with a concrete culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC4B	Yes, road crossing with a concrete culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC8	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC10	None observed	Crossing to be installed with road construction
WC11	None observed	Crossing to be installed with road construction
WC22	None observed	Crossing to be installed with road construction.
WC23	None observed	Crossing to be installed with road construction.
WC24	None observed	Crossing to be installed with road construction.
WC25	None observed	Crossing to be installed with road construction.
WC26	None observed	Crossing to be installed with road construction.
WC27	None observed	Crossing to be installed with road construction.
WC29	None observed	Crossing to be installed with road construction.
WC30	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC31	None observed	Crossing to be installed with road construction
WC32	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC33	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC35	None observed	Crossing to be installed with road construction.
WC36	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.

Watercourse	Existing Alteration Present?	Forecasted Alteration
WC37	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC41	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC42	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC43	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC44	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC45	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC46	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC48	None observed	Crossing to be installed with road construction.
WC50	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC51	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC52	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC53	No road crossing at the proposed new crossing. Old crossing should not be altered.	Crossing to be installed with road construction.
WC54	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC55	None observed	Crossing to be installed with road construction.
WC57	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC58	None observed	Crossing to be installed with road construction.
WC59	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC60	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC65	None observed	Crossing to be installed with road construction.
WC66	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.

Watercourse	Existing Alteration Present?	Forecasted Alteration
WC67	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC68	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC69	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC70	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC71	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC72	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC73	None observed	Crossing to be installed with road construction.
WC75	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC76	None observed	Crossing to be installed with road construction.
WC77	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC78	Yes, road crossing with a bridge	Culvert to be assessed and potentially replaced during road upgrades.
WC80	Yes, road crossing with a plastic culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC82	None observed	Crossing to be installed with road upgrade.
WC83	Yes, road crossing with a wooden box culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC84	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.
WC85	Yes, road crossing with a metal culvert	Culvert to be assessed and potentially replaced during road upgrades.

The majority (44 of 55) of forecasted alterations involve possible upgrades to current road crossings or installation of culverts at existing crossings. The construction of new roads may require the installation of 11 new watercourse crossings. Upgrades and new installations will be designed to accommodate road widening or to meet current engineering standards and NSECC flow/sizing requirements. Watercourse crossings will be designed to avoid permanent diversion, restriction, or blockage of natural flow, such that the hydrologic function of the watercourse is maintained. Project engineers will make final culvert upgrade/installation determinations during the detailed design phase.

Following the detailed design process, and prior to construction, the Proponent will obtain approval under the NSECC watercourse alteration process (NSECC, 2015c) which includes DFO review. Based on Strum's experience with culvert design, crossing construction, monitoring, and mitigation implementation, it is anticipated that standard design and construction practices can be applied to avoid a HADD determination in the above instances (Table 9.8). Direct impacts from crossing upgrades or installations are not expected to result in a measurable death of fish with proper mitigation techniques (i.e., fish rescue, watercourse isolation, etc.).

Erosion and Sedimentation

The mobilization of sediment within aquatic environments can cause shifts in ecological integrity, including changes to the plant species composition, the distribution of primary and secondary producers, and the habitat suitability for vulnerable species (Tilman et al., 1997). Furthermore, sedimentation can irritate the gills of fish, sometimes resulting in death, bury and suffocate fish eggs, transport toxic industrial and agricultural compounds into fish habitat, and increase water temperature (ECCC, 2007). Erosion and sedimentation can occur throughout the lifecycle of the Project; however, the highest potential for these effects is related to the construction and upgrading of access roads, the installation of crossing structures and the routine maintenance during the operational phase. The alteration or removal of riparian vegetation can also result in bank instability and erosion, further exasperating these effects (MTO, 2009).

Fish Injury or Mortality

If required, blasting may result in sensory disturbance to fish, impacting fish behaviour, spawning grounds, and migration patterns. The detonation of explosives near watercourses can produce post-detonation shock waves which involves a rise to a high peak pressure and then a subsequent fall to below ambient hydrostatic pressure. This pressure deficit can cause impacts in fish. An overpressure in excess of 100 kilopascals can result in effects to fish including damage to the swim bladder in finfish, and potential rupture and hemorrhage to the kidney, liver, spleen and sinus venous. It is also possible that fish eggs and larvae can be damaged (Wright & Hopky, 1998). The degree of damage is related to the type of explosive, size and pattern of the charges and the distance to the watercourse, depth of water within the watercourse, and species, size and life stage of the fish.

Sublethal effects have also been observed including changes in fish behavior as a result of noise produced during blasting (Wright & Hopky, 1998). Should blasting be required, guidance outlined by Wright and Hopky (1998) will be used to develop a Blasting Management Plan. The Blasting Management Plan will be designed to ensure that appropriate setback distances are maintained, or mitigations are implemented to protect fish and fish habitat from the potential impacts of blasting.

Changes in Surface Water Quantity and Quality

Changes to the amount of flow can alter channel morphology, increase flood potential, and disrupt habitat characteristics that support vulnerable species (MTO, 2009). These impacts could result from:

- Alteration of bank or channel grades for road development.
- New or upgraded watercourse crossings.
- Compaction of soil from the heavy machinery required for turbine assembly.
- Alteration of channel beds to facilitate the removal and replacement of preexisting infrastructure (e.g., rusted culverts).

Changes in the quality of surface water can arise from alterations to the surrounding environment and can include an increase in water temperature from decreased shade, an increase in pollutants from machinery and infrastructure, and the mobilization of sediments (MTO, 2009). Given the dynamic nature of channeling water, effects upon water quality can quickly spread throughout different reaches of the respective watershed.

Mitigation Measures

The following mitigative measures will be implemented to avoid and mitigate any potential effects on surface water and fish and fish habitat. In addition, the Proponent will develop and implement a Surface Water Management Plan, Erosion and Sediment Control Plan, Blasting Management Plan (if blasting is required), and a site-specific Contingency Plan.

As required, all work completed under the provincial watercourse alteration notification process will be done in accordance with the Nova Scotia Watercourse Alterations Standards and will be executed by a certified Watercourse Alteration Installer/Sizer. For work requiring a watercourse alteration approval, specific and detailed mitigation will be developed and submitted to NSECC as part of the application process.

The following mitigation measures will be implemented:

Habitat Loss

- Educate Project personnel on the sensitivity of aquatic habitat.
- Flag wetlands and watercourses and avoid impacts to these features and adjacent riparian habitat to the extent possible.
- Obtain wetland and watercourse alteration approval from NSECC and adhere to the terms and conditions of the approval, as required.
- Require that the crossing is installed by a certified Watercourse Alteration Installer/Sizer, and designed to avoid any permanent diversion, restriction or blockage of natural flow, such that the hydrologic function of the watercourse is maintained.
 - Follow best management practices during culvert installation (e.g., installation in the dry and following appropriate timing windows, where possible).
- Require that Project activities (fueling included) or removal of vegetation not be conducted within 30 m of any delineated or mapped watercourse, without authorization from NSECC.
- Allow for natural vegetation along the watercourse edge and above the ordinary high-water mark to facilitate the stabilization of the area, and restoration of fish habitat.

- Conduct any work within the bed of a watercourse between June 1 and September 30 to avoid sensitive periods in the life cycles of fish, to better control water flow, and to allow for a faster vegetation period (NSECC, 2015b).
 - Consult with NSECC and DFO if work is required outside of appropriate timing windows.
- Complete a fish rescue, as required, during instream work requiring isolation of flow.

Erosion and Sedimentation

- Develop a site-specific Erosion and Sediment Control Plan during the detailed design phase.
 - The plan will target the disturbance to banks (as required) and adjacent land, and will address the type of control structures, proper installation techniques, grading, maintenance and inspection, timing of installation, and vegetation.

Fish Injury or Mortality

- Develop a Blasting Management Plan, if blasting is required, that is informed by the guidance provided in Wright and Hopky (1998).

Changes in Surface Water Quantity and Quality

- Develop and implement a Surface Water Management Plan.
 - Integrate water management systems including diversion and collection ditches, roadside drainage channels, vegetated swales, and stormwater retention ponds, as directed by the Surface Water Management Plan.
- Design any necessary alterations in a way that maintains the natural grade of the watercourse, to ensure the hydroperiod remains as it was pre-alteration.
- Fit any watercourse crossings with appropriately sized infrastructure, as prescribed by a certified Watercourse Alteration Installer/Sizer.
- Maintain 30 m vegetated buffers around watercourses, to the extent possible.
- Integrate outlet protection features to dissipate flow velocities and decrease erosion at the outflow.
- Require that if concrete is to be used, it is pre-cast and cured for at least one week prior to use at a crossing site (NSECC, 2015b).
- Use untreated, rot-resistant timber (e.g., hemlock, tamarack, juniper, or cedar) below the ordinary highwater mark to avoid the leaching of toxic preservatives into waterways (NSECC, 2015b).
- Use rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life (NSECC, 2015b).
- Plan any construction activities that may impact stream banks and substrate to align with low-flow periods, where possible.

Monitoring

For crossing subject to provincial notification requirements, visual monitoring will be completed during the installation process to ensure the work is conducted in accordance with the Nova Scotia Watercourse Alteration Activity Standards (NSECC, 2015c). If the crossing requires an approval, monitoring will be determined as part of the permitting process.

A watercourse monitoring plan, if required as part of the permitting phase, may include hydrological, sediment, and stability assessments upstream, downstream, and at the crossing of the watercourse.

Conclusion

After mitigations, residual effects on surface water and fish and fish habitat are characterized in Table 9.9.

Table 9.9: Surface Water and Fish and Fish Habitat Residual Effects

Effect Detail	Habitat Loss	Erosion and Sedimentation	Fish Injury or Mortality	Changes to Water Quality and Quantity
Magnitude of Effect	Low: A small loss of fish habitat.	Low: Minimal potential for impact to fish.	Negligible: No loss of fish expected.	Low: Minimal potential for altered hydrology or water quality.
Geographic Extent of Effect	Assessment Area	Assessment Area	NA	Assessment Area
Frequency of Effect	Single Event: Effects may occur during initial construction.	Intermittent: Effects may occur during initial construction and during operations.	NA	Single Event: Effects may occur during construction.
Duration of Effect	Medium Term: Effects may occur during all phases but will not extend beyond decommissioning.	Medium Term: Effects may occur during all phases but will not extend beyond decommissioning.	NA	Medium Term: Effects may occur during all phases but will not extend beyond decommissioning.
Reversibility of Effect	Partially Reversible	Partially Reversible	NA	Partially Reversible
Significance Level	Not Significant	Not Significant	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions)				
Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible				

9.2 Wetlands

9.2.1 Overview

Wetland assessments were conducted to identify and delineate wetland habitat so that impacts to wetland area and function could be avoided and minimized, to the extent possible. This was achieved by using the following approach:

- Identify wetland habitat in the Study Area using desktop resources.
- Ground-truth and delineate wetland habitat within the Assessment Area.
- Complete functional assessments for delineated wetlands within the Assessment Area.
- Identify the potential for and confirm the presence of Wetlands of Special Significance (WSS) within the Assessment Area.
- Use the results to refine the Project design to avoid/minimize impacts to wetlands, to the extent possible.

9.2.2 Regulatory Context

The Nova Scotia Wetland Conservation Policy (NSECC, 2019) outlines a policy goal of no loss of WSS and no net loss in area and function for other wetlands. Wetlands are considered WSS based on the wetland having significant species or species assemblages, high levels of biodiversity, significant hydrological value, or high social or cultural importance. Under this policy, the following wetlands are considered WSS:

- All salt marshes.
- Wetlands that are within or partially within a designated Ramsar site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Area or lands owned or legally protected by non-government charitable conservation land trusts.
- Intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the Nova Scotia Eastern Habitat Joint Venture program.
- Wetlands known to support at-risk species as designated under SARA or ESA.
 - This applies only to the portion of the wetland directly supporting species designated as 'Threatened' and/or 'Endangered' (M. Gorman, 2023)
- Wetlands in designated protected water areas as described within Section 106 of the *Environment Act*, S.N.S. 1994-95, c. 1.

Additionally, a wetland can be determined to be a WSS based on its functional assessment score (discussed further in Section 9.2.4).

Per Section 5 of the *Environment Act*, S.N.S. 1994-95, c. 1, approval from NSECC is required to alter a wetland. Nova Scotia considers a wetland alteration to be any activity that may affect wetland function and habitat. Such activities include, but are not limited to, excavating, flooding, infilling, or draining (Nova Scotia, 1995b).

9.2.3 Desktop Review

A desktop review of the location and extent of potential wetlands across the Study Area was completed using the following information sources:

- Wetlands Inventory (ECCC, 2024)
- WSS Database (NSECC, 2020b)
- Nova Scotia Hydrographic Network (ODNS, 2024)
- WAM Database (NSECC, 2022b)

- Nova Scotia Digital Elevation Model (DEM) (GeoNOVA, 2024b)
- Provincial Landscape Viewer (NSNR, 2024e)
- Satellite and aerial imagery

The Wetland Inventory (ECCC, 2024) identified 102 wetlands within or partially intersecting with the Assessment Area, which are classified: swamp (68), marsh (9), fen (2), shallow water (2), peatland (18) and unclassified (13). The wetlands ranged in size from 0.1 to 37.8 ha (Drawing 9.5).

According to the NSNR WSS database (2020b), 17 designated WSS intersect or partially intersect with the Study Area. Of these, four intersect with the Assessment Area: three intersect with existing roads and two with turbine pads. The remainder of the WSS in the Study Area will not interact with the Project (Drawing 9.5).

The Nova Scotia Hydrographic Network (ODNS, 2024) was used in conjunction with the WAM database (NSECC, 2022b) and the DEM layer to further assess the distribution of confirmed and potential wetland habitat within the Study Area. These sources identified potential wet areas and predicted flow based on the assumed depth-to-water generated from digital elevation data (Drawing 9.2). The depth-to-water ranged from 0 m to >10 m from the surface across the Study area, with the majority of the Study Area being well to moderately-well drained.

The Provincial Landscape Viewer (NSNR, 2024e) was reviewed to confirm the presence of both wetlands and WSS. The Study Area borders the Tracadie Wilderness Area (Drawing 3.3) and wetlands that are within or partially within Wilderness Areas are designated as WSS (NSECC, 2019). The Provincial Landscape Viewer confirmed wetlands and WSS are present within or partially intersecting the Assessment Area; the results mirror the Wetland Inventory and NSNR WSS database results described above. According to the Significant Species and Habitats Database layer, there are no polygons intersecting with Study Area (NSNR, 2024f).

9.2.4 Field Assessment

9.2.4.1 *Field Assessment Methodology*

General

Wetland field assessments were completed within the Assessment Area in June 2023, September to November 2024, and May to July and October 2025. Gap area surveys were completed in January 2026 to evaluate layout changes to the Assessment Area and updated land access. Surveys included high-level assessments for hydrology, complemented by in-depth wetland delineations and functional assessments (except January 2026 gap surveys). Wetland surveys were done in conjunction with watercourse assessment surveys (Section 9.1).

To accompany wetland field surveys, a list of SAR and SOCI known to occur within the region was compiled to help with incidental identification. Details of any incidental SAR or SOCI

observations are captured under their respective reporting sections, as applicable to the species observed.

Field Delineations

Ecologists surveyed the Assessment Area, delineating and characterizing each wetland identified in accordance with the U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987). Wetland boundaries were determined by confirming the following:

- Presence of hydrophytic (water loving) vegetation.
- Presence of hydrologic conditions which result in periods of flooding, ponding, or saturation during the growing season.
- Presence of hydric soils.

A positive indicator must typically be present for all three parameters to definitively identify any given site as a wetland (Environmental Laboratory, 1987). Field staff walked meandering transects throughout the landscape to look for wet areas. When wetlands were identified, the boundary was flagged, and the spatial boundaries were recorded on iPads using the Environmental Systems Research Institute software Survey 123.

Identification of Hydrophytic Vegetation

Hydrophytic vegetation is defined as the sum of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produces permanent or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present (Environmental Laboratory, 1987). Hydrophytic vegetation should be the dominant plant type observed in wetland habitat (Environmental Laboratory, 1987).

Dominant plant species observed in each wetland were classified according to indicator status (probability of occurrence in wetlands), in accordance with the U.S. Fish and Wildlife Service National List of Vascular Plant Species that Occur in Wetlands: NE Region (Region 1) (US FWS, 1988) (Table 9.10). These indicators are used as this region most closely resembles the flora and climate regime of Nova Scotia.

Table 9.10: Classification of Wetland-Associated Plant Species

Plant Species Classification	Abbreviation ⁽¹⁾	Probability of Occurring in Wetland
Obligate	OBL	>99%
Facultative Wetland	FACW	66% to 99%
Facultative	FAC	33% to 66%
Facultative Upland	FACU	1% to 33%
Upland	UPL	<1%
No indicator status	NI	Insufficient information to determine status
Plants That Are Not Listed (assumed upland species)	NL	Does not occur in wetlands in any region

Source: (US FWS, 1988)

⁽¹⁾ A '+' or '-' symbol can be added to the classification to indicate greater or lesser probability, respectively, of occurrence in a wetland.

If the majority (greater than 50%) of the dominant vegetation at a data point is classified as obligate (OBL), facultative wetland (FACW), or facultative (FAC), then the location of the data point is considered to be dominated by hydrophytic vegetation.

Identification of Hydric Soils

A hydric soil is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper layer (USDA NRCS, 2003). Indicators of the presence of hydric soils include soil colour (gleyed soils and soils with bright mottles and/or low matrix chroma), aquic or preaquic moisture regimes, reducing soil conditions, sulfidic material (odour), soils listed on the hydric soils list, iron and manganese concretions, organic soils (histosols), histic epipedons, high organic content in the surface layer of sandy soils, and organic streaking in sandy soils.

During field surveys, soil pits were excavated to a minimum depth of 40 cm or until (auger) refusal. The soil in each pit was then examined for hydric soil indicators. The matrix colour and mottle colour (if present) of the soil were determined using Munsell Soil Colour Charts.

Determination of Wetland Hydrology

Wetland habitat, by definition, either periodically or permanently has a water table at, near, or above the land surface. To be classified as a wetland, a site should have at least one primary indicator or two secondary indicators of wetland hydrology (Table 9.11). Wetland habitat is assessed for signs of hydrology via visual observations across the area and through the assessment of soil pits.

Table 9.11: Indicators of Wetland Hydrology

Examples of Primary Indicators	Examples of Secondary Indicators
Surface Water	Oxidized Root Channels in the Upper 30 cm
Saturation	Local Soil Survey Data
Sediment Deposition	Dry Season Water Table
Drainage Patterns	Stunted or Stressed Plants
Water-stained Leaves	Drainage Patterns
Sparsely Vegetated Concave Surfaces	Surface Soil Cracks
Hydrogen Sulfide Odor	Moss Trim Lines

Source: As identified in the Nova Scotia Wetland Delineation Data Form (NSECC, 2011c) which has been adapted from the U.S. Army Corps of Engineers form for Northeast-North Central Supplement for use in Nova Scotia (Environmental Laboratory, 1987)

Functional Assessments

Wetland functional assessments were completed for all field-delineated wetlands identified in-season within the Assessment Area. Wetlands that were found during gap analysis surveys were done out of season and will be re-visited to collect functional assessment data during the growing season. Functional assessments were completed using the Wetland Ecosystems Services Protocol – Atlantic Canada (WESP-AC) evaluation technique Version 2 in 2023 and 2024, and Version 3.3 and 3.4 in 2025 (Adamus, 2021, 2025). Version 3.3 was converted to version 3.4 after field work was completed.

The WESP-AC process involves the completion of three forms: a desktop review portion (Office Form) that examines the landscape level aerial conditions to which the wetland is situated, and two field forms identifying biophysical characteristics of the wetland (Field Form) and stressors to the wetland (Stressors Form), if any. The process serves as a rapid method for assessing individual wetland functions and values. WESP-AC addresses multiple specific functions that wetlands may provide, presented in Table 9.12 (WESP-AC Version 2.0) and Table 9.13 (WESP-AC Version 3.4).

Table 9.12: WESP-AC Version 2 Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Aquatic Support	Aquatic Invertebrate Habitat
	Stream Flow Support
	Organic Nutrient Export
	Water Cooling
Water Quality Support	Sediment Retention & Stabilization
	Phosphorus Retention
	Nitrate Removal & Retention
	Carbon Sequestration
Aquatic Habitat	Anadromous Fish Habitat
	Resident Fish Habitat
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian and Turtle Habitat
Transition Habitat	Songbird, Raptor, & Mammal Habitat
	Pollinator Habitat
	Native Plant Habitat

Source: (Adamus, 2021)

Table 9.13: WESP-AC Version 3.4 Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Water and Climate Protection	Sediment and Toxicant Retention and Stabilization
	Phosphorus Retention
	Nitrate Removal and Retention
	Wildlife Resistance
	Carbon Stock Preservation
Aquatic Support	Stream Flow and Temperature Support
	Organic Nutrient Export
	Aquatic Primary Productivity
Aquatic Habitat	Anadromous Fish Habitat
	Resident and Other Fish Habitat

Grouped Wetland Function	Specific Wetland Functions
Transition Habitat	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian Habitat
	Raptor and Wetland Songbird Habitat
	Pollinator Habitat
	Keystone Mammal Habitat
	Native Plant Habitat

Source: (Adamus, 2025)

The specific wetland functions are individually allocated into grouped wetland functions and measured for “functional” and “benefit” scores. Wetland function relates the wetland’s natural ability (i.e., water storage), whereas wetland benefits are benefits of these functions, whether it is ecological, social, or economic. The highest functioning wetlands are those that have both high ‘function’ and ‘benefit’ scores for a given function. WESP-AC enables a comparison to be made between individual wetlands within a province to gain a sense of the importance each has in providing ecosystem services.

In addition to the grouped wetland functions above, WESP-AC Version 2 also measures the following specific wetland functions, however, these are only evaluated by their benefit scores:

- Wetland Condition
- Wetland Risk (i.e., sensitivity to potential impacts)

For each wetland evaluated, the WESP-AC process calculates the overall score for the grouped wetland functions and the specific wetland functions listed in Tables 9.12 and 9.13. One score each is provided for function and benefit. Scores are ranked as ‘Lower,’ ‘Moderate,’ or ‘Higher’ allowing for analysis of the wetland as compared to calibrated baseline wetland scores in Nova Scotia to date. A ‘Higher’ WESP-AC score means that wetland has a greater capacity to support those processes as compared to other wetlands in the province. A ‘Higher’ WESP-AC score in both the function and benefits category means the wetland supports the natural ecosystem functions and provides services with potentially societal importance.

Additionally, the WESP-AC process assesses the wetland for a determination of WSS based on the functional results. The grouped functions outlined in Table 9.12 and Table 9.13 are further combined into “supergroups” for habitat (Aquatic Habitat and Transition Habitat) and support [Hydrologic, Water Quality Support (Version 2)/Water & Climate Protection (Version 3.3) and Aquatic Support/ Water Quality Support & Transitional Habitat (Version 3.4)] functions. WSS designation is dependent on a certain combination of ‘moderate’ and ‘high’ scores within these groups.

The WESP-AC functional evaluation technique recognizes that, in many cases, delineation of entire wetlands where they extend beyond a Study Area is not always feasible (e.g., property

ownership) or required to complete an appropriate assessment using this tool (NBDELG, 2021). Instead, WESP-AC permits the delimitation of an assessed area, defined as the wetland or portion of wetland physically assessed in the field, while the Office Form considers the broader landscape characteristics and functions that extend beyond the assessed area and/or study area boundary.

9.2.4.2 Field Assessment Results

General

Field surveys completed between 2023 and 2026 identified 152 wetlands, either partially or fully within the final iteration of the Assessment Area (Drawing 9.6A to 9.6L). For coherence, wetlands were given a numerical ID based on the order of their occurrence from north to south. If a wetland was segmented, but segments remained hydrologically connected, the wetland was given the same numeric ID. Detailed results, and a photograph log of each wetland are found in Appendix J. As functional assessments were completed across three field seasons, results for those completed using WESP-AC version 2 and WESP-AC version 3.4 are presented separately.

Of the 152 identified wetlands, the most prominent wetland type was swamp (113). The Canadian Wetland Classification System (NWWG, 1997) defines a swamp as a wetland characterized by the dominance of woody vegetation in which the water table is typically at or near the surface or inundates the soil for a significant portion of the growing season. Swamps are often associated with poorly drained or saturated soils, and they provide important habitat for various plant and animal species adapted to wet conditions. Swamps can be further subdivided into treed swamps or shrub swamps, depending on their physiological makeup.

Of the identified swamps, 74 were classified as treed swamps. Treed swamps are characterized by the presence of trees as the dominant vegetation [>7.5 cm diameter at breast height (DBH)] and an environment that is not as waterlogged as other wetland types, such as shrub swamps or marshes. These wetlands typically experience their highest hydroperiod during spring and fall precipitation events (NSNR, 2018b). As a result, treed swamps provide deciduous trees [e.g., red maple (*Acer rubrum*) and yellow birch (*Betula alleghaniensis*)] and coniferous trees [e.g., black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*)] the opportunity to establish themselves and adapt to the inconsistent inundation periods (NSNR, 2018b). Typical species composition of the identified treed swamps consisted of cinnamon fern (*Osmundastrum cinnamomeum*), bunchberry (*Cornus canadensis*), Sensitive fern (*Onoclea sensibilis*), Goldthread (*Coptis trifolia*), Northern Starflower (*Lysimachia borealis*), red maple (*Acer rubrum*), yellow birch (*Betula alleghaniensis*), black spruce (*Picea mariana*), and balsam fir (*Abies balsamea*). Surface water, high water table, and saturation was often present as identified through the excavation of small soil pits. Some wetlands showed signs of sediment and drift deposits, water-stained leaves, and aquatic fauna.

An additional 29 identified swamps were classified as shrub swamps. Shrub swamps are dominated by shrubs and smaller woody plants (<7.5 cm DBH, >1 m tall) with a denser

understory and tend to form in permanently or seasonally flooded areas where the surface is moist from ground saturation. Trees may be present but are less dominant than in treed swamps. In many cases, shrub swamps eventually transition into treed swamps via succession (NSNR, 2018b). The typical species composition of shrub swamps identified within the Assessment Area included mountain holly (*Ilex mucronatus*), speckled alder (*Alnus incana*), tamarack (*Larix laricina*), alder buckthorn (*Rhamnus frangula*), cinnamon fern, sensitive fern, hairy flat-top white aster (*Doellingeria umbellata*), red maple, and balsam fir. High water table and saturation were most often present, with some shrub swamps also showing signs of surface water and water-stained leaves.

The classification of the remaining 10 swamps were not further subdivided into type of swamp.

There were 11 bogs observed within the Assessment Area. These wetlands are characterized by their poor drainage, accumulation of peat, and dense coverage of either *Sphagnum* moss or graminoids (NSNR, 2018b). Bogs typically have a high water table and receive most of their water from precipitation, resulting in nutrient-poor, acidic environments (NWWG, 1997). This acidity is further compounded due to the release of organic acids that result from the decomposition of *Sphagnum* spp. Typical species composition observed included Three-leaved False Solomon's Seal (*Maianthemum trifolium*), sheep laurel (*Kalmia angustifolia*), three seeded sedge (*Carex trisperma*), small cranberry (*Vaccinium oxycoccos*), northern wild raisin (*Viburnum cassinoides*), and black spruce. Trees, when present, were often stunted and scattered throughout.

Two fens were identified within the Assessment Area. Fens typically exhibit more open water than bogs, often with a connection to a watercourse, or abutting a lakeshore. They may also receive hydrology from neighbouring uplands. Ultimately, this inundation of water from outside sources facilitates a transfer of nutrients that allow fens to support a wider variety of flora and fauna than bogs (NSNR, 2018b). Typical species assemblages included steplebush (*Spiraea tomentosa*), soft rush (*Juncus effusus*), speckled alder, smooth blackberry (*Rubus canadensis*), common woolly bulrush (*Scirpus cyperinus*), and broad-leaf cattail (*Typha latifolia*).

Four marshes were observed within the Assessment Area. These wetlands often display more persistent surface water areas that tend to shrink as the growing season progresses. Hydrology can be influenced by various external sources, including precipitation, surface runoff, surface water connections, and groundwater. This diversity of hydrological sources typically fosters a nutrient-rich environment which, when paired with the lack of canopy cover, often facilitates the vigorous growth of herbaceous vegetation (NSNR, 2018b). In many cases, this vigorous growth can lead to the full engulfment of any open water areas, resulting in meadow-like marshes that may be partially or fully inundated. Vegetation composition included sensitive fern, three-seeded sedge, fowl blue grass (*Poa palustris*) and tussock sedge (*Carex stricta*). In addition to the four marshes, one vernal pool was identified.

There were 19 wetlands identified within the Assessment Area that were wetland complexes, vernal pools, and unidentified wetlands. The complex wetland types found included treed-shrub swamp, bog-swamp, fen-marsh, fen-swamp, and marsh-swamp. These wetlands contained defined areas of each wetland type in one, contiguous wetland. Two additional wetlands will be assessed and delineated later in the permitting process, as needed.

Functional Assessments – Version 2

Functional assessments using WESP-AC Version 2.0 were completed in 2023 and 2024 by wetland specialists for 40 wetlands within the Assessment Area. A summary is provided in Table 9.14.

Table 9.14: Summary of WESP-AC Assessments Using Version 2.0 for Wetlands within the Assessment Area

WL ID	HYDROLOGIC Group		WATER Quality Group		AQUATIC SUPPORT Group		AQUATIC Habitat Group		TRANSITIONAL Habitat Group		WETLAND CONDITION		WETLAND RISK		Average Function	Average Benefits	WSS ⁽¹⁾
	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL36	3.25	7.67	3.63	2.57	5.88	6.48	5.80	3.80	7.35	3.30	N/A	5.36	N/A	6.39	5.18	5.08	No
WL39	6.13	7.95	5.52	2.86	5.64	5.86	2.19	1.56	8.07	4.11	N/A	8.84	N/A	7.10	5.51	5.47	No
WL42	2.17	5.02	2.29	3.68	6.09	6.06	5.22	4.00	8.03	4.17	N/A	1.88	N/A	5.31	4.76	4.30	No
WL43	0.65	7.90	2.52	5.62	5.95	7.45	5.81	4.29	7.64	3.48	N/A	3.33	N/A	7.90	4.52	5.71	No
WL46	7.63	7.84	9.00	3.94	3.72	3.65	6.30	4.92	7.26	3.32	N/A	0.00	N/A	5.75	6.78	4.20	No
WL48	7.75	7.90	9.23	2.57	5.22	4.94	7.73	4.27	8.14	3.67	N/A	1.88	N/A	4.94	7.62	4.31	No
WL50	7.32	7.95	9.16	2.72	5.75	3.40	5.51	3.77	8.65	3.67	N/A	5.36	N/A	6.88	7.28	4.82	No
WL51	1.90	7.44	2.52	2.36	6.94	7.64	6.29	3.50	7.95	8.33	N/A	0.00	N/A	5.48	5.12	4.96	No
WL52	9.06	4.51	7.70	3.63	4.16	0.77	1.90	0.88	6.94	3.07	N/A	3.04	N/A	6.92	5.95	3.26	No
WL55	1.36	4.51	2.58	3.72	6.45	6.79	6.43	3.13	8.04	3.56	N/A	3.62	N/A	5.46	4.97	4.40	No
WL63	0.37	7.78	2.92	5.32	6.81	9.16	6.47	4.71	8.64	3.97	N/A	5.65	N/A	8.29	5.04	6.41	No
WL68	8.92	8.46	7.87	1.96	4.68	0.78	2.01	1.47	7.82	4.09	N/A	6.52	N/A	5.98	6.26	4.18	No
WL72	2.14	7.78	3.28	9.37	8.07	9.00	6.76	4.42	8.49	3.83	N/A	5.94	N/A	6.58	5.75	6.70	No
WL74	5.85	5.53	5.29	1.96	5.67	6.17	1.75	1.43	8.31	4.10	N/A	7.39	N/A	5.29	5.37	4.55	No
WL75	5.39	7.28	8.97	2.49	7.28	4.04	6.17	4.24	8.08	3.64	N/A	3.62	N/A	6.98	7.18	4.61	No
WL76	9.48	7.90	8.33	2.76	6.44	0.81	1.77	0.96	7.80	3.42	N/A	10.00	N/A	7.69	6.77	4.79	No
WL77	1.16	5.13	3.52	1.94	6.39	6.83	4.64	2.51	8.26	3.55	N/A	3.33	N/A	4.79	4.79	4.01	No
WL78	1.14	7.56	1.75	3.32	6.06	7.37	5.44	4.71	7.89	3.75	N/A	2.75	N/A	8.50	4.46	5.42	No
WL79	0.14	7.44	2.99	9.53	8.37	9.44	8.42	4.48	7.97	3.08	N/A	2.17	N/A	6.75	5.58	6.13	No
WL80	3.07	7.61	3.16	3.82	5.73	6.28	4.55	4.40	7.70	4.10	N/A	4.78	N/A	6.81	4.84	5.40	No
WL81	6.73	7.28	8.28	3.32	4.23	3.20	5.05	4.60	8.28	7.46	N/A	7.10	N/A	5.76	6.51	5.53	No
WL82	6.52	7.56	8.96	5.40	5.05	2.85	4.45	4.39	7.92	4.13	N/A	8.26	N/A	7.80	6.58	5.77	No
WL83	1.20	7.39	2.81	2.11	7.45	7.88	6.01	3.63	8.60	3.88	N/A	4.49	N/A	6.67	5.22	5.15	No
WL84	6.96	4.96	9.00	2.73	4.64	2.81	4.53	4.13	7.70	4.12	N/A	3.62	N/A	6.99	6.57	4.20	No
WL86	1.47	7.78	2.70	3.94	6.93	6.93	4.78	4.78	8.86	4.41	N/A	3.33	N/A	8.51	4.95	5.67	No
WL87	2.09	4.68	3.20	3.74	6.28	6.44	4.67	4.37	7.53	4.10	N/A	4.78	N/A	6.45	4.75	4.94	No
WL92	2.21	7.56	4.43	3.80	7.61	6.59	5.79	3.19	7.97	3.78	N/A	0.00	N/A	7.87	5.60	4.68	No
WL93	5.99	5.13	5.00	2.87	5.01	5.73	2.13	0.98	7.04	3.18	N/A	4.78	N/A	8.75	5.03	4.49	No
WL94	7.05	7.67	6.63	5.29	5.66	0.74	1.85	0.86	7.24	3.29	N/A	5.94	N/A	8.15	5.69	4.56	No
WL96	7.93	5.64	7.29	5.58	7.06	0.58	1.52	1.34	6.67	3.99	N/A	4.78	N/A	7.77	6.09	4.24	No
WL99	8.21	7.22	7.09	2.63	5.92	0.78	2.22	0.82	6.75	3.18	N/A	6.52	N/A	6.85	6.04	4.00	No
WL100	9.33	7.84	7.99	1.95	4.63	0.61	0.67	0.96	8.07	3.56	N/A	8.84	N/A	7.45	6.14	4.46	No
WL102	6.71	8.01	9.17	2.53	3.51	3.00	5.44	4.45	7.10	4.05	N/A	6.52	N/A	5.67	6.39	4.89	No
WL103	9.19	5.30	7.96	1.89	5.05	0.58	1.59	1.33	6.08	3.95	N/A	8.26	N/A	7.41	5.97	4.10	No

WL ID	HYDROLOGIC Group		WATER Quality Group		AQUATIC SUPPORT Group		AQUATIC Habitat Group		TRANSITIONAL Habitat Group		WETLAND CONDITION		WETLAND RISK		Average Function	Average Benefits	WSS ⁽¹⁾
	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL105	8.19	5.41	7.55	4.03	4.10	0.73	2.98	0.61	7.72	3.30	N/A	3.62	N/A	8.41	6.11	3.73	No
WL107	8.19	7.95	7.58	2.63	4.19	0.72	4.04	0.82	7.74	3.40	N/A	7.10	N/A	8.70	6.35	4.48	No
WL108	8.91	7.67	7.70	1.78	4.72	0.62	1.63	1.36	6.25	3.97	N/A	4.78	N/A	6.89	5.84	3.87	No
WL110	6.91	7.90	8.36	2.66	4.05	4.30	6.51	4.28	8.44	3.36	N/A	4.78	N/A	8.12	6.85	5.06	No
WL112	0.54	4.85	2.91	2.60	7.12	6.78	4.81	4.47	8.00	4.24	N/A	3.62	N/A	6.33	4.68	4.70	No
WL115	7.39	7.90	9.00	2.57	3.25	3.74	7.27	4.42	6.90	4.04	N/A	1.88	N/A	5.17	6.76	4.24	No
WL138	6.81	10.00	9.23	4.11	4.31	2.60	4.73	3.94	8.55	4.14	N/A	7.10	N/A	8.76	6.73	5.81	No
WL139	3.01	10.00	2.96	5.39	5.89	6.14	4.85	2.35	7.48	3.40	N/A	1.01	N/A	6.41	4.84	4.96	No
Average Score	5.15	7.07	5.91	3.56	5.67	4.46	4.49	3.08	7.76	3.93	-	4.68	-	6.92	5.80	4.82	
Average Rating ⁽²⁾	Moderate	Higher	Higher	Moderate	Higher	Moderate	Moderate	Moderate	Higher	Lower	-	Moderate	-	Higher			

⁽¹⁾ WSS determination as dictated by the Functional WSS Interpretation Results within the WESP-AC spreadsheet calculator.

⁽²⁾ Average group rating calculated based on the Nova Scotia normalized reference values in the WESP-AC tool. Ratings are represented by colours, where red corresponds to a 'lower' rating, yellow corresponds to a 'moderate' rating, and green corresponds to a 'higher' rating.

Hydrological Group

The hydrologic group evaluates the effectiveness of a wetland to store or delay the downslope movement of surface water. However, the model does not account for wetland size, and in turn, the ability of larger wetlands to store more water than smaller wetlands. Wetlands that have the highest benefit scores within this group tend to be located within developed areas, where water storage is more valuable to reduce flood risks.

Wetlands had a mix of lower (41%), moderate (35%), and high (23%) hydrologic function score, and lower (27%), moderate (30%), and high (69%) hydrologic benefit score.

Water Quality Group

The water quality group is compiled from four different functions: sediment retention and stabilization; phosphorus retention; nitrate removal; carbon sequestration. The main function of this group is to evaluate the wetland's potential to intercept, retain, and filter sediments, particulates, and organic matter. Similar to the hydrologic group, the wetlands that have the higher benefit score in this regard include those that do not have a surface water outlet and instead are isolated from flowing surface water. This model also does not account for wetland size and as such, larger wetlands do not necessarily score higher than small wetlands, although size may factor into this function.

A slight majority of wetlands had a high (53%) functional water quality score, and a moderate (53%) water quality benefit score.

Aquatic Support Group

The aquatic support group comprises four individual functions: stream flow support; aquatic invertebrate habitat; organic nutrient export; and water cooling. The main function of this group is to determine the wetland's ability to support ecological stream functions that promote habitat health. Wetlands lying adjacent to or containing flowing water score higher than those that do not (e.g., isolated wetlands). Additionally, headwater wetlands are crucial for supporting stream flow during the dry season by contributing to water flow via groundwater input and storage capacity. Headwater wetlands provide stream flow and cooling functions due to their typically limited exposed surface water, insulating properties and groundwater water storage and retention time. Treed swamps can also provide aquatic support through groundwater discharge (e.g., seeps) and vegetation shading.

Wetlands had a moderate (39%) or high (61%) score for the aquatic support functional group, and a majority of wetlands had a lower (48%) aquatic support group benefit score, as compared to 42% that had a moderate benefit score and 10% that had a higher benefit score.

Aquatic Habitat Group

The aquatic habitat group is compiled from five different functions: anadromous fish habitat, resident fish habitat, amphibian and turtle habitat, waterbird feeding habitat, and waterbird nesting habitat. Wetlands that have the higher functions within this group include those that are adjacent to or contain water features with potential habitat characteristics (e.g., in-stream cover, aquatic vegetation, etc.).

More wetlands (48%) received moderate aquatic habitat functional scores, as compared to lower (31%) or higher (21%). The majority of wetlands received moderate aquatic habitat group benefit scores (69%).

Transition Habitat Group

The transition habitat group comprises three different functions: songbird, raptor, and mammal habitat, native plant habitat and pollinator habitat. The main function of the collective group is to evaluate the wetland's ability to support healthy habitat for birds, mammals, and native plants.

The Assessment Area has a mix of remote habitat and fragmented or disturbed habitat. The majority of wetlands (89%) scored high on transition habitat function, and (94%) scored lower on transition habitat group benefit.

Wetland Condition

Wetland condition refers to the integrity or health of a wetland as defined by its vegetative composition and richness of native species. Scores are derived from the similarity between the wetland being evaluated and reference wetlands of the same type and landscape setting (Adamus, 2021).

The wetlands in the Assessment Area had a range of wetland condition scores with 43% lower scores, 28% moderate scores, and 28% higher scores. The wetlands with moderate to higher ranks contain a relatively good level of ecological integrity and species diversity. Lower ranked wetlands are typically smaller wetlands associated with historic disturbances such as roads, trails, timber harvesting etc., which may be more susceptible to changes in their surroundings.

Wetland Risk

Wetland risk takes sensitivity and stressors into account by averaging the two. Sensitivity is the lack of intrinsic resistance and resilience of the wetland to human or naturally caused stress (Niemi et al., 1990). Stress relates to the degree to which the wetland is or has recently been anthropogenically altered in a way that degrades natural condition and/or function. The functional assessment tool uses five metrics to measure sensitivity: abiotic resistance, biotic resistance, site fertility, availability of colonizers, and growth rate. The model applies four stress groups: hydrologic stress, water quality stress, fragmentation stress, and general disturbance stress. Wetlands that are highly resilient may have lower risk scores despite their exposure to multiple stressors. Additionally, wetlands exposed to fewer threats, but with low resilience may have higher risk scores. Wetland resilience is tied to multiple factors, such as size, proximity to natural land cover, and presence of invasive species.

Most of the wetlands in the Assessment Area scored moderate (41% of wetlands) or high (58% of wetlands) for wetland risk, meaning they have a reasonable resilience and are not highly susceptible to change.

Functional Assessments – Version 3.4

Functional assessments using WESP-AC Version 3.4 were completed in 2025 and 2026 by Strum wetland specialists for 84 wetlands located within the Assessment Area. A summary is provided in Table 9.15.

Table 9.15: Summary of WESP-AC Assessments Using Version 3.4 for Wetlands within the Assessment Area

WL ID	HYDROLOGIC Group		WATER & Climate Protection Group		AQUATIC SUPPORT Group		AQUATIC Habitat Group		TRANSITIONAL Habitat Group		Average Function	Average Benefits	WSS ⁽¹⁾
	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL1	6.65	8.89	9.06	2.95	0.77	4.05	1.71	1.10	6.41	5.37	4.92	4.47	No
WL2	7.44	3.05	9.29	1.30	0.00	2.92	1.32	1.43	6.42	5.78	4.89	2.90	No
WL3	-0.26	3.21	3.22	2.03	8.50	5.52	2.59	0.86	7.79	1.93	4.37	2.71	No
WL4	7.44	9.53	9.24	2.22	-0.04	3.89	1.56	1.16	7.51	2.92	5.14	3.94	No
WL5	5.31	7.76	4.52	2.41	7.27	5.35	1.32	1.07	7.84	2.87	5.25	3.89	No
WL6	6.65	8.89	9.06	2.95	0.77	4.05	1.71	1.10	6.41	5.37	4.92	4.47	No
WL7	8.62	7.81	9.44	2.07	1.56	4.49	5.10	2.37	8.16	1.54	6.58	3.66	No
WL9	7.44	7.33	9.20	1.24	1.04	4.56	1.33	1.08	7.97	8.62	5.40	4.57	No
WL10	6.18	7.81	9.65	2.02	1.41	4.78	4.23	3.27	7.46	5.18	5.78	4.61	No
WL12	7.44	8.03	9.28	4.71	0.82	4.68	4.12	2.63	6.72	1.50	5.67	4.31	No
WL13	4.44	6.99	3.00	2.30	5.82	5.76	5.28	6.37	9.14	2.89	5.54	4.86	No
WL14	7.24	5.91	8.50	2.82	0.51	4.60	1.44	1.39	8.07	3.64	5.15	3.67	No
WL15	8.62	7.94	9.45	4.60	0.88	4.61	4.44	2.67	8.12	1.58	6.30	4.28	No
WL16	6.65	4.57	8.94	1.87	0.91	4.73	2.59	0.81	7.58	1.90	5.33	2.78	No
WL17	7.44	7.94	9.24	7.02	1.18	4.51	3.65	2.62	6.77	1.49	5.66	4.72	No
WL18	3.13	9.84	3.65	7.09	5.03	6.07	5.08	6.85	8.72	2.84	5.12	6.54	No
WL19	6.53	4.46	9.85	2.60	4.08	5.70	5.55	6.92	8.62	3.74	6.93	4.68	No
WL20	3.77	9.93	4.94	6.44	6.84	5.84	5.00	6.47	8.43	2.84	5.80	6.30	No
WL21	8.62	7.99	9.52	4.60	1.27	4.67	4.27	2.71	8.25	1.61	6.39	4.31	No
WL22	5.22	10.33	9.90	3.46	1.37	5.26	4.78	6.13	7.12	5.42	5.68	6.12	No
WL23	5.02	5.91	9.30	2.64	1.56	5.43	4.58	6.46	8.23	1.77	5.74	4.44	No
WL24	3.67	5.98	5.00	1.83	7.22	5.16	5.52	6.29	9.11	2.90	6.10	4.43	No
WL25	7.44	7.67	9.16	4.66	0.64	4.19	3.97	2.91	7.76	2.83	5.79	4.45	No
WL28	4.77	6.60	3.06	2.34	5.77	7.31	7.50	4.13	9.32	7.64	6.08	5.60	No
WL29	3.80	7.05	2.68	1.39	5.13	6.94	5.70	5.39	8.98	2.82	5.26	4.72	No
WL30	0.68	8.39	4.16	2.52	8.55	8.05	7.35	5.65	8.66	1.56	5.88	5.23	No
WL31	4.98	10.04	4.17	2.98	5.71	5.84	3.81	6.15	8.48	2.95	5.43	5.59	No
WL32	7.44	3.05	9.29	1.30	0.00	2.92	1.32	1.43	6.42	5.78	4.89	2.90	No
WL33	4.39	8.93	2.91	3.69	4.62	11.43	7.36	4.37	8.72	1.63	5.60	6.01	No
WL34	2.11	7.90	8.67	1.21	0.48	5.53	5.12	2.34	8.09	2.74	4.89	4.78	No
WL35	7.44	8.39	9.31	1.71	0.65	5.36	5.77	2.13	8.28	1.44	6.29	3.81	No
WL37	5.02	5.73	9.30	2.65	1.59	5.23	4.61	6.57	8.39	1.96	5.78	4.43	No
WL38	0.33	8.30	2.12	4.97	5.78	8.07	6.33	5.57	8.92	1.61	4.70	5.70	No
WL40	7.44	8.18	9.27	1.20	0.72	5.81	4.63	2.54	8.12	2.78	6.04	4.10	No
WL41	1.05	8.17	3.93	6.36	7.46	8.72	7.71	5.61	9.15	1.55	5.86	6.08	No

WL ID	HYDROLOGIC Group		WATER & Climate Protection Group		AQUATIC SUPPORT Group		AQUATIC Habitat Group		TRANSITIONAL Habitat Group		Average Function	Average Benefits	WSS ⁽¹⁾
	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL44	8.62	8.75	9.44	1.70	1.12	5.81	5.18	2.32	8.99	1.49	6.67	4.01	No
WL45	7.44	17.03	9.23	3.28	1.02	4.51	2.88	0.90	7.51	2.93	5.61	5.73	No
WL47	4.12	7.61	9.11	1.23	0.39	5.35	6.13	2.17	8.56	8.45	5.66	4.96	No
WL54	7.81	8.44	9.85	3.91	3.85	5.95	5.38	2.87	10.28	1.43	7.43	4.52	No
WL56	8.62	8.03	9.47	4.86	0.90	4.81	5.21	2.23	8.18	1.50	6.47	4.29	No
WL57	4.77	8.75	3.90	3.14	5.45	7.18	5.43	5.23	8.72	1.70	5.65	5.20	No
WL58	-1.91	0.00	-2.42	-0.09	-0.50	4.20	3.95	1.57	1.80	5.90	0.18	2.32	No
WL59	6.65	5.92	9.10	1.94	1.10	3.04	1.88	1.03	6.56	5.19	5.06	3.42	No
WL60	5.47	6.77	5.17	3.49	6.41	8.76	6.53	5.57	8.87	2.04	6.49	5.32	No
WL61	6.36	7.56	9.93	1.37	1.63	6.32	5.91	6.31	9.50	8.47	6.67	6.01	No
WL62	7.44	8.17	9.23	2.05	1.06	4.95	4.64	2.54	8.10	2.78	6.09	4.10	No
WL64	7.44	5.08	9.27	1.21	-0.02	5.27	2.42	0.76	7.49	2.87	5.32	3.04	No
WL66	4.42	5.02	4.10	1.36	4.00	7.64	6.24	5.18	8.74	2.88	5.50	4.41	No
WL67	7.44	7.28	9.19	1.27	1.36	4.93	5.51	2.42	8.56	2.75	6.41	3.73	No
WL69	5.90	6.09	4.76	1.54	5.89	6.11	3.02	0.50	7.26	2.73	5.37	3.39	No
WL70	7.44	6.63	6.17	1.76	5.08	6.78	5.01	2.86	7.71	5.12	6.28	4.63	No
WL71	7.83	6.00	9.33	2.89	-0.08	4.95	3.38	0.51	8.07	1.63	5.71	3.20	No
WL73	5.17	0.00	9.67	1.36	1.37	1.02	6.34	5.91	8.21	1.18	6.15	1.89	No
WL88	8.22	8.01	5.94	4.46	6.97	6.46	5.70	2.44	8.49	7.58	7.07	5.79	No
WL89	7.08	10.09	9.15	1.35	1.48	6.52	5.99	2.28	7.92	1.47	6.33	4.34	No
WL90	6.50	13.13	9.86	2.74	2.65	8.41	7.48	6.66	8.77	1.84	7.05	6.56	No
WL95	6.65	8.12	8.94	4.62	0.18	5.75	4.69	2.73	7.72	2.86	5.63	4.82	No
WL97	8.62	8.01	9.24	1.21	-0.05	5.68	5.09	2.56	8.17	2.78	6.21	4.05	No
WL101	1.10	5.19	3.65	1.27	7.23	8.84	6.99	5.12	8.77	2.81	5.55	4.64	No
WL104	7.44	8.06	9.49	1.21	1.11	5.81	5.56	2.35	8.29	1.43	6.38	3.77	No
WL106	7.44	11.28	9.44	2.90	1.95	6.20	5.52	2.37	7.93	2.74	6.45	5.10	No
WL109	7.44	8.89	9.41	2.91	1.98	5.62	1.98	1.45	5.79	5.93	5.32	4.96	No
WL114	5.28	6.77	5.12	3.93	6.14	8.52	6.00	7.86	9.03	1.72	6.32	5.76	No
WL117	5.81	8.71	9.85	3.49	3.65	6.28	5.34	7.56	7.54	1.95	6.44	5.60	No
WL118	9.21	4.62	8.82	1.27	1.04	4.74	1.97	0.82	7.63	1.53	5.73	2.60	No
WL119	1.65	5.08	2.79	6.66	7.76	8.87	6.89	6.85	9.08	4.24	5.63	6.34	No
WL121	7.44	9.87	9.52	2.17	2.05	6.11	4.29	0.30	8.32	1.46	6.32	3.98	No
WL122	6.00	7.22	9.84	5.83	3.18	5.68	5.69	5.46	8.82	1.57	6.71	5.15	No
WL123	7.44	3.83	8.81	2.82	1.49	4.87	1.77	0.75	7.07	1.57	5.31	2.77	No
WL124	7.44	4.78	8.81	3.25	1.82	-0.02	1.30	3.13	7.12	9.23	5.30	4.07	No

WL ID	HYDROLOGIC Group		WATER & Climate Protection Group		AQUATIC SUPPORT Group		AQUATIC Habitat Group		TRANSITIONAL Habitat Group		Average Function	Average Benefits	WSS ⁽¹⁾
	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL126	5.90	3.52	4.85	1.51	6.38	5.55	1.43	0.80	6.41	1.38	4.99	2.55	No
WL128	8.42	5.73	3.78	2.20	4.12	5.53	1.91	1.54	8.16	3.71	5.28	3.74	No
WL130	0.89	10.88	4.85	6.23	8.34	8.35	7.30	5.01	8.85	1.64	6.04	6.42	No
WL132	7.44	8.75	9.15	2.36	1.55	5.83	5.43	2.39	8.25	2.75	6.36	4.42	No
WL133	10.00	4.85	9.60	0.90	2.51	5.02	2.01	0.88	8.24	1.58	6.47	2.65	No
WL134	5.90	3.65	4.76	1.50	6.01	5.74	1.49	0.83	6.48	1.39	4.93	2.62	No
WL135	7.24	5.53	9.17	1.54	1.82	5.73	1.89	0.85	7.87	1.56	5.60	3.04	No
WL136	4.61	10.26	3.51	1.25	6.45	7.73	6.31	6.29	8.25	1.83	5.83	5.47	No
WL140	7.83	3.44	8.80	3.00	0.05	0.41	1.58	2.77	5.47	6.41	4.74	3.20	No
WL141	4.29	4.11	4.60	1.64	7.35	7.41	4.76	6.72	8.31	2.13	5.86	4.40	No
WL142	6.65	8.44	8.96	4.70	1.75	5.41	5.66	2.52	7.53	3.94	6.11	5.00	No
WL144	7.44	4.91	8.82	1.25	1.12	5.28	4.24	2.70	7.83	1.58	5.89	3.14	No
WL146	4.95	10.53	3.30	1.36	4.59	7.02	4.67	6.89	7.42	1.54	4.99	5.47	No
WL149	8.62	10.15	5.44	1.85	6.95	8.22	5.50	2.23	8.12	1.48	6.93	4.79	No
Average Score	5.99	7.28	7.33	2.76	3.01	5.68	4.40	3.33	7.94	3.07	5.74	4.44	
Average Rating ⁽²⁾	Moderate	Higher	Higher	Lower	Moderate	Moderate	Moderate	Moderate	Higher	Lower			

⁽¹⁾ WSS determination as dictated by the Functional WSS Interpretation Results within the WESP-AC spreadsheet calculator.
⁽²⁾ Average group rating calculated based on the Nova Scotia normalized reference values in the WESP-AC tool. Ratings are represented by colours, where red corresponds to a 'lower' rating, yellow corresponds to a 'moderate' rating, and green corresponds to a 'higher' rating.

Hydrologic Group

The hydrologic group evaluates the effectiveness of a wetland to store or delay the downslope movement of surface water. However, the model does not account for wetland size, and in turn, the ability of larger wetlands to store more water than smaller wetlands. Wetlands that have the highest benefit scores within this group tend to be located within developed areas, where water storage is more valuable to reduce flood risks.

The majority of the wetlands had a moderate hydrologic function score (71%), and a higher hydrologic benefit score (66%).

Water and Climate Protection Group

The water quality group is compiled from four different functions: sediment and toxicant retention and stabilization; phosphorus retention; nitrogen removal and retention; and carbon stock preservation. The main function of this group is to evaluate the wetland's potential to intercept, retain, and filter sediments, particulates, and organic matter. Similar to the hydrologic group, the wetlands that have the higher benefit score in this regard include those that do not have a surface water outlet and instead are isolated from flowing surface water. This model also does not account for wetland size and as such, larger wetlands do not necessarily score higher than small wetlands, although size may factor into this function.

The wetlands had a majority higher (67%) functional water and climate protection scores, and the majority (71%) had a lower water and climate protection benefit score.

Aquatic Support Group

The aquatic support group comprises four individual functions: stream flow and temperature support; aquatic primary productivity; and organic nutrient export. The main function of this group is to determine the wetland's ability to support ecological stream functions that promote habitat health. Wetlands lying adjacent to or containing flowing water score higher than those that do not (e.g., isolated wetlands). Additionally, headwater wetlands are crucial for supporting stream flow during the dry season by contributing to water flow via groundwater input and storage capacity. Headwater wetlands provide stream flow and cooling functions due to their typically limited exposed surface water, insulating properties and groundwater water storage and retention time. Treed swamps can also provide aquatic support through groundwater discharge (e.g., seeps) and vegetation shading.

Wetlands showed majority lower (60%) scores for the aquatic support functional group, and the majority of wetlands (76%) had a moderate aquatic support group benefit score.

Aquatic Habitat Group

The aquatic habitat group is compiled from five different functions: anadromous fish habitat; resident and other fish habitat; amphibian habitat; waterbird feeding habitat, and waterbird nesting habitat. Wetlands that have the higher functions within this group include those that are adjacent to or contain water features with potential habitat characteristics (e.g., in-stream cover, aquatic vegetation, etc.).

The majority of wetlands received a moderate aquatic habitat functional score (59%), while aquatic habitat group benefit scores were mostly moderate (38%) and higher (33%).

Transition Habitat Group

The transition habitat group comprises three different functions: songbird, raptor, and mammal habitat, native plant habitat, and pollinator habitat. The main function of the collective group is to evaluate the wetland's ability to support healthy habitat for birds, mammals, and native plants.

The Study Area has a mix of remote habitat and fragmented or disturbed habitat. Majority of wetland scored higher (88%) on transition habitat function, but scored lower (88%) on transition habitat group benefit.

Wetlands of Special Significance

None of the field-delineated wetlands met the criteria for WSS, as dictated by the Functional WSS Interpretation Results within the WESP-AC spreadsheet calculator. The results of the wetland field assessments were also cross-referenced with breeding bird, vegetation, and lichen survey results, specifically for SAR (listed as 'Endangered' or 'Threatened') with habitat requirements tied to wetlands. As a result, 12 wetlands were later determined to be potential WSS based on the confirmed presence of SAR (Table 9.16). Official WSS designation will be made by NSECC. Due to the location-sensitive nature of some of the SAR observed, two additional wetland IDs will be provided to NSECC directly for these potential WSS.

Table 9.16: Summary of Field-Identified Potential WSS, as Determined by the Presence of SAR

WL ID	Wetland Type(s)	Rationale for Potential WSS Designation
WL21	Shrub Swamp	Canada warbler, olive-sided flycatcher. Both species observed singing within the wetland during breeding bird survey dates.
WL26	Treed Swamp	Canada warbler. Heard singing within the wetland during breeding bird survey dates.
WL30	Shrub Swamp	Olive-sided flycatcher. Heard and visually observed within the wetland during breeding bird survey dates.
WL33	Treed Swamp	Canada warbler. Heard singing within the wetland during breeding bird survey dates.
WL41	Treed and Shrub Swamp	Canada warbler. Two individuals observed, a parent and juvenile together within the wetland during breeding bird and fall migration survey dates.
WL44	Treed Swamp	Canada warbler. Heard and visually observed within the wetland during breeding bird survey dates.
WL81	Treed Swamp	Canada warbler, olive-sided flycatcher. Both species observed singing within the wetland during breeding bird survey dates.
WL90	Shrub Swamp	Olive-sided flycatcher observed within wetland during breeding bird and fall migration survey dates

WL ID	Wetland Type(s)	Rationale for Potential WSS Designation
WL91	Fen	Olive-sided flycatcher. Heard singing and visually observed within the wetland during breeding bird survey dates.
WL152	Unknown	Canada warbler. Observed three times, heard singing within the wetland during breeding bird survey dates.

9.2.5 Effects Assessment

Project-Wetland Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact wetlands through habitat removal, disruptions to hydrology, and/or displacement of sediment (Table 9.17).

Table 9.17: Potential Project-Wetland Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Interconnection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for wetlands is the Assessment Area. The RAA is the boundary of secondary watersheds that intersect with the Study Area (Drawing 9.4).

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for wetlands. The VC-specific definition for magnitude is as follows:

- Negligible: No direct loss of wetland habitat or alteration to wetland functions expected.
- Low: Direct loss of wetland habitat, but overall wetland functions remain intact.
- Moderate: Direct loss of wetland habitat and impact to wetland functions, but wetland area loss will not impact the hydrology of the watershed. Where WSS are impacted, adequate general SAR habitat is prevalent elsewhere within the RAA.
- High: Direct loss of wetland habitat and impact to wetland functions; and wetland area loss will affect the hydrology of the watershed and the impacted wetland areas are part of a WSS that provides unique SAR habitat within the RAA.

Effects

Effects to wetlands include both habitat loss and changes in wetland functionality and can occur throughout the life of the Project. Effects might be direct (e.g., habitat loss through infilling) or indirect (e.g., changes to functionality due to hydrologic shifts). Effect-specific active management, mitigation, and long-term monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

Habitat Loss

Habitat loss can occur both directly (i.e., excavation or infilling) and indirectly (i.e., altered hydrology or canopy cover) from the Project (Trombulak & Frissell, 2000). Loss of habitat can fragment wildlife corridors, potentially isolating species and lowering species richness. Habitat loss can also disrupt vital habitat characteristics that support vulnerable species. Further, the removal or infilling of wetland habitat can impact the hydroperiod of neighbouring wet areas, resulting in farther reaching impacts on habitat quality (Mitsch & Gosselink, 2000).

A GIS suitability analysis was conducted to design a Project Footprint that would optimize the placement of Project infrastructure to avoid and minimize loss of wetland area and function, to the greatest extent possible. Potential habitat alteration within wetlands is outlined in Table 9.18.

Table 9.18: Habitat Alteration Potential for Field-Delineated Wetlands

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m ²)	Estimated Area of Potential Impact (m ²)	Activity
WL1	Treed Swamp	Partial	712	193	Existing road upgrades
WL2	Treed Swamp	Partial	3,053	169	New road construction
WL3	Treed Swamp	Full	642	425	New road construction
WL4	Treed/shrub swamp	Partial	606	140	Existing road upgrades
WL5	Treed Swamp	Full	1,998	583	Existing road upgrades

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m ²)	Estimated Area of Potential Impact (m ²)	Activity
WL7	Shrub Swamp	Partial	426	256	Existing road upgrades
WL9	Treed Swamp	Partial	4,898	2,778	Existing road upgrades, new road construction
WL10	Treed Swamp	Partial	2,309	52	Existing road upgrades
WL12	Bog	Full	404	108	Existing road upgrades
WL13	Treed Swamp	Partial	2,748	807	New road construction
WL14	Treed Swamp	Partial	597	104	Existing road upgrades
WL15	Shrub Swamp	Full	684	3	Existing road upgrades
WL16	Treed Swamp	Partial	1,944	270	Turbine pad
WL18	Treed Swamp	Full	316	2	Existing road upgrades
WL19	Swamp	Partial	2,511	1,968	New road construction
WL20	Shrub Swamp	Partial	1,456	631	Existing road upgrades
WL21	Shrub Swamp	Partial	2,208	76	Existing road upgrades
WL22	Shrub Swamp	Partial	1,145	332	Existing road upgrades
WL23	Treed Swamp	Partial	776	15	Existing road upgrades
WL26	Treed Swamp	Partial	2,987	1,456	Existing road upgrades
WL27	Treed Swamp	Partial	720	455	Existing road upgrades
WL28	Marsh	Partial	2,156	515	New road construction
WL29	Treed Swamp	Partial	649	335	New road construction
WL30	Shrub Swamp	Partial	10,165	1,542	Existing road upgrades
WL32	Shrub Swamp	Partial	19,660	3,669	Turbine pad, existing road upgrades
WL32	Treed Swamp	Partial	10,423	2,336	Turbine pad, new road construction
WL33	Shrub Swamp	Partial	7,875	1,169	Existing road upgrades
WL35	Treed Swamp	Partial	1,252	48	Existing road upgrades
WL36	Treed Swamp	Partial	370	282	Existing road upgrades
WL37	Treed Swamp	Partial	1,506	43	Existing road upgrades
WL39	Shrub Swamp	Partial	3,230	242	New road construction
WL43	Shrub Swamp	Partial	1,550	198	Existing road upgrades
WL45	Treed Swamp	Partial	12,149	4,229	New road construction
WL46	Bog	Full	1,069	35	Existing road upgrades
WL50	Swamp	Partial	2,092	222	Existing road upgrades
WL51	Treed Swamp	Partial	11,166	3,025	New road construction
WL52	Swamp	Partial	3,631	1,181	New road construction
WL56	Treed/shrub swamp	Partial	4,600	25	Existing road upgrades

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m ²)	Estimated Area of Potential Impact (m ²)	Activity
WL59	Bog, Treed Swamp	Partial	2,397	777	New road construction
WL60	Treed Swamp	Partial	1,011	508	New road construction
WL61	Treed Swamp	Partial	6,414	1,706	New road construction
WL62	Treed Swamp	Partial	861	56	Existing road upgrades
WL63	Treed/shrub swamp	Partial	11,141	466	Existing road upgrades
WL64	Treed Swamp	Partial	1,842	1,095	New road construction
WL65	Treed Swamp	Partial	1,332	932	Collector line
WL66	Treed Swamp	Partial	285	276	Turbine pad, new road construction
WL67	Treed Swamp	Partial	19,569	1,321	Turbine pad, new road construction
WL68	Treed Swamp	Full	4,460	1,126	Turbine pad
WL69	Treed Swamp	Partial	16,815	7,958	Existing road upgrades, new road construction
WL68	Treed Swamp	Full	4,460	1,126	Turbine pad
WL70	Treed Swamp	Partial	1,191	653	New road construction
WL72	Swamp	Partial	5,305	1,072	Existing road upgrades
WL73	Treed Swamp	Partial	6,825	3,645	New road construction
WL75	Treed/shrub swamp	Partial	5,447	555	New road construction
WL76	Shrub Swamp	Partial	11,938	1,449	Existing road upgrades, collector line
WL77	Treed/shrub swamp	Full	557	314	Turbine pad
WL78	Treed swamp and Bog	Full	459	259	Existing road upgrades
WL79	Marsh	Partial	2,410	435	Existing road upgrades
WL80	Shrub Swamp	Partial	912	55	Existing road upgrades
WL81	Treed Swamp	Full	2,642	1,054	Existing road upgrades
WL82	Shrub Swamp	Partial	927	75	Existing road upgrades
WL83	Shrub Swamp	Partial	3,638	150	Existing road upgrades
WL86	Treed Swamp	Partial	1,618	97	Existing road upgrades
WL87	Shrub Swamp, Marsh	Partial	7,219	1,081	Existing road upgrades
WL88	Treed Swamp	Partial	7,752	2,249	Existing road upgrades
WL90	Shrub Swamp	Partial	4,456	603	Existing road upgrades
WL91	Marsh	Partial	667	276	Existing road upgrades

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m ²)	Estimated Area of Potential Impact (m ²)	Activity
WL92	Shrub Swamp	Partial	4,676	1,608	Existing road upgrades
WL94	Treed Swamp	Partial	1,431	113	Existing road upgrades
WL95	Bog	Partial	3,647	813	New road construction
WL97	Treed Swamp	Partial	8,660	90	Existing road upgrades
WL98	Fen	Partial	783	422	Existing road upgrades
WL99	Treed Swamp	Full	313	273	New road construction
WL101	Shrub Swamp	Partial	26,424	4,342	Turbine pad, existing road upgrades, new road construction
WL102	Swamp	Partial	2,934	116	Existing road upgrades
WL105	Treed Swamp	Partial	7,147	694	Existing road upgrades
WL106	Bog	Partial	1,060	662	Existing road upgrades
WL107	Shrub Swamp	Partial	2,104	293	Existing road upgrades
WL108	Treed Swamp		2,163	730	New road construction
WL109	Bog	Partial	658	299	Existing road upgrades
WL110	Bog	Partial	2,386	458	Existing road upgrades
WL111	Treed Swamp	Full	1,408	191	New road construction
WL112	Treed Swamp	Partial	389	63	Existing road upgrades
WL114	Treed and Shrub Swamp	Partial	1,112	501	Existing road upgrades
WL117	Treed Swamp	Partial	3,824	2,455	Existing road upgrades, new road construction
WL119	Treed Swamp	Partial	396	86	Existing road upgrades
WL120	Treed Swamp	Partial	10,275	1,137	Existing road upgrades
WL121	Treed swamp, bog	Partial	32,268	2,185	Turbine pad, new road construction
WL123	Treed Swamp	Partial	304	191	Existing road upgrades
WL124	Treed Swamp	Partial	474	67	Existing road upgrades
WL126	Shrub Swamp	Partial	1,455	512	Existing road upgrades
WL128	Treed Swamp	Partial	211	30	Existing road upgrades
WL129	Treed Swamp	Full	1,916	20	Existing road upgrades
WL130	Marsh	Partial	20,862	1,018	New road construction
WL131	Shrub Swamp	Partial	3,614	1,928	Existing road upgrades
WL132	Treed Swamp	Partial	6,917	1,180	Existing road upgrades, new road construction
WL133	Treed Swamp	Partial	4,851	58	Turbine pad
WL134	Shrub Swamp	Partial	494	138	Existing road upgrades
WL135	Swamp	Partial	36,616	118	New road construction
WL137	Treed Swamp	Partial	596	271	Existing road upgrades

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m ²)	Estimated Area of Potential Impact (m ²)	Activity
WL138	Swamp	Partial	19,176	1,214	Existing road upgrades, new road construction
WL139	Shrub Swamp	Partial	13,035	2,752	Existing road upgrades, new road construction
WL141	Treed Swamp	Partial	701	100	Existing road upgrades
WL142	Treed Swamp	Partial	1,451	1,426	Existing road upgrades
WL143	Treed Swamp	Partial	4,317	941	Existing road upgrades
WL144	Treed Swamp	Partial	768	59	Existing road upgrades
WL146	Treed Swamp	Partial	731	85	Existing road upgrades, new road construction
WL147	Fen	Partial	3,239	1,600	Existing road upgrades
WL148	Bog	Partial	32,182	2,653	Turbine pad, new road construction
WL149	Treed Swamp	Partial	6,471	4,277	Existing road upgrades
WL 151	Unknown	Partial	10,566	1,136	Existing road upgrades
Total Estimated Area with Potential Impact				100,593 m²	

The results of the field assessments indicate that there is potential for 111 field delineated Project-wetland interactions comprising partial or complete infills to facilitate Project development. The Proponent prioritized the use of existing disturbed areas, with approximately 15 km of new road being constructed and approximately 51 km of previously existing road being utilized. As such, 75 of the potential alterations would be associated with upgrades to existing roads (if determined to be required during the detailed design phase) and 24 of the potential alterations are associated with the construction of new roads and collector lines. The remaining 12 potential alterations stem from the turbine pad and laydown area development.

Many wetlands within the Assessment Area around turbines are expected to be completely avoided through the micro-siting of turbines and turbine pads during the detailed design phase. Based on approval conditions for other wind projects, approval from NSECC is required to work within 30 m of a wetland, and alteration approval is needed for alterations. In areas where wetland alteration is unavoidable, the layout will be adjusted to impact as little of the wetland as possible. Furthermore, any necessary wetland crossings will be designed to avoid any permanent diversion, restriction or blockage of natural flow, such that the hydrologic function of the wetland is maintained. Specific details of the crossings will be finalized during the detailed design phase and will be included in the application for wetland alteration.

Provincial wetland data obtained from the Canadian Wetland Inventory (CNWI) (ECCC, 2024) was used to estimate the total amount of wetland habitat within the 47,412 ha RAA. An estimated 2,333 ha of wetland habitat within the RAA was identified as a desktop exercise, which equates to approximately 4.9% of the RAA. Field delineated wetland habitat that may be

directly impacted by the Project comprises approximately 10.06 ha, or 0.02% of the total area within the RAA, approximately 0.41% of the potential wetland habitat within the RAA, and approximately 16.8% of wetland habitat within the LAA. Mitigations for loss of wetlands will ensure that the provincial wetland policy of no net loss of wetland habitat and function will be upheld.

There were nine potential WSS that may have direct impacts due to Project infrastructure. Three are due to the presence of olive-sided flycatcher and are associated with road upgrades. Based on SAR bird habitat modelling, there is 3,315 ha of modelled suitable habitat for the olive-sided flycatcher identified within a 5 km buffer of the Study Area (described further in Section 10.4). Habitat modeling suggests that habitat used by olive-sided flycatcher is not unique within the Assessment Area and the surrounding region.

Four potential WSS alterations are due to the presence of Canada Warbler, three of which are associated with road upgrades and one associated with new construction. Based on SAR bird habitat modelling, there is 4,476 ha of modelled suitable habitat for the Canada warbler (Section 10.4) within a 5 km buffer of the Study Area. Habitat modeling suggests that habitat used by Canada warbler is not unique within the Assessment Area and the surrounding region.

Two wetlands were identified as potential WSS through the presence of black ash (*Fraxinus nigra*), a 'Threatened' species under ESA (S-Rank S1S2). One tree was found in a field-delineated wetland classified as a treed swamp during 2025 surveys. The second was observed during plant and lichen surveys next to an existing road in a wetland.

Where practical, potential WSS will be avoided through the detailed design process. If impacts to WSS are determined to be unavoidable, the proposed impacts will be minimized and, where practical, development will avoid portions of the wetlands that support the respective SAR species. Refinements of the Clearing and Project Footprint will be made during the detailed design stage to minimize the impact of Project activities within and near wetlands that host black ash. Surface water flows that influence the existing hydrological regimes of the host wetlands will not be impacted through purposeful Project infrastructure siting and proposed mitigation.

Indirect Loss

Indirect losses to wetlands generally occur from construction but the effects become noticeable during the operation of the Project. Indirect loss of wetland habitat occurs through disruption of the hydrology of a wetland through the redirection of surface and subsurface water to a wetland. The hydrology of a wetland is one of the most important aspects of its overall structure and function. Project infrastructure located within or near a wetland can result in changes in the quantity and timing of water flow, potentially affecting species composition, water treatment capacity, and nutrient export (Mitsch & Gosselink, 2000). Additionally, disruptions to hydrology in one area may reduce the hydrological connectivity to other areas, causing impacts that may extend into neighbouring wetlands.

Indirect loss may be mitigated through surface water management to ensure that pre-existing hydrologic sources are continuing to feed into a wetland. As hydrologic impacts are not immediately identified, long-term monitoring is required to evaluate wetland changes post-alteration and are included within the wetland alteration approval process. Often shifts in hydrology on a project site do not result in direct loss, but rather a change in the wetland type and function. Surface water management for the Project will consider the location of wetlands not directly impacted by the Project, and hydrology will be maintained in partially altered wetlands.

Changes to Wetland Functionality

Changes to wetland functionality may be caused through habitat loss, as discussed above, or through other Project activities that may release dust, sediment or invasive species into the wetland, thus shifting its ecological, chemical, and hydrological profiles.

Erosion and Sedimentation

Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, daily traffic, routine road and collector line right of way (ROW) maintenance. The accumulation of sediment within wetland environments can cause shifts in ecological integrity, including the plant species composition and subsequent nutrient retention potential, hydrological storage capabilities, and habitat suitability for vulnerable species (Tilman et al., 1997). Additionally, the use of road salt for winter maintenance may result in indirect adverse effects on microbial and vegetative wetland communities, including detrimental salinity levels and increased soil erosion due to salt-damaged vegetation (Jones et al., 2017).

Dust

The potential for dust deposition will likely be highest during the construction phase, though the risk will be present throughout the Project's lifecycle. Dust primarily impacts vegetative health, with particle size influencing the scale of the impact (Farmer, 1993). Smaller particulate can result in clogged pores, hindering vital biochemical processes including photosynthesis, respiration, and transpiration; and larger particulate can result in lacerations in plant tissues, thus jeopardizing the health of the plant (Farmer, 1993).

Invasive Species

The colonization of invasive species can result in detrimental impacts on wetland environments, including alterations to evapotranspiration rates, infilling from reduced decomposition rates, and ultimately a reduction in the complexity of the wetland and its subsequent species richness (Zedler & Kercher, 2004). The creation of roadways can act as a vector for invasive species, with the potential for seed dispersal increasing with both vehicular and animal traffic. Further, because many invasive species thrive in disturbed soils, routine maintenance of roadways can provide ideal conditions for their establishment (Trombulak & Frissell, 2000).

Compaction

Compaction can hinder both the vegetative and hydrological structure of a wetland, with a loss of pore space restricting root growth and groundwater infiltration (Duiker, 2004). This impacts the absorption of moisture and nutrients, thus impacting the ecological integrity of the wetland and the ecosystem services it provides. Further, compaction can decrease percolation rates, resulting in prolonged periods of saturation, and increasing the potential for flooding (Duiker, 2004).

The temporal and spatial extent of indirect effects such as erosion and sedimentation, dust, invasive species, and compaction can be far reaching, but are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes. Changes to wetland functionality can be assessed through long-term wetland monitoring to identify biological, hydrologic and physical shifts within a wetland.

Mitigation Measures

The following specific mitigative measures will be implemented to avoid and mitigate any potential effects on wetlands.

Habitat Loss

- Clearly mark wetlands to avoid interference with wetland habitat to the extent possible.
- Avoid impacts to wetlands to the extent possible.
 - Where wetland impacts are unavoidable, wetland alterations will be completed in accordance with the NSECC Wetland Conservation Policy (2019). The wetland alteration process will occur during the permitting stage, which includes a requirement to compensate for lost wetland habitat and functions.
 - Adhere to the terms and conditions of the wetland alteration approval.
 - For wetlands along collector lines, orient placement of structures in dry areas adjacent to wetlands thus allowing cables to span wetlands, to the extent possible.
 - If temporary access roads are required within wetlands, appropriate mitigations, including the use of geotextile matting (i.e., swamp mats), will be implemented to prevent disturbance.
 - Design wetland crossings to occur at the narrow portion of the wetland or the wetland's edges, to the extent possible.
 - Swamp mats will be used to limit impacts outside of the alteration area.

Indirect Habitat Loss

- Design wetland crossings to avoid permanent diversion, restriction or blockage of natural flow, such that hydrologic function of wetlands will be maintained.

Erosion and Sedimentation

- Develop a site-specific Erosion and Sediment Control Plan during the detailed design phase.
 - The plan will address the type of control structures, proper installation

techniques, grading, maintenance and inspection, timing of installation, and revegetation.

- Limit the area of exposed soil and the length of time soil is exposed without mitigation.
- Use the existing roads and access routes to the greatest extent feasible.
- Avoid travel through wetlands.
 - If travel through wetlands is required, use swamp mats and if possible, time work to occur during frozen ground conditions and/or travel through the drier portions of the wetland, where possible.
- Direct run-off from construction activities away from wetlands.
- Maintain existing vegetation cover, where possible.

Dust Deposition

- Use water or an approved dust suppressant to control dust on roads as required.
- Establish site speed limits to minimize dust generation.

Invasive Species

- Use quarried, crushed materials for road construction to reduce the introduction of invasive vascular plant species.
- Clean and inspect work vehicles prior to use to prevent the introduction of invasive/non-native species.

Compaction

- Require that wetland delineation tape is in place and visible to avoid unnecessary compaction within wetlands.
- Hold pre-construction site meetings to educate staff on the sensitivity of wetlands.
- Avoid travel through wetlands.
 - If travel through wetlands is required, use swamp mats and time work to occur during frozen ground conditions, or travel through the drier portions of the wetland, to the extent practicable.

Monitoring

A site-specific post-construction wetland monitoring plan will be developed to facilitate adaptive management and contribute to the safeguarding of ecological integrity and environmental stability. The plan will be provided to NSECC as part of the permitting process and will likely consist of detailed monitoring and general spot checks. Detailed monitoring typically includes vegetative, hydrological, and soil assessments within the wetland habitat adjacent to the infill site. Spot checks typically involve a general overview of vegetative, hydrological, and soil conditions, focusing on evidence of significant hydrologic alterations and sedimentation.

Conclusion

The predicted residual effects of the Project on wetlands are characterized in Table 9.19.

Table 9.19: Wetland Resources Residual Effects

	Habitat Loss	Changes in Wetland Function
Magnitude of Effect	Moderate: Direct loss of habitat, including that of WSS, but wetland area loss will not impact the hydrology of the watershed. Where WSS are impacted, adequate general SAR habitat is prevalent elsewhere within the RAA.	Low: Project activities have low potential for changes to wetland function with the implementation of mitigation measures.
Geographic Extent of Effect	Assessment Area	Assessment Area
Frequency of Effect	Single Event: Effects will occur once, during initial ground disturbance or vegetation clearing for the Project.	Single Event: Direct effects resulting from construction activities will occur once, and indirect effects to wetland function will be mitigated through the use of controls.
Duration of Effect	Medium Term: Residual effects will extend until wetlands are restored during decommissioning and/or compensated for following construction.	Medium Term: Residual effects may extend through the operation and maintenance phase of the Project.
Reversibility of Effect	Partially Reversible	Partially Reversible
Significance Level	Not Significant	Not Significant
<u>Effects Assessment Ratings (Refer to Table 4.4 for definitions)</u> Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible		

10.0 TERRESTRIAL ENVIRONMENT

10.1 Terrestrial Vegetation Communities and Flora

10.1.1 Overview

The vegetation community and flora assessment was completed using a combination of desktop and field studies to achieve the following objectives:

- Develop a preliminary understanding of the landscape features, vegetation communities, and flora species within and near the Study Area using desktop resources.
- Undertake field surveys to document the range of vegetation communities and flora present within and near the Assessment Area, with a focus on sensitive and/or uncommon communities and flora SAR and SOCI (and their supporting habitat).
- Use the information collected during field studies to iteratively update the Project design to avoid or minimize interactions between vegetation communities, flora SAR and SOCI, and Project components.

- Apply mitigation techniques including construction, and operational management practices to minimize the Project's effects on vegetation communities, flora, and their supporting habitat.

10.1.2 Regulatory Context

Several laws and regulations provide protection for vegetation communities and rare flora in Nova Scotia.

- *Species At Risk Act* (Canada, 2002)
- *Endangered Species Act* (Nova Scotia, 1998)
- *Biodiversity Act* (Nova Scotia, 2021)
- *Environment Act* (Nova Scotia, 1995b)

Species that are listed as 'Endangered' or 'Threatened' receive individual protection from harm and destruction under SARA and/or ESA, including protection of habitually occupied spaces.

For certain rare and sensitive lichen species, special management practices (SMPs) have been established to limit disturbance to individuals and their supporting habitat on Crown land, as outlined in the At-Risk Lichens—Special Management Practices (NSNR, 2018a). For example, limitations to the type and extent of land development are prescribed within protected and/or restricted zones around the occurrence of certain rare lichens. Additional regulations aim to protect important landscape features such as wetlands (described in Section 9.2) that support many plant and lichen SAR and SOCI in Nova Scotia.

The Silvicultural Guide for the Ecological Matrix (McGrath et al., 2021) and An Old-Growth Forest Policy for Nova Scotia (NSNR, 2022a) make recommendations on, and regulate forestry and forest management practices on provincial Crown land and advise BMPs for forests on private land. The publications provide direction for maintaining forest ecological integrity and identifying and preserving old-growth forests. Old-growth forest stands are defined in Nova Scotia as "area(s) where 20% or more of the basal area is in trees greater than or equal to the reference age for that forest (ecosystem classification vegetation) type" (NSNR, 2022a). The Old-Growth Forest Policy requires no net loss of old-growth forests on Crown land and stipulates development limitations within 100 m of confirmed old-growth stands.

Finally, the *Environment Act* (Nova Scotia, 1995b) supports and promotes the protection, enhancement, and use of the provincial environment while maintaining ecosystem integrity and sustainable development. The *Biodiversity Act* (Nova Scotia, 2021) provides for the stewardship, conservation, sustainable use, and governance of biodiversity of Nova Scotia.

10.1.3 Desktop Review

Several databases were referenced as part of the desktop review to provide an initial understanding of the landscape characteristics, vegetation communities, and flora species present within and near the Study Area. The following references were included in the desktop review:

- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- Provincial Landscape Viewer (NSNR, 2024e)
- Nova Scotia Forest Inventory (NSNR, 2021g)
- WAM Database (NSECC, 2022b)
- Canopy Height Model (GeoNOVA, 2024a)
- Old-Growth Policy Layer (NSNR, 2024d)
- Old-Growth Potential Index (NSNR, 2025)
- ACCDC Data Report (ACCDC, 2025a)
- Boreal Felt Lichen Habitat Layer (NSNR, 2012)
- MTRI Vole Ears (*Erioderma mollissimum*) and extant boreal felt lichen (*Erioderma pedicellatum*) GIS databases (MTRI, 2019a, 2019b)
- SARA Critical Habitat Layers (ECCC, 2025d)

Landscape Characteristics

The Study Area falls within the Northumberland/Bras D'Or and the Nova Scotia Uplands Ecoregions (Drawing 7.1). The Northumberland/Bras D'Or Ecoregion (northern and eastern portions of the Study Area) covers 15.2% of the province, including all lands north of the Cobequid Hills on mainland Nova Scotia. Much of the ecoregion is at low elevation (25 to 50 masl) with rolling topography also present in some areas. Wetlands are abundant in this ecoregion due to level terrain. The Nova Scotia Uplands Ecoregions (majority of the Study Area) covers 19.8% of the province and is characterized by summits and plateaus, an abundance of rivers and streams, and uneven-aged forests exhibiting old-growth characteristics (Neily et al., 2017).

The majority of the Study Area lies within the Mulgrave Plateau Ecodistrict (360) (Neily et al., 2017) (Drawing 7.1), which is the most easterly physiographic feature in mainland Nova Scotia. Non-coastal areas in the ecodistrict are characterized by relatively level to hummocky, imperfectly drained soils, with the eastern portion generally much wetter than the west. This ecodistrict contains a variety of forest types, including red spruce (*Picea rubens*) and eastern hemlock (*Tsuga canadensis*) dominated riparian zones, mixed wood forests growing in deep, rich soils, and open woodlands occurring on shallow soils. There are also many large, treeless wetlands. Forested areas on imperfectly drained soils are likely within the Spruce Pine Forest Group, and are subject to frequent disturbance from wind, fire, and senescence which limits the potential for the development of old-growth conditions. Tolerant hardwood forests, however, experience gap dynamics and are more likely to become uneven-aged stands with old-growth forest characteristics.

The northern and eastern-most portions of the Study Area lie within the St. George's Bay Ecodistrict (520), which extends inland to the Mulgrave Plateau Ecodistrict from the shoreline of St. George's Bay (Neily et al., 2017). Elevations are between 30 to 60 masl and increase with distance from the coast. Soils are dominated by moderately and imperfectly drained loams. The presence of gypsum bedrock in some areas results in unique overlying vegetation communities. Approximately 60% of the landscape is composed of a matrix forest of tolerant hardwoods (Tolerant Hardwood Forest Group). Other significant forests include yellow birch-

dominated mixed woods (middle and lower slopes), and large patches of black spruce on nutrient poor sites. Natural stand-level disturbance is rare in this ecodistrict; however, the area has an extensive history of agriculture and forestry.

Vegetation Communities

Various sources of geospatial data were used in the desktop assessment of vegetation communities to understand the abundance and distribution of major land cover types (vegetation communities and disturbed areas) within the Study Area. A land cover classification was developed for the Project by reclassifying and combining data from the Nova Scotia Forest Inventory (NSNR, 2021g), WAM Database (NSECC, 2022b), and Canopy Height Model (GeoNOVA, 2024a). The resulting layer was reviewed for accuracy against high-resolution aerial imagery (dated July 2022) and depicts polygons of generalized land cover types (Drawing 10.1A to 10.1K). While the land cover classification provides a useful general picture of land cover types, the accuracy of the model is limited by the geospatial data used as inputs. For example, field studies found extensive evidence of forest harvesting and silvicultural treatments that do not appear to be fully represented, which may result in an underestimation of the extent of cutovers and disturbed areas. The extent of each land cover type within the Study Area is provided in Table 10.1.

Table 10.1: Predicted Land Cover Types within the Study Area

Land Cover Type	Study Area	
	ha	%
Cutover upland	137.9	2.8
Cutover wetland	14.7	0.3
Hardwood forest	610.1	12.3
Hardwood wet forest	51.3	1.0
Mixedwood forest	1,168.3	23.5
Mixedwood wet forest	165.9	3.3
Open area	358.3	7.2
Open wetland	314.9	6.3
Shrub/alders	41.2	0.8
Softwood forest	1,563.3	31.5
Softwood wet forest	378.5	7.6
Urban/developed	114.8	2.3
Water	42.2	0.9
Total	4,961.4	100.0

Source: Landcover type predictions derived from the provincial WAM Database (NSECC, 2022b), Canopy Height (GeoNOVA, 2024a), and Forest Inventory Data (NSNR, 2021g).

The land cover classification indicates that softwood (31.5%) and mixedwood (23.5%) forests are the dominant forest cover types within the Study Area. Open areas, which include barrens, old field/agricultural land, and disturbed open areas, are the most common cover type

associated with disturbed areas (7.2%). A review of open areas against satellite imagery indicates that many polygons in this land cover class consist of cutovers, forestry trails, and roads.

Old-Growth Assessments

Old-growth forest stands hold high ecological and cultural value and are known to support high levels of biodiversity (NSNR, 2022a). The Old-Growth Policy layer (NSNR, 2024d) and Old-Growth Potential Index (OGPI) layer provided by NSNR (2025) were reviewed to identify protected forest stands and areas with elevated potential for old-growth forests within the Study Area. The Old-Growth Forest Policy layer is a database of stands protected under the Old-Growth Forest Policy (NSNR, 2022a), whereas the OGPI is a desktop tool intended to guide forest management and land use decisions. The OGPI ranks forest stands from 0 to 11 based on their height in comparison to stands with the same tree cover and ecological site conditions. Stands ranking seven or higher are included in the resulting layer due to their elevated potential to be old-growth.

The Study Area intersects with one forest stand protected under the Old-Growth Forest Policy. The forest stand spans an existing road that is also part of the Assessment Area. The OGPI layer was reviewed to identify polygons with an old-growth potential rank ≥ 7 that overlap the Assessment Area on Crown land. The forest stands associated with these polygons were selected for field assessments as described in Section 10.1.4.

Flora Species

The ACCDC data report (2025a) includes records of 20 flora SAR and SOCI within approximately 5 km of the Study Area boundary (10 vascular plant and 10 lichen species), including occurrence records of one vascular plant and two lichen SAR (Drawing 10.2):

- Black ash (*Fraxinus nigra*) - COSEWIC and ESA 'Threatened', S1S2
- Frosted glass whiskers (Atlantic population) (*Sclerophora peronella*) - COSEWIC 'Threatened', SARA 'Special Concern', S3S4
- Blue felt lichen (*Peltigera collina*) – COSEWIC and SARA 'Special Concern', ESA 'Vulnerable', S3

Black ash is a location sensitive species in Nova Scotia, and confirmation that ACCDC occurrence records and associated core habitat are located outside of the Study Area was provided by NSNR (SAR Biologist S. Spencer, January 14, 2025).

Of the flora SAR and SOCI identified in the ACCDC data report, records of one flora SAR (blue felt lichen; three occurrences) and 12 flora SOCI are within a 5 km buffer of the Study Area, and records of seven flora SOCI are in the Assessment Area (Table 10.2). The complete ACCDC data report for the Project, which includes species records within 100 km of the Study Area, is provided in Appendix H.

Table 10.2: ACCDC Flora SAR and SOCI in the Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Record in Assessment Area?
Vascular Plants						
American Beech	<i>Fagus grandifolia</i>	-	-	-	S3S4	Yes
Downy Rattlesnake-plantain	<i>Goodyera pubescens</i>	-	-	-	S2S3	Yes
Downy Willowherb	<i>Epilobium densum</i>	-	-	-	S3	Yes
Rosy Sedge	<i>Carex rosea</i>	-	-	-	S3	No
Running Serviceberry	<i>Amelanchier spicata</i>	-	-	-	S3S4	Yes
Small Round-leaved Orchid	<i>Platanthera orbiculata</i>	-	-	-	S3S4	No
Lichens						
Appressed Jellyskin Lichen	<i>Scytinium subtile</i>	-	-	-	S3S4	No
Blue Felt Lichen	<i>Pectenia plumbea</i>	Special Concern	Special Concern	Vulnerable	S3	No
Granular Soil Foam Lichen	<i>Stereocaulon condensatum</i>	-	-	-	S2S3	No
Naked Kidney Lichen	<i>Nephroma bellum</i>	-	-	-	S3	Yes
Powdered Fringe Lichen	<i>Heterodermia speciosa</i>	-	-	-	S3S4	Yes
Shaggy Fringed Lichen	<i>Anaptychia palmulata</i>	-	-	-	S3S4	Yes
Tree Pelt Lichen	<i>Peltigera collina</i>	-	-	-	S3	No

Source: ACCDC (2025a)

In addition to the ACCDC data report, several geospatial resources were reviewed to assess the potential for encountering rare lichens within and near the Assessment Area. Following the direction of the At-risk Lichens - Special Management Practices (NSNR, 2018a), a boreal felt lichen (Atlantic population; SARA and ESA 'Endangered', S1) potential habitat layer provided by NSNR (2012) was reviewed for areas within 100 m of the Assessment Area identified as having high potential for boreal felt lichen occurrence. The habitat layer was derived from a geospatial model developed by Cameron and Neily (2008) that considers known boreal felt lichen occurrences alongside the species' habitat preferences [e.g., occurrence on balsam fir trees within or adjacent to peatlands that are in close proximity (< 30 km) to the Atlantic Ocean]. Boreal felt lichen potential habitat features identified through this review were used to

inform the approach for rare lichen surveys. No records of known boreal felt or vole ears lichen (SARA and ESA 'Endangered', S1) occurrences were identified in the rare lichen databases maintained by the Mersey Tobeatic Research Institute (2019a, 2019b) within 5 km of the Study Area.

Finally, a review of Atlantic Coastal Plains Flora SMP buffers (NSNR, 2024e) and federal critical habitat layers for flora SAR (ECCC, 2025d) revealed no records within 5 km of the Study Area. Likewise, no features records associated with "Significant Areas" (which may include karst terrain and cliffs, features that are known to support rare flora species and unique vegetation communities in Nova Scotia) were identified within 5 km of the Study Area in the NSNR Significant Species and Habitat Database (NSNR, 2024f).

10.1.4 Field Assessment

10.1.4.1 *Field Assessment Methodology*

The findings of the desktop review were used to guide the field survey design, ensuring that all land cover types, including those affected by anthropogenic disturbance, were assessed.

Vegetation Community Classification

Information about the terrestrial vegetation communities present in the Study Area was collected during vascular flora and lichen surveys in 2024 and 2025. Vegetation communities were classified according to the Forest Ecosystem Classification (FEC) for Nova Scotia (Neily et al., 2023). Observations of the following were recorded if encountered:

- Landscape features such as watercourses, wetlands, and caves/mine shafts
- Forest stands noted as having potential to be old-growth
- Vegetation communities known to serve as habitat for rare flora or that provide important lifecycle functions for moose, birds, bats, and insects

Old-Growth Assessments

Old-growth forest assessments were completed in June and October 2025 in 12 forest stands [based on Nova Scotia Forest Inventory polygons (2021g)] identified in the desktop review as occurring on Crown land, intersecting the Assessment Area, and having an OGPI ≥ 7 (NSNR, 2025). Field biologists with demonstrated experience conducting old-growth forest assessments travelled to pre-determined, semi-random sample plots within each stand to conduct a rapid assessment for old-growth conditions. Rapid assessments included confirming the presence of long-lived intermediate-tolerant (LIT) or late-successional (LT) tree species (an attribute of old-growth forests) and collecting evidence of human or natural disturbances resulting in drastically altered stand composition (e.g., harvesting and blowdown; indicating that the stand is not old-growth).

Where a rapid assessment was inconclusive or indicated potential for old-growth conditions, Part 1 of the old-growth scoring procedure was employed, as defined by NSNR (2024g). At each plot, a tree core was collected from one LIT/LT tree representative of the top 20% basal area for the plot and characteristic of the identified FEC vegetation type. In plots where

blowdown or harvesting prevented the collection of a core, multiple cores were collected from another pre-determined plot in the stand. Collected tree cores were processed and analyzed to determine the ages of the sampled trees and determine if stands met the criteria for old-growth status.

Flora Surveys

Vascular flora surveys were completed in 2024 (July and September) and 2025 (June, July, and October) in a range of habitats including wetlands, clear-cuts, riparian areas, mature forest stands, and regenerating softwood stands. Most survey effort was concentrated within the Assessment Area; however, surveys also took place in areas near the Assessment Area that were part of earlier Project layouts. Surveys focused on describing the general diversity of vascular plant species, and on documenting the presence and abundance of vascular flora SAR and SOCI. An intelligent, random meander search pattern was used, which is an accepted method for detecting presence of plant species, including rare flora. All major land cover types were surveyed, with search effort concentrated in areas expected to provide suitable habitat for flora SAR and SOCI.

During surveys, vascular flora species were identified and tabulated on an overall species inventory. Occurrences of flora SAR and SOCI were georeferenced, counted (when possible), photographed, and a description of their habitat was recorded. If an unknown species was encountered, surveyors took photos and samples (when appropriate) to verify identification with guidebooks and/or experts as required. In addition to the prior knowledge of the surveyors, keys and descriptions from various print and electronic resources were used to assist with identification. Non-vascular flora (primarily mosses) were recorded incidentally during flora surveys, and incidental observations of flora SAR and SOCI were recorded during other biophysical surveys (e.g., wetland determinations, fauna surveys), if observed.

Lichen surveys were completed in 2023, 2024, 2025, and 2026. Surveys targeted areas of suitable habitat for lichen SAR and SOCI within and near the Assessment Area, including potential boreal felt lichen habitat polygons (NSNR, 2012) up to 100 m from Assessment Area.

Meandering transects were completed on foot and targeted mature trees appropriate for hosting lichen SAR or SOCI. Host trees were visually inspected, focusing on tree trunks, branches, and twigs. Upon encountering a lichen SAR or SOCI, specimens were georeferenced, counted (when possible), photographed, and a description of their habitat was recorded. If a lichen specimen could not be readily identified, photos and/or specimens were collected and identified in laboratory conditions via microscopy and standard chemical spot tests [in accordance with Brodo et al. (2001)] and a variety of literature resources. Specimens were only collected for ex-situ identification if they were abundant on the site (i.e., specimens were not collected if less than three individuals were observed).

While the majority of the Assessment Area has been surveyed for vascular flora and lichens, a portion will require additional field assessment during the growing season as noted in Section 4.1.

10.1.4.2 Field Assessment Results

Vegetation Community Classification

As predicted by the desktop landcover model, the Study Area was observed to be comprised of a range of forest types, wetlands, and disturbed areas. Several vegetation communities were encountered in the Study Area during field surveys in 2024 and 2025, with most belonging to the tolerant hardwood (TH) and wet forest groups (Table 10.3). Vegetation communities within the intolerant hardwood (IH), oldfield (OF), mixedwood (MW), floodplain (FP), and spruce hemlock (SH) forest groups were also observed. Representative points for vegetation communities are shown in Drawing 10.1A to 10.1K.

Table 10.3: Vegetation Communities Observed in Study Area

Community Type	Forest Group	Vegetation Community
Upland Forest Group	FP	FP1 (Sugar maple - White ash / Ostrich fern - Wood goldenrod)
	IH	IH6 (White birch – Red maple / Sarsaparilla – Bracken)
	MW	MW4 (Hemlock - Red maple / Wood fern - Starflower)
		MW7 (Balsam fir - Red maple / Wood-sorrel - Goldthread)
		MW8 (White birch – Balsam fir / Starflower)
	OF	OF1 (White spruce / Aster - goldenrod / Shaggy moss)
	SH	SH5b (Red spruce - Balsam fir / Schreber's moss - Stair-step moss), Balsam fir variant
	TH	TH1 (Sugar maple / Wood fern - Hay-scented fern)
		TH2 (Sugar maple / New York fern - Northern beech fern)
		TH2a (Sugar maple / New York fern - Northern beech fern), Yellow birch variant
		TH3 (Sugar maple - White ash / Christmas fern)
		TH7 (Yellow birch – White birch / Evergreen wood fern)
		TH8 (Red maple - Yellow birch / Striped maple)
		TH9 (Red maple – Sugar maple / Hay-scented fern – Evergreen wood fern)
Wetland Forest Group	Wet Coniferous (WC)	WC1 (Black spruce / Cinnamon fern / Sphagnum)
		WC6 (Balsam fir / Cinnamon fern - Three seeded sedge / Sphagnum)
	Wet Deciduous (WD)	WD1 (White ash / Sensitive fern - Lady fern)

Community Type	Forest Group	Vegetation Community
		WD3 (Red maple / Sensitive fern - Lady fern / Sphagnum)
		WD2 (Red maple / Cinnamon fern / Sphagnum)
	Wet Mixedwood (WM)	WM1 (Red maple - Balsam fir / Wood aster / Sphagnum)
		WM4 (White spruce – Yellow birch / Cinnamon fern – Dwarf raspberry)
Anthropogenic	-	Cutover
		Plantation
		Regeneration (Mixedwood, Hardwood, Softwood, or Unspecified)
		Utility Corridor

Historic and ongoing forestry operations, as well as past agricultural land use, have resulted in modifications to natural conditions within the Study Area. For example, current forest habitat includes stands that have been subject to various timber harvesting treatments and other silvicultural interventions. Within the Assessment Area, disturbed areas are largely composed of young regenerating forest stands, roadside brush, and cutovers (including overgrown forestry trails). Extensive areas of blowdown were also noted during field assessments.

The forest groups identified within the Study Area are described in detail within the following subsections.

Upland Vegetation Communities

Floodplain Forest Group

The FP forest group occurs on riparian floodplains that are enriched by alluvial sediments. Canopies are usually dominated by hardwood species [sugar maple (*Acer saccharinum*), red maple, red oak (*Quercus rubra*), white ash (*Fraxinus americana*), ironwood (*Ostrya virginiana*), balsam poplar (*Populus balsamifera*), black cherry (*Prunus serotina*), and white spruce] and understories are characterized by high species richness. FP forests offer a diverse range of microhabitats for wildlife and have high biodiversity value; plant species diversity in these forests is the highest of all forest groups in Nova Scotia (Neily et al., 2023).

Intolerant Hardwood Forest Group

The IH forest group occurs across a range of moisture and nutrient regimes and includes early- to mid-successional hardwood vegetation types. Forest stands in the IH group typically have closed canopies, with tree species primarily consisting of shade intolerant to intermediate hardwoods (e.g., red maple, white birch, grey birch, and aspens). The shrub and herbaceous layers in IH forests can be well-developed, whereas lichen and bryophyte cover is generally low (Neily et al., 2023). Regenerating IH stands are a source browse for terrestrial fauna species (e.g., moose, deer, snowshoe hare, and mature IH stands provide habitat for several species of avifauna (Neily et al., 2023).

Mixedwood Forest Group

The MW forest group is a diverse group of closed canopy forests that include early to late successional vegetation types. Early successional forests often include red maple (*Acer rubrum*), white and gray birch (*Betula papyrifera* and *Betula populifolia*), aspen(s), and/or balsam fir. Overstory structure, soil attributes, and disturbance influence the formation of the shrub and herbaceous layer, which is often well developed in areas of deciduous tree cover. Although few fauna are exclusive to mixedwood forests, their diverse structure and composition creates a range of habitat features for wildlife (Neily et al., 2023).

Oldfield Forest Group

The OF forest group consists of early successional forests originating from abandoned farmland where land was cleared to create pastures for farmstock. Past cultivation has removed most microtopography from these sites. These forests are typically dominated by even-aged softwood species and develop dense overstory canopies with little understory cover. Common species found throughout this group include white spruce, tamarack (*Larix laricina*), Eastern white pine (*Pinus strobus*), or balsam fir. Forests are short-lived and often succumb to insects and disease (Neily et al., 2023).

Spruce Hemlock Forest Group

The SH forest group is widespread throughout Nova Scotia and consists of mid to late successional vegetation types. The canopies of this group are dominated by shade tolerant softwoods such as balsam fir, red spruce (*Picea rubens*), and eastern hemlock (*Tsuga canadensis*). The shrub layer often consists of regenerating conifers and soils are often derived from glacial till. The SH group provides habitat for a diverse community of birds and mammals (Neily et al., 2023).

Tolerant Hardwood Forest Group

The TH forest group is classified as a mid to late successional hardwood vegetation group. It is generally composed of a closed canopy dominated by sugar maple, beech, yellow birch, and red maple, with balsam fir as a significant understory species. The shrub layer in TH groups can be extensive and will show high diversity and abundance of ferns. Most TH sites contain soils ranging from fresh to moist. Rare plants are often associated with the TH forest group due to the presence of fertile soils (Neily et al., 2023).

Wetland Vegetation Communities

Wet Coniferous Forest Group

The WC forest group has partial to closed canopies dominated by softwood species, and well-developed understories composed of ericaceous shrubs (e.g., mountain holly, winterberry). Sphagnum moss is generally abundant, and herbaceous species include cinnamon fern (*Osmundastrum cinnamomeum*), creeping snowberry (*Gaultheria hispidula*), and sedges. In addition to serving important landscape functions (e.g., carbon and water storage, nutrient cycling), forests in the wet coniferous group provide habitat for many flora and fauna species, including rare lichens, moose, and birds (Neily et al., 2023).

Wet Deciduous

Forests within the WD forest group have water at or near the ground surface throughout most of the growing season, and partly open to closed canopies that are often dominated by red maple. Nutrient availability is moderate to high, with white ash present in areas of elevated soil richness. Natural disturbance within this group can arise from fluctuating water levels, windthrow, and insects and disease. Wet deciduous forests provide habitat for many wildlife species, including wood turtle, moose, lichens, and various avifauna (Neily et al., 2023).

Wet Mixedwood Forest Group

The WM forest group occurs in areas where water is present at or near the ground surface during most of the growing season. Canopies are partly open to closed, and dominated by red maple, spruce and balsam fir, with the presence of white ash increasing alongside nutrient availability. The shrub layer generally contains regenerating tree species, winterberry (*Ilex verticillata*), mountain holly (*Ilex mucronata*), and speckled alder (*Alnus incana*) (Neily et al., 2023). Several uncommon flora and bird species, as well as a variety of amphibians, find suitable habitat conditions within this forest group (Neily et al., 2023).

Anthropogenic

The vegetation community classification guides used during field assessments focus on “natural” communities and do not describe human-disturbed landscapes, as they are often dynamic and unpredictable. Several cutover areas and regenerating softwood and mixedwood forest stands were observed throughout the Study Area and Assessment Area. Observations recorded by surveyors suggest that the extent of field-observed disturbance is greater than reflected in the land cover model developed in the desktop review.

Summary of Vegetation Types

The Study Area consists of vegetation types within the FP, IH, MW, OF, SH, TH, WC, WD, and WM forest groups. The vegetative communities identified within the Study Area are common in the surrounding landscape and the province. Vegetation types TH1, TH1b, TH2, WM1, and FP1 are known to support rare plants due to fertile soils and saturated conditions. Evidence of past forestry activity was observed across the Study Area and Assessment Area, and several of the vegetation community points captured the presence of cutovers and early-successional forests that clearly followed human disturbance. The vegetation types identified during community assessments informed field surveys for rare vascular plant and lichen species.

Old-Growth Assessments

Of the 12 stands selected for field assessments, two were identified during rapid assessment as being ineligible for old-growth status due to most or all the stand's plots being classified as early- to mid-successional vegetation types (Mapstand IDs C020-03422 and C020-02413) (Table 10.4 and Appendix K). According to guidance provided by NSNR (2024g), at least 30% of a stand's assessed plots must be of an eligible vegetation type. The remaining 10 forest stands were assessed using old-growth scoring procedures. Four of the assessed forest stands meet the criteria for old-growth status (Mapstand IDs C020-02740, C020-02731, C020-03411, and C020-03422; Table 10.4 and Drawing 10.3A to 10.3H). Canopies within these stands are predominantly tolerant hardwood with an abundance of yellow birch, red maple, and sugar maple.

Table 10.4: Results of Old-Growth Forest Assessments

Mapstand ID	Stand Size (ha)	Potential Old-Growth Rank	Plot #	Species Cored ⁽¹⁾	DBH ⁽²⁾ (cm)	Height (m)	Age (years)	NS FEC VT ⁽³⁾	Old-Growth Reference Age (years)	Avg. Age Cored Trees (years)	Old-Growth Status
B020-01515	4.9	9	1	SM	42.1	15.75	149	TH1	140	136.7	Not old-growth
			2	SM	45.1	18.5	146	TH1			
			3	SM	33.7	18.75	115	TH1			
B020-01629	7.9	9	1	RM	39.3	18.5	101	WD2*	140	109.6	Not old-growth
			2	WA	34.6	18	107	WD1*			
			3	YB	34.3	19	133	TH1a			
			4	RM	29.9	16	112	IH6*			
			5	RM	27.5	14	95	IH6*			
B020-01635	8.0	9	1	YB	23	18.5	119	TH8	140	110.6	Not old-growth
			2	YB	27.7	18	119	TH8			
			3	YB	32.2	17.5	112	TH8			
			4	YB	29.9	18.5	101	TH1a			
			5	YB	27.3	19	102	TH1a			
C020-02413	13.3	8	1	-	-	-	-	IH6*	-	-	Ineligible for old-growth status
			2	-	-	-	-	TH8			
			3	-	-	-	-	TH8a			
			4	-	-	-	-	MW7*			
			5	-	-	-	-	MW8*			
			6	-	-	-	-	MW8*			
			7	-	-	-	-	MW7*			
C020-02731	5.0	9	1	RM	31.8	15	72	TH9	140	153.0	Old-growth
			2	YB	42.4	14	192	TH1a			

Mapstand ID	Stand Size (ha)	Potential Old-Growth Rank	Plot #	Species Cored ⁽¹⁾	DBH ⁽²⁾ (cm)	Height (m)	Age (years)	NS FEC VT ⁽³⁾	Old-Growth Reference Age (years)	Avg. Age Cored Trees (years)	Old-Growth Status
			3	YB	33.8	16.5	176	TH8			
			4	YB	38.4	21.5	190	TH1a			
			5	SM	39.6	17	135	TH1			
C020-02740	7.3	9	1	SM	49.4	20.5	182	TH1	140	180.6	Old-growth
			2	YB	58.1	18	191	TH1a			
			3	YB	51.9	21	173	TH1a			
			4	SM	52.6	22.5	192	TH9			
			5	YB	53.7	22	165	TH1a			
C020-02770	16.3	9	1	SM	49.6	21	107	TH1	140	118.8	Not old-growth
			2	SM	43.6	19	143	TH2			
			3	SM	39.6	19	138	TH1			
			4	SM	36.4	18.5	142	TH9			
			5	YB	37.6	21	149	TH1a			
			6	RM	41.1	17	83	TH8			
			7	RM	25.3	18.5	60	TH8			
			8	YB	54.7	19.5	128	TH1a			
C020-02793	5.6	8	2	SM	28.1	16	77	TH9	140	83.7	Not old-growth
			2	RM	27.1	13	89	TH9			
			3	RM	37.3	17	85	TH8			
C020-03342	4.9	8	1	-	-	-	-	MW7*	-	-	Ineligible for old-growth status
			2	-	-	-	-	MW7*			
			3	-	-	-	-	MW7*			

Mapstand ID	Stand Size (ha)	Potential Old-Growth Rank	Plot #	Species Cored ⁽¹⁾	DBH ⁽²⁾ (cm)	Height (m)	Age (years)	NS FEC VT ⁽³⁾	Old-Growth Reference Age (years)	Avg. Age Cored Trees (years)	Old-Growth Status
C020-03411	7.7	11	1	YB	37.8	17	130	TH1a	140	149.2	Old-growth
			2	YB	49.2	18	179	TH1a			
			3	YB	38.6	18.5	148	TH1a			
			4	YB	40	19.5	151	TH1a			
			5	YB	44.4	17.5	138	TH1a			
C020-03422	7.9	9	3	YB	31	17.5	126	TH1a	115	120.0	Old-growth
			3	YB	31.7	16	143	TH1a			
			3	YB	31.4	17	134	TH1a			
			4	RM	28.2	15	72	WD3			
			5	YB	29.5	12.5	125	TH8			
C020-03423	13.0	7	1	BF	26.9	13.5	60	MW8*	140	97.6	Not old-growth
			3	YB	33.3	13	190	WM4*			
			4	YB	40.8	14.5	117	TH2a			
			5	YB	20.5	14	63	TH8			
			5	YB	20.5	14	58	TH8			

⁽¹⁾ BF = balsam fir; RM = red maple; SM = sugar maple; WA = white ash; YB = yellow birch

⁽²⁾ DBH = Diameter at Breast Height

⁽³⁾ VT = Vegetation Type

* VT is not eligible for old-growth status

Flora Surveys

A total of 619 species were recorded during flora surveys spanning 2023 to 2026, including 439 vascular plant species and 180 species of non-vascular flora (bryophytes, fungi, and lichens). A complete list of flora identified during field surveys (including incidental observations) is provided in Appendix L.

One vascular flora SAR, black ash (ESA 'Threatened', S1S2), was observed in the Study Area (eight occurrences) and Assessment Area (two occurrences) (Table 10.5). Occurrences of nine additional vascular flora SOCI were observed in the Study Area, five of which are present in the Assessment Area. Four lichen SAR, blue felt lichen (SARA 'Special Concern' and ESA 'Vulnerable', S3), Eastern waterfan (SARA and ESA 'Threatened', S1), frosted glass-whiskers (SARA 'Special Concern', S3S4), and wrinkled shingle lichen (SARA and ESA 'Threatened', S2S3) were observed in the Study Area, with blue felt lichen and eastern waterfan also occurring in the Assessment Area. An additional 12 lichen SOCI were observed in the Study Area, four of which are present in the Assessment Area.

Table 10.5: Flora SAR and SOCI Observed in the Study Area and Assessment Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Number of Occurrences in Study Area	Number of Occurrences in Assessment Area
Plants (Vascular)							
American beech	<i>Fagus grandifolia</i>	-	-	-	S3S4	N/A ⁽¹⁾	N/A ⁽¹⁾
Black ash	<i>Fraxinus nigra</i>	Threatened	---	Threatened	S1S2	8	2
Downy Rattlesnake-Plantain	<i>Platanthera grandiflora</i>	-	-	-	S2S3	1	1
Large Purple Fringed Orchid	<i>Platanthera grandiflora</i>	-	-	-	S3	15	10
Lesser pyrola	<i>Pyrola minor</i>	-	-	-	S3	2	2
Rosy Sedge	<i>Carex rosea</i>	-	-	-	S3	1	0
Small Round-leaved Orchid	<i>Platanthera orbiculata</i>	-	-	-	S3S4	1	0
Southern Twayblade	<i>Neottia bifolia</i>	-	-	-	S3	11	5
White Elm	<i>Ulmus americana</i>	-	-	-	S3S4	1	0
Yellow Lady's-slipper	<i>Cypripedium parviflorum</i>	-	-	-	S3	1	0
Lichens (Non-vascular)							
A Lichen	<i>Fuscopannaria sorediata</i>	-	-	-	S2S3	1	0
Acadian Jellyskin Lichen	<i>Leptogium acadiense</i>	-	-	-	S3S4	1	1

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Number of Occurrences in Study Area	Number of Occurrences in Assessment Area
Appalachian Speckleback Lichen	<i>Punctelia appalachensis</i>	-	-	-	S3	1	0
Appressed Jellyskin Lichen	<i>Scytinium subtile</i>	-	-	-	S3S4	1	0
Blue felt lichen	<i>Pectenien plumbea</i>	Special Concern	Special Concern	Vulnerable	S3	26	7
Eastern Waterfan	<i>Peltigera hydrothyria</i>	Threatened	Threatened	Threatened	S1	1	1
Frosted Glass-whiskers Lichen	<i>Sclerophora peronella</i>	Special Concern	Special Concern	-	S3S4	5	1
Granular Soil Foam Lichen	<i>Stereocaulon condensatum</i>	-	-	-	S2S3	1	0
Naked Kidney Lichen	<i>Nephroma bellum</i>	-	-	-	S3	1	1
Powdered Fringe Lichen	<i>Heterodermia speciosa</i>	-	-	-	S3S4	3	2
Roughened Shingle Lichen	<i>Fuscopannaria ahlneri</i>	-	-	-	S3	3	0
Shaggy Fringed Lichen	<i>Anaptychia palmulata</i>	-	-	-	S3S4	6	3
Tree Pelt Lichen	<i>Peltigera collina</i>	-	-	-	S3	23	9
White-rimmed Shingle Lichen	<i>Fuscopannaria leucosticta</i>	-	-	-	S3	1	0
Wrinkled Shingle Lichen	<i>Pannaria lurida</i>	Threatened	Threatened	Threatened	S2S3	2	0

Source: ACCDC (2025c)

(1) As the species is relatively widespread throughout the Study Area, each observation was not recorded.

There were 85 non-native flora species (14% of all identified) recorded during field surveys (Appendix L). Of these, five are considered to be invasive species in Nova Scotia (MTRI, 2022):

- Glossy buckthorn (*Frangula alnus*)
- Japanese knotweed (*Reynoutria japonica*)
- Purple loosestrife (*Lynthrum salicaria*)
- Reed canary grass (*Phalaris arundinacea*)
- Scotch pine (*Pinus sylvestris*)

The results of flora surveys (Drawing 10.4A to 10.4L) have been incorporated into the design phase of the Project. Protection of flora SAR and SOCI will continue to be employed throughout operation and decommissioning phases through targeted mitigation and BMPs.

Priority Species

The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a) was used to identify priority species and habitat associated with this Project. All terrestrial flora SAR and SOCI and their respective habitat associations identified within the Study Area through desktop review and field inventory were initially considered. Only those terrestrial flora SAR and SOCI, and their respective habitats with potential to interact with the Project have been designated as Project-specific priority species. Project interactions may include removal or disturbance of a SAR or SOCI and/or their associated habitat.

These priority species include the following SAR identified within the Assessment Area (Table 10.5):

- Black ash
- Blue felt lichen
- Eastern waterfan
- Frosted glass-whiskers

As well as the following SOCI (Table 10.5):

- American beech
- Downy rattlesnake-plantain
- Large purple fringed orchid
- Lesser pyrola
- Southern twayblade
- Acadian jellyskin lichen
- Naked kidney lichen
- Powdered fringe lichen
- Shaggy fringed lichen
- Tree pelt lichen

American Beech

American beech (S3S4) was once a common tree species in Nova Scotia; however, over the past century the health of American beech trees has been affected by beech bark disease. Beech bark disease has reduced the potential for the species to mature into an overstory tree, and its ecological role has thus shifted to that of an understory or intermediate species (NSNR, 2021d). American beech were observed throughout the Study Area, suggesting that the species is not likely habitat-limited in this area. Many of the American beech trees observed were in poor health and/or showed signs of beech bark disease (e.g., cankers, bark damage).

Black Ash

Black ash (ESA 'Threatened', S1S2) is a slow-growing, broadleaf deciduous tree found primarily in moist habitats, including riparian areas adjacent to watercourses and within wetlands that have poorly drained peat or muck soils. The species is tolerant of short-term seasonal or annual hydrological fluctuations, and its habitat represents a specific, narrow niche where individuals will not be out-competed by either more flood-tolerant species [e.g., alders (*Alnus* spp.)] or upland species (e.g., red maple) (COSEWIC, 2018a; Tardif & Bergeron, 1992, 1999). Habitat requirements for black ash are thus defined by a stable hydrological regime averaged over years that provides adequate soil moisture and conditions where competition is limited. A key threat to this species is habitat loss and the alteration of wet habitats resulting in hydrological changes. Research and data show that the decline in black ash in Nova Scotia can be partially attributed to habitat destruction, disease, and changing environmental conditions (COSEWIC, 2018a; NSNR, 2015; Zinck, 1998). The arrival of the invasive emerald ash borer beetle in Nova Scotia poses a significant threat to the species (CFIA, 2025; NSNR, 2015).

Black ash was designated as 'Threatened' under ESA in 2013 (Nova Scotia, 2017), which grants individual protection to black ash trees from harm or destruction. The criteria to identify core habitat for the species has been described and has been mapped for known occurrences of black ash (NSNR, 2021b). No areas of core habitat have been designated (granted legal protection) through legislation within the Study Area. Eight black ash occurrences were observed during field surveys in the Study Area, two of which are in the Assessment Area (three suckering stems and one moderately sized individual).

Downy Rattlesnake-plantain

Downy rattlesnake-plantain (S2S3) is an evergreen orchid that occurs in dry wooded areas throughout eastern Canada and the United States. Individuals are up to 60 cm tall with white to greenish-white flowers and leaves with distinct white markings (Missouri Botanical Garden, n.d.). One occurrence of downy rattlesnake-plantain was observed in the Assessment Area near an existing road.

Large Purple Fringed Orchid

Large purple fringed orchid (S3) is a perennial wetland species with pink to purple, lobed and fringed flowers, that occurs throughout eastern Canada and the United States. Threats to the status of the species include land conversion, forest management practices, browsing, and climate change (NatureServe, 2025a). The species is considered secure due to its large range and abundance of occurrences (NatureServe, 2025a). A total of 15 occurrences consisting of > 200 individuals were observed in the Study Area, of which 10 are within the Assessment Area.

Lesser Pyrola

Lesser pyrola (S3) is a small flowering plant with shiny, basal leaves, and a short stalk that produces a cluster of three to 11 white, nodding, flowers. Lesser pyrola is a circumboreal species with a broad geographic range that includes Canada and the western United States (NatureServe, 2025b). The species occurs in shady, wet, forested areas. Two occurrences of Lesser Pyrola were observed in the Assessment Area adjacent to an existing road.

Southern Twayblade

Southern twayblade (S3) occurs throughout eastern Canada and the eastern United States, ranging from eastern Texas to Florida in the south, and Ontario to Nova Scotia in the north (NatureServe, 2024). The most secure populations of the species are found in the eastern to south-eastern United States, though Nova Scotia has the most apparently secure population in Canada. Southern twayblade is most likely to be found in undisturbed swamps and may serve as an indicator species for ecosystem integrity (Hill et al., 2018). Southern twayblade was observed in 11 locations in the Study Area, five of which are within the Assessment Area.

Blue Felt Lichen

Blue felt lichen is listed as 'Special Concern' under SARA and 'Vulnerable' under ESA (S3), and was declared Nova Scotia's provincial lichen in 2022 (Nova Scotia, 2022). The species occurs in eastern North America, Europe, and Africa (NSDNR, 2025). In North America, the species is restricted to Maine in the United States and the Atlantic provinces in Canada, where the vast majority of known occurrences are in Nova Scotia (ECCC, 2022a). Blue felt lichen requires mature hardwood or mixedwood forests with high humidity, where several successional stages are present. Activities that result in the loss of host trees and creation of edge effects, including forestry, resource extraction, renewable energy developments, and industrial activities, pose a major threat to the species (NSNR, 2025). The At-Risk Lichens – Special Management Practices (NSNR, 2018a), which apply on Crown land, recommend that lands within 100 m of occurrences of blue felt lichen be managed for minimal disturbance.

A total of 26 occurrences of blue felt lichen were observed in the Study Area, with seven occurrences in the Assessment Area and an additional nine within 100 m of the Assessment Area.

Eastern Waterfan

Eastern waterfan (SARA and ESA 'Threatened', S1) is one of the only foliose lichens in the northeast that always grows submerged in fresh water. It is a medium-sized (2 to 8 cm broad) species with fan-shaped lobes and a brownish to bluish-black upper surface that can range from smooth to warty (NSNR, 2021h). The most distinctive feature of this species is the presence of veins on the underside. It often prefers small streams with a steady flow and a rocky bed, and it tends to persist in calm pools adjacent the main flow of a watercourse. The At-Risk Lichens – Special Management Practices (NSNR, 2018a), which apply on Crown land, recommend that lands within 200 m of occurrences of eastern waterfan be managed for minimal disturbance. One occurrence of eastern waterfan was observed in the Assessment Area at the base of a waterfall.

Frosted Glass-whiskers

Frosted glass-whiskers lichen (SARA 'Special Concern', S3S4) is a minute stubble lichen that occurs on the heartwood of mature trees (ECCC, 2011). The species belongs to a group known as calicioids or "stubble" lichen, due to their tiny, stalked structures, which are imbedded in substrates. The species is very rare across its range, and Nova Scotia has the most substantial population (COSEWIC, 2014). The At-Risk Lichens – Special Management

Practices (NSNR, 2018a), which apply on Crown land, recommend that lands within 100 m of occurrences of frosted glass-whiskers lichen be managed for minimal disturbance. Five occurrences of frosted glass-whiskers lichen were observed in the Study Area, one of which is in the Assessment Area.

Other Lichen Species

In addition to the above SAR-listed lichens, five lichen SOCI were observed within the Assessment Area (16 total occurrences):

- Acadian jellyskin lichen
- Naked kidney lichen
- Powdered fringe lichen
- Shaggy fringed lichen
- Tree pelt lichen

Lichen SOCI are not discussed further due to the lack of specific habitat requirements associated with each.

10.1.5 Effects Assessment

Project Interactions with Vegetation Communities and Flora

Project activities, primarily those that involve earth-moving and/or vegetation removal, have the potential to impact terrestrial vegetation communities and flora (Table 10.6). These activities could result in the loss of vegetation communities, the loss of flora individuals and impacts to associated habitat, and effects associated with the creation of edge habitat.

Table 10.6: Potential Project Interactions with Terrestrial Vegetation Communities and Flora

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Interconnection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	X

Project Phase	Potential for Interaction
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for terrestrial vegetation communities and flora is a 100 m buffer of the Clearing Footprint (Drawing 10.5). This area was selected to assess the direct and indirect impacts of vegetation clearing and edge effects on vegetation communities and flora. The RAA is the Study Area plus a 5 km buffer. This area was selected for the RAA to contextualize the impacts to terrestrial vegetation communities and flora within the broader landscape.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for terrestrial flora and vegetation communities. The VC-specific definition for magnitude is as follows:

- **Negligible:** No loss of unique vegetation communities; no loss of terrestrial flora SAR or SOCI individuals; no alteration to habitat known to support terrestrial flora SAR or SOCI expected.
- **Low:** Small loss of unique vegetation communities; small loss of or effects on habitat supporting terrestrial flora SAR or SOCI; no terrestrial flora SAR or SOCI individuals lost.
- **Moderate:** Moderate loss of unique vegetation communities; small loss of or effects on terrestrial flora SAR or SOCI individuals (and associated habitat) that do not have legislated protection status, but their populations remain largely intact.
- **High:** High loss of unique vegetation communities; high loss of or effects on the habitat that supports terrestrial flora SAR or SOCI that do have legislated protection status and/or loss of an entire population of terrestrial flora SAR or SOCI.

Effects

Project activities have the potential to have direct and indirect impacts on vegetation communities and flora, including:

- Loss or alteration of unique vegetation communities
- Loss of flora SAR or SOCI and impacts on supporting habitat
- Edge effects

Loss or Alteration of Unique Vegetation Communities

Impacts on vegetation communities will occur as a result of land clearing and ground disturbance required for the placement of Project infrastructure. This will occur during the site preparation and construction phase (e.g., road development, collector line corridors, turbine pads). A total of 596 ha of land is expected to be cleared, with a portion of this allowed to revegetate throughout the lifespan of the Project. Allowing for revegetation will reduce the overall duration and extent of vegetation loss, although the composition of newly established

communities will likely differ from pre-clearing conditions. Presently, vegetation within the Assessment Area largely consists of vegetation types that are common to the region and the province, including managed forests and harvested areas.

In the absence of continuous spatial data regarding vegetation types, the land cover mapping developed through the desktop review may be used to quantify the impacts of the Project on vegetation communities. The main land cover types expected to be impacted in the Clearing Footprint are softwood (202.0 ha) and mixedwood forest (141.8 ha) (Table 10.7). During field assessments, several planted and regenerating forest stands were observed in areas classified as having these cover types. The amount of softwood and mixedwood forest cleared for the Project amounts to 34.2% and 31.2% of the amount mapped within the LAA, and 2.8% and 2.3% of the amount mapped within the RAA. Within the LAA, large proportions of the available urban/developed, cutover (uplands and wetlands), and open area classes are being used for the Project, which highlights the prioritization of disturbed lands (including existing roads). The estimated area to be cleared in each land cover class relative to the amount available in the LAA and RAA is shown in Table 10.7.

Table 10.7: Land Cover Types within the Clearing Footprint as a Percentage of the Amount Available within the LAA and RAA

Land Cover Class	Hectares Cleared for the Project	LAA		RAA	
		Hectares Available	% Cleared	Hectares Available	% Cleared
Cutover upland	13.9	52.3	26.6	1,317.1	1.1
Cutover wetland	0.5	3.9	11.7	125.8	0.4
Hardwood forest	62.4	213.8	29.2	4,456.9	1.4
Hardwood wet forest	5.8	17.6	32.7	370.7	1.6
Mixedwood forest	141.8	454.0	31.2	6,090.5	2.3
Mixedwood wet forest	14.8	63.7	23.2	941.6	1.6
Open area	76.6	168.0	45.6	3,650.0	2.1
Open wetland	16.3	82.7	19.7	1,289.0	1.3
Shrub/alders	3.1	12.7	24.6	592.6	0.5
Softwood forest	202.0	591.0	34.2	7,285.9	2.8
Softwood wet forest	26.4	113.1	23.3	1,525.7	1.7
Urban/developed	32.0	74.8	42.8	1,157.5	2.8
Water	0.2	6.4	3.8	340.1	0.1
Total	595.7	1,854.1	32.1⁽¹⁾	9,143.5	2.0⁽¹⁾

⁽¹⁾ Percentage of land cleared for the Project relative to the size of the LAA and RAA.

Source: Landcover types predictions derived from provincial WAM Database (NSECC, 2022b), Canopy Height (GeoNOVA, 2024a), and Forest Inventory Data (NSNR, 2021f).

The impacts of the Project on unique vegetation communities can be further assessed by reviewing the potential for interactions with old-growth forest stands. The Assessment Area overlaps one forest stand currently protected under the Old-Growth Forest Policy (NSNR, 2024d). Four additional stands were confirmed as old-growth based on field assessments in 2025. The protected forest stand spans an existing road and the newly confirmed old-growth

stands each overlap with the Assessment Area in areas planned for the placement of turbines and an existing road. The Proponent will avoid these confirmed old-growth stands near turbines and is committed to minimizing impacts for road upgrades. Encroachment within 100 m buffers will be required.

The results of desktop modelling and field surveys indicate that the land cover classes and vegetation types observed in the Clearing Footprint are abundant within the LAA and RAA, and no loss of unique or uncommon vegetation communities is expected. Considering that forest stands have already been influenced by prior anthropogenic activities (e.g., historical forestry operations) and direct impacts to old-growth forest stands will be minimized, the overall loss of vegetation communities due to the Project is considered low.

Loss of Flora SAR or SOCI and Impacts on Supporting Habitat

Activities requiring ground disturbance and vegetation clearing during the site preparation and construction phase have the potential to directly impact flora SAR and SOCI individuals. Throughout the planning phase of the Project, information from the desktop review and the results of subsequent field surveys were used to iteratively update the layout to maximize avoidance of field-observed SAR and SOCI and their associated habitat. Refinement of the Clearing Footprint will be made during the detail design stage to avoid direct impacts to flora SAR with protection status.

American Beech

Numerous occurrences of American beech (S3S4) were observed during field assessments in the Study Area, such that not all occurrences were recorded. Its prevalence suggests the species is not habitat limited in this area. Individuals of this species will be impacted by vegetation clearing.

Black Ash

Eight occurrences of black ash (ESA 'Threatened', S1S2) were identified during field surveys in three locations within the Study Area. One tree was observed late in the Project's development, and the occurrence and its host wetland overlaps the Clearing Footprint in an area planned for a new road. A cluster of six occurrences was also observed in a wetland in the Study Area, and the trees are more than 200 m from the Clearing Footprint. Finally, one occurrence was observed in the Clearing Footprint adjacent to an existing road. The wetland containing the occurrence was delineated using desktop resources as described in Section 9.2. Adjustments to the Clearing and Project Footprints will be undertaken during detailed design and engineering to ensure that all black ash trees are avoided by the Project.

Alterations to wetland habitat have been identified as a threat to black ash in Nova Scotia (NSNR, 2021h), as vegetation clearing and infilling has the potential to impact black ash by altering hydrological regimes (Erdmann et al., 1987). To minimize indirect impacts associated with habitat alteration, refinements to the Clearing and Project Footprint will be made during detailed design and engineering to minimize disturbance to host wetlands. This includes completing road upgrades in the direction opposite from the occurrence located near an

existing road. Surface water flows that influence the existing hydrological regimes of the host wetlands are not expected to be impacted.

The locations of black ash trees and their associated wetlands will be provided directly to NSNR as a location sensitive species.

Downy Rattlesnake-plantain

An occurrence of downy rattlesnake-plantain (S2S3) was observed in the Assessment Area near an existing road. The occurrence will be impacted by vegetation clearing if road upgrades are required.

Large Purple Fringed Orchid

A total of 10 occurrences of large purple fringed orchid (S3) were identified in the Assessment Area. It is possible that some of these may be avoided (e.g., those near the edge of the Clearing Footprint); however, it is likely that most will be impacted by vegetation clearing.

Lesser Pyrola

Two occurrences of Lesser Pyrola (S3) were observed in the Assessment Area near an existing road. These occurrences will be impacted by vegetation clearing if it is determined that road upgrades are required.

Southern Twayblade

Southern twayblade (S3) was observed in five locations within the Assessment Area. Two are in an area planned for turbine placement and one near an existing road; these occurrences are expected to be directly impacted by the Project.

Blue Felt Lichen

Five occurrences of blue felt lichen (SARA 'Special Concern', ESA 'Vulnerable', S3) are in the Clearing Footprint. An additional nine occurrences are within 100 m of the Clearing Footprint (the buffer recommended for minimal disturbance in the At-Risk Lichens – Special Management Practices) in areas planned for new roads, upgrades to existing roads, and turbine placement. Adjustments to the Clearing Footprint will be undertaken to limit direct impacts to occurrences of blue felt lichen to the extent possible. Adjustments to the Clearing Footprint will be made to minimize encroachment within buffers.

Eastern Waterfan

One occurrence of Eastern waterfan (SARA and ESA 'Threatened', S3) was observed in a watercourse within 200 m of the Clearing Footprint (the buffer recommended for minimal disturbance in the At-Risk Lichens – Special Management Practices). No direct impacts to the occurrence are expected, and the Clearing Footprint will be refined during detailed design and engineering to maximize the separation between Project activities and the watercourse containing Eastern waterfan. Proposed mitigations, including the development of a Surface Water Management Plan and Erosion and Sediment Control Plan will further reduce the potential for erosion and sedimentation to impact the species occurrence and its associated watercourse.

Frosted Glass-whiskers

Frosted glass-whiskers was not identified in the Clearing Footprint, and direct impacts to the species are not expected. There are three occurrences of frosted glass-whiskers (SARA 'Special Concern', S3S4) within 100 m of the Clearing Footprint (the buffer recommended for minimal disturbance in the At-Risk Lichens – Special Management Practices). Adjustments to the Clearing Footprint will be made during detailed design and engineering to maximize undisturbed buffers around individual occurrences, including completing road upgrades in the direction away from the species occurrence to limit new habitat disturbance.

Other Lichen Species

Four species of lichen SOCI were observed in the Assessment Area during field surveys:

- Acadian jellyskin lichen (S3S4)
- Naked kidney lichen (S3)
- Powdered fringe lichen (S3S4)
- Shaggy fringed lichen (S3S4)
- Tree pelt lichen (S3)

Based on their locations within the Assessment Area, one occurrence of powdered fringe lichen, two occurrences of shaggy fringe lichen, and nine occurrences of tree pelt lichen are expected to be directly impacted by the Project (vegetation clearing for road construction and/or upgrades).

Edge Effects

Vegetation clearing for the Project will create new edge habitat that will alter the environmental conditions experienced by vegetation communities and flora near the Clearing Footprint. Effects associated with the creation of edge habitat (i.e., edge effects) can include changes in microclimate conditions such as light, moisture, and temperature (Braithwaite & Mallik, 2012; Hamberg et al., 2009). These factors can cause shifts in vegetation community composition as species better adapted to new conditions may outcompete those suited to interior forests (Hamberg et al., 2008). Similarly, the creation of edge habitat may create opportunities for the introduction and spread of invasive species and dust, and/or accidental compaction by vehicles and equipment. These effects also have the potential to result in altered vegetation community composition and to impact the growth of flora individuals.

The edge effects associated with the Project will occur within the LAA. The creation of new edge habitat will primarily be related to the development of linear features, including access roads and collector line corridors. Approximately 15 km of new roads will be built for the Project. The length of new roads and extent of new disturbance required for the Project is being minimized through the use of existing roads (77% of the total roads required are associated with existing roads) within the Study Area. A portion of the area surrounding the Clearing Footprint already consists of existing cutovers, roads, and other open areas, such that edge effects associated with the Project's development will not occur throughout the entire LAA.

Altered Habitat Conditions

Forest edges, generally adjacent to clearings or disturbances, are exposed to stronger winds, more light exposure, and drier conditions than interior forest areas. These areas are often vulnerable to both natural and anthropogenic disturbances and may have altered vegetative structure and composition compared to forest interiors. For instance, tree mortality is higher along a forest edge due to windthrow, and edges are more directly exposed to pollutants, changes in humidity, light, and sound (Boudreault et al., 2008). Changes in the composition of understory plants are also possible due to altered microclimate and soil properties (Hamberg et al., 2008).

Multiple studies have shown that edge effects relating to drying of plant material can be observed from 15 m to 120 m (Gauslaa et al., 2019). Lichens and non-vascular plants are especially sensitive to edge effects and changes in air quality due to being unable to regulate and maintain their water content (Boudreault et al., 2008; Nash, 2008). Edge effects from activities such as forest harvesting have a negative impact on lichens that extends 50 m into the forest interior (Rheult et al., 2002). In some cases, this can result in the death of individual lichens, or impact establishment of juvenile thalli (COSEWIC, 2010a). A total of 13 occurrences of lichen SAR are within the 100 m are surrounding the Clearing Footprint and may be impacted by the creation of edge habitat.

Dust Deposition

Dust deposition may impact flora within the LAA when fugitive dust is generated by road traffic on unpaved areas, crushing material, and blasting (if required for the Project). Dust from unpaved areas has been found to change the pH of lichen substrates (i.e., the tree bark they are attached to) and impact individual health and species richness (Degtjarenko, 2016). The effects of dust on flora may depend on the duration of exposure; one study found that lichens along a gravel road were unaffected within two years, but significant changes to the communities were observed after 10 years (Farmer, 1993). Vascular plants may be impacted by dust through reductions in photosynthesis and leaf diffusion (Thompson et al., 1984).

The spread of fugitive dust is influenced by several factors, including the height at which the dust is released, wind conditions, and particle size. Under standard conditions, fugitive dust particles above 30 µm settle out within 100 m of the emission source. Other finer particles have a slower settling velocity and may travel further (US EPA, 1995). It is expected that impacts to vegetation communities and flora relating to dust deposition will be greatest during the site preparation and construction phase (short-term duration) within the 100 m surrounding the Clearing Footprint (the LAA). Site traffic will be greatly reduced during the operational and maintenance phase of the Project.

Invasive Species

Terrestrial flora, particularly rare native flora, may be at risk due to threats from invasive species (BCMECCS, 2018). Non-native species, often introduced to a landscape accidentally by humans, can become invasive when they cause harm to the environment, economy, or

human health through rapid reproduction and out-competing of native species (Rutledge et al., 2024). Industrial projects can lead to the introduction of invasive species in two main ways:

- Revegetation of cleared land with non-native seed mixes.
- Increased access to remote areas with equipment carrying seeds, spores, or other reproductive materials from non-native species.

The construction of new roads and subsequent increase in vehicle traffic on access roads associated with the operation and maintenance of the wind farms can lead to the introduction or spread of non-native species, some of which are invasive. Within the Study Area, 85 non-native vascular plant species were observed, of which five are considered invasive in Nova Scotia. This suggests that mitigation strategies to minimize the risk posed by invasive species are warranted.

Mitigation Measures

To minimize the effects of the Project on terrestrial vegetation communities and flora, the following mitigation measures will be implemented:

Loss or Alteration of Unique Vegetation Communities

- Minimize overall area to be altered by prioritizing the use of previously disturbed areas (i.e., clearcuts and use of existing access), where possible.
- Allow for natural revegetation wherever possible to promote continued growth of terrestrial vegetation communities and flora.
- Minimize disturbance to important habitat features identified during desktop and field assessment (e.g., wetlands and old-growth forests) by micro-siting, where possible.

Loss of Flora SAR or SOCI and Impacts on Supporting Habitat

- Continue to avoid flora SAR with protection status and minimize interactions with supporting habitat during the detailed design phase.
- Ensure that Project personnel are aware of confirmed locations of the black ash and are familiar with identifying characteristics to avoid accidental losses during vegetation clearing.
- Consult with NSNR and NSECC if unexpected flora SAR with protection status are encountered during construction activities.
- Develop and implement an Erosion and Sediment Control Plan.

Edge Effects

- Minimize the development of new linear features through the use of previously disturbed areas and existing roads.
- Use only native seed mixes, if seed mixes are used to aid in revegetation.
- Ensure equipment is cleaned periodically to prevent the introduction and spread of non-native species.
- Implement speed limits to reduce dust emissions.
- Use dust suppressants (e.g., water trucks) when required.

Monitoring

No monitoring programs specific to terrestrial vegetation communities and flora are proposed.

Conclusion

The predicted residual effects of the Project on terrestrial vegetation communities and flora (after mitigation) are characterized in Table 10.8.

Table 10.8: Terrestrial Vegetation Communities and Flora Residual Effects

Effect Detail	Loss or Alteration of Unique Vegetation Communities	Loss of Flora SAR or SOCI and Impacts on Supporting Habitat	Edge Effects
Magnitude of Effect	Low: Small loss of unique vegetation communities	Moderate: Small loss of or effects on terrestrial flora SAR or SOCI individuals (and associated habitat) that do not have legislated protection status, but their populations remain largely intact.	Moderate: Small effect to habitat supporting terrestrial flora SAR and/or SOCI due to edge effects.
Geographic Extent of Effect	100 m buffer of the Clearing Footprint	100 m buffer of the Clearing Footprint	100 m buffer of the Clearing Footprint
Frequency of Effect	Single Event: Effects may occur during initial site preparation and construction	Single Event: Effects may occur during initial site preparation and construction	Single Event: Effects may occur during initial clearing and ground disturbance, and during operations
Duration of Effects	Medium Term: Effects may extend through all phases but will not extend beyond decommissioning	Medium Term: Effects may extend through all phases but will not extend beyond decommissioning	Medium Term: Effects may extend through all phases but will not extend beyond decommissioning
Reversibility of Effect	Partially Reversible	Partially Reversible	Partially Reversible
Significance Level	Not Significant	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible			

10.2 Terrestrial Fauna

10.2.1 Overview

The terrestrial fauna assessment was completed using a combination of desktop and field assessments to achieve the following objectives:

- Identify significant species and habitat supporting SAR or SOCI within/near the Study Area using desktop resources.
- Determine the likelihood of SAR and SOCI occurring in the Study Area.
- Use data from targeted surveys as well as incidental observations for different taxa of terrestrial fauna to document the presence of species within the Study Area, particularly SAR and SOCI.
- Use the information collected through field studies to update the Project design, as necessary, to avoid or minimize interactions between Project infrastructure and confirmed locations of terrestrial fauna SAR and SOCI and/or the habitats that are known to support terrestrial fauna SAR or SOCI.
- Apply mitigation, construction, and operational management practices to minimize effects to terrestrial fauna.

10.2.2 Regulatory Context

Several laws and regulations provide protection for terrestrial fauna (i.e., mammals and herpetofauna, terrestrial invertebrates) and their habitats in Nova Scotia:

- *Species At Risk Act* (Canada, 2002)
- *Canadian Environmental Protection Act* [CEPA, (Canada, 1999)]
- *Canada Wildlife Act* (Canada, 2000)
- *Endangered Species Act* (Nova Scotia, 1998)
- *Wildlife Act* (Nova Scotia, 1989b)
- *Biodiversity Act* (Nova Scotia, 2021)
- *Environment Act* (Nova Scotia, 1995b)

ESA and SARA prohibit harm to SAR listed as 'Endangered' or 'Threatened' along with their habitually occupied spaces and core/critical habitat. The *Canada Wildlife Act* (Canada, 2000) provides a framework for the creation of protected wildlife areas, and the *Wildlife Act* (Nova Scotia, 1989b) provides policies and programs for wildlife to maintain diversity of species at levels of abundance to meet specific management objectives. The *Wildlife Act* (Nova Scotia, 1989b) includes a clause for the protection of den/habitation of a furbearer [48(3)] and prohibits harm to the nest of a (bird or) turtle [51(a)]. The *Biodiversity Act* (Nova Scotia, 2021) provides a framework for the creation of Biodiversity Management Zones used for conservation and sustainable biodiversity values. Lastly, CEPA and the *Environment Act* (Nova Scotia, 1995b) both provide measures for the protection of the environment and pollution prevention.

10.2.3 Desktop Review

Prior to undertaking the terrestrial field assessment, a detailed desktop review of known fauna occurrence records and potential habitat for terrestrial fauna was completed to support the design of surveys. The following databases were reviewed:

- ACCDC Data Report (ACCDC, 2025a)
- NSNR Significant Species and Habitat Database (NSNR, 2024f)
- SARA and ESA Recovery Documents
- SMP Layers

Mammals

The ACCDC data report prepared for the Project (2025a) contains no records of terrestrial mammal SAR or SOCI occurrences (excluding bats, see Section 10.3) within 5 km of the Study Area. The nearest record of mainland moose (*Alces alces americana*), a terrestrial fauna SAR (ESA 'Threatened', S1), is 15.6 km from the Study Area. A complete list of SAR and SOCI recorded within 100 km of the Study Area is available in Appendix H.

The NSNR Significant Species and Habitat Database (2024f) contains one unique habitat record related to terrestrial mammals within 5 km of the Study Area: a record of "Deer Wintering" associated with white-tailed deer (*Odocoileus virginianus*) approximately 4.5 km south of the Study Area.

A review of the provincial Recovery Plan for the Moose (*Alces alces americana*) in Mainland Nova Scotia [the "Mainland Moose Recovery Plan", (NSNR, 2021i)] and correspondence with NSNR (Species at Risk Biologist S. Spencer, January 14, 2026) confirmed that the Study Area is within core habitat for mainland moose (these lands are not currently designated under ESA). Core habitat represents areas that meet the habitat and landscape connectivity requirements of mainland moose, and that are essential for the long-term survival and recovery of the species (NSNR, 2021i). Approximately 22,300 km² of core habitat has been identified for mainland moose in Nova Scotia, within which the suitability of 10 km x 10 km hexagons has been ranked based on combined Habitat Suitability Index (HSI) and road density scores. Scores of three or below are not considered to meet suitability criteria, and scores 4 to 9 meet the criteria, with higher scores reflecting higher suitability. As shown in Figure 5 of the Mainland Moose Recovery Plan, the majority of the Study Area does not have an associated combined HSI/roads criteria score (indicating a low suitability). The nearest areas of high (i.e., 7 to 9) combined HSI/roads criteria values are over 5 km south of the Study Area, near East Roman Valley.

Mainland Moose Habitat Suitability Mapping

As an ecological and cultural keystone species, impacts to mainland moose habitat may serve as a useful proxy for quantifying impacts for terrestrial mammals more broadly. Habitat loss and reduced habitat quality may result in behavioural changes in mainland moose, including from reduced opportunities for thermoregulation, loss of overwintering areas, loss of adequate sources of food, reduced space for mating, and reduced protection for calves (NSNR, 2021i).

Breeding season for mainland moose takes place between September and October, with calving generally occurring in late May to early June, where one to two calves are born (NSNR, 2021i). Cows may require specific habitat types for calving, such as secluded islands, peninsulas, and shorelines, such that land conversion to support Project-related infrastructure may impact mainland moose by removing breeding/calving habitat and reducing seclusion. To characterize the suitability of habitat for mainland moose within and near the Study Area, habitat suitability mapping was completed by Strum based on methodology established in the Mainland Moose Recovery Plan (NSNR, 2021i).

Habitat suitability mapping for mainland moose was completed using the following data sources:

- Provincial Forest Inventory Database (NSNR, 2021g)
- Provincial Roads and Railroads Database (GeoNOVA, 2024c)
- Provincial Wet Area Mapping Database (NSECC, 2022b)

The approach assesses habitat types known to be suitable for moose in relation to a series of mapped positive and negative influences. Positive inputs include attributes such as proximity to parks and protected areas, proximity to watercourses, forestry cover types, and suitable habitat areas (e.g., areas that, based on land cover characteristics, provide summer and/or winter forage, summer and/or winter cover, and/or meet requirements for calving habitat). Negative inputs include the calculated distance to human development features, distance to harvested area, and road density.

The output illustrates habitat availability and quality in relation to land cover types and uses (e.g., anthropogenic disturbances), based on the weighting of positive and negative inputs. It is a grid of 5 ha hexagons expressing habitat suitability ranging from -3 to 5 (methodologically the lowest and highest habitat suitability scores). For descriptive purposes, this range was divided into discrete bins that describe habitat on a scale from “poor” to “best”. Areas classified as “fair” or better provide at least one habitat type requirement for the mainland moose. Habitat designated as “best” provides multiple habitat types for the species while being minimally impacted by negative factors such as roads or conflicting land-uses. Scores greater than 4.01, while mathematically possible, are ecologically infeasible due to the unique characteristics of different mainland moose habitat types.

The mainland moose habitat suitability map indicates that Clearing Footprint primarily consists of “fair” (52.0%) and “poor” (20.9%) habitat, with areas of “best” habitat making up < 1% of the Clearing Footprint (Table 10.9 and Drawing 10.6). This suggests that much of the land to be cleared for the Project meets at least one habitat requirement for mainland moose, but that areas highly suitable habitat (“better” or “best” class) are limited. Overall, the proportional distribution of quality habitat within the Clearing Footprint is similar to the LAA. The proportion of “poor” habitat is higher within the LAA (33.1%) than the Clearing Footprint due to the presence of developed lands. The placement of the Clearing Footprint within disturbed portions of the Study Area (including existing roads) is highlighted by the higher proportion of “poor” habitat in the Clearing Footprint (20.9%) relative to the Study Area (13.5%).

Table 10.9: Moose Habitat Suitability Weighting Scheme

Habitat Suitability Score Range	Habitat Suitability Category	Clearing Footprint		Study Area		LAA ⁽¹⁾	
		ha	ha	ha	%	ha	%
<0	Poor	124.7	20.9	667.7	13.5	9,654.7	33.1
0	Neutral	76.7	12.9	753.9	15.2	3,011.9	10.3
0 to 1.35	Fair	309.5	52.0	2,664.9	53.7	11,330.3	38.9
1.36 to 2.68	Better	79.7	13.4	817.3	16.5	4,616.7	15.9
2.69 to 4.01	Best	5.1	0.9	57.6	1.2	521.6	1.8
Total		595.7	100.0		4,961.4	100.0	100.0

⁽¹⁾ The LAA for the terrestrial fauna includes a 5 km buffer of the Study Area (Section 10.2.5). This distance was selected based on the expected home ranges and short distance migrations of species between habitat types.

Herpetofauna

The ACCDC data report (2025a) includes records of one herpetofauna SAR, wood turtle (*Glyptemys insculpta*, SARA and ESA 'Threatened', S2), within 5 km of the Study Area (no records of herpetofauna SOCI). Wood turtles are a location sensitive species in Nova Scotia, and confirmation that the occurrence was recorded outside of the Study Area was provided by NSNR (SAR Biologist S. Spencer, July 8, 2025). No other records of herpetofauna SAR or SOCI are within 5 km of the Study Area.

One watercourse relating to "Species at Risk" was identified within 5 km of the Study Area in the Significant Habitat Database on the Provincial Landscape Viewer (NSNR, 2024e). A detailed Significant Species and Habitat Database layer provided by NSNR (2024f) was subsequently reviewed and confirmed that this record is related to wood turtle habitat (approximately 3 km southwest of the Study Area). During the review of SMPs, a wood turtle buffered stream was identified within the Study Area. A small portion of the 200 m SMP buffer surrounding this stream coincides with the Assessment Area.

Terrestrial Invertebrates

The ACCDC data report (2025a) and NSNR Significant Species and Habitats Database (2024f) contain no records of terrestrial invertebrate SAR or SOCI within 5 km of the Study Area.

10.2.4 Field Assessment

10.2.4.1 Field Assessment Methodology

The objective of the field assessment was to understand which species of terrestrial fauna are present within the Study Area and determine how they could potentially interact with the Project. Targeted field surveys were conducted for two SAR identified in the desktop review as having potential to occur within the Study Area: mainland moose and wood turtle. Direct observations of terrestrial fauna, or signs thereof, were recorded during other biophysical field surveys if observed, with an emphasis on SAR and SOCI. Signs of fauna include features such as dens, nests, scat, tracks, and evidence of foraging.

Most targeted surveys described in the following sections were completed within the current Assessment Area or Study Area; however, some surveys occurred in nearby areas associated with a previous Project layout. Data from these surveys are included in the assessment, as species observed could be reasonably expected to use similar habitat within the Study Area.

Mammals

Pellet surveys and winter tracking were completed in 2023 and 2024 to document the presence and distribution of mammals within and near the Study Area, with an emphasis on SAR mammals. Surveys were conducted along 12 pre-determined transects approximately 1 km in length (seven of which are in the Study Area; Table 10.10; Drawing 10.7). Transect locations were selected in consultation with NSNR staff (SAR Biologist M. McGarrigle, May 3 to 8, 2023) to cover a range of habitats representative of the area, with priority given to habitat where mainland moose were expected to be active during the winter, if present.

Table 10.10: Mammal Assessment Survey Information

Transect	Dates Completed		Transect Length (km)	Habitat Type
	Pellet Surveys	Winter Tracking		
1 ⁽¹⁾	May 11, 2023	January 31, 2024	1.0	Forested area between road and watercourse
2 ⁽¹⁾	May 11, 2023	January 31, 2024	1.1	Access road/trail
3 ⁽¹⁾	May 11, 2023	January 31 and February 7, 2024	0.9	Forested area accessible from road/trail
4 ⁽¹⁾	May 11, 2023	January 31 and February 7, 2024	1.0	Forested area
5	May 12, 2023	-	1.0	Forested area
6	May 12, 2023	February 7, 2024	1.0	Road
7	May 11, 2023	January 31, 2024	1.1	Road
8 ⁽¹⁾	May 12, 2023	-	1.0	Road
9	May 12, 2023	January 31 and February 7, 2024	0.9	Road and adjacent forest
10	May 11, 2023	January 31 and February 7, 2024	1.0	Road
11	---	January 31, 2024	1.0	Road and adjacent forest
12	May 12, 2023	January 31, 2024	1.1	Forested area with watercourse

⁽¹⁾ Indicates transect is outside of the current Study Area

Pellet surveys and winter tracking were completed following methods adapted from the recommendations of NSNR Wildlife Division (2022d, 2022e). Pellet surveys were completed over one round in May 2023 after the snow had completely melted, revealing animal droppings that had been preserved in the snow over the previous winter. Winter wildlife tracking surveys took place over one or two rounds in January and February 2024 within seven days of the most recent snowfall of 10 cm or more, and when possible, within two to three days of the most recent snowfall. This timeline allows sufficient time for animals to leave their tracks while

limiting opportunities for tracks to deteriorate or disappear due to excessive snowfall, melting, or rain. Care was taken to ensure winter tracking surveys were not completed during rain or snow events.

During surveys, transects were traversed by foot. While slowly travelling along a transect, an approximately 4 m wide area was scanned for any sign of animal activity, including tracks, pellets/scat, browse, dens, or animal sightings. When suspected activity from a terrestrial mammal SAR or SOCI, including mainland moose, was observed, additional detailed notes and photos relating to habitat and animal sign were recorded. Observations and signs of white-tailed deer were also recorded as their presence and abundance may influence habitat use by, and the potential spread of disease to mainland moose. Additional observations of interest, such as evidence of predator and prey interactions, were also recorded, if observed. Upon completing a transect, a general description of the transect including overall tracking conditions and different habitats encountered was recorded. All survey tracks were recorded using handheld global positioning system (GPS) units, and any changes to predetermined transects in the field were such that the new course was similar in length to the planned transect and covered similar or improved habitat types.

Herpetofauna

Targeted turtle surveys were conducted in spring 2023 with a focus on wood turtles and their preferred habitat. The locations of surveys were determined through a desktop review to identify areas of potential wood turtle habitat and in consultation with NSNR staff (SAR Biologist M. McGarrigle, May 3 to 8, 2023). Mapped watercourses in the Study Area that are within watersheds known to support wood turtles, were prioritized. Generally, transects were established to target clear, meandering watercourses with a moderate flow, sandy or sand-gravel areas, and artificial nesting sites which may include gravel pits, road shoulders, and residential sites. The suitability of habitat surrounding watercourses (including riparian or forested areas, or open areas such as flood plains, meadows, river oxbows, and beaver ponds) was also considered when selecting transect locations.

Surveys were completed along 21 pre-determined transects (including the SMP buffered stream identified in the desktop review) in May 2023 on days when the ambient air temperature was higher than the water temperature (at least 10°C target) but not higher than 25°C (Drawing 10.7). Nine of the 21 transects overlap the Assessment Area. Transects were surveyed simultaneously by two field biologists walking on each side of the watercourse 200 m up and downstream from a central point. Surveyors scanned the ground, the banks, and the water up to 20 m on either side for a total search area of 40 m on both sides of the watercourse. Search efforts focused on bank areas with high sun exposure or other adequate basking areas such as instream rocks or logs. Wood turtles may occur under or near deadfall, grasses, leaf litter, or woody shrubs (particularly alder trees) where they are more inconspicuous, and these areas were therefore searched with greater intensity. All survey tracks were recorded using handheld GPS units, and any changes to transects were made such that the new course was similar in length to the planned transect and covered similar or improved habitat types. Three rounds of surveys were conducted unless the transects were determined to have no suitable habitat during the initial survey round.

Any observation of Nova Scotia's four native turtle species or other herpetofauna SAR or SOCI were recorded and georeferenced in the field using handheld GPS units, if observed. Upon completion of each transect, a general description of the transect, including the presence of any notable habitat features, was recorded. Any additional observations of herpetofauna SAR or SOCI made during other survey types such as wetland or watercourse surveys, as well as observations of suitable wood turtle habitat, were also recorded if observed.

Terrestrial Invertebrates

Targeted surveys for terrestrial invertebrates were not completed. Incidental observations of invertebrate SAR or SOCI made during other field surveys were documented, if observed. Obligate habitat for SAR invertebrates was also recorded if observed incidentally or during flora surveys – specifically, this refers to observations of milkweed (*Asclepias* spp.), which is an obligatory food source and breeding habitat for the monarch butterfly.

10.2.4.2 Field Assessment Results

Mammals

A total of 11 mammal species, as well as unidentified small mammals, were observed during field assessments (including incidental observations) (Table 10.11). Of these, possible signs of one fauna SAR, mainland moose, were observed. Signs of mainland moose included evidence of browsing at a height of over 1.8 m (6 feet) observed during winter tracking surveys along a road in the Assessment Area (image provided in photo log, Appendix M). Signs (tracks) of one mammal SOCI, fisher (*Pekania pennanti*), were observed during non-target surveys in 2026 in the Assessment Area.

Table 10.11: Summary Results of the Mammal Field Assessments

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Source (1)
American Black Bear	<i>Ursus americanus</i>	-	-	-	S5	P
Bobcat	<i>Lynx rufus</i>	-	-	-	S5	W
Eastern Coyote	<i>Canis latrans</i>	-	-	-	S5	P, W
Fisher	<i>Pekania pennanti</i>	-	-	-	S3	I
Mainland Moose	<i>Alces alces americana</i>	-	--	Endangered	S1	W
North American Beaver	<i>Castor canadensis</i>	-	-	-	S5	I
Raccoon	<i>Procyon lotor</i>	-	-	-	S5	P
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	-	-	-	S5	W
Snowshoe Hare	<i>Lepus americanus</i>	-	-	-	S5	P, W
Unknown Small Mammal	N/A	-	-	-	---	W

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Source ⁽¹⁾
Red Fox	<i>Vulpes vulpes</i>	-	-	-	S5	P
White-tailed Deer	<i>Odocoileus virginianus</i>	-	-	-	S5	P, W

⁽¹⁾ Indicates the type of survey being completed when the species was observed (P – Pellet Inventory; W – Winter Tracking; I – Incidental Observation)
Source: ACCDC (2025c)

Herpetofauna

Most of the watercourses surveyed for wood turtles contained areas of good to highly suitable habitat (Table 10.12). Suitable areas were characterized by sandy/gravelly shores, clear, flowing water, and adequate sun exposure. Some portions of the surveyed watercourses, including five entire transects (T02, T03, T09, T10, T11), were found to have limited or no suitable wood turtle habitat. These areas were characterized as beaver ponds, watercourses with low/no flow, streams covered by blowdown, and/or deep, stagnant streams with mucky substrates.

Table 10.12: Habitat Description for Wood Turtle Transects

Transect Number	Substrate	Potential Wood Turtle Habitat		
		Nesting	Overwintering	General
T01 ⁽¹⁾	Muck, gravel	N	Y	Y
T02 ⁽¹⁾	Overgrown	N	N	N
T03 ⁽¹⁾	Overgrown	N	N	N
T04	Muck	N	Y	N
T05	Muck, gravel, cobble	N	Y	Y
T06	Muck, gravel, boulder/cobble, sand/silt	Y	N	Y
T07	Muck, gravel, cobble, sand/silt	Y	Y	Y
T08	Muck, gravel, cobble, boulder	Y	N	Y
T09	Muck/overgrown	N	N	N
T10	Overgrown	N	N	N
T11	Overgrown	N	N	N
T12	Muck, gravel, cobble, boulder	Y	Y	Y
T13	Muck, cobble	Y	Y	Y
T14	Muck, cobble, boulder	N	Y	N
T15	Muck	N	Y	N
T16	Muck, cobble, boulder, sand	N	Y	Y
T17	Muck, cobble, gravel, sand	Y	Y	Y
T18	Muck, cobble, gravel, boulder	Y	Y	Y
T19	Muck, cobble, gravel, boulder, silt/sand	Y	N	Y

Transect Number	Substrate	Potential Wood Turtle Habitat		
		Nesting	Overwintering	General
T20	Muck, gravel	N	N	Y
T21	Muck, cobble	N	Y	Y

(1) Indicates transect is outside of the current Study Area

No herpetofauna SAR or SOCI, or signs thereof (e.g., nests, eggshells) were observed during targeted field studies in 2023. One incidental observation of a herpetofauna SAR, snapping turtle (SARA 'Special Concern', ESA 'Vulnerable', S3), was recorded during non-target surveys in June 2025. The turtle, an adult, was observed on a gravel road in the Assessment Area (Drawing 10.4A to 10.4L and Appendix M).

Terrestrial Invertebrates

There were no observations of terrestrial invertebrate SAR or SOCI recorded during field assessments, and no occurrences of milkweed were observed to support monarch butterflies.

Priority Species

Based on the desktop review and field survey results, terrestrial species that have been recorded or are likely to occur within the Study Area were screened against the criteria outlined in the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a) to develop a list of priority species, as detailed in the sections that follow.

- Mainland moose: ESA 'Endangered', S1
- Fisher: S3
- Wood turtle: SARA and ESA 'Threatened', S2
- Snapping turtle: SARA 'Special Concern', ESA 'Vulnerable', S3

Mainland Moose

Mainland moose are a SAR listed as 'Endangered' under ESA with an S-Rank of S1 (highest priority). Threats to mainland moose include habitat loss and fragmentation, particularly resulting from industrial activities; and loss of habitat connectivity due to the increased placement and density of roads (NSNR, 2021i). The Study Area has previously been and continues to be subject to the above-mentioned threats as a result of historical and current land-uses, including forestry activities and recreation. Renewable energy projects are described as a medium level threat in the Mainland Moose Recovery Plan (NSNR, 2021i), as the nature of wind projects usually requires the construction or expansion of road networks and loss of forested habitat.

Potential evidence of mainland moose activity was observed in the Assessment Area during winter tracking surveys in 2024. Signs of browsing on at a height of over 1.8 m were recorded along an existing road in the Assessment Area. The area surrounding the road corresponds to "fair" habitat identified during habitat suitability modelling. No other evidence of moose activity was observed during targeted field surveys or other biophysical surveys.

Fisher

Fishers, a SOCI with an S-Rank of S3, prefer dense, mature to old-growth forests with continuous overhead cover with abundant mammalian prey (snowshoe hare, red squirrel, porcupine) (Allen, 1983). Generally considered an interior-forest species (OMNR, 2000), fishers require large tracts of well-connected habitat (Meyer, 2007) and prefer areas of topographic and ecological diversity (Potter, 2002). Fishers are distributed throughout mainland Nova Scotia, and trapping data suggest the population is concentrated in Cumberland, Colchester, and Pictou counties (NSNR, 2024a). Mature and old-growth forest stands nearby the Project may provide suitable canopy closure and coarse woody debris of sufficient diameter for fishers on the site. Fisher tracks were observed along an existing road surrounded by a tolerant hardwood forest in January 2026.

Wood Turtle

Wood turtles are a SAR listed as 'Threatened' under SARA and ESA with an S-Rank of S2. Wood turtles are a habitat generalist but are associated with perennially flowing watercourses within forested habitat and require specific conditions for nesting (gravel beaches or bars) and overwintering (pools). The most significant threats to the species include road development and land use practices (NSNR, 2020). Core and critical habitat has been identified for wood turtles in Nova Scotia (NSNR, 2020), and SMPs have been established that include recommendations for activity and development limitations in the area (up to 200 m) surrounding wood turtle occurrences (NSNR, 2020).

Areas of suitable nesting, overwintering, and general habitat were identified along most of the transects surveyed for wood turtles, and an SMP buffered watercourse is in the central portion of the Study Area (partially overlapping the Assessment Area). No occurrences or signs of wood turtles were recorded during target or non-target field surveys within or near the Study Area.

Snapping Turtle

Snapping turtles are a SAR listed as 'Special Concern' under SARA and 'Vulnerable' under ESA (S-Rank S3). Snapping turtles are fairly common throughout mainland Nova Scotia, particularly in the southwest of the province (NSNR, n.d.-a). The species uses a variety of habitats; however, snapping turtles prefer slow-moving water with a soft mud bottom and dense aquatic vegetation. Overwintering sites are aquatic environments (e.g., lentic, lotic, and mud) where water will not freeze to the bottom, the substrate is a thick layer of mud, and other cover (e.g., large woody debris) is present. Typical nesting habitat includes sand or gravel banks in proximity to water with sparse vegetative cover (ECCC, 2020a). The primary threats to snapping turtles are habitat conversion and road mortality (ECCC, 2020a). Due to their delayed reproductive age, populations of snapping turtles are highly sensitive to the survival rates of adults.

One adult snapping turtle was observed during non-target surveys in the Assessment Area in 2025. The observation was recorded on a gravel road near a watercourse crossing, adjacent to two waterbodies (Drawing 10.4A to 10.4L). It is possible that other portions of the Study Area also offer suitable habitat for snapping turtles, but this has not been confirmed.

10.2.5 Effects Assessment

Project-Terrestrial Fauna Interactions

Project activities, primarily those that involve earth-moving or vegetation removal, have the potential to impact terrestrial fauna (Table 10.13).

Table 10.13: Potential Project-Terrestrial Fauna Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Interconnection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for the terrestrial fauna includes a 5 km buffer of the Study Area (Drawing 10.5). This distance was selected based on the expected home ranges and short distance migrations of species between habitat types. The RAA for terrestrial fauna is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for terrestrial fauna. The VC-specific definition for magnitude is as follows:

- **Negligible:** No loss of fauna habitat or impact to fauna through sensory disturbance or injury/mortality.
- **Low:** Small loss of habitat supporting fauna and low impacts to fauna through sensory disturbance or injury/mortality.
- **Moderate:** Moderate loss of fauna habitat and/or moderate impacts to fauna through sensory disturbance or injury/mortality, but these impacts will only be experienced by individuals rather than entire populations.

- High: High loss of fauna habitat or high impact to fauna through sensory disturbance or injury/mortality that would impact fauna on a population scale.

Effects

Habitat Loss and Fragmentation

Habitat for terrestrial fauna may be lost, altered, or fragmented during the construction phase from activities requiring vegetation clearing and ground disturbance. The estimated Clearing Footprint for the Project consists of 596 ha of land that will be cleared during the construction phase, a portion of which will be allowed to naturally revegetate over the lifespan of the Project. To the extent possible, the Project will avoid sensitive habitats, such as mature forests, wetlands, and watercourses (i.e., areas regularly frequented by terrestrial fauna), and maintain vegetated buffers to these features, to reduce the overall impacts to fauna habitat.

Related to habitat loss, habitat fragmentation (the division of suitable habitat into smaller, and more isolated areas) has the potential to change how fauna use, move, and migrate across the landscape. Species of terrestrial mammals may respond differently to the effects of habitat fragmentation. For example, generalists, such as black bears (*Ursus americana*) and coyotes (*Canis latrans*), tend to be more adaptable to altered habitats and favour edge habitats or open corridors compared to species with specific habitat requirements. In contrast, species such as mainland moose and fisher are more sensitive to habitat fragmentation due to their association with large areas of intact forest cover (Meyer, 2007; NSNR, 2021i). Habitat fragmentation is identified as a threat to mainland moose in the Mainland Moose Recovery Plan (NSNR, 2021i), where wind farms are identified as having potential to contribute to habitat loss, conversion, and degradation due to vegetation clearing required for infrastructure.

Mainland Moose

The Study Area is located within core habitat for mainland moose (NSNR, 2021i) (these lands are not currently designated under ESA). Within core habitat, areas are ranked as having high or low suitability based on a combined HSI and road density score. Scores of three or below are not considered to meet suitability criteria, and scores 4 to 9 meet the criteria, with higher scores reflecting higher suitability. The majority of the Study Area does not have an associated combined HSI/roads criteria score (indicating a low suitability). The nearest areas of high (i.e., 7 to 9) combined HSI/roads criteria values are over 5 km south of the Study Area, near East Roman Valley.

The mainland moose habitat suitability map developed as part of the desktop review (Section 10.2.3) provides a useful reference for quantifying the impacts of the Project on suitable moose habitat. The model suggests that highly suitable habitat areas within the Clearing Footprint are limited and that the Project Footprint has prioritized placement of infrastructure within the disturbed portions of the Study Area. Within the Study Area, most areas of contiguous, suitable habitat will be avoided by the Clearing Footprint. The greatest loss of suitable habitat will occur in the southwestern portion of the Study Area. As visible in Drawing 10.6, suitable habitat for mainland moose appears to be more abundant in the southern portion of the LAA than in the

Clearing Footprint and Study Area, indicating that areas of suitable habitat will remain available within the LAA.

On a broad scale, the connectivity of areas of suitable habitat is a major concern for the longevity of mainland moose in Nova Scotia, where communities are already highly localized to three areas of the province. Road placement and road density are the main drivers of reduced habitat connectivity and road construction is one of the main activities likely to result in destruction of important moose habitat (NSNR, 2021i). Current and historical land-use in the Study Area [i.e., forestry activities and recreational off-highway vehicle (OHV) use] has altered the landscape within the Study Area to its current state, where road networks are large portions of forested habitat have been altered and degraded. Habitat modelling indicates that the western, northern, and eastern portions of the LAA have low suitability for mainland moose, such that the Project is not expected substantially disrupt connectivity between areas of suitable habitat.

The potential for habitat fragmentation due to the Project is mainly related to the development of linear features such as roads and collector line corridors. The total length of roads required is 66 km, approximately 51 km (77%) of which will utilize existing roads. Alterations to some existing roads will be required to facilitate Project activities (e.g., the widening of a turn to accommodate a radius sufficient for turbine blade transport), whereas existing roads that are large enough to accommodate forestry equipment will generally remain as true to their current state as Project developments will allow. Several species of terrestrial mammals were documented as using roads during targeted and non-target field surveys, and it is expected that species will continue to use these areas throughout the lifespan of the Project.

The use of existing roads and previously disturbed areas by the Project has helped to reduce the overall loss of habitat for terrestrial fauna and has reduced the extent of new landscape fragmentation. The effect of habitat loss on terrestrial mammals is expected to be low.

Herpetofauna

Terrestrial habitat used by herpetofauna, including wood turtles and snapping turtles, includes riparian areas along wetlands and watercourses, forested areas near watercourses, and rocky or gravelly areas such as roadsides. These habitats support different biological needs of species and relate directly to life history strategies. The layout of Project infrastructure aims to reduce impacts to intact habitat and has been specifically designed to minimize interactions with riparian areas and intact forest. No significant impacts resulting from habitat loss within the LAA are expected.

Terrestrial herpetofauna utilize the terrestrial environment to move across the landscape, particularly between wetlands and watercourses. The alteration of these habitats and conversion of intact forest to roads may result in a fragmented landscape, preventing natural patterns of movement across the landscape. Alternatively, roads can act as corridors for some herpetofauna. Habitat fragmentation has been minimized through the Project design, which prioritized the use of pre-existing roads (77% of roads being used are pre-existing) or

otherwise disturbed habitats. Effects to herpetofauna related to habitat fragmentation are therefore expected to be low within the LAA.

Injury or Mortality

Collisions

Wildlife-vehicle interactions have the potential to cause injury or mortality to terrestrial mammals. The Project will result in increased road traffic within the LAA, where evidence of small and large mammals using roadways has been observed (described in Section 10.2.5). Many roads within the Study Area are currently used for recreation by ATV, snowmobile, and dirt bike users and for forestry activities. Although the additional traffic associated with the Project may increase opportunities for wildlife-vehicle collisions, this is expected to mainly be limited to the construction phase. During the operations and maintenance phase of the Project, only a small number of technicians will be required to access the site to perform regular maintenance and equipment checks. 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 in the LAA.

Increased road traffic may affect herpetofauna within the Clearing Footprint due to an increased risk of vehicle or equipment collisions with herpetofauna species. Turtles, salamanders, and snakes, if present, may cross roads daily in search of food, or seasonally during migration to find nesting habitat or to escape uninhabitable climatic conditions (Wills, 2021).

Road traffic and the development of gravel roads pose unique risks for herpetofauna, as some species are attracted to exposed gravel areas for nesting. This recognized ecological trap is known to increase the risk of traffic-related mortality for species such as wood turtle (ECCC, 2020b). Some herpetofauna, such as salamanders and snakes, may also face elevated road collision risk due to daily movements for foraging or seasonal migrations (Wills, 2021). One herpetofauna SAR, snapping turtle, was observed during field assessments, and areas of suitable nesting and overwintering habitat for wood turtle were observed in the Assessment Area (though not individuals or signs thereof were observed). Mitigation measures will be employed to minimize risk if herpetofauna SAR are observed during Project phases, especially throughout sensitive windows (nesting).

The pre-existing traffic load and the minimal traffic to be associated with the Project both indicate that road traffic is not expected to have a significant effect on terrestrial herpetofauna in the LAA.

Uniquely among terrestrial fauna, swarming and migrating insects are susceptible to mortality from collisions with wind turbines. There are a number of hypotheses as to whether, or why, these insects are attracted to wind turbines (Jansson et al., 2020; Long et al., 2010; Rydell et al., 2010). Questions remain in the literature concerning how this potential attraction affects mortality rates; whether insect fatalities at wind turbines are contributing to population declines;

and how these fatalities are impacting ecological functions (Voigt, 2021). No significant effects to invertebrate SAR are expected as a result of this Project based on current insect population and ecology research and a lack of confirmed invertebrate SAR within the Study Area.

Disease

Problematic native species have been identified as a pervasive threat to mainland moose due to their potential to spread debilitating disease. Specifically, white-tailed deer are hosts for brainworm (*Parelaphostrongylus tenuis*) and winter tick (*Dermacentor albipictus*), both of which cause mortality in moose and are thought to be regulators of population abundance and distribution (NSNR, 2021i). A possible concern associated with developments is their potential to cause indirect effects on mainland moose by increasing access to the site by white-tailed deer and therefore, increasing the chances of disease spreading to mainland moose.

There is one record of deer over-wintering within the LAA in the NSNR Significant Habitat Database (NSNR, 2024f), and signs of white-tailed deer were observed throughout the Study Area during field assessments during spring pellet group and winter tracking surveys. It is unlikely that the new and upgraded roads will greatly increase access for white-tailed deer as they are already present and have existing access to the Study Area. As such, effects to mainland moose from disease due to the Project are expected to be negligible.

Poaching

Road development and upgrades could also increase access for humans and problematic native species within the LAA. Poaching has been identified as a potential threat to mainland moose in the Mainland Moose Recovery Plan (NSNR, 2021i), and is a threat to all terrestrial mammal populations, especially those with unstable populations. Increased human access within the LAA may increase the risk of poaching rare, sought-after animals. However, the Study Area is already highly accessible to the public, including local hunters and recreational users, and the presence of Project staff may act as a deterrent to poaching. Due to the pre-existing access to the Study Area, effects to terrestrial fauna (including mainland moose) from poaching due to the Project are expected to be negligible.

Sensory Disturbance

The Project may induce sensory disturbance in terrestrial fauna during all Project phases through the production of noise, the use of anthropogenic lighting, and the elevated presence of human activity in the LAA. Many species have sensitive windows for breeding and birthing, and small disruptions during these periods may reduce reproductive success in a population. Lovich and Ennen (2013) stress the importance of turbine siting relative to the needs of wildlife to minimize effects. The iterative Project design process has prioritized avoidance and minimizing interactions with important wildlife habitat such as wetlands and mature forest, which will reduce sensory disturbance in these areas.

Elevated sound levels have the potential to alter patterns of activity, stress levels, immune response, reproductive success, risk of predation, communication with conspecifics and antipredator predator behaviours, and hearing damage in fauna species (Lovich & Ennen,

2013; Rabin et al., 2006). The auditory capabilities of fauna species vary (Shannon, McKenna, et al., 2016), with sound levels above 55 dBA during the day and 45 dBA at night-time shown to cause physiological stress and behavioural changes in wildlife (Environment Canada, 2009). Similarly, a literature review conducted by Shannon et al. (2016) found that an increase in stress and decrease in reproductive success in terrestrial mammals has the potential to occur at sound levels ranging from 52 to 68 dBA.

The sound levels produced by the Project will be highest during construction. Sound levels will vary by activity and will be primarily generated from vehicles, heavy machinery [e.g., backhoes, cranes, blasting (if required)], smaller equipment like welding tools, and backup alarms. Although construction noise will exceed current ambient conditions, sound levels will decrease with distance from the source and be of short-term duration. Sound levels will be reduced during the operations phase of the Project, when noise will primarily be generated by turbines and occasional vehicle traffic.

Artificial lighting has the potential to impact wildlife by causing disorientation or altering attraction/avoidance of an area (Longcore & Rich, 2004). During the construction phase, lighting will be restricted to the amount required to ensure the safety of Project personnel, and construction activities will be predominantly within daytime hours when feasible. Lighting during the operations phase will be minimal and turbine lighting at night will be restricted to navigation hazard lights mounted on the turbine nacelles.

Given that the Study Area is already subject to noise from forestry activities and recreation vehicles (snowmobiles, ATVs) and despite the pre-existing noise, different mammal species were still observed across the Study Area, impacts from sensory disruptions caused by the Project within the LAA are anticipated to be low.

Sensitive windows for herpetofauna may relate to migration or nesting periods, and interference with these animals' activities during these windows may disrupt their natural life history. Interference may be both temporal and spatial. Project related activities occurring during sensitive windows may impact migratory or breeding behaviours, and habitat removal or fragmentation may create a physical barrier to herpetofauna species from reaching important habitat. Low impacts to life history are expected due to the small Project Footprint and minimized interactions with important habitat features such as wetlands and watercourses.

Mitigation Measures

To address the abovementioned effects to terrestrial fauna, the Proponent will develop and implement a Terrestrial Habitat and Wildlife Management Plan. Additionally, the following mitigation measures will be implemented:

Habitat Loss and Fragmentation

- Minimize overall area to be cleared by using previously altered areas (i.e., clearcuts) and existing roads.

- Allow for natural revegetation in the Clearing Footprint as possible to limit the effects of habitat loss and fragmentation.
- Minimize fragmentation and habitat isolation by using pre-existing roads and previously altered areas during the design phase.
- Support connectivity by maintaining vegetated buffers around wetlands and watercourses, where possible.
- Follow best practices to ensure that watercourse alterations (e.g., new culverts or upgrades to existing alterations) do not restrict the movement of terrestrial fauna and other wildlife.

Injury and Mortality

- Design the Project Footprint to minimize road density and use pre-existing roads to the greatest extent possible.
- Leave coarse woody debris in areas that will be re-vegetated after construction in place to provide alternative refugia and foraging areas for herpetofauna.
- Install traffic signs to alert road users of speed limits and the presence of wildlife in the area.
- Inform all Project-related staff working on the site of dangers to wildlife and create awareness around wildlife hotspots.
- Minimize Project-related traffic to reduce chances of wildlife collisions and traffic-related stress to wildlife.
- Prohibit harassment and feeding of wildlife by Project personnel.

Sensory Disturbance

- Maintain all equipment and machinery on the site to reduce noise and vibration emissions associated with malfunctions. Where practical, install vehicles and machinery with noise muffling equipment to limit disturbance.
- Prohibit harassment and feeding of wildlife by Project personnel.
- Limit use of lights to the amount necessary to ensure safe operation.

Monitoring

Project-specific monitoring activities for terrestrial fauna are not being proposed.

Conclusion

After mitigations, residual effects to terrestrial fauna are characterized as shown in Table 10.14.

Table 10.14: Terrestrial Fauna Residual Effects

Effect Detail	Habitat Loss and Fragmentation	Injury and Mortality	Sensory Disturbance
Magnitude of Effect	Low: Small loss of habitat supporting fauna	Low: Low impacts to fauna through injury and mortality	Low: Low impacts to fauna through sensory disturbance
Geographic Extent of Effect	5 km buffer of the Study Area	5 km buffer of the Study Area	5 km buffer of the Study Area
Frequency of Effect	Single Event: Effects expected to occur during construction phase	Intermittent: Effects occur occasionally or intermittently during one or more phase of the Project.	Intermittent: Effects occur occasionally or intermittently during one or more phase of the Project.
Duration of Effect	Medium Term: Effects will end following decommissioning	Medium Term: Effects will end following decommissioning	Medium Term: Effects will end following decommissioning
Reversibility of Effect	Partially Reversible	Partially Reversible	Reversible
Significance Level	Not Significant	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible			

10.3 Bats

10.3.1 Overview

A desktop review and field studies were undertaken to gather information on bat species and associated habitat in the Study Area. Objectives were as follows:

- Assess observations, species diversity, and habitat utilization of bats within the Study Area during the active bat period (spring to fall).
- Use the information collected to inform and refine the Project design (i.e., avoid impacts to SAR/SOCI and their habitats).
- Use the information collected to inform mitigation and management practices.

10.3.2 Regulatory Context

There are seven species of bats documented in Nova Scotia, of which four are resident species that reside in the province year-round and three are migratory species that overwinter in the southern United States. Resident species include the little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), tri-colored bat (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*). Migratory species include the eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*).

Three resident species (the little brown myotis, northern myotis, and tri-colored bat) are protected federally and provincially under SARA and ESA. These three species were added to ESA as 'Endangered' on July 11, 2013, and were declared 'Endangered' under Schedule 1 of SARA on November 26, 2014. The designation under SARA and ESA was driven by the emergence of white-nose syndrome (a disease caused by the fungus *Geomyces destructans*), which was first detected in Canada in 2010 and led to a 90% population decline in Nova Scotia by 2013 (COSEWIC, 2013b). All three migratory bat species were listed by COSEWIC in May 2023 as 'Endangered' (COSEWIC, 2023). The big brown bat is not listed under SARA or ESA.

10.3.3 Desktop Review

Databases and online resources referenced as part of this desktop review include:

- Locations of Known Bat Hibernacula in Nova Scotia (Moseley, 2007)
- Nova Scotia Geoscience Atlas – Abandoned Mine Openings (NSNR, 2024b)
- Nova Scotia Significant Species and Habitats Database (NSNR, 2024f)
- ACCDC Data Report (ACCDC, 2025a)

Locations of Known Bat Hibernacula

Moseley (2007) provides an overview of known and recorded bat hibernacula within Nova Scotia. This research indicates three known hibernacula within a 100 km radius of the Study Area (Table 10.15).

Table 10.15: Known Bat Hibernacula within 100 km of the Study Area

Hibernaculum	Approximate Distance from Study Area ⁽¹⁾	Direction
Hirschfield Galena Prospect	39 km	Southwest
McLellan's Brook Cave	68 km	West
New Laing Adit #1 and #2	86 km	West

⁽¹⁾ Distance measured to the nearest point of the Study Area.
Source: (Moseley, 2007)

The nearest recorded hibernaculum to the Study Area is Hirschfield Galena Prospect, located 39 km to the southwest near Glenelg, Nova Scotia. This hibernaculum is an abandoned mine adit with a surveyed length of 215 m, suspected to support approximately 200 to 300 bats. The next nearest hibernaculum is McLellan's Brook Cave, located 68 km to the west near McLellans Brook, Nova Scotia. This is an 85 m long dissolutional stream cave with associated observations of *Myotis* species around the cave but no records of underground bat activity. The only other recorded hibernaculum within 100 km of the Study Area is New Laing Adit #1 and #2, located 86 km to the west. These are abandoned mine openings supporting an estimated population of 200 to 300 individuals (Moseley, 2007). It should be noted that these hibernacula were assessed prior to the onset of white-nose syndrome in Nova Scotia, therefore, populations of bats using these habitats may vary from original estimates.

Abandoned Mine Openings

According to the British Columbia Ministry of Environment and Climate Change Strategy, Ecosystems Branch (2019), abandoned mine openings (AMOs) may serve as overwintering bat habitat if they have a depth greater than 30 m. Mine openings must also be of a suitable type (i.e., shafts, slopes, adits, or pits) and remain accessible to bats (i.e. not flooded or ponded and not having an intact fill, cap, or plug) to provide suitable habitat. Based on a review of the AMO Database (NSNR, 2024b), there are no recorded AMOs within the Study Area.

A total of 176 AMOs are documented within 25 km of the Study Area (NSNR, 2024b). Of these, six are potentially open/dry mine shafts, slopes, or adits with an original depth that could potentially support overwintering habitat for resident bat species (Drawing 10.8, Table 10.16). The remainder were not considered potential bat overwintering habitat as they were characterized as unsuitable opening types, shallow in depth, infilled, capped, plugged, ponded, or flooded.

Table 10.16: Abandoned Mine Openings with Potential to Support Overwintering

Name	Location	Commodity	Opening Type	Original Depth	Approximate Distance to Study Area ⁽¹⁾
MacGillivray Tunnel	Polsons Brook	Iron	Adit	30 m	17 km
Unnamed	Forest Hill	Gold	Shaft	58 m	23 km
Breton Coal Company Main Shaft	Port Malcolm (Caribou Cove)	Coal	Shaft	90 m	23 km
J.A. Campbell Seacoal Bay Level	Port Malcolm (Caribou Cove)	Coal	Adit	106 m	24 km
Unnamed	Port Malcolm (Caribou Cove)	Coal	Adit	40 m	23 km
Lake Copper Company No.2 Shaft	Copper Lake (Goshen)	Copper	Shaft	54.9 m	25 km

⁽¹⁾ Distance Measured to the nearest point of the Study Area

Source: (NSNR, 2024b)

Significant Species and Habitat Records

The Significant Species and Habitats Database (NSNR, 2024f) contains 99 unique species/habitat records pertaining to bats and associated habitat within a 100 km buffer of the Study Area. These consist of:

- 13 “Species of Concern” records relating to caves.
- Six “Other Habitat” records relating to caves (two) and unclassified bats (four).
- 80 “Species at Risk” records relating to tri-colored bat (one), silver-haired bat (two), eastern red bat (two), hoary bat (six), northern myotis (seven), little brown myotis (11), *Myotis* species (22), and unclassified bat species (29).

None of the above records are located within the Study Area.

ACCDC Records

The ACCDC Data Report (ACCDC, 2025a) does not contain records of bat species within 5 km of the Study Area. According to the ACCDC Report, there are no known “bat hibernaculum or bat species occurrence” within the Study Area (ACCDC, 2025a).

10.3.4 Field Assessment

10.3.4.1 Field Assessment Methodology

Monitoring conducted within the Study Area consisted of passive acoustic monitoring within the 2023 and 2024 active bat seasons. Monitoring locations targeted a combination of turbine locations and ideal bat habitat features such as, riparian areas and forest edges. Ideal habitat features were identified by combining a review of aerial imagery with accumulated knowledge from field studies. Monitoring locations were selected to prioritize low-clutter environments that would allow for higher accuracy in species identification, site coverage, and access considerations (Drawing 10.7).

Acoustic monitoring was conducted using Song Meter SM4BAT FS detectors from Wildlife Acoustics. The detectors were programed to monitor from 30 minutes before sunset to 30 minutes after sunrise to correspond with peak bat activity. GPS points and supplementary information (i.e., habitat descriptions) for each monitor location and detector set up were recorded upon deployment.

Passive acoustic monitoring in 2023 was conducted for 119 consecutive nights between the dates of March 23 and July 21, encompassing the spring and early summer active bat seasons. In 2024, monitoring was conducted for 124 consecutive nights between the dates of July 10 and November 12, encompassing the late summer and fall active bat seasons. Not all detectors were deployed and retrieved on the same day, resulting in varied numbers of monitoring nights at different detectors. Batteries were also depleted in all detectors in late September, resulting in a loss of between four and eight nights of data collection at detectors BAT1, BAT2, BAT4, and BAT5. BAT5 was moved from its original location and installed on the MET tower partway through the 2023 season and was also installed on the MET tower for the 2024 season.

Five detectors were deployed, four within the Study Area and one approximately 2 km outside of the Study Area as part of an earlier layout. Supplementary data for each detector is provided in Table 10.17 and detector locations are shown in Drawing 10.7. The number of detectors used for the Project was based The Nova Scotia Guidance for Bird and Bat Surveys Pre- and Post-Construction Surveys and Monitoring – Wind Energy (NSNR, 2022b), which recommends a minimum of two to three detectors for sites of 10 or fewer turbines, with an additional detector for every additional five turbines.

Table 10.17: Monitoring Periods for Detectors (2023 and 2024)

Detector ID	Detector Location	Location Details	Habitat Description	Monitoring Duration	Number of Monitoring Nights
BM1	45.533914, -61.746467	Outside SA	Mid-age softwood forest along a dirt road.	March 23 to July 20, 2023 July 10 to November 4, 2024	228
BM2	45.541179, -61.702266	Within AA (road)	Young softwood forest along a clearing on a dirt road.	March 26 to July 12, 2023 July 10 to November 12, 2024	221
BM3	45.559946, -61.691380	Within AA (road)	Open field containing a few small trees at the edge of a dirt road.	March 26 to July 21, 2023 July 10 to November 2, 2024	198
BM4	45.543502, -61.669525	Within AA (road)	Young mixedwood forest along dirt road.	March 23 to July 20, 2023 July 10 to November 1, 2024	222
BM5A ⁽¹⁾	45.558257, -61.675872	Within AA (road)	Young mixedwood forest at a clearing along a dirt road.	March 23 to May 10, 2023	47 ⁽²⁾
BM5B ⁽³⁾	45.559545, -61.674831	Within AA (turbine pad)	Open area dominated by shrubs and graminoids at the base of a MET tower.	May 10 to July 21, 2023 July 10 to November 2, 2024	176
Survey Total					1,092

⁽¹⁾ Detector was moved 150 m to the northeast and installed on the MET tower partway through the 2023 season.

⁽²⁾ Denotes detectors with missing data files due to technological malfunction.

⁽³⁾ Detector was installed at the base of the MET tower in 2024.

Acoustic monitoring data (i.e., sonograms) was processed using Kaleidoscope Pro software from Wildlife Acoustics, complementary to the detectors used. Sonograms were analyzed for potential bat generated ultrasonic vocalizations and speciated when possible, first by the automatic identification feature of Kaleidoscope Pro and then manually by a trained biologist.

Due to their similarity, the calls of Nova Scotia's two resident *Myotis* species (little brown myotis and northern myotis) can be difficult to reliably distinguish from one another (O'Farrell & Gannon, 1999), so these calls were not identified to the species level. In addition, bat generated calls were identified as Unknown (UNKW) if the recording was within the correct frequency range for bats but was unable to be speciated based on the quality or length of the recording. Unknown calls between 20 kHz and 35 kHz were labelled as unknown low frequency bats (UNLO) and unknown calls between 35 kHz and 120 kHz were labelled as unknown high frequency bats (UNHI) when possible.

10.3.4.2 Field Assessment Results

During the 2023 and 2024 monitoring period, 31,375 files were recorded by acoustic detectors, of which 945 were determined to be bat generated ultrasound (Table 10.18). The remaining files were determined to be caused by extraneous noise from sources such as insects, birds, vegetation, wind, or precipitation. It should be noted that the recorded bat passes may belong

to the same or a different individual bat; for example, a bat foraging near a detector may be recorded several times throughout the night and/or over multiple nights. The following species and species groups were recorded during the acoustic survey:

- *Myotis* species (MYOT)
- Eastern red bat (LABO)
- Hoary bat (LACI)
- Silver-haired bat (LANO)
- Tri-colored bat (PESU)
- Unknown low-frequency bat (UNLO)
- Unknown high-frequency bat (UNHI)
- Unknown bat (UNKW)

Table 10.18: Results of the Passive Acoustic Bat Survey (2023 and 2024)

Detector ID	MYOT	LABO	LACI	LANO	PESU	UNLO	UNHI	UNKW	Bat Passes per Detector
BAT1	27	3	172	0	0	0	13	3	218
BAT2	21	1	66	0	0	0	25	3	116
BAT3	32	2	6	0	0	4	44	1	89
BAT4	57	0	370	1	0	3	31	0	462
BAT5	28	3	13	0	1	2	7	6	60
Passes per Species	165	9	627	1	1	9	120	13	Survey Total 945

Approximately 67% of recorded bat passes were determined to be migratory species, with more than 98% of these recordings being hoary bats. About 18% of total bat passes were attributed to resident species, with all but one recording being *Myotis* species. The remaining 15% of bat passes were unable to be attributed to a species or species group, with just over 90% of these bat passes being high-frequency species. Hoary bats were the most commonly detected species at BAT1, BAT2, and BAT4, *Myotis* species were the most commonly detected species at BAT5, and unknown high-frequency species were most commonly detected at BAT3, followed by *Myotis* species. Throughout the entirety of passive acoustic monitoring (a total of 1,092 detector nights), 945 bat passes were detected, resulting in an average of 0.87 bat passes per night across the Study Area.

All detectors recorded some bat activity, with varying levels of activity and different species compositions being recorded at each location. BAT5 recorded the fewest bat passes. This detector was deployed in three slightly different locations throughout the monitoring period. It did not record any bats in its original roadside location near the MET tower and only recorded two bat passes (both *Myotis* species) while deployed hoisted up the MET tower. The remaining 58 bat passes were recorded in 2024 when it was deployed near the base of the MET tower.

BAT4 recorded the most bat passes, with 462. About 80% of these were hoary bats, and approximately 90% of all bat passes recorded by this detector occurred in July and August of

2024. This detector was deployed along a dirt road near the center of the Study Area. Detectors BAT1 and BAT2 also recorded more than 100 bat passes. Both were deployed at forest edges bordering on open areas, with BAT1 being outside the updated Study Area and BAT2 being near the western edge of the Study Area.

Bat activity was analyzed monthly for the 2023 and 2024 monitoring periods (Figure 10.1). Recorded bat activity peaked in August of 2024, with high activity also occurring in July 2024 and much less activity being recorded throughout the rest of the monitoring period. High activity in summer months may be associated with bat pups maturing to the point of flying and feeding between June and August, whereas the decrease in activity through September and October is likely related to southern migration and returns to hibernacula (Fenton & Barclay, 1980; Shump & Shump, 1982).

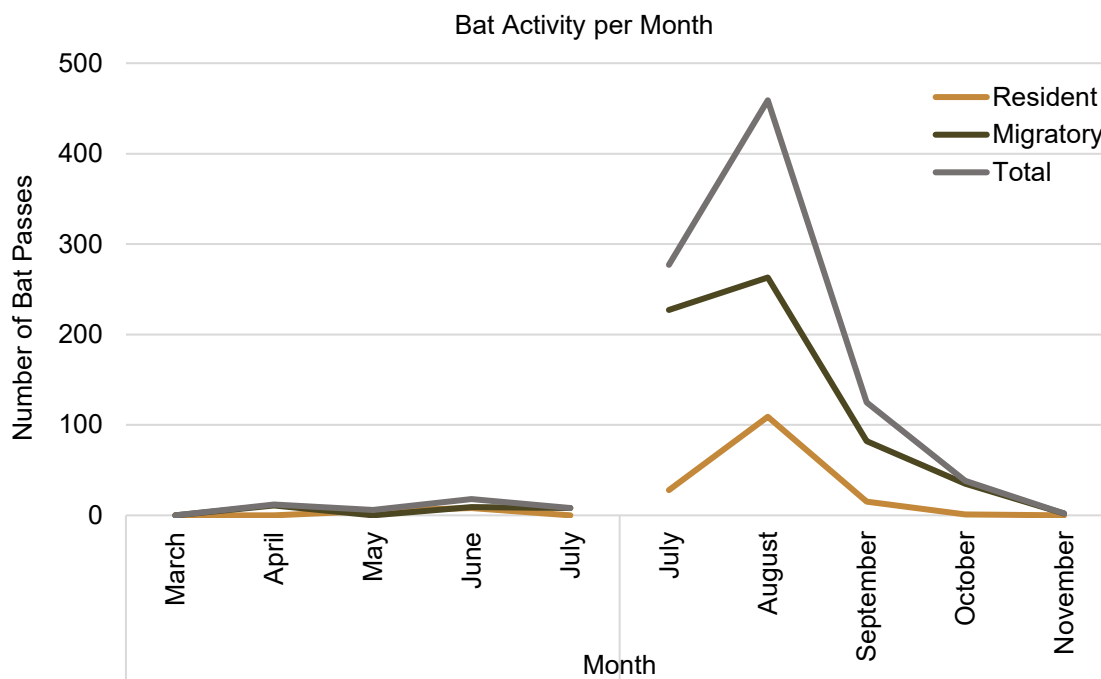


Figure 10.1: Bat Activity per Month

Note: Unknown bats were not included independently in this figure but are included in the total number of bat passes.

Despite similar lengths of monitoring periods in 2023 and 2024, more than 95% of bat passes in the dataset were recorded in 2024. Approximately 29% of recorded bat passes occurred in July 2024, with another 49% occurring in August 2024. As monitoring was conducted in the same locations using the same equipment over the course of 2023 and 2024, the difference in the level of recorded activity between 2023 and 2024 may be attributed to inter-year variability in local population size and habitat use patterns.

Bat passes were also analyzed by hour throughout the night for both monitoring periods (Figure 10.2). Hourly bat activity was observed to begin after 19:00 and increase steadily to a

peak around 23:00 before decreasing gradually until dawn, with the last activity occurring before 06:00. A second, smaller peak in activity is present at 01:00. When broken down into migratory and resident species, the trend displayed by the activity of migratory species mimics the overall trend; however, the trend in resident species is notably different, with activity increasing between 19:00 and 22:00 and remaining high until 02:00 before decreasing until dawn. The relatively consistent activity level of resident species throughout the night may indicate the presence of both northern myotis and little brown myotis, as the two species have different timings of peak foraging (J. B. Johnson et al., 2013).

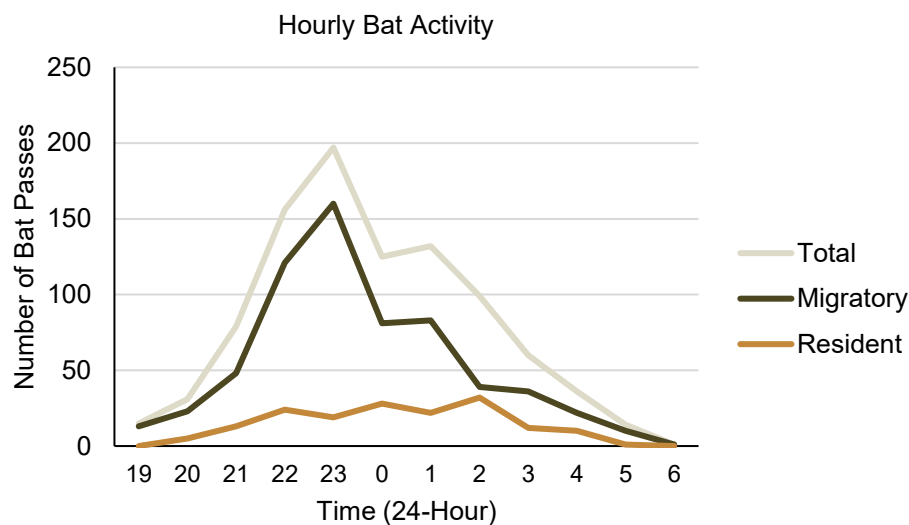


Figure 10.2: Bat Activity per Hour

Note: Unknown bats were not included independently in this figure but are included in the total number of bat passes.

The results of passive acoustic monitoring show a peak in activity around three to four hours after sunset (assuming an average sunset time of approximately 7:30 throughout the monitoring period) and a return to roosts approximately 7 to 10 hours after sunset. Factors that may influence the distribution of nightly bat activity include species presence and abundance, environmental conditions, foraging location, time of year, competition and resource partitioning, and/or diet (Fern et al., 2018; K. M. Gorman et al., 2021). The observed timing of emergence from roosts to feed is relatively consistent with existing literature, though the recorded return to roosts occurs a few hours later than indicated by previous research (Agosta et al., 2005; J. B. Johnson et al., 2013). The observed patterns demonstrate that bats recorded in and near the Study Area exhibit relatively normal and predictable foraging behaviours.

Priority Species

The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009) was utilized to identify any priority species and habitat associated with this Project. All bat SAR and SOCI, and their respective habitat associations identified within the

LAA through desktop review and field assessments were considered. Only those bat SAR and SOCI with potential to interact with the Project have been designated as Project-specific priority species. Interactions may include removal or disturbance of a SAR and/or SOCI and/or their associated habitat. These priority species include:

- Little brown myotis
- Northern myotis
- Tri-colored bat
- Hoary bat
- Eastern red bat
- Silver-haired bat

Little brown myotis

The little brown myotis is the most common species in Nova Scotia and is likely ubiquitous in the province (Broders et al., 2003). During the day, the little brown myotis will roost under rocks or in buildings, trees, wood piles, and caves, often congregating in tight spaces (Fenton & Barclay, 1980). As a non-migratory species, the little brown myotis hibernates from September to early or mid-May in abandoned mines or caves (Fenton & Barclay, 1980; Moseley, 2007). Field assessments completed for the Project identified myotis species within the Assessment Area.

Northern myotis

The northern myotis, once considered uncommon throughout Nova Scotia (Moseley, 2007), is likely ubiquitous in forested regions of the province (Broders et al., 2003). This species is widely distributed in the eastern United States and Canada and is commonly encountered during swarming and hibernation (Caceres & Barclay, 2000). During the day, northern myotis shows a preference for roosting in trees; however, the habitat preferences of females may vary according to their reproductive status (Garroway & Broders, 2008). Females appear to prefer shade tolerant deciduous trees over coniferous trees, whereas males tend to roost alone in coniferous or mixed-stands in mid-decay stages (Broders & Forbes, 2004). The northern myotis is also non-migratory and typically associated with the little brown myotis during hibernation, being found in caves or abandoned mines alongside this species (Moseley, 2007). Hibernation of the northern myotis is thought to begin as early as September and can last until May (Caceres & Barclay, 2000). Field assessments completed for the Project identified myotis species within the Assessment Area.

Tri-colored bat

The tri-colored bat only has approximately 10% of its range in Canada and is considered rare in Nova Scotia (COSEWIC, 2013). Documented observations of the tri-colored bat predominantly occur in the southwestern region of the province, especially during summer (Broders et al., 2003). The tri-colored bat can be found in a variety of habitats but typically forages in covered riparian areas and around open bodies of water. Hibernation begins in September and extends to early or mid-May, occurring in abandoned mines or caves with high humidity and above freezing temperatures (COSEWIC, 2013). Field assessments completed for the Project identified tri-colored bat within the Assessment Area.

Hoary bat

Hoary bats have the widest range among all native terrestrial mammals within the Western Hemisphere and are found across Canada and the United States (COSEWIC, 2023). As a result, hoary bats travel long distances (i.e., across the continent) during migratory periods, residing in coastal regions of Mexico and the United States during winter and migrating north in the spring. Hoary bats can be found roosting in the foliage of trees or shrubs in coniferous or deciduous forests of any age, but they prefer mature stands with abundant canopy cover and open flight space below. During lactation, females prefer to roost within the sheltered side of coniferous trees in mature forests (Klug et al., 2012). Foraging habitat for hoary bats is associated with open areas containing patches of trees such as fields, grasslands, or wetlands, though they tend to avoid heavily disturbed habitats such as transportation corridors, urban developments, and mines. Migration is thought to occur across coastal and/or large open areas (COSEWIC, 2023). Field assessments completed for the Project identified hoary bat within the Assessment Area.

Eastern red bat

Eastern red bats are typically found east of the Rocky Mountains in Canada and the United States and in northeastern Mexico (COSEWIC, 2023). This species can travel thousands of kilometres north during spring and fall migrations. Eastern red bats roost in similar habitat to hoary bats (described above), often roosting alone or with pups. Maternity roosts for this species are typically found in large diameter trees that reach or exceed the height of the surrounding canopy. Foraging habitat for eastern red bats includes both open and forested habitats as well as forest edges. Heavily disturbed habitats such as transportation corridors, urban developments, or mines are typically avoided by this species. Migration is thought to occur across coastal and/or large open areas (COSEWIC, 2023). Field assessments completed for the Project identified eastern red bat within the Assessment Area.

Silver-haired bat

The silver-haired bat is also widely distributed across Canada and the United States, extending from southern portions of the Northwest Territories and British Columbia east to Nova Scotia (COSEWIC, 2023). The silver-haired bat undertakes long distance migrations, residing in coastal regions of British Columbia and throughout the United States and Mexico during the winter and travelling north in the spring. Silver-haired bats typically roost in cavities or under the bark of large, decaying trees. Maternity roosts are usually small and found in decaying deciduous trees or in buildings. Foraging habitat is not well characterized, but is usually associated with forests, including forest edges and openings. Little is known about migration requirements for this species (COSEWIC, 2023). Field assessments completed for the Project identified silver-haired bat within the Assessment Area.

10.3.5 Effects Assessment

Project-Bat Interactions

Project activities, primarily those involving vegetation clearing and turbine operation, have the potential to impact bats and bat habitat (Table 10.19). These activities could result in habitat

loss and accidental injury or mortality. Other Project activities during construction and operation may impact bat behaviors such as increased noise and lighting.

Table 10.19: Potential Project Interactions with Bats

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Interconnection	-
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for bats includes a 5 km buffer of the Study Area (Drawing 10.5). As most bats forage within 5 km of their roosting sites (Balzer et al., 2023; ECCC, 2015), this area should capture roosting habitat of most bats foraging within the Study Area. The RAA does not apply.

Assessment Criteria

Assessment criteria provided in Section 4.3 applies to bats. The VC-specific definition for magnitude is as follows:

- **Negligible:** No measurable loss of habitat supporting bats and loss of individuals is not expected.
- **Low:** Low loss of habitat supporting bats and loss of individuals is not expected.
- **Moderate:** Moderate loss of habitat supporting bats and/or minimal loss of individuals is expected.
- **High:** High loss of habitat supporting bats and/or loss of individuals at a level which may cause population level impacts is expected.

Effects

Potential impacts to bat species from the Project's construction and operation include:

- Habitat fragmentation and/or loss.
- Direct and/or indirect injury or mortality.
- Sensory disturbance (e.g., lighting, noise, human activity).

Habitat Fragmentation and/or Removal

Habitat fragmentation and removal will be associated with vegetation clearing within the Assessment Area, primarily for access roads, turbine pads, and supporting infrastructure. Vegetation clearing required for construction can result in the removal of bat habitat or disrupt corridors between important habitat features, such as foraging and roosting habitat (Reusch et al., 2022; Segers & Broders, 2014). This may impede movement, foraging, flight activity, and habitat use (ECCC, 2015). Harvesting and the creation of cleared areas can also reduce landscape-level habitat quality as well as result in increased predation risk as bats travel across open areas (Slough et al., 2023).

One study by Segers & Broders (2014) found that different species of bats respond differently to landscape alteration for wind farm development. Some bat species prefer edge habitat over both open clearcuts and intact interior forest as it can provide good foraging habitat (Hein et al., 2008). Little brown myotis has been shown to benefit from edge habitat created during harvesting and road construction, preferring to forage in cut blocks and road rights-of-way over intact forest (Segers & Broders, 2014; Slough et al., 2023). Harvesting can also create foraging habitat suitable for hoary bats and eastern red bats (COSEWIC, 2023). Alternatively, suitable habitat for northern myotis may decrease following construction due to this species' preference to forage in forested areas and around canopy covered streams (Segers & Broders, 2014). Silver-haired bats (a cavity-roosting species) can also experience a reduction in roosting habitat due to some forestry practices (COSEWIC, 2023). Pregnant and lactating female bats have been shown to be particularly sensitive to habitat degradation as their foraging ranges are more constricted due to decreased energy and caring for young (Henry et al., 2002; Segers & Broders, 2014).

The results of passive acoustic monitoring showed that more migratory species (67% of bat passes) are active within the Study Area than resident species (18% of bat passes). Hoary bats accounted for approximately 66% of total bat passes recorded between 2023 and 2024 acoustic monitoring, and *Myotis* species comprised an additional 17%. The remaining bat passes were attributed to tri-colored bat (<1%), silver-haired bat, (<1%), eastern red bat (1%), and unknown (15%). According to a study by Perry & Thill, (2007), hoary bats prefer to roost in unmanaged mixed wood stands with an overstory age of more than 50 years. During lactation, females tend to roost in large coniferous trees of old-growth forests (Klug et al., 2012). Similarly, *Myotis* species have been found to prefer to roost in mature forests with tall, large diameter trees (ECCC, 2015). Through other field surveys described in Section 10.1, four of the 12 surveyed potential old-growth forest stands were confirmed as old-growth, ranging from 120 to 181 years of average stand age. Note that the minimum average stand age for a forest to be considered old-growth is 100 years, which is far older than the minimum age preferences of some bat species (Perry & Thill, 2007). Of the potential old growth stands assessed, the youngest stand surveyed (not including stands with significant blowdown or harvested stands) was found to have an average age of 115 years (Table 10.4, Section 10.1). Although stands

not surveyed are likely to be much younger than surveyed stands, generally, this data indicates that good quality over-day roosting habitat does exist within the Study Area. Old-growth stands will be avoided by micro-siting turbines away from old-growth stands and minimizing further disturbance of old-growth during upgrades to existing roads.

In addition to changes in habitat availability, habitat fragmentation may occur in the Study Area with the construction and subsequent use of new access roads. Some bats, especially migratory species, may avoid high-traffic roads due to an increase in noise pollution (COSEWIC, 2023). A study by Fensome & Mathews (2016) found that 79% of bats crossed a two-lane rural road through forested habitat when vehicles were absent, but this decreased to 59% when vehicles were present. Crossings decreased to 14% without traffic and 3.5% with traffic in areas that lacked a tree line (Fensome & Mathews, 2016). Road density is expected to increase in the Study Area following construction, with 15 km of new roads being built in association with the Project; however, heavy traffic is not expected within the Study Area at night (when bats are active) and many roads will be through forested areas. These factors should reduce the barrier effect of roads within the Study Area.

Impacts to bats from habitat fragmentation and removal are anticipated to be minimal based on existing disturbance and habitat fragmentation within the Study Area, the Project's maximized use of existing roadways and cleared areas, and avoidance of features such as wetlands and mature forests which may provide bat habitat.

Injury or Mortality

Wind project-related bat injuries and mortalities are increasingly becoming a concern, as some researchers have highlighted that turbines could have a greater impact on bats than birds (Barclay et al., 2007). Bats have a slower life cycle than birds, resulting in impacts to population dynamics when mortalities occur (Wellig et al., 2018). This is especially prominent where populations are already small, either naturally or due to the impacts of white-nose syndrome (ECCC, 2018a).

Bat injuries and mortalities can result either from direct collision with turbine blades or from barotrauma, which is caused by the sudden decrease in air pressure following rotating blades (ECCC, 2015). Bats tend to collide with spinning turbine blades, and do not typically collide with stationary blades or towers (Arnett et al., 2008). Bats may collide with blades due to their inability to detect or avoid blades moving at high speeds, which can be up to 300 km/h at the tip of the blade (Wellig et al., 2018).

Research suggests that bats may be attracted to wind turbines because wind turbines attract insects due to their light colour and because they are often built in high places that coincide with insect hill-topping behaviours (Guest et al., 2022). Swarms of insects that can occur near wind turbines provide foraging opportunities for bats, especially migratory species that rely on stopover sites to feed during their migrations (Arnett et al., 2008; Guest et al., 2022). One study also found that bats actively forage near turbines during operation (Horn et al., 2008). During the study, researchers observed bats approaching non-rotating and rotating blades, repeatedly investigating turbine elements, following or becoming trapped by blade-tip vortices, and

colliding with turbine blades (Horn et al., 2008). Wind turbines may also attract bats because they can be perceived as potential mating sites or roost trees or because of their movement and sound (Guest et al., 2022; Wellig et al., 2018). Some research suggests that bats may exhibit attraction to or avoidance of wind turbines depending on inter-individual and interspecific variation (Reusch et al., 2022).

Bat activity and use of habitat within the Study Area was assessed through passive acoustic monitoring. Bat species identified during monitoring include *Myotis* species (i.e., little brown myotis and/or northern myotis), hoary bat, silver-haired bat, and eastern red bat. Migratory species (hoary bat, eastern red bat, and silver-haired bat) accounted for approximately 67% of recorded bat passes within the Study Area. These long distance migrating bats comprise most of the reported mortalities from wind turbines due to their higher flight elevations and long migration distances (Arnett et al., 2008; ECCC, 2015; Parisé & Walker, 2017). In the COSEWIC Assessment and Status Report on the Hoary bat, Eastern red bat, and Silver-haired bat (2023), wind energy development was determined to have a high to very high impact, with these three species comprising approximately 75% to 80% of bat fatalities associated with wind turbines. A review of mortality studies at wind farms between 1996 and 2006 found that mortality consistently peaked during fall migration, between mid-summer and autumn (Arnett et al., 2008).

Myotis species have relatively low fatality rates compared to other species due to their lower flight elevations and short migration distances (ECCC, 2015); nevertheless, in the Recovery Strategy for Little Brown Myotis, Northern Myotis, and Tri-colored Bat, collisions and barotrauma from wind turbines were listed as a high level of concern in areas impacted by white-nose syndrome (like Nova Scotia), with localized seasonal impacts in the spring, summer, and fall (ECCC, 2015). *Myotis* species accounted for approximately 17% of recorded bat passes during the 2023 and 2024 monitoring period.

To reduce the potential for bat mortality associated with wind turbines, scientific literature recommends that wind turbines be strategically sited away from ideal bat habitats such as mature forests, wetlands, and waterbodies (Reusch et al., 2022; Roeleke et al., 2016). The Project has been strategically sited in an area that has an extensive history of harvesting and disturbance with little remaining intact mature forest (described in detail in Section 10.1). The selection of turbine locations also prioritized avoidance suitable habitat features such as lakes, wetlands, watercourses, and old-growth forests to the extent possible. Additional opportunities to increase avoidance and minimization of interactions with these features will be reviewed during the detailed design phase.

Other Project activities that have the potential for injury or mortality to bats include vegetation removal, blasting during construction (if required), and increased vehicle traffic. Potential exists for bats to be harmed during vegetation clearing if they are roosting in vegetation as it is being cleared. This risk can be mitigated by planning to conduct vegetation clearing between November 1 and April 30 while bats remain in hibernation underground. Injury and/or mortality is also possible if a hibernaculum is heavily disturbed while occupied. Construction activities,

such as blasting (if required) or the use of heavy machinery, could potentially cause a hibernaculum to collapse (ECCC, 2015). No known hibernacula are located within 25 km of the Study Area (Moseley, 2007), and no AMOs with potential to support bat overwintering are located within 15 km of the Study Area (NSNR, 2021f). Additionally, the ACCDC report and personal communication with NSNR (S. Spencer, personal communication, July 8, 2025) indicate no known hibernacula within 5 km of the Study Area.

Increased traffic associated with the construction of new roads and upgrading of existing roads within the Study Area may also pose a risk to bats. Low-flying species, such as *Myotis* species, account for the majority of recorded vehicle-related mortality events, with juveniles being particularly vulnerable due to their reduced maneuverability and preference to forage in low-clutter habitats (Fensome & Mathews, 2016; Lesiński, 2007). Mortality is likely to be higher in areas where roads intersect good habitat, such as watercourses or forest edges (Fensome & Mathews, 2016; Lesiński, 2007; Medinas et al., 2013). Traffic volumes on roads within the Study Area are not expected to be high at night, and therefore, the risk of injury and mortality associated with traffic volumes is anticipated to be low.

Sensory Disturbance

Noise and light will be generated during all phases of the Project. During construction, decommissioning, and reclamation, noise and light will be generated by heavy equipment and may be generated by blasting, if required. Noise associated with construction will typically occur during daylight hours; therefore, sensory disturbance should be limited to roosting bats. During operations, noise and light will be generated by wind turbines.

Construction noise (e.g., heavy equipment, blasting, and pile-driving) may disrupt or deter bats, particularly those species that roost nearby, potentially causing roost abandonment; however, bats are well adapted morphologically, physiologically, and behaviourally to avoid acoustic trauma (CDT, 2016). Since bats are often exposed to the exceptionally loud sounds of their own echolocation signals (approximately 110 dB) they have evolved protective mechanisms to prevent sensory overload and damage to the auditory system (CDT, 2016). These mechanisms include behavioural avoidance, changing the shape and orientation of the pinnae, closing the cartilaginous fold in the outer ear canal, the tympanic reflex, and resonance absorption (Wever & Vernon, 1961). While these mechanisms are very effective in achieving protection from constant noise exposure (i.e., in the case of wind turbines), it is speculated that these mechanisms also can prevent overexposure from sudden, unexpected anthropogenic noise shocks (e.g., blasting). The typical lack of construction activity during the nightly 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 lighting during the construction, operations, and decommissioning phases of the Project may also impact bat behaviour. During construction and decommissioning, lighting will be a temporary source of sensory disturbance. A study by Seewagen et al. (2023) found that, while white floodlights had no significant impact on migratory species including the eastern red bat and hoary bat, little brown myotis was impacted

within at least a 75 m radius and experienced a loss of foraging habitat. This risk can be mitigated by using motion activated lighting where possible. During operations, turbine lighting will be in accordance with Transport Canada requirements for safety purposes.

The impacts of necessary noise and light 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 timing of activities that have potential to cause sensory disturbances outside of active bat periods (i.e., when bats are roosting or hibernating). Impacts will be limited to the Study Area, as only those bats roosting or foraging within areas undergoing construction will be exposed to sensory disturbance caused by the Project.

Mitigation Measures

To address the abovementioned effects on bats and bat habitat, the following mitigation measures will be implemented:

- Minimize the overall area to be cleared by utilizing pre-existing roads and previously altered areas (i.e., clearcuts) when possible.
- Maintain a 30 m vegetated buffer around wetlands and watercourses (where possible) to support connectivity and foraging habitat for bats.
- Plan clearing activities outside of April 15 to August 31 (encompasses the active bat window and bird breeding/nesting window) where possible.
- Give preference to motion activated lights on infrastructure to reduce insect attraction and subsequent attraction of bats. Motion activated lighting is only applicable to ground-based infrastructure (i.e., at doorways and substations) as turbine lighting at the top of individual turbines is regulated by Transport Canada.
- Employ noise controls (e.g., mufflers) on machinery, equipment, etc. during the site preparation and construction phase.
- Allow for natural revegetation of temporary construction areas to minimize habitat loss to the greatest extent possible.
- Develop and implement a Surface Water Management Plan to support appropriate drainage and minimize standing water (limiting insect breeding and subsequent attraction of bats) near turbines.
- Develop and implement a Terrestrial Habitat and Wildlife Management Plan.

Monitoring

The Proponent is committed to completing a second year of the baseline bat monitoring program, prior to operations, per requirements of the Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c).

A detailed Post Construction Bat Monitoring Plan will be developed and submitted to NSECC and NSNR for review. Monitoring activities may include:

- Post-construction bat mortality monitoring.
- Adaptive management/contingency plan if post-construction monitoring identifies significant bat mortality, developed in consultation with NSNR.

Conclusion

After mitigations, residual effects to bats have been assessed, including habitat fragmentation and/or loss, injury or mortality, and sensory disturbance. Based on this assessment, residual effects to bats are characterized as shown in Table 10.20.

Table 10.20: Bats and Bat Habitat Residual Effects

Effect Detail	Habitat Fragmentation and/or Loss	Injury or Mortality	Sensory Disturbance
Magnitude of Effect	Low: Low loss of suitable bat habitat is expected.	Moderate: Minimal loss of individuals is expected.	Low: Low impacts to habitat usage (i.e., effective habitat loss) due to sensory disturbance is expected.
Geographic Extent of Effect	5 km buffer of the Study Area	5 km buffer of the Study Area	5 km buffer of the Study Area
Frequency of Effect	Single Event: Effects may only be associated with clearing during construction.	Intermittent: Effects may occur seasonally between dusk and dawn during operations and temporarily during construction.	Continuous: Effects may occur sporadically during construction and decommissioning but may be constant (though spatially limited) during operations.
Duration of Effect	Medium Term: Effects will end following decommissioning	Medium Term: Effects will end following decommissioning.	Medium Term: Effects will end following decommissioning.
Reversibility of Effect	Partially Reversible	Irreversible	Reversible
Significance Level	Not Significant	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible			

10.4 Avifauna

10.4.1 Overview

The avifauna assessment was completed using a combination of desktop and field assessments to achieve the following objectives:

- Assess abundance, species diversity, and habitat utilization of avifauna within and near the Study Area during all seasons.
- Use the information collected to inform and refine the Project design (i.e., avoid impacts to SAR and SOCI and their habitats).

- Assess migratory bird activity and assess the risk that the Project poses to migratory birds.
- Use the information collected to inform mitigation and management practices.

10.4.2 Regulatory Context

Applicable federal and provincial laws and regulations relating to the protection of avifauna include:

- *Species at Risk Act* (Canada, 2002)
- *Migratory Birds Convention Act* (Canada, 1994)
- *Migratory Birds Regulations* (Canada, 2022)
- *Wildlife Act* (Nova Scotia, 1989b)
- *Endangered Species Act* (Nova Scotia, 1998)

The *Migratory Birds Convention Act* (MBCA) protects all migratory birds while they are present in Canadian jurisdiction, including on land, in the air, and on the water. The Migratory Birds Regulations protect the nests of species listed under Schedule 1 of MBCA for a set period, depending on the species. ESA and SARA prohibit harm to listed SAR along with their habitually occupied spaces and designated core/critical habitat.

The Project is also guided by policies, guidelines, and standards that provide guidance on the development of the Project and the survey design. These guidance documents and policies include:

- Environment and Climate Change Canada's Canadian Wildlife Service (Atlantic Region) – Wind Energy & Birds Environmental Assessment Guidance Update (ECCC-CWS, 2022).
- Wind Turbines and Birds - Updated Guidance for Environmental Assessment and Monitoring (ECCC, 2018).
- Wind Turbines and Birds - A Guidance Document for Environmental Assessment (ECCC-CWS, 2007b)
- Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007a)
- Nova Scotia Wetland Conservation Policy (NSECC, 2019).
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a).
- Various NSNR SMP and ECCC Species at Risk Management Plans.

10.4.3 Desktop Review

Desktop information was utilized to gain insight into protected avifauna habitats, species utilization of the area, and to identify SAR or SOCI potentially occurring within or near the Study Area, using the following sources:

- Terrestrial Habitat Mapping (Section 10.1)
- Nova Scotia Parks and Protected Areas (NSECC, 2020a)
- IBAs (IBA Canada, 2025)
- ACCDC
- Maritimes Breeding Bird Atlas (MBBA) (Birds Canada, 2025)
- NSNR Significant Species and Habitats Database (NSNR, 2024f)
- Canadian Wildlife Service Migratory Bird Sanctuaries (MBS) (ECCC, 2021)
- Critical Habitat for SAR National Dataset (ECCC, 2025c)

Terrestrial Habitat Mapping

The Study Area consists of a variety of habitat types, including forests (primarily mixedwood and softwood), wetlands, developed land, and harvested areas. The landscape is fragmented by roads and transmission lines, and historical forestry activity. There are stands with old-growth potential within the Study Area, and a large wilderness area to the south which features mature hardwood forest. The diversity of habitat types, in particular the occurrences of edge/transitional habitat and wetlands, provides for the foraging, breeding, and roosting requirements of a variety of resident and migratory bird species.

Parks and Protected Areas

Tracadie River Wilderness Area is located directly adjacent to the southern boundary of the Study Area (Drawing 10.9). The 2,526 ha area features rolling hills of mature hardwood forest as well as several lakes, rivers, and wetlands (NSECC, 2009b).

Hurlburt Brook Nature Reserve is a pending nature reserve located approximately 2 km east of the Study Area (Drawing 10.9). The reserve features 162 ha of old, tolerant hardwood forest (Province of Nova Scotia, 2013).

There are four forest stands within 5 km of the Study Area that are protected under the Old-Growth Forest Policy, the largest of which is just over 61 ha (Drawing 10.9).

Mature forested habitats such as those found within the aforementioned protected areas are of significant importance to cavity-nesting birds (e.g. owls and woodpeckers), and species such as chimney swift (*Chaetura pelagica*) which utilize large hollow trees for nesting and roosting (Neily & Parsons, 2017).

Important Bird Areas

The closest IBA is the Pomquet Beach Region (NS009), approximately 8 km northwest of the Project (Drawing 10.9). This coastal IBA features barrier beaches, sand flats, dunes, and heath-scrub, and the tidal flats provide feeding opportunities for various shorebird species which stop over during migration (Birds Canada, n.d.). The IBA is known to provide nesting habitat for the federally and provincially 'Endangered' piping plover (*Charadrius melodius*) and has supported one of the most stable piping plover populations in Nova Scotia since the species began declining (Birds Canada, n.d.). There is a great blue heron (*Ardea herodias*) colony on Pomquet Island, and other coastal birds like osprey (*Pandion haliaetus*) and bald

eagle (*Haliaeetus leucocephalus*) are known to breed in the area (Birds Canada, n.d.). Due to the distance between this IBA and the Study Area, no interactions with the Project are expected.

Atlantic Canada Conservation Data Centre

The ACCDC (2025b) data report for the Project identified 221 records of avian SAR (Table 10.21) and 151 records of avian SOCI within a 5 km buffer of the Study Area.

Table 10.21: Avian SAR Recorded within 5 km of Study Area

Species	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank
Bank Swallow	<i>Riparia riparia</i>	Threatened	Threatened	Endangered	S2B
Barn Swallow	<i>Hirundo rustica</i>	Special Concern	Threatened	Endangered	S3B
Bobolink	<i>Dolichonyx oryzivorus</i>	Special Concern	Threatened	Vulnerable	S3B
Canada Warbler	<i>Cardellina canadensis</i>	Special Concern	Threatened	Endangered	S3B
Common Nighthawk	<i>Chordeiles minor</i>	Special Concern	Special Concern	Threatened	S3B
Eastern Wood-pewee	<i>Contopus virens</i>	Special Concern	Special Concern	Vulnerable	S3S4B
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Special Concern	Special Concern	Threatened	S3B
Rusty Blackbird	<i>Euphagus carolinus</i>	Special Concern	Special Concern	Endangered	S2B

Most of the bank swallow records were concentrated around a quarry outside of the Study Area. While the Study Area could provide foraging habitat for this species, it does not appear to provide suitable nesting habitat, which consists of burrows excavated in riverbanks, coastal bluffs, and manmade features such as sand pits (COSEWIC, 2013a). The Study Area lacks those features, but could potentially provide foraging habitat or migratory roost habitat, which is often associated with wetlands (COSEWIC, 2013a).

Barn swallow records were primarily in rural residential areas and near open fields outside of the Study Area. The Study Area could provide suitable foraging habitat for barn swallows and other aerial insectivores, particularly around wetlands and open areas, but there are very few man-made structures within the Study Area that could provide nesting habitat. One residence just inside the northern edge of the Study Area may provide suitable nesting habitat.

The bobolink records were concentrated around fields in rural areas outside of the Study Area. This species primarily nests in hayfields and pastures (COSEWIC, 2010b), which are not present within the Study Area.

The common nighthawk records were along roads, fields, and wet areas outside the Study Area. Common nighthawk nesting habitat includes open areas like clearcuts, fields, forest openings, burned areas, and gravel roads (COSEWIC, 2018b). The Study Area features several of these open habitat types, including clearcuts, roads, and transmission lines.

The evening grosbeak records were in a variety of habitats, including mixed-wood forest, hardwood forest, disturbed roadside areas, and rural residential areas. This species is more of a generalist than the other avian SAR with records in or near the Study Area. While none of the ACCDC records were within the Study Area, it could potentially offer suitable breeding, foraging, or wintering habitat, particularly in areas with intact mixed-wood forest.

The Study Area contains wetlands which may provide suitable breeding habitat for wetland-associated species like Canada warbler, eastern wood-pewee, olive-sided flycatcher, and rusty blackbird. The olive-sided flycatcher records within the Study Area were in or near wetlands, open areas, or edge-habitats, which aligns with this species' known breeding and foraging preferences. The Canada warbler records within the Study Area appear to be within or near wetlands. All the rusty blackbird records within the Study Area were associated with wetlands which appeared relatively open and containing surface water. The eastern wood-pewee records were in wooded roadside habitat with wetlands nearby.

Maritimes Breeding Bird Atlas

The Study Area is contained within the MBBA map squares 20TPR04 and 20TNR94 (Birds Canada, 2025). In the most recent edition of the MBBA (2006-2010), 101 species were identified between the two map squares. Of those species, 23 are SOCI and eight are SAR (Table 10.22).

Table 10.22: Avian SAR Recorded within MBBA Squares 20TPR04 and 20TNR94

Species	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Bank Swallow	<i>Riparia riparia</i>	Threatened	Threatened	Endangered	S2B
Barn Swallow	<i>Hirundo rustica</i>	Special Concern	Threatened	Endangered	S3B
Bobolink	<i>Dolichonyx oryzivorus</i>	Special Concern	Threatened	Vulnerable	S3B
Canada Warbler	<i>Cardellina canadensis</i>	Special Concern	Threatened	Endangered	S3B
Eastern Wood-pewee	<i>Contopus virens</i>	Special Concern	Special Concern	Vulnerable	S3S4B
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Special Concern	Special Concern	Threatened	S3B
Rusty Blackbird	<i>Euphagus carolinus</i>	Special Concern	Special Concern	Endangered	S2B

Confirmed breeding evidence (as per the MBBA breeding evidence codes) was observed for bank swallow, barn swallow, bobolink, olive-sided flycatcher, and rusty blackbird. Probable breeding evidence was observed for Canada warbler, and possible breeding evidence was observed for eastern wood-pewee and evening grosbeak.

NSNR Significant Species and Habitats Database

The NS Significant Species and Habitats database contained five records pertaining to avifauna and/or avifauna habitat within a 5 km radius of the Project (NSNR, 2024f). These consist of:

- Three records classified as “Species of Concern” which relate to boreal chickadee (*Poecile hudsonicus*), Canada jay (*Perisoreus canadensis*), and common loon (*Gavia immer*).
- One record classified as “Species at Risk” which relates to eastern wood-pewee.
- One record classified as “Other Habitat” which relates to bald eagle.

Canadian Wildlife Service Migratory Bird Sanctuaries

There are no Migratory Bird Sanctuaries within 5 km of the Project, or anywhere in eastern Nova Scotia.

Critical Habitat for Species at Risk National Dataset

There is no designated critical habitat for SAR within 5 km of the Project, as per the Critical Habitat for SAR National Dataset (ECCC, 2025a). There is critical habitat for piping plover associated with the Pomquet Beach Region IBA, approximately 8 km northwest of the Project.

10.4.4 Field Assessment

10.4.4.1 Field Assessment Methodology

Several survey methods were employed to assess avian abundance, species diversity, and SAR habitat availability within and surrounding the Study Area. Some field surveys were conducted prior to finalization of the Project layout, and as a result, survey coverage extends partially beyond the Study Area. Data collected near the Study Area is applicable to the Study Area, as the same habitat types are present.

Prior to conducting field surveys, a preliminary desktop survey design (i.e., using provincial aerial imagery, forestry, wetland, depth-to-water, and topography layers) was developed to target suitable habitat for avian species or groups of interest (e.g., migratory birds, breeding birds, waterfowl, and nightjar). In addition, methods were shared with ECCC-CWS and NSNR in April and May 2023 (Table 6.1) for review and comment.

Since species have different habitat requirements for breeding and migratory purposes, a wide range of habitats were targeted, with a goal of achieving representative coverage of all major habitat types in the Study Area (Drawing 10.10). Habitat types surveyed included wetlands, lakes, watercourses and riparian areas, harvested areas in varying stages of regeneration,

softwood, hardwood, and mixedwood forest, and developed areas (e.g., transmission line corridors, roads).

The following survey types were completed:

- Spring and fall migration point count (PC) surveys
- Spring and fall migration diurnal watch count (DWC) surveys
- Breeding bird point count surveys and area searches
- Nightjar surveys

Survey dates were selected to provide representative coverage across appropriate seasons and to ensure migratory bird abundance and species diversity was fully captured (e.g., early and late season migrants). Survey rounds were separated by a minimum of 10 days. A breakdown of survey type, dates, and rationale is described in Table 10.23.

Table 10.23: Avian Surveys Completed for the Project

Survey Type	Survey Rounds	Survey Locations	Dates	Rationale	Reference for Survey Dates and Methods
Spring migration	5	33 PC and 2 DWC	April 11 to 12, 2023 April 26 to 27, 2023 May 10 to 12, 2023 May 31, 2023 June 9, 2023	Most migratory birds return to Canada to breed between late-March and mid-May. Surveys were completed between early-April and early-June to capture both early and late season migrants, as well as early breeding activity.	Wind Turbines and Birds - A Guidance Document for Environmental Assessment (ECCC-CWS, 2007b)
Breeding bird	3	41	June 13, 2023 June 12 to 14, 2024 June 27 to 28, 2024	June is peak breeding season in Nova Scotia. Surveys were completed in mid-June and in late-June to capture early and late season breeders.	Maritimes Breeding Bird Atlas (Birds Canada, 2025)

Survey Type	Survey Rounds	Survey Locations	Dates	Rationale	Reference for Survey Dates and Methods
Nightjar	2	7	June 11 to 12, 2024 June 26, 2024	The goal of these surveys was to understand the use of the land within and surrounding the Study Area by common nighthawk and eastern whip-poor-will (<i>Antrostomus vociferus</i>). Suitable habitat for common nighthawk is thought to be present within the Study Area based on desktop review.	Canadian Nightjar Survey Protocol (Knight et al., 2019)
Fall migration	5	41 PC and 2 DWC	August 14 to 16, 2024 September 6 to 11, 2024 September 17 to 19, 2024 October 2 to 4, 2024 October 23 to 25, 2024	Most migratory birds begin to migrate south for the winter months between August and September. Surveys began in mid-August and extended into late-October to capture both early and late season migrants.	Wind Turbines and Birds - A Guidance Document for Environmental Assessment (ECCC-CWS, 2007b)

Spring and Fall Migration Point Count Surveys

Point count surveys were used as the primary means of assessing avian abundance and species diversity during spring and fall. A total of 33 point count locations were surveyed in spring and 41 were surveyed in fall. As a result of changes to the Project layout, the survey design was adjusted slightly following the completion of the spring migration surveys. Several new locations were added while several others were dropped to improve coverage of the updated infrastructure layout during the breeding bird and fall migration surveys.

Point count locations were spaced a minimum of 250 m apart to reduce the likelihood of double-counting individuals, as outlined in the document Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007a).

Point count surveys were 10 minutes in duration, with the survey period beginning at or within half an hour of sunrise. Effort was made to complete surveys by 10 am to observe the most

active time of day for passerine species. All visual and auditory observations of birds were recorded during each survey, along with relevant behavioural information such as breeding evidence. The estimated distance to target, direction, and number of individuals was recorded for each bird identified. Survey opportunities were maximized for clear weather (i.e., low or no precipitation) and minimal wind within the appropriate timeframe. Habitat descriptions were collected at each point count location. Incidental observations were recorded when notable species or behaviours were observed outside of the allotted point count survey duration or away from designated survey locations (e.g. while travelling through site). Incidental observations were also recorded by staff conducting other field assessments (e.g., wetlands, botany, lichens) throughout the Study Area.

Spring and Fall Migration Diurnal Watch Count Surveys

Diurnal watch count surveys were completed to assess the daytime movements of migratory birds. These surveys help capture the migratory movements of raptors, which tend to become more active in the late morning and early afternoon. The surveys were completed for 120 minutes in the late morning or early afternoon, following the completion of spring/fall migration point count surveys, and data was collected in 30-minute blocks. Details on the movements of birds were recorded, including bearing from the observer, distance to the target, the direction that the target was moving, passing height, and any other behavioural notes. Two survey locations (Drawing 10.10) were selected based on providing ideal vantage points and open, unobstructed views of the sky, including areas that could potentially serve as stop-over sites during migration. One of the selected survey locations overlooked a lake, while the other overlooked an open clearcut area. A spotting scope was used when necessary to aid in the identification of distant targets.

The absence of observable migration patterns or notable events during field surveys does not rule out such activity in the area. Radar and acoustic monitoring programs have a higher likelihood of detecting large migration events since they record data for longer periods of time, including at night. Many species migrate nocturnally and may therefore be missed or under-represented by field surveys conducted in the morning. The radar and acoustic monitoring programs are intended to help fill this gap.

Breeding Bird Surveys

Breeding bird surveys consisted of a combination of point count surveys and area searches. The methodology used during the point count surveys was the same that was used during the spring and fall migration point count surveys. The goal of these surveys was to assess the breeding activity and habitat utilization of birds during the breeding season.

Breeding bird area searches were conducted in the morning, following the completion of the point count surveys. The area searches were meandering, non-standardized transects which focused on notable habitat features (e.g. wetlands, watercourses, potential SAR habitat or areas where SAR were previously identified) or areas which could benefit from additional survey coverage. All bird observations were recorded in the same manner as the point count methodology but with a focus on identifying novel species, SAR/SOCI, and breeding evidence.

Four area searches were completed for approximately one to two hours each, depending on bird activity.

During the point count surveys and the area searches, all signs of breeding behaviour (e.g. agitation, carrying food, nest building, the presence of a pair of birds in suitable nesting habitat, etc.) were thoroughly documented. Breeding evidence codes from the Maritimes Breeding Bird Atlas (MBBA, 2006) were used to determine breeding status based on field observations. Breeding evidence was described using the following four categories:

- **Observed:** The species was observed in its breeding season, but no breeding evidence was observed.
- **Possible:** Breeding is possible based on species' presence in suitable nesting habitat during its breeding season or based on the presence of a male singing in suitable nesting habitat in its breeding season.
- **Probable:** Breeding is probable based on strong indicators of breeding behaviour (e.g. nest building, agitated behaviour, the presence of a pair in suitable nesting habitat during the breeding season, etc.)
- **Confirmed:** Breeding is confirmed based on the observation of behaviour which indicates the presence of an active nest (e.g. recently fledged young, a nest containing eggs or young, nest building behaviour, an adult carrying food, distraction display, etc.)

Nightjar Surveys

Common nighthawk and eastern whip-poor-will (*Antrostomus vociferus*) are aerial insectivores belonging to the nightjar family, both of which are considered SAR. Both species are known to utilize a wide range of open to semi-open habitats for nesting, including forest openings, logged areas, fields, barrens, bogs, and burned-over areas (COSEWIC, 2018b; ECCC, 2018b). Considering the location of the Project and eastern whip-poor-will's known breeding range, this species is unlikely to occur within the Study Area. Based on desktop review and habitat modelling results, common nighthawk could occur within the Study Area.

Two rounds of targeted nightjar surveys were completed in June 2024. Survey methodology was based on the Canadian Nightjar Survey Protocol (Knight et al., 2019). Seven survey locations were selected in habitats suitable for nightjar nesting and/or foraging. Habitats surveyed included disturbed forest, logged areas, transmission line, wet areas, and commercial blueberry fields. For the safety of staff completing the surveys at night, all survey locations were accessible by road. As per Knight et al. (2019), survey locations were spaced a minimum of 1.6 km apart to avoid overlapping observations. Surveys were completed between one hour before sunset and two hours after sunset, when nightjars are most active. The survey dates selected provided good weather conditions (i.e. low wind and no precipitation) and ideal moon phase (within seven days before or after a full moon) for observing nightjars.

Surveys were six minutes in duration and were passive, meaning no playback was used. During the survey period, surveyors recorded the number of nightjars observed as well as the behaviour of each individual (i.e. calling, wing-boom display). Details on survey conditions such

as wind level, noise level, cloud cover, precipitation, number of passing cars, and visibility of the moon were also recorded. Any other bird species observed (particularly novel species or SAR/SOCI) were recorded as incidentals.

10.4.4.2 Field Assessment Results

Spring Migration Point Count Surveys

Five rounds of spring migration point count surveys were completed at 33 locations between early-April and early-June 2023. A total of 1,515 birds were observed, representing 72 different species (Tables 1 and 2, Appendix N). The point count locations with the highest species diversity were PC17, PC26, PC28, and PC4, all of which were near wetlands or water features. PC26, which featured a roadside riparian wetland, had both the highest species diversity and highest number of individuals overall, including a Canada warbler observation. Migratory activity was highest among passerines, with small flocks of species including American robin, blue jay (*Cyanocitta cristata*), and yellow-rumped warbler (*Setophaga coronata*) recorded.

The most common species were:

- American robin
- White-throated sparrow (*Zonotrichia albicollis*)
- American crow (*Corvus brachyrhynchos*)
- Blue jay
- Ruby-crowned kinglet (*Corthylio calendula*)

Avian SOCI observed were:

- American kestrel (*Falco sparverius*; one)
- Bay-breasted warbler (*Setophaga castanea*; three)
- Blackpoll warbler (*Setophaga striata*; two)
- Boreal chickadee (two)
- Canada jay (three)
- Solitary sandpiper (*Tringa solitaria*; one)
- Spotted sandpiper (*Actitis macularius*; one)
- Turkey vulture (*Cathartes aura*; one)
- Wilson's snipe (*Gallinago delicata*; one)

Avian SAR observed were:

- Canada warbler (five)
- Eastern wood-pewee (one)
- Evening grosbeak (one)

Four of the Canada warbler observations were made in or near wetland habitat, and the fifth was made along a transmission line corridor. All five observations were made between late-

May and early-June, likely signifying breeding individuals. The single eastern wood-pewee observation was made near a large wetland (fen) complex in late-May, while the evening grosbeak observation was made near the edge of a mixedwood forest stand in early-April.

Spring Migration Diurnal Watch Count Surveys

Five rounds of spring migration diurnal watch count surveys were completed at two locations between early-April and early-June 2023. A total of 173 birds were observed, representing 42 different species (Tables 3 and 4, Appendix N).

The most common species were:

- American robin
- Blue jay
- Dark-eyed junco (*Junco hyemalis*)
- Common raven (*Corvus corax*)
- Black-capped chickadee (*Poecile atricapillus*)

Avian SOCI observed were:

- American goshawk (*Accipiter atricapillus*; one)
- Bay-breasted warbler (one)
- Turkey vulture (one).

No SAR were observed. Raptor activity was generally low, with American goshawk, bald eagle, northern harrier (*Circus hudsonius*), and turkey vulture observed in low numbers. DWC2 (overlooking Donnelly's Lake) had significantly higher avian abundance and species diversity than DWC1 (located in a clearcut), although waterfowl activity on the lake was relatively low.

2023 Spring Migration Surveys - Probable and Confirmed Breeding Evidence

Breeding evidence can be observed before the core breeding season begins, particularly for bird groups like waterfowl and raptors whose courtship often takes place throughout winter and early spring. Observations of probable and confirmed breeding evidence, based on the Maritimes Breeding Bird Atlas (MBBA, 2006) include:

- Belted kingfisher (*Megaceryle alcyon*): Probable breeding evidence (agitated behaviour).
- Black-and-white warbler (*Mniotilta varia*): Probable breeding evidence (agitated behaviour).
- Common merganser (*Mergus merganser*): Probable breeding evidence (pair observed in suitable nesting habitat in nesting season).
- Song sparrow (*Melospiza melodia*): Probable breeding evidence (pair observed in suitable nesting habitat in nesting season).
- Yellow-rumped warbler: Probable breeding evidence (pair observed in suitable nesting habitat in nesting season).
- Wilson's snipe: Probable breeding evidence (courtship or display).

2023 Breeding Bird Surveys

One round of breeding bird surveys was completed in June 2023, and two rounds were completed in June 2024, at 41 locations. A total of 549 birds were observed, representing 64 different species (Tables 5 and 6, Appendix N). PC36, located near the edge of a large bog, was the point count location with both the highest avian abundance and the highest species diversity.

The most common species were:

- American redstart (*Setophaga ruticilla*)
- Ovenbird (*Seiurus aurocapilla*)
- Alder flycatcher (*Empidonax alnorum*)
- Black-throated green warbler (*Setophaga virens*)
- Red-eyed vireo (*Vireo olivaceus*)

Avian SOCI observed were:

- American kestrel (one)
- Bay-breasted warbler (two)
- Canada Jay (one)
- Pine siskin (*Spinus pinus*; one)
- Turkey vulture (two)
- Wilson's snipe (one)

Avian SAR observed were:

- Canada warbler (six)
- Eastern wood-pewee (one)
- Olive-sided flycatcher (four)

All three SAR observed are wetland specialists, and all observations of these species were made in or near wetland habitats. One wetland was noted as containing an olive-sided flycatcher and more than one male Canada warbler competing for territory.

2023 Breeding Bird Surveys - Probable and Confirmed Breeding Evidence

Notes on breeding evidence were recording during all breeding bird surveys (MBBA, 2006). For species with multiple indications of probable or confirmed breeding evidence, the highest level of breeding evidence is provided.

- American crow: Probable breeding evidence (agitated behaviour).
- Canada warbler: Probable breeding evidence (an adult bird observed twice in the same location, a week or more apart, in breeding habitat, during its breeding season).
- Hairy woodpecker (*Dryobates villosus*): Probable breeding evidence (agitated behaviour).

- Red-eyed vireo: Probable breeding evidence (pair observed in suitable nesting habitat in nesting season).
- Wilson's snipe: Probable breeding evidence (courtship or display).

Canada warbler was the only SAR with probable or confirmed breeding evidence.

2024 Breeding Bird Surveys

Two rounds of breeding bird surveys were completed in June 2024, at 41 locations. A total of 1,522 birds were observed, representing 78 different species (Tables 7 and 8, Appendix N). PC37, located at the edge of a commercial blueberry field, was noted as having particularly high avian abundance and species diversity. PC10, located along a transmission line corridor and PC2, located near a fen, also had high species diversity.

The most common species were:

- American robin
- Red-eyed vireo
- American goldfinch (*Spinus tristis*)
- White-throated sparrow
- Black-throated green warbler

Avian SOCI observed were:

- Bay-breasted warbler (nine)
- Blackpoll warbler (two)
- Boreal chickadee (six)
- Canada jay (four)
- Cape May warbler (*Setophaga tigrine*; three)
- Killdeer (*Charadrius vociferus*; one)
- Pine siskin (two)
- Red crossbill (*Loxia curvirostra*; one)
- Tennessee warbler (*Leiothlypis peregrina*; one)
- Wilson's warbler (two)

Avian SAR observed were:

- Canada warbler (nine)
- Eastern wood-pewee (two)
- Olive-sided flycatcher (seven)
- Red-headed woodpecker (*Melanerpes erythrocephalus*; one)

The Canada warbler observations were all made in or near wet areas, while the eastern wood-pewee observations were made in riparian habitats or in upland forest with lakes and/or watercourses nearby. The olive-sided flycatcher observations were made in or near wetlands

or edge habitats (e.g. clearcuts). The single red-headed woodpecker observation was made in shrubby riparian habitat, surrounded by mixed-wood forest, with commercial blueberry fields nearby. Nova Scotia is outside of this species' typical range, and it is listed as an "Accidental Transient" by ACCDC (2025).

2024 Breeding Bird Surveys - Probable and Confirmed Breeding Evidence

Notes on breeding evidence were recording during all breeding bird surveys (MBBA, 2006). For species with multiple indications of probable or confirmed breeding evidence, the highest level of breeding evidence is provided.

- American redstart: Probable breeding evidence (pair observed in suitable nesting habitat in the breeding season).
- Bald eagle: Probable breeding evidence (agitated behaviour / anxiety calls of an adult).
- Black-throated green warbler: Probable breeding evidence (pair observed in suitable nesting habitat in the breeding season).
- Canada jay: Confirmed breeding evidence (recently fledged young observed).
- Pileated woodpecker (*Dryocopus pileatus*): Confirmed breeding evidence (an adult was observed leaving or entering a presumed nest site).
- Ring-necked duck (*Aythya collaris*): Probable breeding evidence (pair observed in suitable nesting habitat in the breeding season).
- Ruffed grouse (*Bonasa umbellus*): Confirmed breeding evidence (recently fledged young observed).
- Savannah sparrow (*Passerculus sandwichensis*): Probable breeding evidence (agitated behaviour or anxiety calls of an adult).

Confirmed breeding evidence was observed for pileated woodpecker, which is notable since pileated woodpecker cavities are protected year-round under the Migratory Bird Regulations (Canada, 2022). The pileated woodpecker cavity is outside of the proposed Project layout.

2024 Nightjar Surveys

Two rounds of nightjar surveys were completed in June 2024. No nightjars were observed; however, several incidental observations were collected. These incidental observations amounted to 78 individual birds, representing 25 different species (Tables 9 and 10, Appendix N).

The most common species were:

- American robin
- Dark-eyed junco
- Hermit thrush (*Catharus guttatus*)
- Savannah sparrow

Avian SOCI observed were:

- Bay-breasted warbler (one)
- Red-breasted merganser (*Mergus serrator*; two)

No SAR were identified and no observations of probable or confirmed breeding evidence were made.

Fall Migration Point Count Surveys

Five rounds of fall migration point count surveys were completed in June 2024, at 41 locations. A total of 4,110 birds were observed, representing 91 different species (Tables 11 and 12, Appendix N). Migratory activity primarily consisted of passerines, with small flocks of finches, sparrows, and warblers regularly observed moving through the Study Area. Waterfowl, while more abundant than during spring migration, were still relatively sparse. Diurnal raptors such as merlin (*Falco columbarius*), broad-winged hawk (*Buteo platypterus*), American kestrel, and red-tailed hawk (*Buteo jamaicensis*) were relatively abundant, particularly in open habitats such as commercial blueberry fields and transmission line corridors. Migratory activity was highest during the survey rounds completed in September. The point count locations with the highest avian abundance and species diversity were PC1, PC10, PC16, and PC18, and these locations all featured edge habitats, which are known to attract migrants. Avian abundance, species diversity, and observations of migratory behaviour were higher during fall migration surveys than during spring migration surveys. This result was expected, as migration generally occurs more slowly in the fall than it does in the spring, allowing for more individuals and species to be recorded (Nilsson et al., 2013).

The most common species were:

- Black-capped chickadee
- Blue jay
- American robin
- Golden-crowned kinglet (*Regulus satrapa*)
- White-throated sparrow

Avian SOCI observed were:

- American kestrel (four)
- Blackpoll warbler (178)
- Black-billed cuckoo (*Coccyzus erythrophthalmus*; three)
- Boreal chickadee (25)
- Canada jay (53)
- Cape May warbler (five)
- Philadelphia vireo (*Vireo philadelphicus*; two)
- Pine grosbeak (*Pinicola enucleator*; one)
- Pine siskin (32)

- Red crossbill (one)
- Wilson's warbler (two)

Avian SAR observed were:

- Canada warbler (seven)
- Common nighthawk (five)
- Evening grosbeak (nine)
- Olive-sided flycatcher (one)
- Rusty blackbird (four)

Most of the SAR observations are assumed to be migrants passing through the area; however, some of the early season observations (particularly those made during round one in August) could represent individuals that had yet to depart their breeding grounds. All Canada warbler observations were made between mid-August and mid-September, including one observation of confirmed breeding evidence on August 14. The common nighthawk observation involved a group of five individuals migrating in mid-September. Evening grosbeak observations were all made in October and consisted of migrating individuals flying overhead. The single olive-sided flycatcher observation was made in mid-August and consisted of one possible breeding individual in suitable habitat. Rusty blackbird observations were made in mid-August (one possible breeding individual located in suitable habitat), mid-September (two presumed migrants) and early-October (one presumed migrant).

Fall Migration Diurnal Watch Count Surveys

Five rounds of fall migration diurnal watch count surveys were completed at two locations between mid-August and late-October 2024. A total of 552 birds were observed, representing 51 different species (Tables 13 and 14, Appendix N).

The most common species were:

- American robin
- Yellow-rumped warbler
- European starling (*Sturnus vulgaris*)
- Blue jay
- Cedar waxwing (*Bombycilla cedrorum*)

Avian SOCI observed were:

- Bay-breasted warbler (one)
- Blackpoll warbler (20)
- Canada jay (three)
- Pine siskin (19)
- Tennessee warbler (one)

No SAR were observed during fall migration diurnal watch count surveys. Raptor activity was moderate, with bald eagle, broad-winged hawk, northern harrier, red-tailed hawk and sharp-shinned hawk (*Accipiter striatus*) observed. Bald eagle was the most abundant raptor with 11 observations, followed by sharp-shinned hawk with six observations. DWC1 (located in a clearcut) had higher avian abundance and species diversity than DWC2 (overlooking Donnelly's Lake). The reverse was true during the 2023 spring migration surveys, suggesting that habitat use by migrants varies between spring and fall.

2024 Fall Migration Surveys - Probable and Confirmed Breeding Evidence

Breeding evidence can continue be observed after the peak breeding season ends, particularly for birds that arrive later to their breeding grounds or those who lay more than one clutch of eggs. Observations of probable and confirmed breeding evidence, based on the Maritimes Breeding Bird Atlas (MBBA, 2006), include:

- Blue jay: Confirmed breeding evidence (recently fledged young observed).
- Broad-winged hawk: Confirmed breeding evidence (recently fledged young observed).
- Canada warbler: Confirmed breeding evidence (adult and juvenile observed together in suitable breeding habitat).
- Common yellowthroat (*Geothlypis trichas*): Confirmed breeding evidence (recently fledged young observed at three separate survey locations).
- Magnolia warbler (*Setophaga magnolia*): Confirmed breeding evidence (recently fledged young observed).
- Pileated woodpecker: Probable breeding evidence (pair observed in suitable breeding habitat).
- Red-eyed vireo: Confirmed breeding evidence (recently fledged young observed at two separate survey locations).
- Ruffed grouse: Confirmed breeding evidence (recently fledged young observed).
- Swamp sparrow (*Melospiza georgiana*): Confirmed breeding evidence (recently fledged young observed at three separate survey locations).
- Wood duck (*Aix sponsa*): Confirmed breeding evidence (adult with young observed in suitable breeding habitat).

Incidental Observations

Incidental observations were collected during various field programs in 2022, 2023, 2024, and 2025 (Table 15 and 16, Appendix N). Observations were made during preliminary field work for the Project in 2022, during targeted avifauna surveys and other biophysical survey efforts (e.g. wetland surveys, botany surveys, etc.) in 2023 to 2024, and during field work for other biophysical surveys in 2025. A total of 718 birds were observed, representing 76 different species.

The most common species across all years were:

- Purple finch (*Haemorhous purpureus*)
- White-throated sparrow

- Ruffed grouse
- Black-capped chickadee
- European starling

In 2022, 500 birds were recorded incidentally, representing 39 different species. The only SOCI was boreal chickadee (14). Evening grosbeak (five) was the only SAR and was observed flying overhead in April. Probable breeding evidence was observed for barred owl (*Strix varia*) (pair observed in suitable breeding habitat) and spruce grouse (*Canachites canadensis*) (courtship display).

In 2023, 16 birds were recorded incidentally, representing 11 different species. No SAR or SOCI were observed.

In 2024, 190 birds were recorded incidentally, representing 61 different species. SOCI observed were American kestrel (three), boreal chickadee (two), Canada jay (two), Cape May warbler (one), northern goshawk (one), and pine siskin (one). SAR observed were barn swallow (eight), Canada warbler (one), eastern wood-pewee (one), olive-sided flycatcher (two), and rusty blackbird (one). The group of eight barn swallows was observed near a residence on the northern edge of the Study Area in July, which could potentially be providing suitable nesting habitat. The Canada warbler was observed in a disturbed wetland in early-July. The two olive-sided flycatchers were observed together in a fen in mid-August. The rusty blackbird was observed in a dense, treed swamp in mid-September and was likely a migrant passing through.

In 2025, 12 birds were recorded incidentally, representing four different species. All species observed were either SAR or SOCI and were observed during the breeding season. The only SOCI observed was Canada jay (two), and SAR observed were Canada warbler (four), eastern wood-pewee (two), and olive-sided flycatcher (four). The Canada warbler observations were all made in wetlands or forested habitats. The two eastern wood-pewee observations were presumably the same individual, near the edge of a lake and riparian area outside of the Assessment Area. The olive-sided flycatcher observations were all within or near wetlands.

10.4.4.3 Habitat Trends with Avian Abundance and Species Diversity

The Study Area and surrounding habitat supports a variety of avian species and features several different habitat types. Habitat types targeted by the avifauna surveys included areas of ongoing or recent human disturbances (e.g., PC1, PC9, and PC37); softwood-dominated forests (e.g., PC8, PC19, and PC31); hardwood-dominated forests (e.g., PC5, PC22, and PC39); mixed-wood forests (e.g., PC4, PC13, and PC40); treed or shrubbed wetlands (e.g., PC16, PC26, and PC33); graminoid-dominated wetlands (e.g. PC14 and PC17); reed or cattail-dominated wetlands (PC34); open-water wetlands bordering lakes (PC18 and PC23), and ponds (PC15). The abundance and diversity of avifauna varied across different habitat types captured by the survey design and reflected different habitat usages according to the season (i.e. breeding habitat vs. migratory stopover habitat).

During the 2023 and 2024 breeding bird surveys, habitat types with the highest avian abundance and species diversity were wetlands (particularly bogs and fens), open habitats (e.g., commercial blueberry fields, transmission line corridors, and open to semi-open wetlands), and forested habitats. Wetlands are attractive to many bird species as they often contain ample food sources (particularly insects), diverse vegetation, and a source of water which can attract marsh birds, waterfowl, and aerial insectivores. Many of the SAR observed during the breeding bird surveys are wetland specialists that would generally not be found in other habitat types. Open, disturbed habitats were also found to have high avian abundance and species diversity during the breeding season, likely because these habitat types can support a wide variety of generalist species, particularly those which favour young, shrubby vegetation for nesting.

During the 2023 spring migration and 2024 fall migration point count surveys, habitat types with the highest avian abundance and species diversity were wetlands, water features, and open, disturbed habitats such as clear cuts. Many bird species are drawn to open habitats or edge habitats during migration, including species that generally would not utilize those habitat features during the breeding season. In addition to attracting migrants, open habitats also provide a better vantage point for the observer (particularly for recording migratory flyovers), which may also have contributed to the higher levels of bird activity recorded in these areas.

Diurnal watch counts target habitats with long sightlines, with a specific focus on flyovers and soaring species (e.g., raptors). DWC2 overlooked a lake (Donnelly's Lake), bordered by a vegetated shoreline with some emergent vegetation, and surrounded by a mixed-wood forest stand. DWC1 was in a clearcut, primarily consisting of young regeneration that allowed the surveyor to see for several hundred metres over the vegetation. DWC2 had greater avian abundance and species diversity during spring migration, whereas DWC1 had higher species diversity during fall migration, suggesting that habitat use by migrants varies between spring and fall. Migratory trends often differ between spring and fall, with migrants stopping over for shorter periods of time during the spring when they are eager to reach their breeding grounds and competitive pressure is higher (Nilsson et al., 2013). Conversely, fall migrants may stopover for longer periods of time, as they are no longer competing to reach their breeding grounds. The population of fall migrants consists in large part of juveniles born that year, which are generally slower and less efficient than adults (Nilsson et al., 2013). Therefore, habitat alone may not explain the observed differences in abundance and species diversity between DWC1 and DWC2.

10.4.5 Avian Species at Risk Potential Habitat Modelling

10.4.5.1 *Avian SAR Habitat Modelling Methods*

Habitat modelling was completed to provide an evaluation of habitat availability and habitat loss for avian SAR that were observed during field surveys or that are likely to occur near the Project. Habitat preferences for each species were used to create models in ArcGIS Pro, which were then used to estimate the abundance of suitable habitat. The model criteria for each species are as follows:

Barn swallow

Barn swallow was observed at a single location along the northern edge of the Study Area in July 2024, near a building that could provide suitable nesting habitat. This species nests primarily on human-made structures, and no negative Project-related impacts to their nesting habitat are anticipated.

While no impacts to barn swallow nesting habitat are anticipated, there is potential for a loss of foraging habitat. This species forages over a wide range of open and semi-open habitats, including natural and anthropogenic environments, and often nests on anthropogenic structures. Buildings (e.g., houses, camps, sheds, garages, barns) and bridges were identified and buffered 600 m to allow for their respective foraging range.

Bobolink

Despite historical records within 5 km of the Project, this species was not observed during field surveys and was not detected during the acoustic monitoring program. Bobolink had the least amount of predictive habitat, likely due to this species' specialized habitat requirements (grasslands, pastures, and agricultural fields).

Natural grassland habitat is absent within and surrounding the Study Area. Old Field and Agriculture land cover classes were queried to develop the model; however, Agriculture was the only class found to be present. Open habitats where the combined coverage of trees and tall shrubs (over 1 m) is less than 60% were queried.

Canada warbler

Canada warbler was observed at several locations during all seasons. This species breeds primarily in wet, mixedwood forest with a well-developed shrub layer (COSEWIC, 2020). A broader range of habitats are utilized during migration, including forest edges, riparian areas, and second-growth forest (COSEWIC, 2020). The species was detected during spring and fall migration field surveys, suggesting it utilizes the Study Area as a migratory stopover, and during the acoustic monitoring program, suggesting it also migrates nocturnally over the Study Area.

To account for moist forests with a dense, deciduous shrub layer, complex understory, and available perch trees, the NSECC WAM GIS layer (NSECC, 2022b) was filtered to include values up to 0.5 m depth to water. The NSNR forestry GIS inventory data (NSNR, 2021g) was queried to include the FORNON code 39, which are areas where alders (*Alnus* spp.) comprise 75% or more of the total canopy. Records where the leading species (SP1) was indicated as larch (*Larix laricina*), red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), and black spruce (*Picea mariana*) were included in the model. Stands including larch as the second or third most abundant species were also included. To account for wetland features and their respective edge habitat, all wetlands from the CNWI data (ECCC, 2024) were included. These methods are consistent with habitat requirements outlined in the document ECCC Recovery Strategy for the Canada Warbler (*Cardellina canadensis*) in Canada (2016a).

Chimney swift

Chimney swift habitat is thought to be minimal within the Study Area due to a lack of suitable nesting chimneys and the immaturity of many of the forest stands present. Mature, hollow trees which provide natural nesting and roosting habitat for this species have become rare in the region as a result of logging (ECCC, 2023c) and do not appear to be abundant within the Study Area. There are, however, a small number of confirmed old-growth stands within the Study Area that could contain trees large enough to provide suitable nesting cavities. Wetlands within the Study Area could provide suitable foraging habitat; however, the species was not observed during any field surveys or acoustic monitoring programs. Due to the nature of the chimney swift model, calculations could not be compiled; however, based on a qualitative interpretation of the model output, areas of suitable habitat within the Study Area appear minimal.

This species primarily nests in chimneys and other anthropogenic structures. Natural nest cavities can be found in large, hollow snags (dead standing trees). Dead forest stands were mapped using a query on the land cover classification, and mature forest stands were also targeted to encompass potential natural nest cavities. Forest stands that contain trees with a DBH of 50 cm or more have a higher likelihood of containing suitable cavities. A canopy height model was queried at a VALUE > 18.83 m, based on the relationship between various tree species' height to DBH being about 50 cm. The maximum height was averaged within one standard deviation, and the lower value was used to set the height threshold. The averages were derived from 15 tree species.

Common nighthawk

Common nighthawk habitat, which includes open areas with bare ground (COSEWIC, 2018b) appears minimal within the Study Area. Many of the forested or disturbed areas within the Study Area appear to have regenerated enough that they are likely no longer suitable for nesting. There are some roads, clearings, and a transmission line which could offer suitable nesting habitat. The species was observed during 2024 fall migration surveys, in an area that is no longer within the Study Area due to layout changes. The species was not observed during targeted nightjar surveys conducted in 2024.

Open ground and/or clearings for nesting (e.g., sandy areas, open forests, grasslands, wetlands, barrens, and other rocky areas) were considered from the land cover classification. A 10 m buffer was included on the road network, including unpaved forestry roads [Government of Nova Scotia's Topographic Database (GeoNOVA, 2024c)], to account for push up topography features from past road construction. The CNWI was filtered to include only open wetland types (e.g., bog, bog or fen, fen, marsh). The land cover types of 'Urban, Landfill, Quarry, Transport Corridor', 'Utility Corridor', or 'Blueberries or Barren' were queried. These methods are consistent with habitat requirements outlined in the document ECCC Recovery Strategy for the Common Nighthawk (*Chordeiles minor*) in Canada (2016b).

Eastern wood-pewee

The species was observed during 2023 spring migration surveys, 2023 breeding bird surveys, and 2024 breeding bird surveys, in habitats featuring or near wetlands, riparian areas, and lakes.

All hardwood-dominated stands from the land cover classification were included with the additional criterion of crown closure being less than or equal to 30%. Stands included in the model included those where the species found in the SP1 field were:

- Large tooth (*Populus grandidentata*) and trembling aspen (*Populus tremuloides*)
- Black (*Fraxinus nigra*) and white ash (*Fraxinus americana*)
- Black cherry (*Prunus serotina*)
- American beech (*Fagus grandifolia*)
- Balsam poplar (*Populus balsamifera*)
- White elm (*Ulmus americana*)
- Gray birch (*Betula populifolia*)
- Yellow birch (*Betula alleghaniensis*)
- White birch (*Betula papyrifera*)
- Ironwood (*Ostrya virginiana*)
- Oak (*Quercus rubra*)
- Red maple
- Sugar maple (*Acer saccharum*)
- Willow (*Salix* spp.)
- Shade tolerant hardwood, a combination of sugar maple, yellow birch, American beech, and red oak
- Shade intolerant hardwood, a combination of red maple and white birch
- Other hardwood
- Unclassified hardwood
- Unclassified species

All CNWI wetlands received a 50 m internal and external buffer on their boundaries to include edge habitat, and rivers and streams that were represented by a polyline received a 50 m buffer to include edge habitat. A 50 m buffer was also placed on the edges of waterbodies but did not include the waterbody itself. This wet-areas-derived layer was then merged and only edge habitat that connected or intersected with the forestry criteria above was included using the point density method (described below). Any areas that intersected but were less than 100 m² were eliminated. These methods are consistent with habitat requirements outlined in the document ECCC Management Plan for the Eastern Wood-pewee (*Contopus virens*) in Canada [Proposed] (2023b).

Evening grosbeak

This species overwinters in Nova Scotia, and its overwintering habitat broadens to include residential areas and backyard feeders. Evening grosbeak was observed during field surveys in spring 2022, spring 2023, and fall 2024, but was not observed during the breeding season, suggesting that the Study Area may provide habitat during migration and possibly overwintering, but is likely unsuitable for breeding.

The forest inventory data was used to select stands where the SP1 field indicated that the stand was dominated by large tooth or trembling aspen. Since nesting and overwintering often occur in large, mature, mixedwood stands with a high percentage of fir, spruce, tamarack, pine, and aspen, these were filtered from SP1 to include all pine, fir, and spruce species in addition to tamarack that comprised greater than 50% but less than 70% of a given stand.

Filtering was conducted on fields SP1, SP2, SP3, and SP4 to capture stands where any of the following species made up any proportion of the canopy:

- Eastern larch
- Austrian pine (*Pinus nigra*)
- Jack pine (*Pinus banksiana*)
- Red pine (*Pinus resinosa*)
- Scots pine (*Pinus sylvestris*)
- White pine (*Pinus strobus*)
- Balsam fir
- Douglas fir (*Pseudotsuga menziesii*)
- Black spruce
- Norway spruce (*Picea abies*)
- Red spruce (*Picea rubens*)
- Sitka spruce (*Picea sitchensis*)
- White spruce (*Picea glauca*)
- Red and black spruce mixed stand

For further analysis, each layer was converted to its respective percentage values for composition by species then summed and queried to select for stands that were greater than or equal to 50% but less than 70% softwood composition. These methods are consistent with habitat requirements outlined in the document ECCC Management Plan for the Evening Grosbeak (*Coccothraustes vespertinus*) in Canada (2022b).

Olive-sided flycatcher

Olive-sided flycatcher was observed during breeding bird surveys in 2023 and 2024, during fall migration surveys in 2024, and incidentally during other biophysical surveys in summer 2025. It was also detected during the acoustic monitoring program in fall 2024. This species typically breeds in open habitats such as open wetlands (i.e. bogs, fens, riparian areas) and forest edges, featuring coniferous trees and tall trees and/or snags for perching (COSEWIC, 2018c). The observations made during field surveys were primarily associated with wetland habitats, with human influenced edge habitats (e.g. clearcuts) also appearing to provide suitable breeding habitat.

The forest inventory data was filtered to select for stands where the leading species attribute included any of the following species:

- Black spruce
- Red spruce
- White spruce
- Scots pine
- Red pine
- Jack pine
- Eastern hemlock (*Tsuga canadensis*)

The archived Crown harvest plans and harvest land cover class received a 20 m internal buffer to include only edge habitat. All wetlands were included from the CNWI data. Burn data was also included as habitat in the analysis. A large burn area from 2020 intersects the Study Area.

Further filtering the leading species attribute field to a height greater than 12 m was not completed due to the resulting significant habitat loss. These methods are consistent with habitat requirements outlined in the document ECCC Recovery Strategy for the Olive-sided Flycatcher (*Contopus cooperi*) in Canada (2016b).

Rusty Blackbird

Rusty blackbird was observed exclusively during fall migration surveys in 2024; however, the ACCDC records suggest that there is suitable breeding habitat within and surrounding the Study Area. This species breeds in wetlands and riparian areas with forest edges that are primarily coniferous (COSEWIC, 2006).

Forest inventory data was filtered based on potential wet softwood forests (e.g., fir and all spruce near water bodies or wetlands). To capture wet areas containing the softwood species specified and potential softwood dominated treed swamps, the forestry data was intersected with wet areas mapping of 50 cm or less and the CNWI database. Forest stands flagged with breeding evidence were included.

10.4.5.2 Avian SAR Habitat Modelling Results

The habitat models were used to calculate the amount of predictive habitat for each species within the Clearing Footprint, Assessment Area, Study Area, and LAA (Table 10.24). Due to the nature of the chimney swift model, area calculations were not possible for this species.

Table 10.24: Potential Avian SAR Habitat within Various Spatial Boundaries

Avian SAR	Amount of Potential Habitat [ha (%)]			
	Clearing Footprint ⁽¹⁾	Assessment Area ⁽¹⁾	Study Area ⁽¹⁾	Local Assessment Area (5 km buffer of the Study Area ⁽¹⁾)
Barn swallow	209 (35.1%)	224 (31.5%)	1,389 (28.0%)	11,818 (40.8%)
Bobolink	5 (0.81%)	5 (0.68%)	35 (0.71%)	1,684 (5.8%)
Canada warbler	54 (9.1%)	72 (10.2%)	864 (17.4%)	4,477 (15.4%)
Common nighthawk	128 (21.5%)	136 (19.1%)	459 (9.2%)	3,071 (10.6%)

Avian SAR	Amount of Potential Habitat [ha (%)]			
	Clearing Footprint ⁽¹⁾	Assessment Area ⁽¹⁾	Study Area ⁽¹⁾	Local Assessment Area (5 km buffer of the Study Area ⁽¹⁾)
Eastern wood-pewee	31 (5.2%)	40 (5.7%)	326 (6.6%)	1,628 (5.6%)
Evening grosbeak	49 (8.1%)	56 (7.9%)	430 (8.7%)	2,359 (8.1%)
Olive-sided flycatcher	43 (7.1%)	56 (7.8%)	512 (10.3%)	3,315 (11.4%)
Rusty blackbird	27 (4.5%)	34 (4.7%)	390 (7.9%)	1,730 (6.0%)

⁽¹⁾Calculations based on a Clearing Footprint of 596 ha, Assessment Area of 710 ha, Study Area of 4,961 ha, and Local Assessment Area of 28,996 ha.

Drawings 10.11 to 10.19 show the results of the habitat modelling for each species. Of the 11,818 ha of predictive barn swallow habitat within the LAA, 1.8% overlaps with the Clearing Footprint. Barn swallow had the most predictive habitat of all the modelled species, likely because the model is inclusive of the species' foraging habitat, which includes fields and other open areas.

Of the 1,684 ha of predictive bobolink habitat within the LAA, 0.3% overlaps with the Clearing Footprint.

Of the 4,477 ha of predictive Canada warbler habitat within the LAA, 1.2% overlaps with the Clearing Footprint.

Of the 3,072 ha of predictive common nighthawk habitat with the LAA, 4.2% overlaps with the Clearing Footprint. It is possible that clearing associated with the Project could increase the amount of suitable breeding habitat for this species.

Eastern wood-pewee breeding habitat appears to be scattered throughout the Study Area. This species prefers open, mature hardwood forest and is often associated with the presence of wetlands and riparian areas (COSEWIC, 2012b). Of the 1,628 ha of predictive eastern wood-pewee habitat within the LAA, 1.9% overlaps with the Clearing Footprint.

Evening grosbeak is more of a generalist than many of the other SAR discussed in this section, which is reflected in the results of the habitat modelling. Evening grosbeak breeding habitat generally includes open, mature mixedwood forest containing fir and/or spruce (COSEWIC, 2016a). Of the 2,359 ha of predictive evening grosbeak habitat within the LAA, 2.1% overlaps with the Clearing Footprint.

Of the 3,315 ha of predictive olive-sided flycatcher habitat within the LAA, 1.3% overlaps with the Clearing Footprint.

Of the 1,730 ha of predictive rusty blackbird habitat within the LAA, 1.5% overlaps with the Clearing Footprint.

The results of the habitat modelling show that local habitat loss for avian SAR should be low, and that the amount of suitable habitat within the Clearing Footprint is generally low relative to the amount of suitable habitat present in the LAA. The species with the highest potential for habitat loss based on the results of this analysis is common nighthawk. Of the species modelled, common nighthawk had the highest proportion of predictive habitat within the LAA overlapping with the Clearing Footprint. This percentage is still relatively low (4.2%), and the habitat types favoured by this species have often been heavily disturbed (open areas, clearcuts, etc.). It is possible that clearing for the Project could result in the creation of new common nighthawk habitat.

10.4.6 Remote Sensing

10.4.6.1 *Avian Radar Monitoring*

Avian radar monitoring was undertaken during the 2023 spring and 2024 fall migratory periods to assess the patterns and abundance of birds migrating over the Study Area. Deployment and data analysis for the 2023 spring monitoring period was completed by Ausenco Sustainability ULC, while deployment and data analysis for the 2024 fall monitoring period was completed by Strum. The avian radar system (ARS) was placed in the same location in the northeastern portion of the Study Area (Drawing 10.20) during both monitoring periods.

Avian radar assessment results were processed using radR, an open-source platform designed for the processing of radar data for biological applications (P. Taylor et al., 2010). Data analysis focused on assessing the number of targets moving through the Study Area and the heights at which flyovers occurred, especially during the migration seasons. Migratory cues were examined to assess the influence weather and climatic conditions (i.e., wind speed, wind direction, temperature, lunar cycle) may have on migratory patterns. Data analysis also included an assessment of migratory bird density at various height bins to provide insight on potential interactions between targets and wind turbine infrastructure. The total height of the wind turbine (221.7 m) was calculated using the hub height and rotor diameter of the proposed turbine model, which was subsequently used to determine the rotor sweep area where avifauna would interact with the turbine (i.e., bird strike). The risk of avian interaction is calculated by comparing the proportion of avian targets detected within the calculated rotor sweep area of the proposed turbine.

Detailed methods for the 2023 spring radar assessment completed by Ausenco are provided in Appendix O, and detailed methods for the 2024 fall radar assessment completed by Strum are provided in Appendix P.

Data collected by the ARS was analyzed to provide the number of biological targets by date and by height (comparable with altitudinal height), while also factoring in the influence of possible migration cues. Due to the difference in methodology used to deploy and analyze radar data, there were variations in how results were compiled and presented within each accompanying technical reports. Differences in results may relate to differences in filtering methods (i.e. the processes used to filter out detections attributable to sources such as rainfall or insects).

During the 2023 spring monitoring period, most detections occurred in late-May and early-June; activity was highest on May 28 when over 20,000 targets were detected. Detections were primarily recorded nocturnally, with data demonstrating peak migratory activity within 00:00 to 06:00 timeframe. Most detections were observed above the assumed rotor swept zone; however, approximately 40% were detected within the rotor swept zone. Detailed results for the 2023 spring radar monitoring period, including figures and discussion, are provided by Ausenco in Appendix O.

During the 2024 fall radar monitoring period, most detections occurred in mid to late-August; activity was highest on August 15 when over 15,000 targets were detected. Throughout the monitoring period, peak migratory activity occurred within the 17:00 to 23:00 timeframes. Most detections were observed above the rotor swept zone, with approximately 1% of targets detected within the rotor swept zone. Detailed results for the 2024 fall radar monitoring period are provided in Appendix P.

10.4.6.2 Acoustic Monitoring

Five autonomous recording units (ARUs) were deployed within the Study Area during the 2023 and 2024 monitoring periods (Drawing 10.20) to provide insight on patterns and species composition of birds migrating over the Study Area. The acoustic monitoring program was heavily focused on identifying nocturnal migrants. This data supplements the field survey data, which primarily captures diurnal avian activity. It also supplements the avian radar data, which provides a quantitative assessment of nocturnal avian migration but cannot identify the detected targets to species-level.

The ARUs were deployed from March to November in 2023 and from July to November in 2024, in areas that provided ease of access for maintenance checks while also providing the microphone with open access to the sky. Data from the ARU closest to the ARS (ARU3) was selected for analysis using Nighthawk, a machine learning model that specializes in the detection and classification of avian nocturnal flight calls. The output files from the model were then brought into Raven Pro, a computer program specializing in the visualization and analysis of sounds, for manual verification. Strum staff manually verified a subset of detections for each species detected by Nighthawk, to assess the accuracy of the model.

Data from the remaining four ARUs was analyzed through manual listening; a process that involved listening to a collection of audio clips and manually recording all avian vocalizations heard. Staff listened to two ten-minute audio clips (one from sunset and one from sunrise) per date selected. Three dates were selected during the spring, and three dates were selected during the fall, as follows:

- May 3, 16, and 28, 2023
- August 15, September 10, and October 4, 2024

This process was repeated for each of the three ARUs, for a total listening time of 360 minutes.

The dates above were selected based on weather data from the Tracadie Weather Station (Table B and C, Appendix P. Dates with optimal weather conditions (e.g. little or no precipitation and low winds) were selected, since these conditions are suitable for avian migration while also providing audio recordings with less noise interference. Limitations included noise interference from sources like frogs and other wildlife, human activity, wind, trees rustling, etc.

Complete, detailed methods are provided in Appendix P.

Nighthawk

Spring Nighthawk Results

During spring, Nighthawk made the highest number of detections in April and June (Table E, Appendix P); however, the detections made in late spring (late-May to June) were found to have a very low accuracy rate. Nighthawk specializes in nocturnal flight calls and cannot identify singing birds, so the abundance of singing birds in late spring likely triggered an abundance of false detections. April had the highest proportion of correct detections. Following manual verification by Strum staff, nine species were confirmed to have been positively detected by the model during the 2023 spring monitoring period. Of these species, the most common were:

- White-throated sparrow
- Dark-eyed junco
- Hermit thrush
- Savannah sparrow

Killdeer was the only SOCI positively identified by Nighthawk (all detections made in early-April), and Canada warbler was the only SAR detected, on May 31.

Fall Nighthawk Results

During fall, Nighthawk made the highest number of detections in August and September, which represents peak fall migration movement (Table F, Appendix P). August and September also had the highest proportion of correct detections during the fall season. Following manual verification by Strum staff, 27 species were confirmed to have been positively detected by the model during the 2024 fall monitoring period. Of these species, the most common were:

- Dark-eyed junco
- Common yellowthroat
- White-throated sparrow
- Black-and-white warbler
- Mourning warbler

Avian SOCI detected were:

- Cape May warbler
- Greater yellowlegs (*Tringa melanoleuca*)
- Least sandpiper (*Calidris minutilla*)
- Rose-breasted grosbeak (*Pheucticus ludovicianus*)
- Spotted sandpiper

Canada warbler was the only SAR detected, with 18 confirmed detections made between late-July and early-September.

During both spring and fall, detections peaked after 21:00 then slowed and remained relatively consistent throughout the night, before peaking again around sunrise. Detections stopped between 06:00 and 07:00.

Manual Listening

Manual listening was completed for a subset of audio recordings from spring 2023 and fall 2024.

Spring Manual Listening

During manual listening for the 2023 spring migration data, 287 individual birds were detected, representing 44 species (Table G, Appendix P). The most common species were:

- White-throated sparrow
- American robin
- Hermit thrush
- Yellow-rumped warbler

Avian SOCI detected were boreal chickadee, Canada jay, pine siskin, and Wilson's snipe. No SAR were detected during this period.

Fall Manual Listening

During manual listening for the 2024 fall migration data, 211 individual birds were detected, representing 41 species (Table H, Appendix P). The most common species were:

- Common grackle (*Quiscalus quiscula*)
- White-throated sparrow
- Blue jay
- Cedar waxwing

Avian SOCI detected were blackpoll warbler, Canada jay, cape may warbler, pine siskin, and Wilson's snipe. One SAR, a solitary olive-sided flycatcher, was detected in mid-August.

Complete, detailed results are provided in Appendix P.

10.4.7 Effects Assessment

Project activities, primarily those that involve earth-moving or vegetation removal, or turbine interactions with avifauna in the airspace, have the potential to impact avifauna (Table 10.25). These activities could result in habitat loss, edge effects, reductions in food availability, and avifauna-turbine interactions (i.e., sensory disturbance, injury, or mortality). Other Project related activities, including during construction and operation, (i.e. increased light, noise, and traffic) may impact avifauna behaviours.

Table 10.25: Potential Project Interactions with Avifauna

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Interconnection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

For the purposes of this assessment, the LAA for avifauna includes a 5 km buffer of the Study Area as well as the airspace that is directly surrounding the turbines to account for the rotor swept area (i.e., risk zone) (Drawing 10.5). The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.3 also apply to avifauna. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of avifauna habitat, no sensory disturbance impacts, and injuries or mortalities to avifauna are not expected.
- Low: Small loss of habitat supporting SAR and habitat-sensitive avifauna, low sensory disturbances, and low risk of injuries and mortalities.

- Moderate: Moderate loss of habitat supporting SAR and habitat sensitive avifauna, moderate sensory disturbances, and moderate risk of injuries and mortalities on individual level rather than entire populations.
- High: High loss of habitat supporting SAR and habitat sensitive avifauna, high sensory disturbances, and high risk of injuries and mortalities that would be sufficient to impact species on a population scale.

Effects

Potential impacts to avifauna from the Project's construction and operation include:

- Habitat loss, alteration/fragmentation, and edge effect
- Sensory disturbance – light and noise
- Injury and mortality

Habitat Loss, Alteration/Fragmentation, and Edge Effect

Through desktop review and field observations, it is apparent that the general area supports various life stages for resident and migratory birds due to the wide range of habitats present. As discussed in Section 10.1, the Study Area is primarily composed of softwood and mixedwood forest, with lesser amounts of hardwood forest, wetlands, open areas, cutover, and developed land. These habitats are abundant in the surrounding areas, and it is expected that any birds utilizing habitats that will be disturbed by Project activities will move to similar habitats within or adjacent to the Study Area. While disturbed and/or cleared areas can be considered degraded habitat for forest-interior species, some avian species prefer shrubby, disturbed, and/or edge habitats. Therefore, even disturbed land within the Study Area may provide valuable habitat for some species.

Vegetation removal will be required for the construction of new roads, the widening of existing roads, and the construction of the turbine pads and other Project components discussed in Section 3. The Project design has prioritized developing previously disturbed lands, which are abundant within the Study Area. Approximately 51 km of existing roads will be re-used, while approximately 15 km of new road construction is required. Up to 28 turbines are planned, each with a cleared area of 130 x 130 m surrounding it. Additional clearing will be required for the construction of laydown areas, the substation and power collection systems, and the operations and maintenance building. This assessment used an estimated Clearing Footprint of 596 ha to evaluate habitat impacts to avifauna.

Within the Clearing Footprint, habitat removal/fragmentation and increased edge areas may have the following effects:

- Increase in the number of habitat generalist species.
- Decrease in the number of habitat specialist species.
- Increase in aerial insectivore foraging habitat (i.e., open and edge habitat).
- Increase in transitional and microhabitats.

- Increase in suitable foraging and/or breeding habitat for common nighthawk, eastern wood-pewee, and olive-sided flycatcher (SAR), though breeding habitat quality may be reduced.
- Decrease in suitable habitat for Canada warbler, evening grosbeak, and rusty blackbird (SAR).
- Increased avian predation.
- Increased nest predation and parasitism.

Loss of wetland habitat will be minimized, which will reduce habitat loss for avian SAR, many of which breed and/or forage in wetlands. Avian SAR such as Canada warbler, olive-sided flycatcher, and rusty blackbird (all three of which were found during field assessments for the Project) are associated with wetland habitats, highlighting the importance of these habitat types. Based on wetland field assessments, the most prominent wetland type present within the Assessment Area is treed and/or shrub swamp. Swamps are of particular importance for Canada warbler, which prefer shrubby or treed wetlands more than the open wetlands favoured by olive-sided flycatcher and rusty blackbird. See section 9.2 for further detail on wetland habitats within the Assessment Area.

Five forest stands within the Study Area were identified as having old-growth status (one existing and four new stands), and impacts will be minimized. These habitat types can support birds that rely on open, mature forests, and those that nest in cavities or hollow trees (e.g. owls, woodpeckers, various waterfowl species, chimney swift).

Since vegetation removal is necessary, this will result in increased edge area which may have negative implications for some species, while potentially benefitting others. Edge effects refer to changes in environmental conditions and biodiversity that occur along the boundary between two different habitats (e.g., the edge where a clearcut meets forested habitat). The creation of edges can alter physical conditions like light, temperature (e.g., higher wind exposure), and wind, which can in turn influence vegetation structure and food availability (Andrén, 1994). These changes can affect avian abundance, species composition, and nesting success. Studies on edge effects have suggested that nest success for forest birds declines with proximity to edges, primarily due to increased predation rates (predators are thought to benefit from increased food availability and ease of movement along edges) (Akresh et al., 2024). Akresh et al. (2024) suggests that this effect is most pronounced within 250 m of forest edges, and that ground-nesting birds such as hermit thrush may be more vulnerable to edge effects than above-ground nesting birds.

Habitat fragmentation has been shown to increase the number of habitat generalist species while decreasing the number of habitat specialists. Habitat generalists have a higher likelihood of surviving in smaller habitat patches in a mosaic landscape (e.g., a road network associated with a wind project) due to their ability to use various habitat patch types (Andrén, 1994). Habitat specialists such as forest-interior birds that prefer larger tracts of undisturbed forest, can be impacted by habitat fragmentation due to reduced connectivity (Andrén, 1994). Species that prefer low-light habitats (e.g., larger eyed birds like owls and thrushes) may be more

sensitive to fragmentation, while other bird species such as insectivores (e.g., flycatchers, swallows, and nightjars) and understory foragers may thrive in fragmented habitats (Andrén, 1994; Tittler et al., 2001).

It has been suggested that low-quality edge habitats produced by human activity may mimic higher quality, naturally occurring edge habitats (e.g. burned forest stands or edges of open wetlands) and may therefore act as an “ecological trap”, drawing species that utilize these areas into low-quality habitats (Robertson & Hutto, 2007). According to Robertson & Hutto (2007), ecological traps can occur when birds select poorer quality habitat even though high-quality habitat is available elsewhere. This phenomenon has been observed in olive-sided flycatchers in the Rockies, where the birds occupy both naturally occurring and human-made post-disturbance habitats, yet nesting success in the naturally occurring habitat was twice that of the human-influenced habitat (Robertson & Hutto, 2007). Although disturbed areas may provide suitable habitat for some species, these habitats may be lower quality.

On the other hand, edge habitats and early-successional forests have been associated with stopover habitat for migrating birds. Rodewald & Brittingham (2004) found that mature edge-dominated and shrub-sapling forests were the habitat types most commonly used by migrating landbirds, featuring the highest abundance and species diversity of the habitats surveyed. Availability of fruits as a food source may be higher in these habitat types, and many insectivorous landbirds broaden their diets during migration to include both insects and fruit; a combination which may be optimal for the accumulation of fat stores necessary for long-distance migration (Rodewald & Brittingham, 2004). This idea is supported by the results of the field surveys for the Project, which found that point count locations in or near edge habitats contained the highest levels of avian abundance and species diversity during migration. These habitat types may also provide nesting opportunities for shrubland birds, a demographic that is experiencing declines in eastern North America (Akresh et al., 2024).

For identified SAR, turbine pad and new road construction may create or reduce suitable habitat within the Clearing Footprint. Suitable breeding habitat for common nighthawk is anticipated to increase due to their affinity for disturbed habitats. Similarly, foraging habitat for eastern wood-pewee and olive-sided flycatchers may also increase as these species utilize edge habitat and clear-cuts for foraging. Alternatively, suitable habitat for Canada warbler, evening grosbeak, and rusty blackbird may decrease within the Clearing Footprint because of impacts to wetlands and forested habitats.

Approximately 10 ha of field delineated wetland inside the 710 ha Assessment Area, predominantly swamp habitat, may be directly impacted by the Project Footprint. Various Canada warbler, olive-sided flycatcher, and rusty blackbird observations occurred in wetlands within both the Assessment Area and Study Area, with Canada warbler having the most occurrences of the three species (i.e., nine observations within wetlands).

Although a decrease in suitable habitat for these SAR is anticipated, avian SAR potential habitat modelling results indicate that there is sufficient suitable habitat surrounding the

Clearing Footprint and Assessment Area to maintain habitat functionality and use within the larger Study Area and LAA. If alternative suitable habitats are unoccupied, the affected species may choose those alternate habitat areas in lieu of the cleared area. However, this may increase competition for territory, nesting areas, and foraging for the affected species in the LAA (Chen & Wang, 2024). In addition to increased competition, habitat loss could alter migration patterns via reduction of stopover areas and negatively affect food availability and abundance (Chen & Wang, 2024).

Lastly, habitat fragmentation and increased edge areas may lead to increased predation (e.g., increase in raptor species) on birds. A study by Manolis, et al. (2002) found that distance to the nearest clear-cut was the best predictor of nest predation in multiple ground laying birds.

Overall, undisturbed avian habitats within the Study Area are not unique and are extensively present within the surrounding landscape of the LAA. It is expected that any birds using habitat that will be disturbed by Project activities will move to similar habitats within and adjacent to the Study Area. Although there will be habitat loss as a result of the Project, habitat functionality across the LAA is expected to remain intact.

In conclusion, the effects of habitat loss, alteration, and/or fragmentation are anticipated to be low to moderate, as effort will be made to re-use existing road infrastructure (51 km or 77%) to the greatest extent possible, and sensitive habitats such as wetlands will be avoided as much as possible.

Sensory Disturbance – Light and Noise

Construction and operation activities for the Project, including lighting, noise, and increased traffic, have the potential to disturb avifauna.

Sensory disturbance may occur during all Project phases. Temporary sensory disturbance is expected during construction, and limited disturbance is expected through operations (i.e., consistent noise from turbine operation and sporadic noise and lighting generated by traffic and facility operations). The noise and light will be concentrated in the Study Area but could also extend beyond it into the portions of the LAA that are near the Project Footprint.

Increased vehicular movement could lead to short-term displacement of birds, particularly ground-nesting or low-flying species within proximity to access routes. Traffic disturbance can be particularly stressful for species with established territories within the area, potentially prompting them to abandon nests or avoid otherwise suitable habitat. While these construction-related disturbances are temporary, they may cause localized changes in bird distribution and behaviour during the active phases of the Project.

Noise from heavy machinery and equipment can disrupt normal behaviours such as foraging, breeding, and resting. The noise associated with construction, while temporary, may lead some birds to avoid areas near active construction zones, possibly altering their habitat use patterns during critical breeding or migration periods (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon, Crooks, et al., 2016).

Sensory disturbance from noise can impact birds in a number of ways. The acute impacts of exposure to noise include temporary or permanent hearing damage, masking of communication, disruption of behaviour, and startling (Blickley & Patricelli, 2010). Since birds are highly dependant on vocalization for various forms of communication, including attracting mates, maintaining pair bonds, establishing territories, and alerting others to danger, masking of these vocalizations by anthropogenic noise can have dramatic impacts on survival and reproduction (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon, Crooks, et al., 2016). In addition to interfering with communication, noise can also mask the sounds of approaching predators or prey, potentially increasing the risk of predation for some individuals or reducing the likelihood of successfully capturing prey for others (Blickley & Patricelli, 2010).

Permanent hearing damage in birds may occur when exposed to noise levels between 125 and 140 dBA, while temporary hearing damage has been recorded between 93 and 110 dBA (Engel et al., 2024). The behavioural changes discussed above may occur with noise levels of 38 dBA or higher, while vocalisation masking has been reported when birds have been exposed to noise levels between 85 and 125 dBA (Engel et al., 2024).

Certain bird species may not be impacted by sensory disturbances. A study of the impact of logging truck traffic on birds reported no observed effects on nesting at noise levels of 53 dBA (Grubb et al., 1998). It was also found that noise-tolerant species had increased nesting success and decreased nest predation through higher awareness and less flushing (Francis et al., 2009).

A literature review conducted by Shannon et al. (2016) found that noise levels greater than 45 dBA have the potential to exhibit changes in avian song characteristics, reproduction, abundance, stress levels, and species richness. Sensory disturbance from noise levels associated with construction activities during the avian breeding season could result in abandonment of nests. If adjacent suitable habitat is not available, birds that have been displaced are not likely to nest until habitat becomes available which may result in a higher non-breeding population. According to avian SAR predicted habitat modelling results, adjacent breeding habitat will remain available for all SAR where breeding habitat may be impacted by the Project (Drawing 10.11 to 10.19).

Based on the noise model developed for the Project (Appendix E), predicted operational noise levels above 45 dBA are expected to be localized around turbines and one substation, depending on the proximity and layout of each turbine with respect to others. Predicted cumulative noise levels at 40 dBA are only expected outside the Study Area in a few cases, leading to a very low or negligible sensory disturbance impact within the LAA (i.e., only in portions within and potentially along the Study Area edge).

Lighting used during construction, particularly if activities extend into early morning or late evening hours, can also impact avifauna. Artificial lighting may disorient nocturnally active birds, increasing the likelihood of attracting them closer to construction areas. For species sensitive to light, especially migratory and nocturnal species, this could temporarily alter natural

behaviours or increase the risk of collisions with equipment or structures. Given the frequency of foggy conditions in the region, light intensity may be amplified, further enhancing the potential for disturbance. The impacts of light sensory disturbance on birds include behavioural effects such as disorientation, avoidance, or attraction (Longcore & Rich, 2004).

Light attraction is a particular concern during nights with low visibility (e.g., low cloud cover or fog) and high winds. Lighting used during construction, particularly if activities extend into early morning or late evening hours, could also impact birds in the vicinity. Artificial lighting may disorient nocturnally active birds, increasing the likelihood of attraction to construction areas. For light-sensitive birds, especially migratory and nocturnal species, this could temporarily alter natural behaviours or increase the risk of collisions with equipment or structures (Longcore & Rich, 2004). Research has demonstrated that birds attracted to or congregating around lights often become disorientated and lose their sense of direction, ultimately disrupting migration (Adams et al., 2021).

Disoriented migratory birds are prone to circling light sources, which increases the potential for death by exhaustion or predation when forced to land in high-risk areas. In turn, these behavioural changes can affect the success of foraging, reproduction, and communication and can disrupt habitat connectivity through anthropogenic development (Bliss-Ketchum et al., 2016; Longcore & Rich, 2004). It has been known that exterior structures such as buildings and other floodlit structures can attract birds during the night and lead to mortality events. In addition, migratory birds during fall and spring are especially attracted to lighting on tall structures. Modifications and timing of use for lighting can be managed to limit impacts on birds (Bliss-Ketchum et al., 2016; Longcore & Rich, 2004).

At night, and especially during cloudy nights with low ceiling, artificial lighting can attract birds during migration. Lights that are known to increase disorientation include consistent white or red lights (Poot et al., 2008). Strobe lights or intermittent/flashing lights have been shown to decrease avian mortality as it interrupts the zone of influence that lighting on birds can have (Longcore et al., 2008). While continuous lighting can attract or disorient birds, especially nocturnal migrants, brief and low-frequency lights reduce the risk of such interactions.

For nocturnally active species that may be more sensitive to artificial lighting, the risk of attraction or disorientation remains low due to the limited light exposure. In the event of foggy or low-visibility conditions (e.g., heavy rain), the short, infrequent flashes will also reduce the overall light presence, limiting the potential for enhanced attraction effects.

Lighting associated with the Project will be minimal and turbine lighting at night will be restricted to Transport Canada required navigation hazard lights mounted on the turbine nacelles. As such, lighting is not expected to impact bird migration.

Upon completion of construction and throughout the lifespan of the Project, the lighting on-site will be minimized, and mitigation measures will be applied to limit the effects of lighting on birds (e.g., motion-activated lighting, shielding, light emitting diodes, etc.).

Injury and Mortality

The diurnal movement surveys and the radar and acoustic monitoring programs provide quantifiable insights into the volume, movement patterns, and flight heights of birds, enabling a more precise understanding of collision risk relative to the Project's infrastructure.

Bird strikes are a primary concern when considering the interactions between avifauna and the Project, as turbine blades spin at high speeds through the airspace frequented by a variety of species at all different altitudes within the rotor sweep area. Bird strikes include instances when birds are struck by the rotating turbine blades, or birds collide with the turbine tower or nacelle structures, which can cause injury or mortality. Estimated bird mortality as a result of wind turbine collisions varies across Canada, with Zimmerling et al. (2013) estimating mortalities at 8.2 per turbine per year. Bird Studies Canada (2016) conducted a study to review mortality across Atlantic Canada and Ontario, showing mortality estimates in Atlantic Canada to be lower, at approximately 1.17 birds per turbine per year. Strum has conducted avian mortality monitoring across a variety of wind projects in Nova Scotia and New Brunswick, with an overall rate of approximately one observable mortality per turbine per year.

While collisions with wind turbines kill fewer birds than other man-made structures such as buildings and transmission lines, these collisions are still noteworthy and can vary greatly depending on the location of the site and species present in the area (Marques et al., 2014). Some species are at higher risk of collision than others, and some species may be disproportionately affected. For long-lived species which mature slowly and tend to have fewer offspring (e.g. raptors), even low mortality rates can have a significant impact (Marques et al., 2014). Variables such as morphological features, sensorial perception, and behaviour may impact a species' susceptibility to collisions (Marques et al., 2014). Raptors, for example, tend to angle their heads towards the ground as they scan for prey while in flight, which could make them less likely to notice a turbine (Marques et al., 2014). Landscape features relating to the wind site itself may also have an effect on the risk for collisions with avifauna. Marques et al. (2014) note that birds may travel along certain landscape features such as ridges, shorelines, valleys, and slopes during migration, or may utilize those features more heavily for hunting.

The spring 2023 radar monitoring program, completed by Ausenco, found that cumulatively, most targets were detected above the maximum turbine height. There were, however, a few peak nights during which high numbers of detections were observed within the rotor swept area (peaking at 8,000 detections in late-May). This report assumed a rotor swept area of 70 to 200 m above ground level, the turbine model that was ultimately selected for the Project has a total height of 221.7 m.

On May 14, 2023, more targets were detected within the rotor swept area than outside of it, when birds presumably began flying at a lower altitude due to strong headwinds. Because wind speed increases with altitude, birds are generally thought to fly at lower altitudes during headwinds to reduce energy expenditures (Finn et al., 2012). A high number of detections was also observed within the rotor swept area on May 21, 2023 during a strong tailwind. The higher number of targets identified during a strong tailwind is likely because the overall number of birds migrating is higher as birds take advantage of the favourable conditions.

The 2024 fall migration radar monitoring program, completed by Strum, found that the vast majority of targets detected were above the assumed maximum turbine height of 221.7 m. The height range bin with the most detections was 500 m to 1,000 m, which accounted for approximately 42% of detections, followed by the 1,000 m to 1,500 m height range bin, which accounted for approximately 34% of detections. Overall, less than 1% of detections were within the maximum turbine height range, suggesting that birds migrating through this area during the fall were generally flying within higher height brackets than the turbines would reach. Peak detections were observed in mid-August, with smaller peaks in late-July. The peaks observed in July could be in part due to migrating shorebirds, as many shorebird species begin migrating early, and a variety of shorebird species were detected by the ARUs in the fall of 2024.

Based on the radar results, the risk of interactions between avifauna and turbine infrastructure is anticipated to be low and mortality events would likely be limited to peak migration times. Mortality risk could be linked to environmental variables such as wind speed and/or direction, with certain wind conditions potentially causing birds to fly at lower altitudes (i.e. during strong headwinds). Since it is difficult to predict mortality events at wind sites before operations occur, and since mortality events can vary greatly based on species, weather, location, and time of year, post-construction avian mortality surveys are important to implement to understand this further.

In addition to the risk of injury or mortality, birds moving through the Study Area during migration seasons may also encounter Project infrastructure as a new structural barrier. This could potentially lead to natural flight path alterations, which could in turn result in additional energy expenditure to avoid these obstacles. The modified airspace could lead to temporary disorientation for birds unfamiliar with the infrastructure, especially during low visibility conditions such as fog or heavy rain, which are common in the region. Although overall disruption to migratory routes is likely minimal, specific conditions or migration events may increase the likelihood of navigational adjustments as birds travel through this altered environment.

An increase in road traffic during construction and wind turbine maintenance may increase the chances of mortality or injury for avifauna species that use roadways, particularly for grouse species and other species known to use roadways for travel or nesting (Madden & Perkins, 2017; Whitaker et al., 2010). Construction and increased road traffic also pose a risk to nests and unfledged nestlings. Outside of the construction phase, the Project will only require technicians to access the site to perform regular maintenance/equipment checks and occasional larger-scale repairs. Considering the pre-existing traffic load (i.e., forestry and off-roading vehicles) and the minimal traffic that will be associated with Project operation, along with road traffic mitigations (e.g., speed limits), road traffic is expected to have a negligible or low effect on avifauna in the LAA.

Mitigation Measures

Mitigation and monitoring measures will be considered to minimize the effects on avifauna, including adhering to the MBCA, SARA, ESA, and the *Nova Scotia Wildlife Act*.

The primary mitigation for avifauna is avoidance in the siting of infrastructure, including:

- Minimizing impacts to the terrestrial environment (e.g., limiting infrastructure impact).
- Minimizing impacts to sensitive bird habitats, such as wetlands, waterbodies, mature forest stands, etc. This includes siting Project infrastructure within areas with existing disturbances, such as existing roads and historically cleared areas, to the greatest extent possible.
- Avoidance of turbine placement within topographic funnels, such as within lake or river valleys, to reduce the likelihood of interactions with concentrated bird movements.

Mitigations to reduce effects on avifauna include:

- Adhere to ECCC guidelines/recommendations on vegetation clearing windows for nesting migratory birds, where possible. If vegetation clearing activities during the nesting season cannot be avoided, nest sweeps will be conducted by a qualified avian biologist
 - Regulatory bodies (i.e., NSECC and NSNR) will be contacted, when necessary, to receive advice on construction buffers for any avian activity that must be avoided during the breeding bird season. When vegetation clearing activities take place during the non-breeding bird season, the Proponent is aware of nests protected year-round under the 2022 update to the Migratory Bird Regulations (under the MBCA), which includes pileated woodpecker nests.
- Minimize the removal of large diameter decaying trees (>40 cm DBH).
- Allow natural revegetation of disturbed areas where vegetation suppression is not required during operations.
- Develop a site reclamation plan in accordance with engineering standards and in consultation with NSECC and NSNR.
- Establish speed limits for construction vehicles to avoid vehicle-avifauna collisions. Traffic signs will be installed to alert road users of speed limits and the presence of wildlife in the area.
- Service construction equipment and vehicles regularly and, where practical, muffle loud machinery to reduce noise disturbance.
- Maintain good housekeeping practices (i.e., designated garbage and recycling cans and pack out all waste) during construction and operation to avoid indirectly feeding birds and potentially attracting nuisance wildlife.
- Develop and implement a Terrestrial Habitat and Wildlife Management Plan.
- Develop a spill response plan (within the Contingency Plan), equip site machinery with spill kits, and instruct site personnel on their use.
- Minimize lighting, to the extent possible, while ensuring employee safety.

Monitoring

A site-specific post-construction Terrestrial Habitat and Wildlife Management Plan will be developed in consultation with government regulators and other relevant parties.

A second year of bird surveys will be completed, prior to operations, per requirements of the Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025b).

A detailed Post Construction Avian Monitoring Plan will be developed and submitted to NSECC and NSNR for review. Monitoring activities may include:

- Post-construction avian mortality monitoring.
- Adaptive management if post-construction monitoring identifies significant avian mortality, developed in consultation with NSNR.

Conclusion

The predicted residual effects of the Project on avifauna (after proposed mitigation and monitoring activities) are characterized in Table 10.26.

Table 10.26: Project-Avifauna Residual Effects

Effect Detail	Habitat Loss, Alteration/ Fragmentation, and Edge Effect	Sensory Disturbance – Light and Noise	Injury and Mortality
Magnitude of Effect	Low to Moderate: Low to moderate loss of habitat supporting avian SAR and habitat-sensitive avifauna, depending on the species.	Low: Low sensory disturbances are expected.	Moderate: Avian use of the Study Area indicates a likelihood of interactions but recorded flight altitudes indicate effect is likely at the individual and not population scale.
Geographic Extent of Effect	5 km buffer of the Study Area	5 km buffer of the Study Area	5 km buffer of the Study Area
Frequency of Effect	Single Event: Loss of habitat occurs once during the construction phase (i.e., clearing and ground disturbance).	Intermittent: Intermittent during the construction, decommissioning, and operations phases.	Intermittent: May vary by Project phase, as well as seasonal differences (e.g., breeding, migration, and winter seasons).
Duration of Effects	Medium Term: Effects will end following decommissioning.	Medium Term: Effects will end following decommissioning.	Medium Term: Effects will end following decommissioning.
Reversibility of Effect	Partially Reversible	Reversible	Irreversible
Significance Level	Not Significant	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible			

11.0 SOCIO-ECONOMIC ENVIRONMENT

11.1 Economy

11.1.1 Overview and Assessment Methodology

The assessment of the economy included consideration of local demographics, income, and businesses, as well as the economic contributions of the Project to the local economy through a review of the following resources:

- Census of Population – Statistics Canada (2023)
- Taxation legislation
- Public mapping resources
- Economic data from EverWind
- Economic Impact Assessment – Deloitte LLP (2024)

11.1.2 Existing Environment

The Project is in Antigonish and Guysborough Counties, near the communities of:

- South Merland (within the Study Area)
- Merland (within the Study Area)
- Upper Afton (within the Study Area)
- New France (734 m west of the Study Area)
- Upper Big Tracadie (adjacent to the northeast corner of the Study Area)
- North Intervale (3.3 km south of the Study Area)
- Fraser's Grant (2.9 km west of the Study Area)
- Monastery (4.2 km northeast of the Study Area)
- Afton (2.7 km northwest of the Study Area)

Population statistics for the province, the census subdivisions of Guysborough Municipal District (MD) and Antigonish, Subdivision B (Subd. B) were summarized using the 2016 and 2021 Census of Population (Table 11.1). The Guysborough MD census subdivision corresponds with MODG, as it will be referred to here. Similarly, Antigonish Subd. B refers to the northern portion of Antigonish County that borders Guysborough County, excluding the Town of Antigonish.

The population of the largely rural MODG declined slightly between 2016 and 2021, contrary to the provincial trend. The population of Antigonish Subd. B experienced a similar population decline from 2016 to 2021. Both census populations have lower population densities than the provincial population.

Table 11.1: Population Characteristics in 2016 and 2021 for Nova Scotia, MODG, and Antigonish, Subdivision B

Population Statistics	Nova Scotia	MODG	Antigonish Subd. B
Population in 2021	969,383	4,585	6,138
Population in 2016	923,598	4,670	6,308
Population changes from 2016 to 2021	+5.0%	-1.8%	-2.7%
Total private dwellings in 2021	476,007	3,043	2,849
Land area	52,824.7 km ²	2,115.2 km ²	522.29 km ²
Population density	18.4/km ²	2.2/km ²	11.8/km ²

Source: (Statistics Canada, 2023)

The age distribution in MODG reveals a median age of 58.4, over 12 years higher than the provincial median age of 45.6 (Statistics Canada, 2023). In contrast, Antigonish Subd. B has a younger overall population, with a median age of 48.0, closer to the provincial median age (Statistics Canada, 2023). Further age statistics comparisons (Table 11.2) reveal MODG has proportionally fewer people in both 0 to 14 and 15 to 64 age groups than both the province and Antigonish Subd. B. This indicates that there are fewer people of working age or who will join the workforce within the next one to two decades in the largely rural MODG. The age distribution of Antigonish Subd. B is comparable to the provincial population.

Table 11.2: Age Distribution in 2021 in Nova Scotia, MODG, and Antigonish Subdivision B

Age Statistics	Nova Scotia	MODG	Antigonish Subd. B
0 to 14 years	136,710 (14.1%)	515 (11.2%)	935 (15.2%)
15 to 64 years	617,345 (63.7%)	2,455 (53.5%)	3,820 (62.3%)
65+ years	215,325 (22.2%)	1,615 (35.2%)	1,385 (22.6%)
Total Population	969,380	4,585	6,140

Source: (Statistics Canada, 2023)

Note: total percentage may be ±100% due to rounding.

Median housing costs and median household total incomes in 2020 for MODG and Antigonish Subd. B were compared to the provincial and national values (Table 11.3). This comparison shows that the median dwelling value in MODG was less than half of the provincial value, which itself is less than half the national median. Similarly, the median dwelling value in Antigonish Subd. B, while higher than that of the MODG, is lower than both the provincial and national values. Examining the relative value of median total income and median dwelling value across these jurisdictions suggests that housing may be more affordable for those on a median income in MODG and the Antigonish Subd. B than in Nova Scotia or Canada as a whole. This aligns with a lower percentage of owners and tenant households that spend over 30% of their income on shelter costs, although this figure may be influenced by legacy homeowners or renters who either own their property outright or have longstanding leases lower than regional averages.

Table 11.3: Housing Costs (2021) and Median Individual Income (2020) for Canada, Nova Scotia, MODG, and Antigonish Subdivision B

Housing and Income Statistics	Canada	Nova Scotia	MODG	Antigonish Subd. B
Median total income	\$41,200	\$38,000	\$31,200	\$38,000
Median dwelling value	\$618,500	\$250,000	\$120,000	\$180,000
Median total income as a % of median dwelling value	6.7%	15.2%	26.0%	21.0%
Median monthly shelter costs for owned dwellings	\$1,498	\$870	\$400	\$645
% of owner households spending 30% or more of its income on shelter costs	14.8%	9.7%	7.0%	8.0%
Median monthly shelter costs for rented dwellings	\$1,209	\$1,000	\$552	\$705
% of tenant households spending 30% or more of its income on shelter costs	33.2%	34.7%	22.0%	28.6%

Source: (Statistics Canada, 2023)

Most residents in MODG (98.6%) and in Antigonish Subd. B (95.8%) use English as their first official spoken language (Statistics Canada, 2023). Because of this, all public outreach and communication for the Project have been in English. There is some knowledge of other languages, though no communication has been requested in other languages.

The nearest fire station to the Study Area is the Tracadie and District Volunteer Fire Department, approximately 4.3 km north of the Study Area in Monastery. Pomquet Fire and Emergency Services Sub-Station 1 is also nearby, approximately 6.9 km northwest of the Study Area in Upper Pomquet. Milford Haven Fire and Emergency Services is approximately 12.6 km southeast of the Study Area.

Health and emergency services also exist in the area and are accessible to Project workers if the need should arise. The closest location is Guysborough Memorial Hospital, approximately 15.4 km southeast of the Study Area on Highway 16. St. Martha's Regional Hospital in Antigonish is the next closest location, approximately 22 km northwest of the Study Area.

Statistics indicate that the unemployment rate in 2021 for MODG (18.1%) was higher than the provincial and national unemployment rates (Table 11.4). The unemployment rate in 2021 for Antigonish Subd. B (12.9%) was similar to the provincial average (12.7%) and more than 2% higher than the national average (10.3%).

Table 11.4: Employment Statistics for Canada, Nova Scotia, MODG, and Antigonish Subdivision B

Unemployment Statistics	Canada	Nova Scotia	MODG	Antigonish Subd. B
Employment rate	57.1%	51.9%	38.0%	53.3%
Unemployment rate	10.3%	12.7%	18.1%	12.9%

Source: (Statistics Canada, 2023)

The top six industries in MODG and Antigonish Subd. B in 2017 were compared with the top industries in the province (Table 11.5), as categorized under the North American Industry Classification System (Statistics Canada, 2023). The highest proportion of workers in MODG fall into the “agriculture, forestry, fishing and hunting” and “health care and social assistance” categories (21.6% and 12.5%, respectively). In contrast, the highest proportion of workers in Antigonish Subd. B are in the “construction”, “educational services”, and “health care and social assistance” categories (14.0%, 13.9%, and 13.7%, respectively). The percentages of the employed labour force in each of the top industries are more similar in Antigonish Subd. B than MODG, suggesting that there are more diverse employment opportunities available in Antigonish Subd. B.

Table 11.5: Top Industries for the Employed Labour Force in 2017 in MODG and Antigonish Subdivision B Compared to the Province of Nova Scotia

Industry	Nova Scotia	MODG	Antigonish Subd. B
Accommodation and Food Services	30,010 (6.2%)	50 (2.7%)	175 (5.5%)
Agriculture, Forestry, Fishing, and Hunting	17,880 (3.7%)	405 (21.6%)	205 (6.5%)
Construction	35,720 (7.3%)	145 (7.7%)	445 (14.0%)
Educational Services	38,425 (7.9%)	145 (7.7%)	440 (13.9%)
Health Care and Social Assistance	70,595 (14.5%)	235 (12.5%)	435 (13.7%)
Manufacturing	31,210 (6.4%)	165 (8.8%)	180 (5.7%)
Mining, Quarrying, and Oil and Gas Extraction	3,065 (0.6%)	20 (1.1%)	50 (1.6%)
Professional, Scientific, and Technical Services	31,400 (6.6%)	55 (2.9%)	125 (3.9%)
Public Administration	42,070 (8.8%)	140 (7.5%)	170 (5.4%)
Retail Trade	58,985 (12.1%)	150 (8.0%)	380 (12.0%)
Transportation and Warehousing	19,930 (4.1%)	90 (4.8%)	110 (3.5%)
Total Employed Labour Force 15 years +	487,260	1,875	3,175

Source: (Statistics Canada, 2023)

The community of Guysborough is the closest economic centre, approximately 17 km southwest of the Project and offering a range of business services. A review of some of the businesses near the Project, both within and near Guysborough, was completed and is shown in Table 11.6.

Table 11.6: Local Businesses and Proximity to the Project

Business	Nearest Community	Approximate Distance and Direction to the Project ⁽¹⁾
BeeCee Farm Wild Blueberries	New France	4.5 km northwest
Alice's Take-Out	Monastery	7 km northeast
Monastery Towing Ltd.	Monastery	7 km northeast
KTV One & Two Used Goods	Monastery	8 km northeast
East Coast Home Heating Ltd.	Monastery	7 km northeast
B&D Family Bakery	Monastery	7 km northeast
Bayside Travel Centre	Afton Station	8 km northwest
Forever Green Farm & Gardens	Afton Station	7 km north
Grace's Thrill Hill Farm	Boylston	20 km southeast
North Riverside Welding	Boylston	17 km southeast
Hart Electric Motor Repairs	Boylston	18 km southeast
Hart's of Boylston General Store	Boylston	18 km southeast
Midcudlynn Refrigeration & Heat Pump Repair	Guysborough	21 km southeast
Route 16 Auto Sales	Guysborough	20 km southeast
Authentic Seacoast Distillery & Brewhouse	Guysborough	21 km southeast
The Canny Canine Bakery	Guysborough	22 km southeast
DesBarres Manor Inn	Guysborough	22 km southeast
Big G's Pizza & Restaurant	Guysborough	22 km southeast

⁽¹⁾ All distances were measured from the centre of the Study Area by a straight line and rounded to the nearest whole number.

The Town of Antigonish is the next closest economic centre, approximately 23 km northwest of the Study Area. As Antigonish is the largest centre within the vicinity of MODG and Antigonish Subd. B, most communities are generally dependent on the town for recreational and commercial purposes, including indoor recreation and retail stores. Many residents of the communities surrounding the Study Area would commute daily to Guysborough or to Antigonish for employment purposes.

11.1.3 Effects Assessment

Project-Economy Interactions

Project activities have the potential to interact with the economy during all phases of the Project (Table 11.7).

Table 11.7: Potential Project-Economy Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X

Project Phase	Potential for Interaction
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Interconnection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for economy is MODG and Antigonish Subd. B. The RAA for economy includes the entire province.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for the economy as well. The VC-specific definition for magnitude is as follows:

- Positive: Project is expected to have a positive effect on the economy.
- Negative: Project is expected to have a negative effect on the economy.

Effects

The Phase 1 portfolio of EverWind projects, of which this Project is a key component, will provide significant economic benefit and employment within MODG, MOCA, and the province of Nova Scotia.

An economic analysis was conducted by Deloitte (2024) to estimate the economic contribution of the Phase 1 and 2 EverWind projects. The capital investments made by EverWind in Phase 1 are expected to contribute \$2.3 billion in gross domestic product (GDP) and support 11,310 full time equivalent positions (FTEs) for Canada, and \$1.3 billion in GDP and 5,190 FTEs for Nova Scotia. Once fully functional, Phase 1 is anticipated to annually contribute \$348 million in GDP, \$59 million in labour income, and \$37 million in government revenue to Canada, and sustain 940 FTEs. Further, this phase will annually contribute \$334 million in GDP, \$51 million in labour income, \$32 million in government revenue to Nova Scotia, and sustain 820 FTEs (Deloitte LLP, 2024).

The Proponent is committed to sharing economic opportunities with the local community throughout the development and lifespan of the Project via the use of local skills and labour where possible, municipal tax revenue, and on-going energy literacy/education (such as site tours to EverWind's Point Tupper Terminal, presentations about renewable energy at local

schools, community meetings or for municipal councils, wind farm tours and visits, etc.). The Proponent has delivered site tours for over 600 students from the Strait Regional School Board and will continue to engage the community, schools, local businesses, and municipal staff and leaders to help identify Project-related opportunities and benefits for the local community.

The Proponent understands the importance of supporting local communities and the Project Team is committed to using as many local skills as possible. In alignment with these commitments, the Proponent has entered into a Community Benefits Agreement (CBA) with MODG and intends to engage with MOCA to formalize long-term social and economic benefits for the community. Under the MODG CBA, the Proponent will establish a community fund based on operating wind capacity (\$1,000/MW annually), supporting local initiatives such as low-income housing, healthcare, education, sports and recreation, and bursaries for students pursuing renewable energy-related post-secondary studies.

The CBA outlines a structured approach to workforce development, including commitments to publicize employment opportunities locally, collaborate on training programs, and reduce barriers to employment for residents. Contractors and suppliers engaged in Project construction and operation will be encouraged to source locally and adhere to equitable employment practices.

The CBA reflects the Proponent's intent to create enduring partnerships with local communities and ensure that the economic and social impacts of the Project are inclusive and community driven.

Potential work includes environmental studies, geotechnical investigation, engineering, land and snow clearing, surveying, worksite security, road construction and maintenance, turbine component transportation, turbine foundation construction, turbine installation, collector system construction, and substation construction. Specifically, elements of job creation throughout the lifespan of the Project may include:

- Project Development: During the development phase of the Project, Nova Scotian professionals have and will continue to deliver services in a variety of areas, including civil and electrical engineering, geotechnical engineering, legal, environmental and biological surveys, archaeological, land and community relations, and many others. Dozens of professionals within Nova Scotia will render their services as part of the development of the Project.
- Construction: The construction phase of the Project will require a large workforce. Much of the construction employment will come through contracting and subcontracting of Canadian, and where possible, Nova Scotian construction firms and specialized service providers related to the balance of plant and installation and commissioning of the wind turbines. It is estimated that the Project will require approximately 200 to 250 jobs for varying scope and duration throughout the approximately three-year construction period. The largest construction scopes of work are anticipated to be:

- Civil installation, that is, land clearing, grubbing, road construction, and foundation installation, which includes:
 - Excavating
 - Rebar supply and installation
 - Anchor bolt supply and installation
 - Forming
 - Concrete supply and pouring
 - Grouting
- Electrical installation, that is, collector line and substation infrastructure installation, and connection to the power grid, which includes:
 - Overhead installation
 - Cable terminations
 - Electrical testing
 - Instrument installation and testing
- Turbine installation, that is, the offloading of turbine components, turbine erection and commissioning, which includes:
 - Crane supply
 - Turbine offload and erection
 - Mechanical works inside turbines
 - Electrical work inside turbines

The Proponent will look to maximize local contractors and personnel where appropriate. To this end, the Proponent will hold a job fair prior to the start of construction to engage with local community members and service providers and identify suitable candidates and/or businesses to support the construction phase employment and service providers.

- Operations: Operational wind projects require long-term operations and maintenance professionals to be located either on-site or within short driving distance of the Project. Approximately eight full-time and part-time jobs will be required for this Project during operations. The employment associated with operations and maintenance is long-term, local, stable, and well-paying, requiring skillsets such as experience managing facilities, working on wind farm, or working with high-voltage systems. These jobs include:
 - Medium-voltage or high-voltage technicians/electricians
 - Wind technicians
 - Road maintenance workers
 - Vegetation management service providers

In addition to operations and maintenance of the wind turbines, there will be a variety of wind farm activities that will require on-going resources including:

- Environmental monitoring
- Snow removal and road surface maintenance
- Administrative support

- Inventory/materials management
- Shipping
- Scheduling
- Coordination of maintenance inspections to accommodate the facility's operation (i.e., power collection system, electrical substation inspections, etc.)

The Proponent will make available a Bursary Fund prior to commercial operations for community members who want to train in renewables industry. This will support the additional use of local labour and skills both during the construction phase and operations phase of the Project. The Proponent has been working directly with the Strait Area Campus of the Nova Scotia Community College to support the development of renewable energy programs to support the projects and communities in the Strait Area.

The Proponent will also create a Community Benefits Fund to provide direct payments to communities, starting at the end of the first year of operations. The payments for the Phase 1 portfolio of projects are expected to be approximately \$650 thousand dollars each year or \$22 million dollars over the life of the projects. A committee of volunteers will determine how the fund is distributed.

In addition to the direct investments that the Project would bring to Nova Scotia's economy, the Project will result in indirect and induced economic benefits that will be realized by governments, local businesses, communities, and residents. Workers that are directly involved with the development, construction, and operations would contribute to the local economy by redistributing wealth to a variety of goods and services such as hotels, restaurants, and grocery stores (NREL, 2016).

As outlined in the *Wind Turbine Facilities Municipal Taxation Act* (Nova Scotia, 2006), Guysborough and Antigonish Counties will receive tax revenues per MW on an annual basis, and the royalty will annually increase as the Consumer Price Index rises. The Project is expected to enhance the community's economic development by providing tax revenues of approximately \$1.5 million annually to Antigonish and Guysborough County (divided proportionally between counties based on the final location of turbines), increasing each year of operation (Bruce, 2024).

Mitigation Measures

The economic impact to the LAA and RAA is positive; therefore, no mitigation is proposed.

Monitoring

A specific monitoring program for the economy is not proposed.

Conclusion

The impacts to the economy are characterized in Table 11.8.

Table 11.8: Economy Residual Effects

Effect Detail	Economic Impact
Magnitude of Effect	Positive: Expected to have a positive impact on the economy.
Geographic Extent of Effect	MODG and Antigonish Subd. B, extending to the entire province
Frequency of Effect	Continuous: Occur continuously during the Project lifespan.
Duration of Effect	Medium Term: Effects are expected throughout operations and decommissioning.
Reversibility of Effect	Irreversible
Significance Level	Positive effect , significance not evaluated.
<u>Effects Assessment Ratings (Refer to Table 4.4 for definitions)</u>	
Magnitude: Negligible, Low, Moderate, High, Positive	
Frequency: Single Event, Intermittent, Continuous	
Duration: Short Term, Medium Term, Long Term	
Reversibility: Reversible, Irreversible, Partially Reversible	

11.2 Land Use and Value

11.2.1 Overview and Assessment Methodology

The assessment of land use and value was completed through a review of desktop resources and in consideration of feedback from public engagement to evaluate how the Project may interact with this VC. The following resources were reviewed:

- Nova Scotia property records
- Public mapping resources
- Literature review of property values and wind farms
- Visual renderings of the Project supplied to Strum, prepared by WSP

11.2.2 Existing Environment

The Study Area consists of both Crown Land, municipal, and private parcels. Land use around the Study Area is primarily forestry and residential use.

The closest proposed wind farm development includes the Goose Harbour Lake Wind Farm Project, approximately 7 km east from the centre of the Study Area. The Goose Harbour Lake Wind Project received an EA approval in 2023 (NSECC, 2023a) and is currently under construction.

There are other proposed developments within the MODG, including the Aulds Cove Wind Project (13 km east), the Strait Crossing Transmission Line Project (approximately 23 km east), the Melford International Terminal (approximately 28 km southeast), and the Setapuktuk Wind Project (19 km southeast).

The Aulds Cove Wind Project is a wind power project that was submitted to NSECC in December 2025. The Strait Crossing Transmission Line Project is a high voltage transmission

line spanning the Strait of Canso that received EA Approval in 2024 (NSECC, 2024). The Melford International Terminal is a marine shipping terminal and rail line that received EA Approval in 2008 (NSECC, 2008). The Setapuktuk Wind Project is a Phase II EverWind Project that received EA Approval in 2025 (NSECC, 2025e).

Several public protected lands and parks are also located in the vicinity (Drawing 3.3), including:

- Tracadie River Wilderness Area, directly adjacent to the southern border of the Study Area.
- Hurlburt Brook Nature Reserve, approximately 7 km east of the Study Area, designation pending approval.
- Bayfield Beach Provincial Park, approximately 12 km northwest of the Study Area.
- Pomquet Island Conservation Lands, approximately 13 km northwest of the Study Area.
- Roman Valley Nature Reserve, approximately 11 km south of the Study Area.
- Ogden Round Lake Wilderness Area, approximately 13 km south of the Study Area.
- Boylston Provincial Park, approximately 17 km southeast of the Study Area.

The Paqtnkek-Niktuek Reserve (No. 23) is the closest Mi'kmaq reserve land, located approximately 2 km northwest of the Study Area (Drawing 3.3). Welnek Reseve (No. 28) is approximately 5 km northwest from the Study Area. Further consideration of Mi'kmaq resources and the MEKS are included in Section 5.

Based on a review of NSNR's Mineral Resource Land Use Atlas (2021e), there are 10 mineral exploration licenses east of the Study Area.

11.2.3 Effects Assessment

Project-Land Use and Value Interactions

Project activities have the potential to interact with land use and value during all phases of the Project (Table 11.9).

Table 11.9: Potential Project-Land Use and Value Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X

Project Phase	Potential for Interaction
Interconnection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for land use and value includes MODG and Antigonish Subd. B. The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for land use and value as well. The VC-specific definition for magnitude is as follows:

- Negligible: No change in land value expected and surrounding land use can largely continue.
- Low: Small reduction in land value expected and/or minor limitations to surrounding land use.
- Moderate: Moderate reduction in land value and/or moderate limitations to surrounding land use.
- High: High reduction in land value and/or widespread limitation to surrounding land use.

Effects

Due to the nature of turbines being tall structures with small footprints, they are highly compatible with other land uses like agriculture, forestry, and ground-based recreation. The forestry activities that are ongoing in the area will not be disrupted by the Project. Upgraded roads and infrastructure will improve access, limit weather-related access disruptions, and improve the access road conditions, which will reduce wear on vehicles and other industrial equipment. None of the existing and permitted users of the Crown land are expected to be impacted by the Project.

A 2017 study mentions that given the traditional energy industry's impacts on conservation in both direct and indirect ways, wind energy can be seen as a complementary land use to conservation and protected areas in a broad way, as wind energy is not a carbon emitter (Wind Europe, 2017). Given the context of Nova Scotia where the traditional energy source has primarily been coal, land use for wind energy can be seen as a positive step.

Visual Aesthetics

People living and working in the vicinity of wind projects express a wide range of perspectives on the visual aesthetics and social acceptability of large turbines (Kirchhoff et al., 2022). While regulations in Nova Scotia do not require aesthetic impact assessment, visual simulation modelling was conducted to demonstrate expected Project visibility from six viewpoints (Appendix Q). These visual simulations were shared at public information sessions to show members of surrounding communities what the Project will look like from these viewpoints, once constructed.

The Project's visibility varies between viewpoints due to the region's terrain, vegetation, and distance of the Project from the viewpoint. For instance, from nearby communities and points of interest, such as the view looking southeast from highway 104, exit 36B, which connects the Paqtnkek-Niktuek Nation (Viewpoint 02), Clarks Road in Upper Big Tracadie to the east of the Project (Viewpoint 05), and Shepherd Lake Park in Lincolnville to the southeast of the Project (Viewpoint 06), the Project turbines are largely hidden by the terrain. While more of the Project's turbines are visible from other viewpoints, such as from the Tracadie Bridge to the northeast of the Project (Viewpoint 01), the New France Road to the west of the Project (Viewpoint 03) turbines appear relatively small on the horizon. The viewpoint near Merland Church Road, directly adjacent to the northernmost Project turbines (Viewpoint 04), several turbines are visible but partially obscured by terrain and vegetation. Overall, turbines are relatively visible from several viewpoints, but the area's terrain, vegetation, and other infrastructure reduce the overall visibility of the turbines, especially up close where they would otherwise appear largest.

Property Value

Potential effects on property value are often a concern of neighbouring residents due largely to anecdotal reports from appraisers of drastic declines in property values following the nearby installation of a wind energy facility (Gulden, 2011). Despite these concerns, many rigorous and statistically defensible studies have concluded that wind energy developments have had no significant effect on surrounding property values.

Prior to 2013, the most comprehensive study on the impact of wind farms on property values was completed by Hoen et al. (2009). This research analyzed data on nearly 7,500 sales of single-family homes situated within 16 km of 24 existing wind farms in the United States. Eight different hedonic pricing models failed to generate statistically significant evidence that property values for houses located within 16 km of wind farms are influenced by the developments. Subsequent research by the same researchers but employing additional analyses confirmed these results (Hoen et al., 2010).

A study by Hinman (2010) tracked property transactions in communities located close to a 240-turbine wind farm for an eight-year period that spanned pre-development and operation stages. Hinman found that before project approval, property values in the area decreased. This was attributed to a fear of the unknown effects that the development would have; an effect known as anticipation stigma. However, once the development became operational, property values

recovered. This recovery was attributed to a greater understanding of the operational effects of the development. Anticipation stigma, however, was not detected in a similar study in Colorado (Laposa & Mueller, 2010), in which it was concluded that the announcement of a large wind energy development did not significantly reduce the selling prices of homes surrounding the proposed development.

The primary limitation of previous research on the effects of wind energy facilities on surrounding home values has long been the relatively small sample sizes (data sets) of relevant home-sale data. The inability to account for the complexity of the various factors that affect property values has also been cited as a limitation of previous studies. Data are limited for homes located within approximately 800 m of turbines, where impacts would be expected to be the largest: Hinman (2010) (sample size of 11); Carter (2011) (sample size of 41). This is in part because setback requirements generally result in wind facilities being sited in areas with relatively few dwellings, limiting the number of sales transactions available to be analyzed (Hoen et al., 2013). Although these smaller data sets are adequate to examine large impacts (e.g., over 10%), they are less likely to reveal small effects with any reasonable degree of statistical significance.

A study published in August 2013 by Berkeley National Laboratory was conducted to address these gaps in data and included the largest home-sale dataset to date (Hoen et al., 2013). Researchers collected data from 51,276 home sales spanning 27 counties in nine states, related to 67 different wind facilities. These homes were within 16 km of 67 different wind facilities, and 1,198 of the sales analyzed were within 1.6 km of a turbine, giving a much larger dataset than previous studies had collected. The data span the periods well before announcement of the wind facilities to well after their construction (Hoen et al., 2013).

Two types of models were employed during Hoen et al.'s (2013) study to estimate property-value impacts: (1) an ordinary least squares model, which is standard for this type of study, and (2) a spatial-process model, which accounts for spatial variability. These models allowed the researchers to control for home values before the announcement of a wind facility (as well as the post-announcement, pre-construction period), the spatial dependence of unobserved factors affecting home values, and value changes over time. A series of robust models was also employed to add an additional level of confidence to the study results (Hoen et al., 2013).

Regardless of model specification, the results of Hoen et al.'s (2013) study revealed no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods. Therefore, the authors concluded that if effects do exist, either the average impacts are relatively small (within the margin of error in the models) and/or sporadic (impacting only a small subset of homes) (Hoen et al., 2013).

A study analyzing more than 7,000 home and farm sales from 2002 to 2010 in the Melancthon Township and 10 surrounding counties found that Ontario's first and largest wind farm (133 turbines) had "no statistically significant effect" on property values. Further, the study found a lack of significant effect is similar across both rural residential properties and agricultural properties (Vyn & McCullough, 2014).

A more recent review based on housing and property values within specific radii of wind farms and other energy infrastructure by Brinkley and Leach (2019) finds that while most energy infrastructure has an impact on nearby land values, renewable energy projects (including wind farms) do not have statistically significant impacts. These findings are based on seven individual studies of varying scales that all consider the value of property relative to the proximity to wind power, whether a single turbine or more (Brinkley & Leach, 2019).

In 2019, researchers at the University of California, Davis conducted an analysis of property values research in the energy sector. Their analysis found that studies on wind turbines and property values overwhelmingly find that wind turbines do not negatively impact property values at any point during their installment (ACPA, 2023). Similarly, a study of onshore wind energy projects in New England found that negative effects on property value were concentrated within 1 km of the project, were not significant beyond this threshold, and dissipated with time (Dong et al., 2023).

Research has consistently demonstrated that, in a variety of spatial settings and across a wide temporal scale, sale prices for homes near wind energy facilities are not significantly different from those attained for homes sited away from wind energy facilities.

Mitigation Measures

The Project has been designed to minimize potential effects to land use and value through siting considerations and engagement with neighbouring landowners.

No specific mitigation related to land use and value is proposed.

Monitoring

No specific land use and value monitoring programs are proposed. The Proponent will maintain ongoing communication with landowners, via a CLC, to minimize impacts to nearby residential dwellings.

Conclusion

The impact to land use and value is expected to be negligible, as no change in land value is expected and surrounding land use can largely continue, therefore the impact is considered not significant.

11.3 Recreation and Tourism

11.3.1 Overview and Assessment Methodology

The assessment of recreation and tourism was completed through a review of desktop resources and in consideration of feedback from public engagement to evaluate how the Project may interact with this VC. The following resources were reviewed:

- Nova Scotia Visitor Exit Survey (TNS, 2024)
- Literature review of wind farm impacts on tourism and recreation

- Review of local governments' tourism and recreation websites:
 - Guysborough County (TGS, 2024)
 - Municipality of the District of Guysborough (MODG, n.d.)
 - Municipality of the County of Antigonish (MOCA, 2025)
 - Visit Antigonish (Visit Antigonish, 2025)

11.3.2 Existing Environment

11.3.2.1 *Outdoor Recreation*

The communities of South Merland, Upper Afton, and others near the Study Area, are home to a variety of primarily outdoor recreational activities. The primary recreational draws are the area's trails, used by ATV riders in summer and snowmobilers in the winter. Outdoor recreation opportunities are focused on use of trails, beaches, and other unstructured recreation venues and not in recreation centres. Boylston Provincial Park is approximately 17 km southeast of the Study Area, and is popular for camping, picnics, hiking, fishing, and kayaking. Bayfield Beach Provincial Park, a sand and pebble beach, is approximately 12 km northwest of the Study Area and is frequented in the summer for picnics and swimming.

Roads and trails within the Study Area are used for recreational activities, including motorsports and cycling. There are several notable hikes in the region, including trails at Monastery Brook Falls, Hartley's Falls, the Guysborough Nature Trail, and more; however, none are found within or near the Study Area. Furthermore, there are no trails within the Study Area on the public trails repository AllTrails.com (n.d.), a popular and well-used source for information about hikes globally recommended by Hike Nova Scotia as the source for information about trails in Nova Scotia. Enjoyment of the region's outdoor recreational activities is not expected to be impacted by the Project and Guysborough and Antigonish Counties will remain areas of interest for visitors from near and far.

Most game and furbearer hunting seasons in Nova Scotia start in the fall and have varying end dates by species. Deer hunting starts in September and October depending on the method of hunting and age of hunter (NSNR, 2024h). Additional approved hunting or trapping may occur on site per NSNR guidelines. Several fish species were confirmed in lakes within the Study Area (Section 9.1), and several waterfowl were also observed (Section 10.4). There are numerous trails that lead to the edges of the lakes that could be used for fishing or waterfowl hunting in this area.

11.3.2.2 *Cultural Attractions*

Guysborough County has a rich history, dating back to over 400 years, and offers museums and historical and cultural attractions including the Old Courthouse Museum in Guysborough. Music and theatre are popular in the area, with Mulgrave Road Theatre, a professional theatre company focused on the Atlantic Canadian experience located in Guysborough, as well as the Chedabucto Place Performance Centre for live performances of all types, also located in Guysborough (MODG, n.d.).

Guysborough is home to the Authentic Seacoast Company, who offer three unique accommodations that are themed on the region's history and attractions (Authentic Seacoast, n.d.). There are other accommodations options for tourists available in Guysborough, but none closer to the Project that can be found through online searches or tourism resources.

Similarly, Antigonish County has a rich history and unique heritage, offering historical and cultural attractions such as the Pictou-Antigonish Regional Library or the Antigonish Heritage Museum. Much of the county is surrounded by scenic and natural beauty, including provincial parks, nature sites, historic homes, lighthouses, and churches. The Town of Antigonish receives the most influx of tourism, with the presence of St. Francis Xavier University and the town's diverse offerings of restaurants and attractions.

Despite the lack of specific tourism destinations within or directly adjacent to the Study Area, many tourists pass near the area on Highway 104 and NS-16. They are either traveling east towards Aulds Cove and Port Hawkesbury towards Cape Breton, west towards Antigonish and New Glasgow, or south towards Boylston and Guysborough.

11.3.2.3 Recreation and Tourism Trends

Tourism Nova Scotia's 2019 visitor exit survey collected information on the reason for people's visits and activities that visitors undertook while in Nova Scotia (TNS, 2021). The top five main reasons for visiting Nova Scotia in 2019 among pleasure visitors were:

- For the scenery/natural landscape (22%)
- To visit a specific area or location in Nova Scotia (18%)
- For the seacoast and ocean (14%)
- To do a specific activity (8%)
- To experience Nova Scotia's culture (8%)

Of those who participated in outdoor activities, the most common were coastal sightseeing, visiting a beach, and hiking (TNS, 2021). No spatial data are available from this or other research products of Tourism Nova Scotia regarding the places visited within province, limiting the understanding of the impact that tourism has on the communities that surround the Project. Additionally, no data were found on intra-provincial travel or local use of these resources. Given the high prevalence of minimally structured and uncommercialized activities (e.g., hiking and beach exploration), the low prevalence of tourism providers near the Study Area would not necessarily be a deterrent to tourists using the area. However, it is more likely that visitors to MODG and Antigonish Counties seeking natural experiences would visit established destinations such as the previously mentioned Boylston and Bayfield Provincial Parks, which are each over 10 km from the Project.

11.3.3 Effects Assessment

Project-Recreation and Tourism Interactions

Project activities have the potential to interact with recreation and tourism during all phases if

access is changed, is temporarily limited to facilitate work, or if changes to the visual environment impact the user's experience (Table 11.10).

Table 11.10: Potential Project-Recreation and Tourism Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Interconnection	-
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	-
Decommissioning	
Infrastructure Removal	X
Site Reclamation	-

Assessment Boundaries

The LAA for recreation and tourism is MODG and MOCA. The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for recreation and tourism as well. The VC-specific definition for magnitude is as follows:

- Negligible: No expected changes to recreation and tourism.
- Low: Small reduction in tourism expected and/or minor limitations to recreational use.
- Moderate: Moderate reduction in tourism and/or moderate limitations to recreational use.
- High: High reduction in tourism and/or widespread limitation to recreational use.

Effects

It is difficult to determine with certainty how tourists will react to a wind power development. Wind farms are objects of fascination for many who might see them as an attraction or at worst neutral in their tourism decisions. Others may find them intrusive in otherwise natural or rural spaces and choose other, less developed areas for tourism and recreational opportunities. Although the Project is generally well-hidden from surrounding vantage points, some of the wind turbines proposed will be visible from several locations. For further information on the viewplanes and landscape impacts related to the proposed turbines, see Section 11.2. While it

is not possible to accurately predict recreationalists' response to the presence of or the aesthetic qualities of the Project, the Project's direct impacts on recreational opportunities and the experiences sought after by locals and tourists alike can be examined.

Construction of the Project will likely overlap with recreational activities practiced in the Study Area. Although the Proponent is not proposing to implement permanent access restrictions (e.g., gates), trails noted to be used by ATVs, snowmobiles, or that provide access to fishing and hunting may be temporarily inaccessible for safety reasons if in proximity to active construction sites. Such closures will be temporary and limited to construction, with similar temporary closures during decommissioning. Private landowners remain free to gate private roads at their discretion.

A variety of research has attempted to understand the connection between wind energy development and tourism outcomes, both in terms of tourism demand and tourist experience. Most research finds that the effect of wind turbines on both demand and experience is neutral to slightly negative. Work in Portugal found a generally net neutral outcome of onshore wind farms, in which some tourists and residents expressed slightly negative to positive outlooks (de Sousa & Kastenholz, 2015). The researchers examined the potential for wind farms to become areas of tourism interest, which they concluded requires more investigation though may be practical. Alternatively, in Iceland, tourists especially expressed negative views towards turbines from one project in particular (Sæþórsdóttir & Ólafsdóttir, 2020). The authors of this study found that further development in the region would put 'nature-based tourism' and wind energy in competition for land use, highlighting that the conflict between tourism and wind development is dependent on the prevailing type of tourism practiced in an area. In Germany, researchers found a negative relationship between turbines and tourism demand, and highlighted a strong difference between the effect of onshore inland and onshore coastal, turbines (Broekel & Alfken, 2015). These authors, however, point to the need for greater study to determine if these relationships hold when examined at a greater scale. Finally, research in the Czech Republic finds a generally neutral attitude towards wind farms among regional visitors (Frantál & Kunc, 2011). The authors noted that interestingly, tourists had higher acceptance of turbines than local residents.

Based on literature review, the potential effects of the Project on tourism demand and experience need to be understood in the context of the Project's features and the tourism demand in the area. The lack of structured recreational opportunities (i.e., established recreation providers) within or adjacent to the Study Area suggest that the Project is unlikely to affect recreational tourism to a substantial degree. It is more likely that the region's tourists seeking structured recreational activities would visit nearby Bayfield Beach Provincial Park or Boylston Provincial Park. Less structured recreational activities, such as trail users, may be more affected by the Project. Some recreationalists, especially OHV riders, may benefit from the Project due to the increased road network allowing for greater access to trails.

The Project Team is committed to working with local recreational groups to ensure continued access to the area and associated trails, within the bounds of all safety considerations,

particularly during construction. Following construction, the Proponent is not proposing to gate any access roads or restrict movement through the Study Area, however, private landowners remain free to gate private roads at their discretion. For Project and public safety, the substation will be fenced throughout operations, but this will only limit access to a small area within the Study Area and not restrict movement. As discussed above, the presence of turbines is highly compatible with most land-based recreation activities and is not expected to limit recreation opportunities, whether by locals or tourists.

Mitigation Measures

The following mitigation measures are recommended:

- Limit trail, road, and areal closures to temporary periods within the construction and decommissioning phases.
- Continue to work with local recreation groups to ensure continued access within the Study Area for recreation, including ATV/OHV use, hunting, and trapping.
- Continue to engage with nearby landowners and community members.

Monitoring

No monitoring is proposed.

Conclusion

The impact to tourism and recreation are characterized in Table 11.11.

Table 11.11: Land Use and Value Effect Assessment

Effect Detail	Change in Recreation or Tourism
Magnitude of Effect	Low: Low direct impact on recreation and tourism activities.
Geographic Extent of Effect	MODG and MOCA.
Frequency of Effect	Intermittent: Occur intermittently, only during activities that limit access.
Duration of Effect	Short Term: Limits to recreation/tourism use within the Study Area limited to the construction and decommissioning phases.
Reversibility of Effect	Reversible
Significance Level	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible	

12.0 ARCHAEOLOGICAL RESOURCES

12.1 Overview

The purpose of the Archaeological Resource Impact Assessment (ARIA) was to identify areas of high archaeological potential within the Assessment Area. Cultural Resource Management Group Limited (CRM Group) was contracted to conduct an ARIA for the Project, which was directed by Kyle Cigolotti. The ARIA initially commenced in 2024 for an earlier layout and was subsequently updated in 2025. Results from both ARIAs have been integrated to represent the current Assessment Area and are described in the sections that follow.

12.2 Regulatory Context

The *Special Places Protection Act* (Nova Scotia, 1989a) provides the province of Nova Scotia with a mandate to protect important archaeological, historical, and paleontological sites and remains, including those underwater. A permit is required for any archaeological or paleontological exploration or excavation in Nova Scotia. The permit system ensures that work is completed based on established standards by qualified applicants.

The ARIAs were conducted in accordance with the terms of Heritage Research Permits A2024NS187 and A2025NS127 issued by the NSCCTH – Special Places Program.

As archaeological work can often result in findings or information that is confidential or sensitive, a summary of the results of the ARIAs are provided in the EA, with the ARIA reports provided directly to NSCCTH for review. It is understood that the findings and recommendations of the ARIAs are considered “draft” until the reports are accepted by NSCCTH. The reports for both Heritage Research Permits have been accepted by NSCCTH (Appendix R).

12.3 Assessment Methodology

The objectives of the ARIAs were to:

- Evaluate archaeological potential within the Assessment Area.
- Identify, delineate, and investigate (where recommended) areas considered to exhibit high potential for encountering archaeological resources.
- Provide detailed and accurate information on the results of the survey.
- Provide comprehensive recommendations so that appropriate archaeological resource management strategies can be devised.

To achieve these objectives, CRM Group designed an assessment strategy consisting of a desktop component (background screening) and a field component (archaeological reconnaissance).

The desktop component of the ARIA consisted of Mi'kmaw engagement and a review of existing historical and cultural information to describe the land use history of the Study Area and surrounding region. CRM Group contacted Kwi'lmu'kw Maw-klusuaqn's Archaeological

Research Division to request available information about traditional or historical Mi'kmaw uses of the Study Area. Relevant provincial databases, archives, and historic documents (e.g., maps, grant records, legal surveys) were also consulted to provide additional understanding of the local environmental, archaeological, and historical context:

- NS Archives
- NS Museum
- The Natural Sciences Library
- NS Registry of Deeds
- NS Property Online
- NS Crown Land Information Management Centre

The desktop component also included a geospatial analysis to identify potential areas of archaeological sensitivity requiring additional attention during the field program. The proximity of the Study Area to existing registered archaeological sites, heritage properties, cemeteries, Mi'kma'ki First Nation Lands, Crown land parcels, and protected areas was determined. Topographic maps, aerial photographs, and satellite and LiDAR digital elevation models were further used evaluate topography and identify evidence of historic infrastructure. Environmental and topographic features that may influence potential for past human settlement and resource exploitation, such as navigable water bodies, were noted.

The field program involved an on-site, surficial examination of the Assessment Area as well as limited exploratory subsurface testing. Walking transects were completed at intervals 30 to 40 m apart (to ensure effective coverage) across the Assessment Area. Surveys were intended to delineate areas of archaeological potential (low, medium, high) by identifying topographic anomalies and visible features to indicate possible buried resources (e.g., structural remains, landscape elements, culturally modified trees, petroglyphs, exposed artifacts). The process and results of the field assessments were documented in field notes, sketches, and digital photographs.

Exploratory subsurface testing included a hand excavated shovel test pit (40 cm depth). Observations about the soil profile were recorded, and excavated soil was sieved to recover potential artifacts.

If areas of high archaeological potential or confirmed archaeological resources were identified, locations and features were sufficiently documented to make informed archaeological resource management recommendations. Confirmed archaeological resources, as determined by NSCCTH, will result in the registration of the site(s) in the Maritime Archaeological Resource Inventory database.

12.4 Assessment Results

The field reconnaissance component of the ARIA under Heritage Research Permits A2024NS187 and A2025NS127 were carried out between October 7 and 11, 2024, and August 14 and 15, 2025, respectively. Field reconnaissance resulted in the identification of eight areas

considered to exhibit high potential for encountering archaeological resources within the Archaeological Assessment Area. Five high potential areas were identified in 2024 (HPA-24-01, HPA-24-02, HPA-24-03, and HPA-24-05, HPA-24-05) and three in 2025 (HPA-25-01, HPA-25-02, and HPA-25-03). No cultural material was recovered during the ARIA.

The remaining portions of the Archaeological Assessment Area are considered to exhibit low potential for encountering archaeological resources. As a result, CRM Group recommends these areas be cleared by NSCCTH of any further requirement for future archaeological assessment. The Archaeological Assessment Area was based on previous Project layout iterations, and several areas of the current Assessment Area require archaeological assessment, which will be completed prior to ground disturbance (Drawing 12.1). Additional archaeological assessment will be undertaken in 2026, and results will be submitted to NSCCTH and subsequently to NSECC for review.

12.5 Effects Assessment

Project-Archaeological Resources Interactions

Project activities could interact with archaeological resources during earthmoving activities in the construction phase (Table 12.1).

Table 12.1: Potential Project-Archaeological Resources Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Interconnection	-
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	-
Decommissioning	
Infrastructure Removal	-
Site Reclamation	-

Assessment Boundaries

The LAA for archaeological resources is the Clearing Footprint (Drawing 3.1A to 3.1K). The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for archaeological resources. The VC-specific definition for magnitude is as follows:

- Low: Activities have a low potential for encountering archaeological resources during ground disturbance.
- Moderate: Activities have a moderate to high potential for encountering archaeological resources during ground disturbance, but risk of harm to potential archaeological resources can be mitigated through appropriate actions and procedures.
- High: Activities have a moderate to high potential for encountering archaeological resources during ground disturbance, and ARIA indicates a high potential for accidental and irrevocable loss of archaeological resources regardless of mitigative measures.

Effects

Impacts to archaeological resources could occur during activities requiring ground disturbance or vegetation clearing. New ground disturbance and vegetation clearing for the Project will be limited to the Clearing Footprint and will occur during the site preparation and construction phase. Ground disturbance will also occur during decommissioning but will be limited to areas previously disturbed during construction.

There is low potential for effects on archaeology resources across most of the Assessment Area. Of the eight areas exhibiting high potential for archaeology resources identified within the Archaeological Assessment Area, the Proponent has completely avoided three (HPA-24-01, HPA-24-03, and HPA-24-05) and anticipates avoidance of five during detailed engineering design (HPA-24-04, HPA-24-02, HPA-25-01, HPA-25-02, and HPA-25-03). If avoidance is not possible, the Proponent will retain an archaeological consulting firm to conduct a shovel testing program.

Mitigation

The following mitigation measures are recommended:

- Maintain avoidance of sites of high potential for archaeological sites, where possible, in detail design.
- Conduct shovel testing in accordance with the recommendations of CRM Group and requirements of NSCCTH in areas with high potential for archaeological resources that cannot be avoided.
- Develop a chance find procedure related to the potential unexpected discovery of archaeological items or sites, or human remains, during construction. This would include halting any work immediately upon discovery of suspected resources and contacting NSCCTH and the KMKNO Archaeological Division.
- Conduct archaeological assessment in areas not assessed, where ground disturbance is required. The EA Branch will be provided with the acceptance letter from NSCCTH prior to completion of any disturbance in newly proposed areas.

Monitoring

No monitoring programs are proposed.

Conclusion

With the implementation of the above mitigation measures, the residual effects to archeological resources (after mitigation) are characterized in Table 12.2.

Table 12.2: Archaeological Resources Residual Effects

Effect Detail	Loss of Archaeological Resources
Magnitude of Effect	Moderate: Activities have a moderate to high potential for encountering archaeological resources during ground disturbance (in identified areas), but risk of harm to potential archaeological resources can be mitigated through appropriate actions and procedures such as avoidance and shovel testing.
Geographic Extent of Effect	Clearing Footprint, should unlikely impacts to archeological resources occur
Frequency of Effect	Single Event: Should unlikely impacts to archeological resources occur, effects would occur once, during initial ground disturbance or vegetation clearing for the Project.
Duration of Effect	Short Term: Should unlikely impacts to archeological resources occur, they would be limited to the construction phase when new ground disturbance and vegetation clearing will occur.
Reversibility of Effect	Irreversible: Should unlikely impacts to archeological resources occur, the effects would not be reversible.
Significance Level	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible	

13.0 EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT

13.1 Summary of Effects of the Undertaking on the Environment

Table 13.1 summarizes the results of the effects assessment for each VC.

Table 13.1: Effects of the Undertaking on the Environment Summary

VC	Effect	Magnitude of Effect	Geographic Extent of Effect	Frequency of Effect	Duration of Effect	Reversibility of Effect	Significance Level
Atmosphere and Air Quality	Fugitive and Exhaust Emissions	Low: Fugitive and exhaust emissions are expected to remain below the maximum permissible ground-level concentrations.	200 m buffer of the Assessment Area	Intermittent: Effects may occur during the Project's construction, operation, and decommissioning phases, but only intermittently.	Short Term: Effects are mainly confined to the construction and decommissioning phases.	Reversible	Not Significant
Climate Change	Net Reduction of GHG Emissions	Positive: Net effect of the Project will be a reduction in GHG emissions.	Nova Scotia	Continuous: Effects will occur continuously during operation.	Medium Term: Effects are expected throughout the operation phase.	Irreversible	Positive effect, significance not evaluated.
Sound	Construction Noise	Low: Construction activities are anticipated to comply with municipal by-laws and permitting.	2 km buffer of turbine locations	Intermittent: Effects are anticipated during both the construction and decommissioning phases, and rarely during operation.	Short Term: Effects are expected throughout construction and decommissioning, but generally not during operations or after decommissioning.	Reversible	Not Significant
	Operational Noise	Low: Operational sound is predicted to comply with the criteria in the Environmental Assessment Supplemental Checklist: Wind Energy Projects.	2 km buffer of turbine locations	Continuous: Effects are anticipated throughout operations, although there may be temporary lapses during calm conditions while rotors are not spinning.	Medium Term: Effects are expected throughout operations but end at the start of decommissioning and not continue.	Reversible	Not Significant

VC	Effect	Magnitude of Effect	Geographic Extent of Effect	Frequency of Effect	Duration of Effect	Reversibility of Effect	Significance Level
Shadow Flicker	Shadow Flicker	Low: Measurable shadow flicker is expected but within regulatory compliance at non-participating receptors.	2 km buffer of turbine locations	Intermittent: Effects may occur whenever the turbine rotors are spinning.	Medium Term: Effects are expected throughout the operational phase of the Project.	Reversible	Not Significant
Geophysical Environment	Encountered Geologic Hazard	Moderate: Risk mapping shows the potential for geologic hazards in the Study Area.	800 m buffer of the Project Footprint	Continuous: If present, effects may occur continuously.	Short Term: If present, effects limited to construction and decommissioning.	Partially Reversible	Not Significant
	Change to Groundwater Quality or Quantity	Moderate: Groundwater wells located within 800 m of the Project Footprint.	800 m buffer of the Project Footprint	Intermittent: Effects may occur during blasting (if required).	Short Term: Effects are possible throughout construction (if blasting is required).	Partially Reversible	Not Significant
Surface Water, Fish, and Fish Habitat	Habitat loss	Low: A small loss of fish habitat.	Assessment Area	Single Event: Effects may occur during initial construction.	Medium Term: Effects may occur during all phases but will not extend beyond decommissioning.	Partially Reversible	Not Significant
	Erosion and Sedimentation	Low: Minimal potential for impact to fish.	Assessment Area	Intermittent: Effects may occur during initial construction and during operations.	Medium Term: Effects may occur during all phases but will not extend beyond decommissioning.	Partially Reversible	Not Significant
	Fish Injury or Mortality	Negligible: No loss of fish expected.	NA	NA	NA	NA	Not Significant
	Changes to Water Quality and Quantity	Low: Minimal potential for altered hydrology or impact to fish.	Assessment Area	Single Event: Effects may occur during construction.	Medium Term: Effects may occur during all phases but will not extend beyond decommissioning.	Partially Reversible	Not Significant

VC	Effect	Magnitude of Effect	Geographic Extent of Effect	Frequency of Effect	Duration of Effect	Reversibility of Effect	Significance Level
Wetlands	Habitat Loss	Moderate: Direct loss of habitat, including that of WSS, but wetland area loss will not impact the hydrology of the watershed. Where WSS are impacted, adequate general SAR habitat is prevalent elsewhere within the RAA.	Assessment Area	Single Event: Effects will occur once, during initial ground disturbance or vegetation clearing for the Project.	Medium Term: Residual effects will extend until wetlands are restored during decommissioning and/or compensated for following construction.	Partially Reversible	Not Significant
	Changes in Wetland Function	Low: Project activities have low potential for changes to wetland function with the implementation of mitigation measures.	Assessment Area	Single Event: Direct effects resulting from construction activities will occur once, and indirect effects to wetland function will be mitigated through the use of controls.	Medium Term: Residual effects may extend through the operation and maintenance phase of the Project.	Partially Reversible	Not Significant
Terrestrial Vegetation Communities and Flora	Loss or Alteration of unique vegetation communities	Low: Small loss of unique vegetation communities	100 m buffer of the Clearing Footprint	Single Event: Effects may occur during initial site preparation and construction	Medium Term: Effects may extend through all phases but will not extend beyond decommissioning	Partially Reversible	Not Significant
	Loss of flora SAR or SOCI and Impacts on supporting habitat	Moderate: Small loss of or effects on terrestrial flora SAR or SOCI individuals (and associated habitat) that do not have legislated protection status, but their populations remain largely intact.	100 m buffer of the Clearing Footprint	Single Event: Effects may occur during initial site preparation and construction	Medium Term: Effects may extend through all phases but will not extend beyond decommissioning	Partially Reversible	Not Significant
	Edge Effects	Moderate: Small effect to habitat supporting	100 m buffer of the Clearing	Single Event: Effects may occur	Medium Term: Effects may extend	Partially Reversible	Not Significant

VC	Effect	Magnitude of Effect	Geographic Extent of Effect	Frequency of Effect	Duration of Effect	Reversibility of Effect	Significance Level
		terrestrial flora SAR and/or SOCI due to edge effects.	Footprint	during initial clearing and ground disturbance, and during operations	through all phases but will not extend beyond decommissioning		
Terrestrial Fauna	Habitat Loss and Fragmentation	Low: Small loss of habitat supporting fauna	5 km buffer of the Study Area	Single Event: Effects expected to occur during construction phase	Medium Term: Effects will end following decommissioning	Partially Reversible	Not Significant
	Injury and Mortality	Low: Low impacts to fauna through injury and mortality	5 km buffer of the Study Area	Intermittent: Effects occur occasionally or intermittently during one or more phase of the Project.	Medium Term: Effects will end following decommissioning	Partially Reversible	Not Significant
	Sensory Disturbance	Low: Low impacts to fauna through sensory disturbance	5 km buffer of the Study Area	Intermittent: Effects occur occasionally or intermittently during one or more phase of the Project.	Medium Term: Effects will end following decommissioning	Reversible	Not Significant
Bats	Habitat Fragmentation and/or Loss	Low: Low loss of suitable bat habitat is expected.	5 km buffer of the Study Area	Single Event: Effects may only be associated with clearing during construction.	Medium Term: Effects will end following decommissioning	Partially Reversible	Not Significant
	Injury or Mortality	Moderate: Minimal loss of individuals is expected.	5 km buffer of the Study Area	Intermittent: Effects may occur seasonally between dusk and dawn during operations and temporarily during construction.	Medium Term: Effects will end following decommissioning.	Irreversible	Not Significant

VC	Effect	Magnitude of Effect	Geographic Extent of Effect	Frequency of Effect	Duration of Effect	Reversibility of Effect	Significance Level
	Sensory Disturbance	Low: Low impacts to habitat usage (i.e., effective habitat loss) due to sensory disturbance is expected.	5 km buffer of the Study Area	Continuous: Effects may occur sporadically during construction and decommissioning but may be constant (though spatially limited) during operations.	Medium Term: Effects will end following decommissioning.	Reversible	Not Significant
Avifauna	Habitat Loss, Alteration/ Fragmentation, and Edge Effect	Low to Moderate: Low to moderate loss of habitat supporting avian SAR and habitat-sensitive avifauna, depending on the species.	5 km buffer of the Study Area	Single Event: Loss of habitat occurs once during the construction phase (i.e., clearing and ground disturbance).	Medium Term: Effects will end following decommissioning.	Partially Reversible	Not Significant
	Sensory Disturbance – Light and Noise	Low: Low sensory disturbances are expected.	5 km buffer of the Study Area	Intermittent: Intermittent during the construction, decommissioning, and operations phases.	Medium Term: Effects will end following decommissioning.	Reversible	Not Significant
	Injury and Mortality	Moderate: Avian use of the Study Area indicates a likelihood of interactions but recorded flight altitudes indicate effect is likely at the individual and not population scale.	5 km buffer of the Study Area	Intermittent: May vary by Project phase, as well as seasonal differences (e.g., breeding, migration, and winter seasons).	Medium Term: Effects will end following decommissioning.	Irreversible	Not Significant
Economy	Economic Impact	Positive: Expected to have a positive impact on the economy.	MODG and Antigonish Subd. B, extending to the entire province	Continuous: Occur continuously during the Project lifespan.	Medium Term: Effects are expected throughout operations and decommissioning.	Irreversible	Positive effect, significance not evaluated.

VC	Effect	Magnitude of Effect	Geographic Extent of Effect	Frequency of Effect	Duration of Effect	Reversibility of Effect	Significance Level
Land Use and Value	Land Use or Value Change	The impact to land use and value is expected to be negligible, as no change in land value expected and surrounding land use can largely continue and is therefore considered not significant.					
Recreation and Tourism	Change in Recreation or Tourism	Low: Low direct impact on recreation and tourism activities.	MODG and MOCA	Intermittent: Occur intermittently, only during activities that limit access.	Short Term: Limits to recreation/tourism use within the Study Area limited to the construction and decommissioning phases.	Reversible	Not Significant
Archaeological Resources	Loss of Archaeological Resources	Moderate: Activities have a moderate to high potential for encountering archaeological resources during ground disturbance (in identified areas), but risk of harm to potential archaeological resources can be mitigated through appropriate actions and procedures such as avoidance and shovel testing.	Clearing Footprint, should unlikely impacts to archeological resources occur	Single Event: Should unlikely impacts to archeological resources occur, effects would occur once, during initial ground disturbance or vegetation clearing for the Project.	Short Term: Should unlikely impacts to archeological resources occur, they would be limited to the construction phase when new ground disturbance and vegetation clearing will occur.	Irreversible: Should unlikely impacts to archeological resources occur, the effects would not be reversible.	Not Significant
Effects Assessment Ratings (Refer to Table 4.4 for definitions) Magnitude: Negligible, Low, Moderate, High, Positive Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible							

14.0 EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING

The following section discusses potential effects of the natural environment, including climate change, natural hazards, and weather events, on the infrastructure and operation of the Project. Potential sources of effects from the environment are described below, including mitigation and design strategies for reducing the significance of residual effects.

The primary mitigative measure employed during the construction and operation of the Project is to educate and train site personnel. Environmental and safety orientations will be conducted prior to the start of construction, and all staff will be informed of the potential effects of the environment on the Project. Staff responsible for the operation and maintenance of the Project will be trained on the design and operation of the turbines, including applicable operating procedures, safety protocols, and evacuation plans. To further mitigate damages that cannot be controlled by education and training alone, turbines will be equipped with safety mechanisms to limit damage resulting from extreme weather events.

14.1 Climate Change

Climate change refers to a long-term, persistent change in average and extreme weather conditions. Contemporary climate change (i.e., since the beginning of the industrial period) is being caused by increases in GHG emissions associated with human activities. Warming temperatures, altered precipitation regimes, and sea level rise are three notable aspects of climate change with potential to impact Project operations.

14.1.1 Increased Air Temperature

A key aspect of climate change is global warming, which refers to the long-term rise in the Earth's average surface temperature, measured over 30 years, in comparison to preindustrial levels (IPCC, 2018). Air temperatures are an important driver of many environmental processes, including the intensity of severe weather events such as hurricanes (Gilford et al., 2024). Based on a range of emissions scenarios (Coupled Model Intercomparison Project Phase 6), mean annual temperatures within the Study Area are expected to increase by 2.4°C to 3.7°C over the period 2041 to 2070 (relative to 1971 to 2000), while the number of days with a humidex above 30°C are expected to increase by 25 to 40 days per year (ClimateData.ca, 2025).

Temperature increases associated with global warming may impact all phases of the Project as well as the comfort of on-site personnel. For example, the demand for cooling in construction vehicles will increase with warmer temperatures and may require Project personnel to take regular breaks to cool down and rehydrate. Warmer temperatures also have the potential to enhance the spread and abundance of disease vectors such as ticks (Bouchard et al., 2019), with associated increases in health risks. Longer and more intense heat waves under climate change may also increase the risk of forest fires (ECCC, 2019b), as described in Section 14.2.2.

The direct risks of increased temperatures to Project personnel will be managed by ensuring staff are trained to understand the importance of regular breaks, proper hydration, and unsafe working conditions.

14.1.2 Changes in Precipitation

Heavy rainfall events are a common, highly probable natural hazard in Nova Scotia that may be exacerbated by climate change. Although it is difficult to accurately forecast decadal-scale changes in rainfall events, future climate scenarios suggest that conditions will become “wetter” over the Project’s lifespan. For example, total annual precipitation in the Study Area is expected to be 94 to 98 mm/y higher by 2041 to 2070 relative to the 1971-2000 baseline (ClimateData.ca, 2025). Heavy rainfall events have the potential to impact construction and operations by increasing the risk of overland flooding which may temporarily restrict site access, overwhelm ditches and culverts, and require operational strategies to be implemented (e.g., sedimentation and erosion controls).

While the climate of the Study Area is expected to become wetter overall, prolonged periods of dry conditions are also expected to become more common (ClimateData.ca, 2025). Periods of dry conditions may impact Project operations (e.g., by limiting construction activities) if forest access is restricted due to increased wildfire risk (woods access restrictions). Droughts may also limit the ability to fight fires if water levels in nearby lakes and rivers are low. Drier-than-normal conditions may also cause an increase in fugitive dust emissions during construction that will require management via mitigations.

The Project will mitigate the risks of flooding and drought by:

- Developing and implementing a Surface Water Management Plan.
- Minimizing alterations to wetlands.
- Sizing culverts appropriately for anticipated increased precipitation events.
- Designing roadside ditches and water off-take infrastructure next to all roads to encourage rainwater drainage.
- Maintaining regular upkeep of surface water infrastructure.
- Allowing for natural revegetation of roadsides to absorb excess water.

14.1.3 Sea Level Rise

On a global scale, sea levels are currently rising because of warming air and ocean temperatures (via thermal expansion of ocean water and increased inputs of melting of sea ice/glaciers). Sections of the Atlantic coastline have been highlighted as some of Canada’s most severely threatened areas from sea level rise and resulting impacts, with rising sea levels expected to amplify coastal flooding, erosion, and storm surge across the Atlantic region (ECCC, 2023a). According to the National Oceanic and Atmospheric Administration (NOAA, n.d.), the relative sea level trends across Nova Scotia ranges from approximately 3.19 mm/y to 3.99 mm/y (based on data from 1895 to 2021). The relative change in sea level for the coastal waters nearest the Project is projected to be 35 cm by 2050 relative to 1986 to 2005 conditions [change in ocean level relative to land (ClimateData.ca, 2025)].

The Project's Study Area is located at a sufficient elevation (65 to 217 masl) and distance from the coast (5 km) such that Project infrastructure is unlikely to be directly impacted by coastal flooding.

14.2 Natural Hazards

Nova Scotia regularly experiences natural hazards, including severe weather events (e.g., blizzards, hurricanes) and wildfires. These events can lead to adverse outcomes such as power outages, health-related emergencies, infrastructure damage, and road damage, thereby posing direct risks to infrastructure (Public Safety Canada, 2024). In addition to severe weather events and wildfires, a natural hazard that is unique to wind energy projects is the possibility of turbine icing.

14.2.1 Severe Weather Events

Hurricanes, blizzards, and other severe weather events are natural hazards that have the potential to impact the Project through direct effects to infrastructure and personnel, and through disruptions to site access. During severe weather events, safety risks may be elevated due to hazardous driving conditions, poor visibility, cold temperatures, and falling debris. Throughout the life of the Project, the safety of Project personnel will be managed by developing and implementing safe work procedures, and ensuring staff are trained in the use of PPE and understand unsafe work conditions.

High winds and lightning, which may be associated with heavy rainfall or hurricane conditions, may increase the risk of mechanical issues or electrical fires. To mitigate this risk, turbines will be monitored remotely and equipped with an automatic shutdown that will engage when wind thresholds are reached (i.e., cut-out speed). Turbines will also be designed with a built-in grounding system for lightning strikes.

14.2.2 Wildfire

Wildfire poses a potential risk to the Project during all Project phases. The Project Footprint is surrounded by forest cover and there is potential for naturally occurring and human-caused forest fires to damage Project infrastructure and elevate safety risks for Project personnel.

Fire is one of the sources of natural disturbance in Nova Scotia, with moderate to high severity fires impacting an estimated 0.17% to 0.4% of forested land per year (A. R. Taylor et al., 2020). Although it is challenging to precisely predict changes to fire regimes, modelling suggests wildfire risk in the Acadian forest region (which includes the Study Area) will increase moderately under climate change as a result of warmer and drier conditions (Whitman et al., 2015). In recent years, several large wildfires have occurred in Nova Scotia, which were exacerbated by prolonged dry periods (e.g., Upper Tantallon/Hammonds Plains fire in 2023, Long Lake fire in 2025).

The following operational and technological measures will be implemented:

- Develop and implement a Project-specific Contingency Plan that includes a fire safety plan. Circulate the plan to local fire departments for input and awareness.
- Engage with first responders on site access and availability of water resources for fire suppression.
- Ensure fire response equipment is available at the O&M building and that site personnel are trained in its use.
- Equip each turbine with integrated condition-monitoring and control systems with automated shutdown function and alerts to operations personnel..

14.2.3 Turbine Icing

Turbine icing occurs when ice accumulates on the surface of turbine blades, a condition created by specific temperatures and levels of humidity or the presence of freezing rain. Icing may occur more frequently when turbine blades reach 150 m above ground where lower clouds may contain supercooled rain during the cold season (Seifert et al., 2003). Turbine icing may lead to ice throw or ice fall, and the distance and direction in which the ice is thrown/falls is dependent on factors such as wind speed, rotor speed, rotor azimuth, the position of the ice on the blade, and the characteristics of the ice itself.

The maximum theoretical throwing distance of ice from a turbine, as determined using the following equation (CanREA, 2020) is:

$$d_t = 1.5 * (D + H)$$

Where:

d_t = Maximum throwing distance (m)

D = Rotor diameter (m)

H = Hub height (m)

Based on the above equation and turbine model specifications (183.4 m rotor diameter and 130 m hub height), the maximum theoretical throwing distance associated with the Project's turbines is 470.1 m. Ice throw presents a risk to maintenance workers who will work in close proximity to turbines during operations. Such access may be required when icing is a factor, and possibly because of icing.

To reduce the risk of injury from ice throw or falling ice, mitigation measures to protect recreation users and site workers from ice throw or shedding will include:

- Equip turbines with blade anti-icing or de-icing systems.
- Equip turbines with automatic shutdown systems that can activate in instances of ice shedding.
- Continue engagement and education with local recreational users regarding the safe continued use of lands within the Study Area.

- Install signage illustrating and warning of potential hazards associated with ice throw and shedding around wind turbines, including on any recreational or logging trails or roads within the danger zone of ice throw or shedding.
- Equip staff and workers accessing turbines for maintenance or other purposes with necessary PPE and associated safety protocols and procedures to mitigate risk of injury and/or fatality, especially during potential icing conditions.

14.3 Summary of Effects

Environmental effects associated with climate change and natural hazards have the potential to affect all phases of the Project. Project location siting and design measures will minimize many of the risks associated with these environmental hazards, and the mitigation measures described above will allow for both proactive and adaptive management of any remaining risks, thus limiting the likelihood of impacts on all phases of the Project.

15.0 ACCIDENTS AND MALFUNCTIONS

Without proper mitigation, accidents and malfunctions can interact with many VCs and potentially result in adverse effects. However, implementing preventative measures limits the probability of occurrence, and having appropriate response procedures in place reduces the magnitude of residual effects.

Accidents, malfunctions, and unplanned events considered for this Project include:

- Erosion and sediment control failure
- Fire
- General hazardous material spill
- Structural damage
- Transportation-related incidents
- Ice throw (addressed in Section 14.2.3)

The safety of on-site personnel is a vital Project component; however, it is not specifically considered in the EA as workplace occupational health and safety is regulated by the policies, procedures, plans, and codes of practice set in the *Occupational Health and Safety Act* (Nova Scotia, 1996). A site-specific Contingency Plan will be developed to address accidents, spills, and malfunctions.

The Proponent will use the principles of Safety in Design, a proactive engineering approach that considers all potential hazards and designs systems to eliminate or minimize the likelihood of accidents or injuries. The Project will be designed and constructed in strict compliance with the principles of Safety in Design. EverWind has a long history of safely operating the Point Tupper Terminal, located approximately 18 km east of the Study Area in Point Tupper, and recognizes the importance of ensuring the safety of workers, the public, and the environment. At the Point Tupper Terminal, EverWind has created a world class Emergency Response Team (ERT). The EverWind ERT is comprised of 40 members that are NFPA 1081 Advanced

Industrial Firefighter certified, NFPA 470/472 Hazardous Materials certified, NFPA 1006 Technical Rescue (High Angle Rescue and Confined Space Rescue), and St. John Ambulance Advance First Aid certified. In addition, one of EverWind's ERT members is a certified Paramedic with 12 years' experience with Wood Buffalo Fire & Emergency Services.

EverWind also operates an NSECC approved fire training facility at its Point Tupper Terminal and hosts bi-annual live fire training exercises for regional volunteer fire departments and other local industrial ERTs.

15.1 Erosion and Sediment Control Failures

Failure of erosion and sedimentation controls may result in potential adverse effects on VCs (primarily during construction), most notably to watercourses, wetlands, and fish and fish habitat. Erosion and sedimentation controls may fail due to extreme weather conditions (e.g., flooding), improper installation, improper maintenance, and unforeseen accidents (e.g., collisions). Failure of these control measures may release sediment into the environment, impacting water quality and aquatic and terrestrial habitats.

Mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include:

- Provide workers with training to properly install and repair erosion and sediment controls.
- Develop and implement an Erosion and Sedimentation Control Plan for all phases of the Project.
- Conduct regular monitoring of all erosion and sediment controls, and repair or replace as necessary.
- Develop and implement a Project-specific Contingency Plan that includes information on sediment and erosion control.

15.2 Fires

An accidental fire could potentially adversely affect the atmospheric environment (emissions), the terrestrial environment (vegetation and wildlife), and the socio-economic environment (land use and value) during all Project phases.

Fires in wind farms are most often caused by lightning strikes, mechanical and hydraulic faults, and electrical installation failure (You et al., 2023). Publicly available data cannot provide exact statistics, but the rate of fire is estimated to be between 1-in-2,000 and 1-in-15,000, or between a 0.05% and 0.007% chance of fire (Krcmar, 2021), though this will be affected by the installation of fire mitigation technologies such as lightning protection systems. The height and remote nature of the turbines may make the early detection and effective control of fires difficult. However, these factors also reduce the direct impacts of electrical fires on human health.

Various standards and guidelines have been implemented to minimize the chances of fires occurring in turbines and associated infrastructure. The turbines planned for use in this Project are compliant with the International Electrotechnical Commission's IEC 61400 international standard to avoid damage from hazards during their operational lifespan. This includes lightning and surge protection measures. The turbines are equipped with early detection and control systems, including breakers and temperature and pressure sensors (e.g., PT sensors), that continuously monitor key components such as the gearbox, generator, and electrical systems. If electrical currents or temperatures exceed pre-set thresholds, the turbine will automatically enter a safe shutdown state to prevent potential damage or fire. These systems are monitored remotely via the turbine's SCADA system, allowing operators to respond quickly to abnormal conditions.

Wildfire is addressed in Section 14.2.2.

A fire prevention and evacuation plan will be developed within the Project's Contingency Plan, in addition to general safety protocol and training.

Mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include:

- Equip each turbine with integrated condition-monitoring and control systems with automated shutdown function and alerts to operations personnel.
- Prohibit the use of campfires or burning within the Study Area by staff and contractors.
- Dispose of all flammable waste regularly at an approved facility.
- Implement mitigation related to chemical and fuel storage (Section 15.3).
- Allow smoking in designated areas only.
- Equip heavy machinery with fire extinguishers.
- Require turbine technicians heading "up-tower" to carry a fire extinguisher.
- Ensure fire response equipment is available at the O&M building and that site personnel are trained.
- Develop a Contingency Plan including fire safety plan. Circulate the plan to local fire departments for input and awareness.
- Continue to engage with first responders on site access and access to water.

15.3 General Hazardous Material Spills

Hazardous spills resulting from fuel (i.e., storage, refueling, operation of combustion vehicles) and other on-site chemicals may occur during the Project's construction and operations activities. Hazardous spills can adversely impact air, soil, surface water, groundwater quality, human health, and safety. In addition, hazardous spills may risk the health of aquatic, avian, and terrestrial wildlife. The severity of the impacts will depend on the nature of the hazardous material and the quantity spilled.

Mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include the following:

- Develop spill prevention and response procedures within the Contingency Plan, which will set out spill prevention and response procedures.
- Store all fuels, lubricants, and chemicals in designated containers and areas.
- Provide secondary containment in storage areas (where possible).
- Inspect equipment for fluid leaks.
- Locate fuel storage areas, refueling, and/or equipment lubrication a minimum of 30 m from any surface and groundwater feature (i.e., watercourse, well).
- Refuel machinery and equipment on an impervious surface, where possible. If this is not possible, require that the work is completed in a designated area, greater than 30 m from a watercourse/water body/wetland.
- Ensure workers remain with equipment during refueling.
- Complete equipment servicing off-site, where possible. If this is not possible, require that the work is completed in a designated area, greater than 30 m from a watercourse/water body/wetland.
- Store all dangerous goods in compliance with the Workplace Hazardous Material Information System.
- Equip mobile equipment with spill kits stocked with appropriate spill containment materials for the activities taking place, such as soaker pads, oil-absorbing materials, and containment booms.
- Locate stationary spill kits or spill drums at work areas using mobile equipment, hazardous fluids and/or in proximity to environmentally sensitive areas (i.e., wetlands or watercourses).
- Stock spill kits with the appropriate quantity and type of material for the anticipated product type(s) and volume(s) in use.
- Train site workers on site specific spill response requirements and equipment.

With the implementation of the above preventative measures, the likelihood of an accident or a malfunction is low. Appropriate response plans will be put in place to ensure any interactions with VCs from an accident or malfunction are limited and the effects can be quickly contained.

15.4 Transportation-related Incidents

Operator error or techno-mechanical malfunctions may occur during all stages of the Project's lifespan, although the type and intensity of vehicular traffic will vary depending on the Project phase. The construction and decommissioning phases will see the highest volume of traffic and largest vehicles both travelling to and on the site. On the site especially, where workers may be near light to heavy-duty traffic, there is a higher risk of incidents affecting human health (HSE, n.d.). During operation, vehicular access by technicians also presents risks that must be managed. Although vehicular use has implicit risks that cannot be fully eliminated, a Traffic Management Plan will be established to ensure that these risks are mitigated to the highest degree possible and that they are understood by anyone accessing the Project.

Additionally, mitigation measures to limit the probability of an incident and reduce the magnitude and extent of potential effects include:

- Develop a Traffic Management Plan outlining traffic management procedures.
- Assess site access routes, including structural integrity of bridges and culverts, baseline traffic levels and high-risk areas prior to construction.
- Install appropriate traffic signage and road markers to identify high-risk areas and communicate traffic rules and safety information.
- Conduct preventative vehicle inspections to ensure all mobile equipment is in good condition (e.g., breaks, light system, leaks absent).
- Develop and maintain roads according to the Erosion and Sedimentation Control Plan.
- Establish, post, and enforce speed limits on site.
- Require that public road speed limits are followed by Project vehicles.
- Require that drivers follow all laws and regulations pertaining to distracted (e.g., cell phone usage) or impaired driving on and off site.
- Require that only licensed individuals operate heavy equipment.
- Follow weather statements and alerts and adjust plans accordingly to avoid transportation in extreme weather conditions.
- Install signage where existing trails cross access roads to avoid potential interactions with trail users when heavy equipment is in use.
- Establish the following practices within the Project Footprint, to the extent feasible (HSE, n.d.):
 - Create clear, separate paths or zones for vehicles and pedestrians to reduce the risk of accidents.
 - Minimize vehicle movements.
 - Minimize reversing by providing adequate room to turn vehicles.
- Operate in appropriate weather and provide ample lighting and visibility aids (e.g., mirrors around tight turns).
- Require that visitors are familiar with the Project Footprint or are accompanied, whether in vehicles or on foot.

Detailed information regarding vehicle collision prevention and response procedures will be outlined in the Contingency Plan.

15.5 Structural Damage

Wind turbine damage up to and including failure may result from a variety of factors, both human and environmental, presenting risks to human health, infrastructure, and the environment. The most frequent causes of damage to turbines that may result in failure include damage from lightning, material fatigue over time, leading edge erosion, and damage from icing (Katsaprakakis et al., 2021). While damage by these mechanisms and others is unavoidable in many cases, preventing failure or harm to human or environmental health is critical. This typically involves detecting damage before it can result in a complete failure, including partial or full blade detachment. Wind turbine structural health monitoring, through use of advanced sensors, can detect anomalies in performance and the presence of abnormal vibrations that might indicate an imbalance requiring further investigation (Algolfat et al., 2023).

Regular monitoring and inspections are essential for ensuring the continued structural integrity of all components of turbines (Enlitia, 2024), and the Proponent will implement mitigative actions to limit the probability of an occurrence and reduce the magnitude and extent of potential effects, including:

- Maintain sufficient lubrication in bearings, and keep seals clean to prevent excess friction and overheating.
- Maintain and test the lighting protection system and verify grounding integrity.
- Prepare and enact severe weather plans to reduce the risk of physical damage from flying debris or hail and minimize the risk that thermo-electric damage by lightning results in blade failure.
- Inspect and properly maintain turbine pitch, yaw, overspeed, and mechanical brake function.
- Check and change lubrication regularly in the turbine gearboxes to prevent excess heat and minimize wear; conduct oil sampling/analysis at regular intervals.
- Test SCADA/condition-monitoring sensors regularly to ensure that anomalous conditions are detected early and managed before they result in damage to turbines, other infrastructure, or harm human health.
- Inspect blades (e.g., drone/rope access), maintain leading-edge protection, and repair surface defects to control blade erosion and fatigue.
- Implement ice detection/operating procedures (e.g., curtailment/shutdown) and establish temporary exclusion zones during icing events.

The separation of turbines from people and public roads also mitigates the risk to human health and public infrastructure in the highly unlikely event of a failure.

16.0 CUMULATIVE EFFECTS

16.1 Overview

Cumulative effects are changes to environmental, social, and economic values caused by the combined effect of past, present, and potential future human activities and natural processes (Government of British Columbia, 2024). Concerns are often raised about long-term changes that may occur not only as a result of a single action but of the combined effects of each successive action on the environment (Hegmann et al., 1999). While a single undertaking might not cause significant adverse effects, multiple undertakings may result in incremental impacts, referred to as cumulative effects. These cumulative effects may potentially result in an overall impact on a VC.

16.2 Cumulative Effects Assessment Methodology

The objective of the cumulative effects assessment (CEA) is to evaluate potential changes to a VC that may result from the combined influence of the proposed Project and other past, present, or reasonably foreseeable future projects or activities. The CEA is conducted using publicly available information, with uncertainties clearly identified, and in accordance with the Cumulative Effects Assessment Practitioners Guide (Hegmann et al., 1999).

As outlined by Hegmann et al. (1999), the CEA scoping process involves the following steps:

- Selection of VCs to be included in the CEA.
- Determination of spatial and temporal boundaries for the CEA.
- Identification and description of other projects or activities within those boundaries.
- Confirmation of which VCs will proceed through the CEA analysis.

For those VCs selected for the CEA process, an analysis was conducted considering the residual effects of the Project on that VC, the effect of other activities or projects on that VC, and potential cumulative effects. Mitigation measures and proposed monitoring programs and follow-up are described, if cumulative effects are predicted. At this stage, the certainty in effects predictions was considered. It is not uncommon for data on effects of other projects or activities to be limited, increasing the uncertainty of the CEA predictions.

16.3 Selection of VCs for Evaluation in the CEA

The primary pathways of effects to the environment from the Project include the loss and alteration of terrestrial habitats (and therefore effects to species that rely on those habitats), as well as potential bird and bat mortality resulting from interactions with wind turbines. Based on the effects assessment for each VC evaluated, no significant adverse residual effects were identified. Details of the effects assessment for each VC can be found in Sections 7 to 12.

Table 16.1 summarizes the potential for VCs to have cumulative impacts with other undertakings in the area.

Table 16.1: Potential for Cumulative Effects on Identified VCs

VC	Cumulative Effects Assessed	Reasoning
Atmosphere and Climate Change	No	Residual positive impacts regarding GHG emissions from the use of renewable energy resources. Effects on climate change will be positive.
Sound	No	Cumulative effects were included in the operational sound modeling and considered in the effects assessment.
Shadow Flicker	No	Cumulative effects were built into the predictive modelling and considered in the effects assessment.
Geophysical Environment	No	The Project will not impact the geologic environment outside the LAA or interact with nearby industrial activities.
Surface Water, Fish and Fish Habitat	No	The Project is maximizing the use of existing disturbed areas to minimize impacts to watercourses. In accordance with provincial permitting requirements, appropriate mitigations will be incorporated into the design of new watercourse crossings, such that there is no significant residual effect, and direct effects are limited to the Project Footprint.
Wetlands	No	The Project has been designed to minimize the overall disturbance footprint and maximizes the use of previously disturbed areas to reduce impacts to wetlands; however, some impacts to wetlands are required for the Project. In accordance with provincial permitting

VC	Cumulative Effects Assessed	Reasoning
		requirements, all impacted wetlands will be compensated for, such that there is no significant residual effect, and direct effects are limited to the Project Footprint.
Terrestrial Habitat	Yes	Habitat disturbance is expected through a large geographic area that may interact with habitat disturbance from nearby projects.
Terrestrial Flora	No	Avoidance of flora SAR with legislated protection status. The Project is maximizing the use of existing disturbed areas to minimize impacts on SAR and SOCI.
Terrestrial Fauna	Yes	Habitat disturbance is expected through a large geographic area that may interact with habitat disturbance from nearby projects.
Bats	Yes	The Project is predicted to have moderate and non-significant impacts to bats through habitat loss and potential mortality. Effects may interact with effects from nearby projects.
Avifauna	Yes	The Project is predicted to have low to moderate and non-significant impacts on birds through habitat loss and potential mortality. Effects may interact with effects from nearby projects.
Economy, Land Use, & Recreation/ Tourism	No	Residual impacts are anticipated to be low to negligible, or positive.
Archeology, Culture, & Heritage	No	Avoidance of archaeological, historical, or culturally significant areas.

The following VCs are assessed for cumulative effects:

- Terrestrial Habitat
- Terrestrial Fauna
- Bats
- Avifauna

16.4 Selection of Spatial and Temporal Boundaries

To identify other Projects for inclusion in the CEA, a 15 km buffer on the Study Area was selected as a conservatively inclusive boundary (Drawing 16.1). This buffer size is consistent with current best practices (Hegmann et al., 1999; IAAC, 2023) and with typical spatial scales used in Nova Scotia EAs for similar project types and remains sufficiently constrained for data analysis and meaningful analytical relevance.

For the CEA, Strum considered past projects as those registered, approved, or constructed within the past 10 years, selected from the Environmental Assessment Projects Dashboard (NSECC, 2025d). Reasonably foreseeable future projects are those which have been registered with an EA document through NSECC but have not been approved or constructed.

16.5 Other Undertaking in the Area

General land use is not accounted for as “other activities or projects” in the CEA. Nova Scotia’s landscape is a mosaic of intensive agricultural land, intact and disturbed forests, communities, and residential development. While these activities all affect the landscape and usage of the

lands by humans and other species, there is not a meaningful way to determine or quantify the effect of these activities on various VCs. No meaningful data is available to support an assessment of cumulative effects associated with general land use. Furthermore, the existing land use was considered in the determination of residual environmental effects within each VC within the Project's EA Registration Document, so no additional conclusions can be made through the lens of a CEA.

There are several existing or planned projects (all are wind projects) in the immediate vicinity of the Project. Table 16.2 summarizes industrial activities/developments within approximately 15 km of the Project.

Table 16.2: Nearby Industrial Activities and Developments

Development	Project Type	Status of Activity	Activity Location	Distance to Study Area (km) ⁽¹⁾	Terrestrial Fauna Pathway	Terrestrial Habitat Pathway	Avian Mortality pathway	Bat Mortality Pathway
Mulgrave Community Wind Power Project	Wind Development	Active	Mulgrave	13	Yes	Yes	Yes	Yes
Goose Harbour Lake Wind Farm Project	Wind Development	Approved with Conditions	Goose Harbour Lake	7	Yes	Yes	Yes	Yes
Aulds Cove Wind Project	Wind Development	Approved with Conditions	Middle Melford	11	Yes	Yes	Yes	Yes
Setapuktuk Wind Project	Wind Development	Approved with Conditions	Middle Melford	15	Yes	Yes	Yes	Yes

⁽¹⁾Distance to nearest point of the Study Area

16.6 Cumulative Effects Assessment

Cumulative effects for the Project were assessed by considering potential residual effects (as identified in VC sections) in relation to past, existing, and reasonably foreseeable future activities within the surrounding area (i.e., projects currently under regulatory review, approval, or construction).

Pathways to cumulative effects were found to be similar among terrestrial fauna and terrestrial habitat, and likewise between bird and bat mortality. Consequently, these VCs are grouped for the purposes of the CEA, such that terrestrial fauna and terrestrial habitat are collectively evaluated under Terrestrial Effects, and avifauna and bat mortality are collectively evaluated under Avian Mortality Effects.

When possible, the effects of assessed projects have been quantified; however, differences in available data, study boundaries, and assessment methodologies among projects limit the extent to which quantitative comparisons can be made. As such, the potential cumulative effects of these projects are evaluated primarily through a qualitative assessment.

16.6.1 Terrestrial Effects

Terrestrial impacts are discussed in terms of pathways for cumulative effects with the following nearby projects:

- Mulgrave Community Wind Project (13 km)
- Goose Harbour Lake Wind Farm Project (7 km)
- Aulds Cove Wind Project (11 km)
- Setapuktuk Wind Project (15 km)

Each of these assessed projects exhibit some degree of spatial and temporal overlap with the Project, with the exception of the Setapuktuk Wind Project. However, the Setapuktuk Wind Project is included in the terrestrial cumulative effects assessment because it adjoins the Goose Harbour Lake Project, establishing a direct terrestrial disturbance linkage to the Project's Study Area boundaries. Consequently, potential cumulative effects may occur among these projects, including the Upper Afton Wind Project.

The Mulgrave Community Wind Project is a 2.35 MW single turbine development approved in 2014 and constructed in 2015. Two additional 50 kW turbines were also built in 2015; however, they were not included in the EA Registration Document. The main turbine pad footprint is approximately 0.8 ha, excluding portions of the existing access road and temporary laydown area, and is located entirely within the Project's Study Area, where it was assessed as part of the designated Assessment Area. The EA Registration Document for the Mulgrave Community Wind Project did not quantify effects on terrestrial fauna or habitat, and no disturbance of wetlands was required for construction. Based on the assessment, any disturbance to terrestrial fauna or habitat is characterized as low and not significant.

The Goose Harbour Lake Wind Farm Project is a 130 MW wind development registered in 2023 and currently under construction. It is located east of the Project and northeast of the

Setapuktuk Wind Project. The EA was approved based on the proposed construction of 29 wind turbines requiring approximately 65 km of roads (12 km of new roads and 53 km of upgrades to existing roads). The project had a Study Area of approximately 9,428 ha, and a Project Footprint of approximately 209 ha, representing a disturbance of approximately 2.2% of the Study Area. The impact to terrestrial fauna and habitat was described as low and not significant, representing a small loss of terrestrial habitat or habitat supporting fauna, with overall habitat functions and terrestrial fauna behaviour expected to remain intact.

The Setapuktuk Wind Project is an approved, but not yet constructed wind project with 54 wind turbines being constructed to support the production of Certified Green hydrogen and ammonia in Nova Scotia. Located southeast of the Project, the Setapuktuk Wind Project encompasses a Study Area of approximately 8,880 ha, with a Project Footprint of roughly 273 ha, representing a disturbance of approximately 3.1% of the Study Area. This includes approximately 44 km of new road construction, widening and improvements to approximately 35 km of existing roads, substations and operations buildings, and turbine pad sites. Impacts to terrestrial fauna and habitat were described as low, reflecting a minor loss of habitat without affecting overall habitat function or terrestrial fauna behaviour, and were considered not significant.

The Aulds Cove Wind Project is an approved, but not yet constructed wind project with up to 21 wind turbines being constructed. Located northeast of the Project, the Aulds Cove Wind Project encompasses a Study Area of approximately 1,417 ha, with a Project Footprint of roughly 64 ha, representing a disturbance of approximately 4.5% of the Study Area. This includes approximately 11.9 km of new road construction, widening and improvements to approximately 2.7 km of existing roads, substations and operations buildings, electrical collection system, transmission line, temporary laydown and turbine pad yards. Impacts on terrestrial fauna and vegetation communities were described as low, reflecting a minor loss of flora without affecting overall habitat function or terrestrial fauna behaviour, and were considered not significant.

Although the nearby wind projects described above and the Upper Afton Wind Project are located near one another, each has a relatively small disturbance footprint within its broader Study Area, leaving substantial portions of intact and undisturbed forest across the landscape. Current and historical land-use in the region (i.e., forestry activities and recreational off-road vehicle use) has altered the landscape to its current state, such that modified and treated forest habitats are widespread and road networks are already established. The cumulative disturbance across the projects within their combined Study Areas is estimated at 547 ha, which is approximately 3.1% of the combined Study Areas, or roughly equivalent to 0.031 ha of disturbance per hectare of Study Area. This represents a conservative (i.e., overestimated) value, as each Project Footprint includes existing roads and previously disturbed areas within its calculations.

The cumulative effects of habitat fragmentation and wildlife interactions within these projects were also considered. None of the projects include infrastructure that would impede the movement of fauna across the landscape, such as pits, large berms, extensive fencing, or

aboveground pipelines. As such, habitat connectivity and movement for fauna between the projects, adjacent undisturbed lands, and the nearby protected areas (Drawing 3.3) are expected to be maintained. Across all five wind projects, approximately 225 km of total roads are associated with development, of which about 83 km represents new road construction. These roads are expected to support low traffic volumes – particularly during each Project's operational and maintenance phases – with similar usage compared with ongoing forestry activities in the area. Given these low traffic levels and speeds, during the majority of each respective project's life, the potential for wildlife-vehicle incidents and sensory disturbance is expected to be limited, particularly when compared to nearby provincial highways or residential roads. In addition, post-construction monitoring of mainland moose is anticipated for all projects, which will allow for qualitative comparisons of pre- and post-construction habitat use and to assess the potential effects of disturbance.

Overall, the Project employed an iterative design process that proactively avoids environmental constraints and uses existing road infrastructure where feasible. Combined with the limited spatial extent of new roads and project infrastructure, the low level of anticipated traffic, and the availability of undisturbed habitat across the landscape, no significant residual cumulative effects on terrestrial fauna or habitat are anticipated.

16.6.2 Avian Mortality

Avian mortality is discussed in terms of cumulative effects based on the Project's proximity to other projects including:

- Mulgrave Community Wind Project
- Goose Harbour Lake Wind Farm Project
- Aulds Cove Wind Project
- Setapuktuk Wind Project

Each of the projects assessed has temporal overlap with the Project, given its operational timeframe and the long operating life of wind projects. As avifauna are mobile and migrate across the landscape, projects located within the 15 km buffer can be viewed as having a spatial overlap with avifauna which may migrate through each of the respective project boundaries. Therefore, all five projects evaluated herein have effects with spatial and temporal overlap with the Project.

The Mulgrave Community Wind Project EA Registration Document did not provide an estimate of avian mortality, but it was predicted that mortality would be low and not significant based on the project's small footprint, geographic setting, and avian usage of the Study Area. Post-construction mortality survey data is not publicly available.

The Goose Harbour Lake Wind Farm Project is currently under construction and includes 29 wind turbines and ancillary infrastructure. While the EA Registration Document did present a summary of migratory bird interaction index (likely activity based on the fall 2022 migratory period which may correlate to increased mortality), no estimate of mortality was presented.

Post-construction mortality monitoring is required as a condition of approval but has not yet been completed as turbines are not yet in operation. Similarly, the 54-turbine Setapuktuk Wind Project, located south of Goose Harbour Lake Wind Project, and the 21-turbine Aulds Cove Wind Project, did not include an avian mortality estimate in its assessment but will undertake post-construction mortality monitoring as required by its approval.

Given the proximity of nearby wind projects, there are likely additive effects to avian mortality. With the lack of publicly available post-construction mortality data, it is not possible to quantify whether any additive cumulative effects would result in a significant impact to avian mortality. Each project indicated that there is potential for avian mortality, though each deemed the effect to be not significant within the spatial boundaries of each respective EA Registration Document.

Wind projects requiring an EA in Nova Scotia are required to complete two years of post-construction mortality monitoring for birds and bats. In addition, it is expected that the Project will be required, as a condition of EA Approval, to develop an Adaptive Management Plan that includes a decision-making process to mitigate potential impacts to bird and bat species during operations. The plan and the monitoring results would be reviewed by NSECC, NSNR, and ECCC. NSECC will also receive the post-construction monitoring results from the Goose Harbour Lake Wind Project, Setapuktuk Wind Project, and Aulds Cove Wind Project. Recent wind EA Approval conditions note NSECC's ability to require additional mitigation as part of adaptive management. Therefore, the potential for cumulative effects will be managed through future requirements for monitoring and adaptive management, as required.

16.7 Cumulative Effects Assessment Summary

The CEA applied a structured approach consistent with established guidance documents (Government of British Columbia, 2024; Hegmann et al., 1999) to identify relevant VCs, define appropriate spatial and temporal boundaries, and assess the combined influence of the Project and other existing or foreseeable activities. This process also incorporated an acknowledgment of uncertainties associated with data gaps and the limited availability of publicly available information for other developments.

Based on the CEA analysis, and given the limited extent of new infrastructure, low anticipated traffic volumes, and the continued availability of undisturbed habitat, no significant cumulative effects on terrestrial fauna or habitat are anticipated. Although potential cumulative effects on avifauna remain uncertain due to limited regional mortality data, mandatory post-construction monitoring requirements will provide a mechanism to detect and respond to any emerging cumulative impacts. Overall, the CEA indicates that cumulative effects for the relevant VCs are expected to be low and not significant and can be effectively managed through mitigation and ongoing monitoring.

17.0 CONCLUSION

In accordance with A Proponent's Guide to Environmental Assessment (NSECC, 2025a), the studies, regulatory assessments and VC evaluations described within this EA Report have been considered both singularly and cumulatively, for all phases of the Project.

The results of this assessment indicate that in consideration of the Project's mitigative and protection measures, adverse residual effects are anticipated to be not significant.

18.0 CLOSURE

This EA Report was completed by Strum Consulting, an independent, multi-disciplinary team of consultants with extensive experience with submission of EA Registration Documents for undertakings within Atlantic Canada. Curriculum vitae for EA Report contributors and Strum Project Team members are provided in Appendix S. A list of the Project Team and their associated roles is provided below.

Senior Review and Oversight

- Melanie Smith, MES, Vice President, Environmental Assessment and Approvals

Project Management and Technical Oversight

- Emma Posluns, MSc., Project Manager
- Mark MacDonald, MScF., Terrestrial Lead

Environmental Assessment Authors

- Katrina Ferrari, BSc., Aquatic Specialist
- Emma Davis, PhD., Terrestrial Specialist
- Leah Riehl, BSc., Environmental Scientist
- Lyndsay Eichinger, MREM, Environmental Scientist, Project Manager
- Dafna Schultz, MREM, EPt, Terrestrial Specialist
- Frank Gascon, P.Eng, Environmental Engineer
- Alex Scott, BSc., EPt, Environmental Scientist
- Polly Nguyen, MREM, Environmental Scientist
- David Foster, PhD, Terrestrial Specialist
- Jessica Lohnes, BSc.H., Terrestrial Specialist
- Renee MacQuarrie, BSc., Environmental Scientist
- Connor Nishikawa, MES, Environmental Scientist

Geomatics

- Mathew Savelle, BSc., Adv Dipl, Manager, Geomatics
- Peter Opra, MSc., Remote Sensing Scientist
- Margaret Partridge, BSc. Adv. Dipl., GIS Specialist
- Kerry Wallace, BSc., Adv. Dipl. GIS Technician

Sub-consultants

- Chris Pepper, Avifauna Expert
- Kyle Cigolotti, BA., Managing Partner CRM Group – Archaeologist
- Florian Reurink, PhD, Senior Wildlife Biologist Ausenco – Avifauna Radar Expert
- Tess Forstner, MSc., Wildlife Biologist Ausenco – Avifauna Radar Expert
- C. Toby St. Clair, MSc., Terrestrial Ecology – Practice Leader Ausenco – Avifauna Radar Expert
- Norberto Lopes Hulle, WSP – Electromagnetic Interference Expert
- Garrett Bell, WSP – Electromagnetic Interference Expert
- Kimberlea Green, Project Manager, WSP – Electromagnetic Interference Expert
- Soheil Tofighiniaki, MSc., MEng, Jr Acoustics and Vibration Consultant, WSP – Noise Expert
- Andrew Faszer, BSc., INCE, Senior Principal, WSP - Noise Expert
- Victor Young, MSc., Acoustic Scientist, WSP – Shadow Flicker Expert

19.0 REFERENCES

ACCDC. (2025a). *Data report 8773: Upper Afton, NS*. Atlantic Canada Conservation Data Centre.

ACCDC. (2025b). *Data report 8773: Upper Afton, NS*. Atlantic Canada Conservation Data Centre.

ACCDC. (2025c). *Species ranks* [Dataset]. <http://accdc.com/en/ranks.html>

ACPA. (2023). *Property values are not affected by land-based wind turbines*. American Clean Power Association. https://cleanpower.org/wp-content/uploads/gateway/2023/12/ACP_Property-Values-Land-Based-Wind-Turbines_Fact-Sheet-Dec-2023.pdf

Adams, C. A., Fernandez-Juricic, E., Bayne, E. M., & St. Clair, C. C. (2021). Effects of artificial light on bird movement and distribution: A systematic map. *Environmental Evidence*, 10(37), 1–28.

Adamus, P. R. (2021). *Wetland ecosystem services protocol—Atlantic Canada (WESP-AC)*. Maritime College of Forest Technology Training Course.

Adamus, P. R. (2025). *Wetland ecosystem services protocol version 3.3—Atlantic Canada (WESP-AC)*. Maritime College of Forest Technology Training Course.

Agosta, S. J., Morton, D., Marsh, B., & Kuhn, K. M. (2005). Nightly, Seasonal, and Yearly Patterns of Bat Activity at Night Roosts in the Central Appalachians. *Journal of Mammology*, 86(6), 1210–1219. <https://doi.org/10.1644/05-MAMM-A-012R1.1>

Akresh, M. E., McInvale, S. L., & King, D. I. (2024). A meta-analysis of edge effects on nesting success in forest and shrubland birds of eastern North America. *Journal of Field Ornithology*, 95(2). <https://doi.org/10.5751/JFO-00481-950212>

Algolfat, A., Wang, W., & Albarbar, A. (2023). Damage identification of wind turbine blades—A brief review. *Journal of Dynamics, Monitoring and Diagnostics*, 2(3), Article 3. <https://doi.org/10.37965/jdmd.2023.422>

Allen, A. W. (1983). *Habitat suitability index models: Fisher*. US Fish and Wildlife Service. <https://www.govinfo.gov/content/pkg/GOVPUB-I49-PURL-LPS101837/pdf/GOVPUB-I49-PURL-LPS101837.pdf>

AllTrails. (n.d.). *AllTrails.com*. Retrieved June 12, 2025, from <https://www.alltrails.com/>

Andrén, H. (1994). Effects of habitat fragmentation on birds and mammals in landscapes with different proportions of suitable habitat: A review. *OIKOS*, 71(3), 355–366.
<https://doi.org/10.2307/3545823>

ANSMC. (2014). *Mi'kmaq Ecological Knowledge Study protocol, 2nd edition*. Assembly of Nova Scotia Mi'kmaq Chiefs.
<https://novascotia.ca/abor/aborlearn/docs/mek%20protocol%20second%20edition.pdf>

Arnett, E. B., Brown, W. K., Erickson, W. P., Fielder, J. K., Hamilton, B. L., Henry, T. H., Jain, A., Johnson, G. D., Kerns, J., Koford, R. R., Nicholson, C. P., O'Connell, T. J., Piorkowski, M. D., & Tankersley, R. D., Jr. (2008). Patterns of bat fatalities at wind energy facilities in North America. *The Journal of Wildlife Management*, 72(1), 61–78.

ASMFC. (n.d.). *Alewife*. Atlantic States Marine Fisheries Commission. Retrieved January 6, 2025, from <https://www.asmfc.org/uploads/file/alewifeHabitatFactsheet.pdf>

Authentic Seacoast. (n.d.). *Authentic Seacoast Distillery & Brewhouse*. Authentic Seacoast. Retrieved June 12, 2025, from <https://www.authenticseacoast.com/places/authentic-seacoast-distillery-brewery/>

Authorizations Concerning Fish and Fish Habitat Protection Regulations (2019). <https://laws-lois.justice.gc.ca/eng/regulations/SOR-2019-286/FullText.html>

Balzer, E. W., McBurney, T. S., & Broders, H. G. (2023). Little brown Myotis roosts are spatially associated with foraging resources on Prince Edward Island. *Wildlife Society Bulletin*, 47(1), e1405. <https://doi.org/10.1002/wsb.1405>

Barclay, R. M. R., Baerwald, E. F., & Gruver, J. C. (2007). Variation in bat and bird fatalities at wind energy facilities: Assessing the effects of rotor size and tower height. *Canadian Journal of Zoology*, 85(3). <https://doi.org/10.1139/Z07-011>

BCMECCS. (2019). *Wildlife habitat features guide (Kootenay boundary region)* (p. 119). British Columbia Ministry of Environment and Climate Change Strategy.
https://www2.gov.bc.ca/assets/gov/environment/natural-resource-policy-legislation/regulation/regulation/frpa-pac/wildlife-habitat-features/whf_field_guide_kootenay_boundary.pdf

Bird Studies Canada. (2016). *Wind Energy Bird and Bat Monitoring Database Summary of Findings from Post-construction Monitoring Reports*.

Birds Canada. (2025). *Maritimes breeding bird atlas*. <https://naturecounts.ca/nc/mbba/main.jsp>

Birds Canada. (n.d.). *Pomquet beach region (NS009)*.
<https://www.ibacanada.org/mobile/site.jsp?siteID=NS009>

Blakeslee, C. J., Galbraith, H. S., & Deems, R. M. (2018). The effects of rearing temperature on American glass eels. *Agricultural Sciences*, 09(08), 1070–1084.

<https://doi.org/10.4236/as.2018.98074>

Blickley, J. L., & Patricelli, G. L. (2010). Impacts of anthropogenic noise on wildlife: Research priorities for the development of standards and mitigation. *Journal of International Wildlife Law & Policy*, 13(4), 274–292. <https://doi.org/10.1080/13880292.2010.524564>

Bliss-Ketchum, L. L., de Rivera, C. E., Turner, B. C., & Weisbaum, D. M. (2016). The effect of artificial light on wildlife use of a passage structure. *Biological Conservation*, 199, 25–28.

<https://doi.org/10.1016/j.biocon.2016.04.025>

Bouchard, C., Dibernardo, A., Koffi, J., Wood, H., Leighton, P. A., & Lindsay, L. R. (2019). Increased risk of tick-borne diseases with climate and environmental changes. *Canada Communicable Disease Report*, 45(4), 83–89.

Boudreault, C., Bergeron, Y., Drapeau, P., & Mascarúa López, L. (2008). Edge effects on epiphytic lichens in remnant stands of managed landscapes in the eastern boreal forest of Canada. *Forest Ecology and Management*, 255(5), 1461–1471.

<https://doi.org/10.1016/j.foreco.2007.11.002>

Brinkley, C., & Leach, A. (2019). Energy next door: A meta-analysis of energy infrastructure impact on housing value. *Energy Research & Social Science*, 50, 51–65.

<https://doi.org/10.1016/j.erss.2018.11.014>

Brodo, I. M., Sharnoff, S. D., & Sharnoff, S. (2001). *Lichens of North America*. Yake University Press.

Broekel, T., & Alfken, C. (2015). Gone with the wind? The impact of wind turbines on tourism demand. *Energy Policy*, 86, 506–519. <https://doi.org/10.1016/j.enpol.2015.08.005>

Bruce, A. (2024, May 1). EverWind, MODG sign new community benefits deal. *Guysborough Journal*. <http://www.guysboroughjournal.com/?page=post&ID=1481>

Buttle, J. M., Boon, S., Peters, D. L., Spence, C., (Ilja) van Meerveld, H. J., & Whitfield, P. H. (2012). An overview of temporary stream hydrology in Canada. *Canadian Water Resources Journal / Revue Canadienne Des Ressources Hydriques*, 37(4), 279–310.

<https://doi.org/10.4296/cwrj2011-903>

Cameron, R. P., & Neily, T. (2008). Heuristic model for Identifying the habitats of *Erioderma pedicellatum* and other rare cyanolichens in Nova Scotia, Canada. *The Bryologist*, 111(4), 650–658.

Canada. (1985). *Fisheries Act*, R.S.C. 1985, c. F-14. <https://laws.justice.gc.ca/eng/acts/F-14/FullText.html>

Canada. (1994). *Migratory Birds Convention Act*, 1994, S.C. 1994, c. 22. <https://laws-lois.justice.gc.ca/PDF/M-7.01.pdf>

Canada. (1999). *Canadian Environmental Protection Act*, S.C. 1999, c. 33. <https://laws-lois.justice.gc.ca/eng/acts/c-15.31/page-1.html>

Canada. (2000). *Canada Wildlife Act*, R.S.A. 2000, c. W-10. <https://laws-lois.justice.gc.ca/eng/acts/W-9/>

Canada. (2002). *Species at Risk Act*, S.C. 2002, c. 29. <https://laws.justice.gc.ca/eng/acts/s-15.3/page-1.html#h-434501>

Canada. (2010). *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*, SOR 2012-201. <https://laws-lois.justice.gc.ca/eng/regulations/sor-2010-201/page-1.html#h-764365>

Canada. (2013). *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations*, SOR/2013-24. <https://laws-lois.justice.gc.ca/eng/regulations/sor-2013-24/index.html>

Canada. (2016). *Ozone-depleting Substances and Halocarbon Alternatives Regulations*, SOR 2016-137. <https://laws-lois.justice.gc.ca/eng/regulations/SOR-2016-137/>

Canada. (2019a). *Physical Activities Regulations*, SOR/2019-285. <https://laws.justice.gc.ca/PDF/SOR-2019-285.pdf>

Canada. (2019b, August 28). *Impact Assessment Act*, S.C. 2019, c. 28, s. 1. <https://laws.justice.gc.ca/PDF/I-2.75.pdf>

Canada. (2022). *Migratory Birds Regulations*, 2022. SOR/2022-105. <https://laws-lois.justice.gc.ca/PDF/SOR-2022-105.pdf>

CanREA. (n.d.). *Sustainable energy: Recycling renewables*. Retrieved July 29, 2025, from <https://renewablesassociation.ca/wp-content/uploads/2025/01/CanREA-factsheet-Recycling-wind-turbine-components.pdf>

CanREA. (2020, June). *Best practices for wind farm icing and cold climate health & safety*. Canadian Renewable Energy Association. https://renewablesassociation.ca/wp-content/uploads/2021/01/Best-Practices-for-Wind-Farm-Icing-and-Cold-Climate_June2020.pdf

Carter, J. (2011). *The effect of wind farms on residential property values in Lee County, Illinois* [Illinois State University]. <https://www.livingstoncounty-il.org/wordpress/wp-content/uploads/2014/11/PR-Ex.-33-2011-Wind-Farms-Effect-on-Property-Values-in-Lee-County.pdf>

CCME. (1999). *Canadian water quality guidelines for the protection of aquatic life—Dissolved oxygen (freshwater)*. Canadian Council of Ministers of the Environment, Winnipeg. <https://ccme.ca/en/res/dissolved-oxygen-freshwater-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>

CCOHS. (2024, May). *Noise: Occupational exposure limits in Canada*. Canadian Centre for Occupational Health and Safety Government of Canada. https://www.ccohs.ca/oshanswers/phys_agents/noise/exposure_can.html

CDT. (2016). *Technical guidance for assessment and mitigation of the effects of traffic noise and road construction noise on bats* (CTHWANP-RT-15-306.04.1). California Department of Transportation Division of Environmental Analysis. <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/noise-effects-on-bats-jul2016-a11y.pdf>

CFIA. (2025). *Emerald ash borer*. Canadian Food Inspection Agency. <https://inspection.canada.ca/en/plant-health/invasive-pests-and-plants/insects/emerald-ash-borer>

Chen, J., & Wang, Y. (2024). Effects of habitat fragmentation on bird behavior and extinction mechanisms. *International Journal of Molecular Zoology*, 14(2). <https://animalsciopublisher.com/index.php/ijmz/article/view/3800>

ClimateData.ca. (2025). *Download variable data*. Climate Data for a Resilient Canada. <https://climatedata.ca/download>

Corey, E., Linnansaari, T., Dugdale, S. J., Bergeron, N., Gendron, J.-F., Lapointe, M., & Cunjak, R. A. (2019). Comparing the behavioural thermoregulation response to heat stress by Atlantic salmon parr (*Salmo salar*) in two rivers. *Ecology of Freshwater Fish*. <https://doi.org/10.1111/eff.12487>

COSEWIC. (2006). *COSEWIC Assessment and Status Report on the Rusty Blackbird* *Euphagus carolinus in Canada*. Committee on the Status of Endangered Wildlife in Canada. https://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_rusty_blackbird_0806_e.pdf

COSEWIC. (2010a). *Blue felt lichen (Degelia plumbea): COSWEIC assessment and status report 2010* [Research;assessments]. Committee on the Status of Endangered Wildlife in Canada. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/blue-felt-lichen-2010.html#_Toc259699968

COSEWIC. (2010b). *COSEWIC assessment and status report on the bobolink Dolichonyx oryzivorus in Canada*.

https://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Bobolink_0810_e.pdf

COSEWIC. (2011, October). *Atlantic salmon (Salmo salar): COSEWIC assessment and status report*. Committee on the Status of Endangered Wildlife in Canada.

<https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/atlantic-salmon.html>

COSEWIC. (2012a). *COSEWIC assessment and status report on the American eel Anguilla rostrata in Canada*. Committee on the Status of Endangered Wildlife in Canada. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_anguille_amer_eel_1012_e.pdf

COSEWIC. (2012b). *COSEWIC assessment and status report on the Eastern Wood-pewee Contopus virens in Canada* (p. 30). Committee on the Status of Endangered Wildlife in Canada.

COSEWIC. (2013a). *COSEWIC Assessment and Status Report on the Bank Swallow Riparia riparia in Canada*. Committee on the Status of Endangered Wildlife in Canada.

[https://www.registrelep-](https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_hirondelle_rivage_bank_swallow_1213_e.pdf)

[sararegistry.gc.ca/virtual_sara/files/cosewic/sr_hirondelle_rivage_bank_swallow_1213_e.pdf](https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_hirondelle_rivage_bank_swallow_1213_e.pdf)

COSEWIC. (2013b). *COSEWIC assessment and status report on the little brown myotis Myotis lucifugus, northern myotis Myotis septentrionalis, tri-colored bat Perimyotis subflavus in Canada*. Committee on the Status of Endangered Wildlife in Canada.

<https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/little-brown-myotis-tri-coloured-bat-2013.html>

COSEWIC. (2014). *Frosted glass-whiskers (Sclerophora peronella): COSEWIC status appraisal summary 2014*. Committee on the Status of Endangered Wildlife in Canada.

<https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/frosted-glass-whiskers-appraisal-summary-2014.html>

COSEWIC. (2016a). *COSEWIC Assessment and Status Report on the Evening Grosbeak Coccythraustes vespertinus in Canada*. Committee on the Status of Endangered Wildlife in Canada.

[https://www.registrelep-](https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Evening%20Grosbeak_2016_e.pdf)

[sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Evening%20Grosbeak_2016_e.pdf](https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Evening%20Grosbeak_2016_e.pdf)

COSEWIC. (2016b). *Recovery Strategy for the Olive-sided Flycatcher (Contopus cooperi) in Canada* (Species at Risk Act Recovery Strategy Series). Environment Canada.

https://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_olive-sided%20flycatcher_e_final.pdf

COSEWIC. (2018a). *COSEWIC Assessment and status report on the black ash* *Fraxinus nigra* in Canada. Committee on the Status of Endangered Wildlife in Canada. https://publications.gc.ca/collections/collection_2019/eccc/CW69-14-776-2019-eng.pdf

COSEWIC. (2018b). *COSEWIC assessment and status report on the common nighthawk* (*Chordeiles minor*) in Canada. Committee on the Status of Endangered Wildlife in Canada. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/common-nighthawk-2018.html>

COSEWIC. (2018c). *COSEWIC assessment and status report on the Olive-sided Flycatcher* *Contopus cooperi* in Canada (p. 52). Committee on the Status of Endangered Wildlife in Canada.

COSEWIC. (2020). *COSEWIC assessment and status report on the Canada warbler* *Cardellina canadensis* in Canada 2020. Committee on the Status of Endangered Wildlife in Canada. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/canada-warbler-2020.html>

COSEWIC. (2023). *Hoary bat* (*Lasiurus cinereus*) *eastern red bat* (*Lasiurus borealis*) *silver-haired bat* (*Lasionycteris noctivagans*): *COSEWIC assessment and status report 2023*. Committee on the Status of Endangered Wildlife in Canada. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/hoary-bat-eastern-red-bat-silver-haired-bat-2023.html>

COSEWIC. (2025). *COSEWIC wildlife species assessments (detailed version), December 2025*. (pp. 1–15).

Davis, D., & Browne, S. (1996). *The natural history of Nova Scotia*. Nova Scotia Museum.

de Sousa, A. J. G., & Kastenholz, E. (2015). Wind farms and the rural tourism experience – problem or possible productive integration? The views of visitors and residents of a Portuguese village. *Journal of Sustainable Tourism*, 23(8–9), 1236–1256. <https://doi.org/10.1080/09669582.2015.1008499>

Deloitte LLP. (2024). *EverWind Fuels: Economic impact assessment of EverWind's Point Tupper Green Hydrogen and Ammonia Project*. https://everwindfuels.com/economic_contribution_study_report.pdf

DFO. (1988). *Trout in Canada's Atlantic provinces* (Underwater World). Fisheries and Oceans Canada. <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40628887.pdf>

DFO. (2003, May). *Interim policy for the use of backpack electrofishing units*. Fisheries and Oceans Canada. <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/273626.pdf>

DFO. (2016, December 19). *Alewife*. Fisheries and Oceans Canada. <https://www.dfo-mpo.gc.ca/species-especes/profiles-profils/alewife-gaspereau-eng.html>

DFO. (2024). *Habitat Highlight: Addressing the acidification of watersheds in Nova Scotia*. https://www.dfo-mpo.gc.ca/ecosystems-ecosystemes/habitat/highlights-faitssailants/nova-scotia-nouvelle-ecosse/acidification-watersheds-bassins-hydrographiques-eng.html#_2

DFO. (2025). *Aquatic species at risk map*. Fisheries and Oceans Canada. <https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html>

Dong, L., Gaur, V., & Lang, C. (2023). Property value impacts of onshore wind energy in New England: The importance of spatial heterogeneity and temporal dynamics. *Energy Policy*, 179, 113643. <https://doi.org/10.1016/j.enpol.2023.113643>

Drage, J. (2019). A karst risk map of Nova Scotia. *NSNR*.

Duiker, S. W. (2004). *Effects of soil compaction*. Pennsylvania State University College of Agricultural Sciences. <https://extension.psu.edu/effects-of-soil-compaction>

ECCC. (2007, January 9). *Water pollution: Erosion and sedimentation* [Guidance]. Government of Canada. <https://www.canada.ca/en/environment-climate-change/services/water-overview/pollution-causes-effects/erosion-sedimentation.html>

ECCC. (2011). *Frosted glass–whiskers (Sclerophora peronella), Nova Scotia: Management plan 2011*. Environment and Climate Change Canada. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/management-plans/frosted-glass-whiskers-nova-scotia-2011.html>

ECCC. (2013). *Federal Halocarbon Regulations, 2003* (p. 7) [Fact Sheet]. Environment and Climate Change Canada. https://publications.gc.ca/collections/collection_2014/ec/En14-108-1-2013-eng.pdf

ECCC. (2015). *Recovery strategy for little brown myotis (Myotis lucifugus), northern myotis (Myotis septentrionalis), and tri-colored bat (Perimyotis subflavus)*. Environment and Climate Change Canada. https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_LittleBrownMyotisNorthernMyotisTricoloredBat_e_proposed.pdf

ECCC. (2016a). *Recovery strategy for the Canada warbler (Cardellina canadensis) in Canada* (Species at Risk Act Recovery Strategy Series). Environment and Climate Change Canada. https://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_canada%20warbler_e_final.pdf

ECCC. (2016b). *Recovery strategy for the common nighthawk (Chordeiles minor) in Canada* (Species at Risk Act Recovery Strategy Series). Environment and Climate Change Canada. https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_common%20nighthawk_e_final.pdf

ECCC. (2018a). *Little brown myotis (Myotis lucifugus), the northern myotis (Myotis septentrionalis), and the tri-colored bat (Perimyotis subflavus): Recovery strategy 2018*. Environment and Climate Change Canada. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/little-brown-myotis-2018.html>

ECCC. (2018b). *Recovery strategy for the eastern whip-poor-will (Antrostomus vociferus) in Canada* (Species at Risk Act (SARA) Recovery Strategy Series, p. vi + 107 pp). Environment and Climate Change Canada. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/eastern-whip-poor-will-2018.html>

ECCC. (2019a). *Canada's changing climate report* (E. Bush & D. Lemmen, Eds.). Environment and Climate Change Canada. https://natural-resources.canada.ca/sites/www.nrcan.gc.ca/files/energy/Climate-change/pdf/CCCR_FULLREPORT-EN-FINAL.pdf

ECCC. (2019b). *Changes in temperature*. Environment and Climate Change Canada. <https://www.canada.ca/en/environment-climate-change/services/climate-change/canadian-centre-climate-services/basics/trends-projections/changes-temperature.html>

ECCC. (2020a). *Management Plan for the Snapping Turtle (Chelydra serpentina) in Canada*. Environment and Climate Change Canada. https://publications.gc.ca/collections/collection_2020/eccc/En3-5-105-2019-eng.pdf

ECCC. (2020b). *Recovery strategy for the wood turtle (Glyptemys insculpta) in Canada* (Species at Risk Act Recovery Strategy Series). Environment and Climate Change Canada. https://publications.gc.ca/collections/collection_2020/eccc/En3-4-333-2020-eng.pdf

ECCC. (2021, May 19). *Map: National Wildlife Areas and Migratory Bird Sanctuaries*. <https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/map.html>

ECCC. (2022a). *Management plan for the blue felt lichen (Degelia plumbea) in Canada* (Species at Risk Act Management Plan Series). Environment and Climate Change Canada. https://sararegistry.gc.ca/virtual_sara/files/plans/mp_blue_felt_lichen_e_final.pdf

ECCC. (2022b). *Management plan for the evening grosbeak (Coccothraustes vespertinus) in Canada* (Species at Risk Act Management Plan Series). Environment and Climate Change Canada.

ECCC. (2023a). *Climate trends and projections*. Environment and Climate Change Canada. <https://www.canada.ca/en/environment-climate-change/services/climate-change/canadian-centre-climate-services/basics/trends-projections.html>

ECCC. (2023b). *Management plan for the eastern wood-pewee (Contopus virens) in Canada [proposed] (Species at Risk Act Management Plan Series, p. 46)*. Environment and Climate Change Canada. https://ecprccsarstacct.z9.web.core.windows.net/files/SARAFiles/legacy/plans/mp_eastern_wod_pewee_e_proposed.pdf

ECCC. (2023c, August 10). *Chimney Swift (Chaetura pelagica): Recovery strategy 2023*. Environment and Climate Change Canada. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/chimney-swift-2023.html>

ECCC. (2024). *Canadian National Wetlands Inventory* [Program descriptions]. <https://www.canada.ca/en/environment-climate-change/services/wildlife-habitat/canadian-national-wetland-inventory.html>

ECCC. (2025a). *Air quality health index—Summary*. Environment and Climate Change Canada. https://weather.gc.ca/airquality/pages/provincial_summary/ns_e.html

ECCC. (2025b). *Climate data—Tracadie*. Environment and Climate Change Canada. https://climate.weather.gc.ca/climate_data/daily_data_e.html?hlyRange=2003-01-20%7C2025-06-08&dlyRange=2003-01-17%7C2025-06-08&mlyRange=2004-01-01%7C2007-07-01&StationID=41575&Prov=NS&urlExtension=_e.html&searchType=stnName&optLimit=yearRange&StartYear=1840&EndYear=2025&selRowPerPage=25&Line=1&searchMethod=contains&Month=6&Day=8&txtStationName=tracadie&timeframe=2&Year=2025

ECCC. (2025c). *Critical habitat for species at risk national dataset—Canada* [Dataset]. <https://open.canada.ca/data/en/dataset/47caa405-be2b-4e9e-8f53-c478ade2ca74>

ECCC. (2025d). *ECCC data catalogue*. Critical Habitat for Species at Risk National Dataset - Canada. <https://data-donnees.az.ec.gc.ca/data/species/protectrestore/critical-habitat-species-at-risk-canada/>

ECCC-CWS. (2007a). *Recommended protocols for monitoring impacts of wind turbines on birds*. https://publications.gc.ca/collections/collection_2013/ec/CW66-364-2007-eng.pdf

ECCC-CWS. (2007b). *Wind turbines and birds: A guidance document for environmental assessment*. <https://publications.gc.ca/site/eng/458437/publication.html>

ECCC-CWS. (2018). *Wind turbines and birds – Updated guidance for environmental assessment and monitoring*. Environment and Climate Change Canada Canadian Wildlife Service.

ECCC-CWS. (2022). *Wind energy & birds environmental assessment guidance update*. Environment and Climate Change Canada - Canadian Wildlife Service.

EIA. (2022). *Frequently asked questions (FAQs)*. U.S. Energy Information Administration. <https://www.eia.gov/tools/faqs/faq.php?id=77&t=11>

Elliot, J. M., & Elliot, J. A. (2010). Temperature requirements of Atlantic salmon *Salmo salar*, brown trout *Salmo trutta* and Arctic charr *Salvelinus alpinus*: Predicting the effects of climate change. *Journal of Fish Biology*, 77(8), 1793–1817.

Engel, M. S., Young, R. J., Davies, W. J., Waddington, D., & Wood, M. D. (2024). A systematic review of anthropogenic noise impact on avian species. *Current Pollution Reports*, 10(4), 684–709. <https://doi.org/10.1007/s40726-024-00329-3>

Enlitia. (2024, May). *Wind Turbine Failures: Causes, Consequences, and Impact on Energy Output*. Enlitia. <https://www.enlitia.com/resources-blog-post/wind-turbine-failures-causes-consequences-and-impact-on-energy-output>

Environment Canada. (2009). *Environmental Code of Practice for Metal Mines*. Environment Canada. <https://www.canada.ca/content/dam/eccc/migration/main/lcpe-cepa/documents/codes/mm/mm-eng.pdf>

Environmental Laboratory. (1987). *Corps of engineers wetlands delineation manual* (Y-87-1 (online edition); Wetlands Research Program Technical Report, p. 143). US Army Corps of Engineers. <https://usace.contentdm.oclc.org/digital/collection/p266001coll1/id/4532/>

EPDItaly. (2025). *Environmental product declaration; Goldwind GWH170-7.2 & GWH175- 7.8 & GWH182-8.0*. EPDItaly.

Erdmann, G. G., Crow, T. R., Peterson, R. J. M., & Wilson, C. D. (1987). *Managing Black Ash in the Lake States* (General Technical Report NC-115). Department of Agriculture, Forest Service, North Central Forest Experiment Station.

Farmer, A. M. (1993). The effects of dust on vegetation—A review. *Environmental Pollution*, 79(1), 63–75. today. [https://doi.org/10.1016/0269-7491\(93\)90179-R](https://doi.org/10.1016/0269-7491(93)90179-R)

Fensome, A. G., & Mathews, F. (2016). Roads and bats: A meta-analysis and review of the evidence on vehicle collisions and barrier effects. *Mammal Review*, 46(4), 311–323. <https://doi.org/10.1111/mam.12072>

Fenton, M., & Barclay, R. (1980). *Myotis lucifugus (LeConte) little brown bat, little brown myotis* (No. 142). The American Society of Mammalogists. <https://www.science.smith.edu/departments/biology/VHAYSEN/msi/pdf/i0076-3519-142-01-0001.pdf>

Fern, R. R., Davis, H. T., Baumgardt, J. A., Morrison, M. L., & Campbell, T. A. (2018). Summer activity patterns of four resident south Texas bat species. *Global Ecology and Conservation*, 16, e00500. <https://doi.org/10.1016/j.gecco.2018.e00500>

Finn, J., Carlsson, J., Kelly, T., & Davenport, J. (2012). Avoidance of headwinds or exploitation of ground effect-why do birds fly low?: Why Do Birds Fly Low. *Journal of Field Ornithology*, 83(2), 192–202. <https://doi.org/10.1111/j.1557-9263.2012.00369.x>

Francis, C. D., Ortega, C. P., & Cruz, A. (2009). Noise pollution changes avian communities and species interactions. *Current Biology*, 19(16), 1415–1419. <https://doi.org/10.1016/j.cub.2009.06.052>

Frantál, B., & Kunc, J. (2011). Wind turbines in tourism landscapes: Czech Experience. *Annals of Tourism Research*, 38(2), 499–519. <https://doi.org/10.1016/j.annals.2010.10.007>

Fuller, P., Maynard, E., Raikow, D., Larson, J., Fusaro, A., Neilson, M., & Bartos, A. (2021). *Alewife (Alosa pseudoharengus)*—Species profile. USGS Nonindigenous Aquatic Species Database. <https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=490>

Fuller, P., Nico, L., Neilson, M., Dettloff, K., & Sturtevant, R. (2019). *American Eel (Anguilla rostrata)*—Species profile. USGS Nonindigenous Aquatic Species Database. <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=310>

Gauslaa, Y., Bartemucci, P., & Solhaug, K. A. (2019). Forest edge-induced damage of cephalo- and cyanolichens in northern temperate rainforests of British Columbia. *Canadian Journal of Forest Research*, 49(5), 434–439. <https://doi.org/10.1139/cjfr-2018-0187>

GeoNOVA. (2024a). *Nova Scotia canopy height model* [Dataset]. <https://nsgi.novascotia.ca/datalocator/elevation/>

GeoNOVA. (2024b). *Nova Scotia digital elevation map* [Dataset]. <https://nsgi.novascotia.ca/datalocator/elevation/>

GeoNOVA. (2024c). *Nova Scotia topographic database—Roads, trails and rails* [Dataset]. Service Nova Scotia. https://data.novascotia.ca/Roads-Driving-and-Transport/Nova-Scotia-Topographic-DataBase-Roads-Trails-and-/62ap-bhkw/about_data

GeoNOVA. (2025a). *Nova Scotia topographic database—Buildings* [Dataset]. Service Nova Scotia. https://data.novascotia.ca/Municipalities/Nova-Scotia-Topographic-DataBase-Buildings-Point-L/n7be-bzwb/about_data

GeoNOVA. (2025b). *Nova scotia topographic database—Water features* [Dataset]. Service Nova Scotia. https://data.novascotia.ca/Lands-Forests-and-Wildlife/Nova-Scotia-Topographic-DataBase-Water-Features-Li/fpca-jrmt/about_data

Gilford, D. M., Giguere, J., & Pershing, A. J. (2024). Human-caused ocean warming has intensified recent hurricanes. *Environmental Research: Climate*, 3(4), 045019. <https://doi.org/10.1088/2752-5295/ad8d02>

Gorman, K. M., Barr, E. L., Ries, L., Nocera, T., & Ford, W. M. (2021). Bat activity patterns relative to temporal and weather effects in a temperate coastal environment. *Global Ecology and Conservation*, 30. <https://doi.org/10.1016/j.gecco.2021.e01769>

Gorman, M. (2023, September 29). Environmentalists question “routine clarification” of Nova Scotia’s wetlands policy. *CBC News*. <https://www.cbc.ca/news/canada/nova-scotia/wetlands-environment-species-at-risk-tim-halman-1.6983094>

Government of British Columbia. (2024, February). *Cumulative effects framework*. Government of British Columbia. <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/cumulative-effects-framework>

Government of Canada. (2025). *Registered population* [Fact sheet; resource list]. https://fnppn.aadnc-aandc.gc.ca/FNP/Main/Search/FNRegPopulation.aspx?BAND_NUMBER=19&lang=eng

Grubb, T. G., Pater, L. L., & Delaney, D. K. (1998). *Logging truck noise near nesting northern goshawks* (RMRS-RN-3; p. RMRS-RN-3). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. <https://doi.org/10.2737/RMRS-RN-3>

Guest, E. E., Stamps, B. F., Durish, N. D., Hale, A. M., Hein, C. D., Morton, B. P., Weaver, S. P., & Fritts, S. R. (2022). An updated review of hypotheses regarding bat attraction to wind turbines. *Animals*, 12(3), Article 3. <https://doi.org/10.3390/ani12030343>

Gulden, W. E. (2011). A review of the current evidence regarding industrial wind turbines and property values from a homeowner’s perspective. *Bulletin of Science, Technology & Society*, 31(5), 363–368. <https://doi.org/10.1177/0270467611421847>

Hammond, G., & Jones, C. (2011). *Inventory of carbon & energy (ICE), Version 2.0*. University of Bath. <http://www.carbonsolutions.com/resources/ice%20v2.0%20-%20jan%202011.xls>

Health Canada. (2023). *Guidance for evaluating human health impacts in environmental assessment: Noise*. Government of Canada.

Health Canada. (2025). *Guidelines for Canadian drinking water quality: Summary tables*.

Hegmann, G., Cocklin, C., Creasey, R., Dupuis, S., Kennedy, A., Kingsley, L., Ross, W., Spaling, H., & Stalker, D. (1999). *Cumulative effects assessment practitioners guide*. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency. <https://publications.gc.ca/collections/Collection/En106-44-1999E.pdf>

Hein, C. D., Castleberry, S. B., & Miller, K. V. (2008). Site-occupancy of bats in relation to forested corridors. *Forest Ecology and Management*, 257(2009), 1200–1207.

Henry, M., Thomas, D. W., Vaudry, R., & Carrier, M. (2002). Foraging distances and home range of pregnant and lactating little brown bats (*Myotis lucifugus*). *Journal of Mammalogy*, 83(3), 767–774. [https://doi.org/10.1644/1545-1542\(2002\)083%253C0767:FDAHRO%253E2.0.CO;2](https://doi.org/10.1644/1545-1542(2002)083%253C0767:FDAHRO%253E2.0.CO;2)

Hill, N., Crowell, M., Lapaix, R., & Hicks, S. (2018). The rare southern twayblade (*Neottia bifolia*): Sentinel of ecosystem integrity for sphagnum swamps. *Rhodora*, 120(982), 117–142. <https://doi.org/10.3119/17-11>

Hinman, J. L. (2010). *Wind farm proximity and property values: A pooled hedonic regression analysis of property values in central Illinois* [Illinois State University]. <https://puc.sd.gov/commission/dockets/electric/2017/el17-055/exhibit4.pdf>

Hoen, B., Brown, J. P., Jackson, T., Wiser, R., Thayer, M., & Cappers, P. (2013). *A spatial hedonic analysis of the effects of wind energy facilities on surrounding property values in the United States* (LBNL-6362E). Ernest Orlando Lawrence Berkeley National Laboratory.

Hoen, B., Wiser, R., Cappers, P., Thayer, M., & Gautam, S. (2009). The impact of wind power projects on residential property values in the United States: A multi-site hedonic analysis. *Journal of Real Estate Research*, 33(3). <https://emp.lbl.gov/publications/impact-wind-power-projects>

Hoen, B., Wiser, R., Cappers, P., Thayer, M., & Sethi, G. (2010). Wind energy facilities and residential properties: The effect of proximity and view on sales prices. *Journal of Real Estate Research*, 33, 51. <https://doi.org/10.1080/10835547.2011.12091307>

Horn, J. W., Arnett, E. B., & Kunz, T. H. (2008). Behavioral responses of bats to operating wind turbines. *The Journal of Wildlife Management*, 72(1), 123–132. <https://doi.org/10.2193/2006-465>

HSE. (n.d.). *Traffic management on site*. Health and Safety Executive. Retrieved December 16, 2024, from <https://www.hse.gov.uk/construction/safetytopics/vehicletrafficmanagement.htm>

IAAC. (2023). *Policy framework for assessing cumulative effects under the impact assessment act* [Guidance - legislative]. <https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/policy-framework-assessing-cumulative-effects-under-impact-assessment-act.html>

IBA Canada. (2025). *Canadian important bird areas*. IBA Canada.
<https://www.ibacanada.com/mapviewer.jsp?lang=EN>

INAC. (2011, March). *Aboriginal consultation and accommodation—Updated guidelines for federal officials to fulfill the Duty to Consult*. Indigenous and Northern Affairs Canada.
<https://www.rcaanc-cirnac.gc.ca/eng/1100100014664/1609421824729>

IPCC. (2018). Annex I: Glossary. In *Global warming of 1.5°C: IPCC special report on impacts of global warming of 1.5°C above pre-industrial levels in context of strengthening response to climate change, sustainable development, and efforts to eradicate poverty* (pp. 541–562). Intergovernmental Panel on Climate Change. <https://doi.org/10.1017/9781009157940.008>

IPCC. (2022). *Technical Summary* (In: Climate Change 2022: Impacts, Adaptation and Vulnerability). Intergovernmental Panel on Climate Change.
<https://www.ipcc.ch/report/ar6/wg2/chapter/technical-summary/>

ISO. (2019). *ISO 14064-2:2019*. International Organization for Standardization.
<https://www.iso.org/standard/66454.html>

ISU. (2025). *Iowa Environmental Mesonet: Custom wind roses plots*. Iowa State University.
https://www.mesonet.agron.iastate.edu/sites/locate.php?network=CA_NS_ASOS

Jansson, S., Malmqvist, E., Brydegaard, M., Åkesson, S., & Rydell, J. (2020). A Scheimpflug lidar used to observe insect swarming at a wind turbine. *Ecological Indicators*, 117, 106578.
<https://doi.org/10.1016/j.ecolind.2020.106578>

Jessop, B. M. (1986). *Alewite* (Underwater World) [Factsheet]. Fisheries and Oceans Canada.

Jessop, B. M. (1995). *Justification for, and status of, American eel elver fisheries in Scotia-Fundy Region*. 95(2).

Johnson, D. H., Shrier, B. M., O'Neal, J. S., Knutzen, J. A., Augerot, X., O'Neil, T. A., & Pearsons, T. N. (2007). *Salmonid field protocols handbook: Techniques for assessing status and trends in salmon and trout populations*. American Fisheries Society.
<https://fisheries.org/docs/books/55055P/fm.pdf>

Johnson, J. B., Rodrigue, J. L., & Ford, W. M. (2013). *Nightly and yearly bat activity before and after white-nose syndrome on the fernow experimental forest in West Virginia* (Research Paper NRS-24). United States Department of Agriculture.

Jones, D. K., Mattes, B. M., Hintz, W. D., Schuler, M. S., Stoler, A. B., Lind, L. A., Cooper, R. O., & Relyea, R. A. (2017). Investigation of road salts and biotic stressors on freshwater wetland communities. *Environmental Pollution*, 221, 159–167. <https://doi.org/10.1016/j.envpol.2016.11.060>

Kalff, J. (2002). *Limnology inland water ecosystems*. <https://livresbioapp.wordpress.com/wp-content/uploads/2016/03/limnology-kalff.pdf>

Katsaprakakis, D. A., Papadakis, N., & Ntintakis, I. (2021). A comprehensive analysis of wind turbine blade damage. *Energies*, 14(18), Article 18. <https://doi.org/10.3390/en14185974>

Kennedy, G. W. (2021). *A Manganese in well water risk map for Nova Scotia*. Nova Scotia Energy and Mines.

Kennedy, G. W., & Drage, J. M. (2016). *A review of activities related to the occurrence of arsenic in Nova Scotia well water*.

Kennedy, G. W., & Drage, J. M. (2017). *An arsenic in well water risk map for Nova Scotia based on observed patterns of well water concentrations of arsenic in bedrock aquifers* (Open File Nos. 2017–003). Nova Scotia Natural Resources.

Keppie, J. D. (2000). *Geological map of the Province of Nova Scotia* (Map ME 2000-1) [Map]. Nova Scotia Natural Resources. https://novascotia.ca/natr/meb/data/mg/map/pdf/map_2000-001_gb_d043v2_dp.pdf

Kirchhoff, T., Ramisch, K., Feucht, T., Reif, C., & Suda, M. (2022). Visual evaluations of wind turbines: Judgments of scenic beauty or of moral desirability? *Landscape and Urban Planning*, 226, 104509. <https://doi.org/10.1016/j.landurbplan.2022.104509>

Klug, B. J., Goldsmith, D. A., & Barclay, R. M. R. (2012). Roost selection by the solitary, foliage-roosting hoary bat (*Lasiurus cinereus*) during lactation. *Canadian Journal of Zoology*, 90(3), 329–336. <https://doi.org/10.1139/z11-139>

Knight, E., Hannah, K., Brigham, M., McCracken, J., Falardeau, G., Julien, M., & Guénette, J.-S. (2019). *Canadian nightjar survey protocol* (p. 18). Environment and Climate Change Canada. <https://wildresearch.ca/wp-content/uploads/2019/05/National-Nightjar-Survey-Protocol-WildResearch-2019.pdf>

Krcmar, A. (2021). Turbines and fire risk. *Wind Systems Magazine*, 21–22.

Laposa, S., & Mueller, A. (2010). Wind farm announcements and rural home prices: Maxwell Ranch and rural Northern Colorado. *Journal of Sustainable Real Estate*, 2(1), 383–402. <https://doi.org/DOI:10.1080/10835547.2010.12091798>

- Lesiński, G. (2007). Bat road casualties and factors determining their number. *Mammalia*, 71(3), 138–142. <https://doi.org/10.1515/MAMM.2007.020>
- Long, C. V. ., Flint, J., & Lepper, P. (2010). Insect attraction to wind turbines: Does colour play a role? *European Journal of Wildlife Research*, 52(7). <https://doi.org/10.1007/s10344-010-0432-7>
- Longcore, T., & Rich, C. (2004). Ecological light pollution. *Frontiers in Ecology and the Environment*, 2(4), 191–198. [https://doi.org/10.1890/1540-9295\(2004\)002%255B0191:ELP%255D2.0.CO;2](https://doi.org/10.1890/1540-9295(2004)002%255B0191:ELP%255D2.0.CO;2)
- Longcore, T., Rich, C., & Gauthreaux, S. A., Jr. (2008). Height, guy wires, and steady-burning lights increase hazard of communication towers to nocturnal migrants: A review and meta-analysis. *The Auk*, 125(2), 485–492. <https://doi.org/10.1525/auk.2008.06253>
- Lovich, J. E., & Ennen, J. R. (2013). Assessing the state of knowledge of utility-scale wind energy development and operation on non-volant terrestrial and marine wildlife. *Applied Energy*, 103, 52–60. <https://doi.org/10.1016/j.apenergy.2012.10.001>
- MacDonald, J. L., Butler, S. M. M., & Lawler, M. M. (2023). *Fish and fish habitat report for Nova Scotia: Summary of the threat analysis prepared to support reporting by the fish and fish habitat protection program—Maritimes region*. Fisheries and Oceans Canada.
- Madden, J. R., & Perkins, S. E. (2017). Why did the pheasant cross the road? Long-term road mortality patterns in relation to management changes. *Royal Society Open Science*, 4(10), 170617. <https://doi.org/10.1098/rsos.170617>
- Manolis, J. C., Andersen, D. E., & Cuthbert, F. J. (2002). Edge effect on nesting success of ground nesting birds near regenerating clearcuts in a forest-dominated landscape. *The Auk*, 119(4), 955–970. <https://doi.org/10.2307/4090226>
- Marler, P., Konishi, M., Lutjen, A., & Waser, M. S. (1973). Effects of continuous noise on avian hearing and vocal development. *Proceedings of the National Academy of Sciences*, 70(5), 1393–1396. <https://doi.org/10.1073/pnas.70.5.1393>
- Marques, A. T., Batalha, H., Rodrigues, S., Costa, H., Pereira, M. J. R., Fonseca, C., Mascarenhas, M., & Bernardino, J. (2014). Understanding bird collisions at wind farms: An updated review on the causes and possible mitigation strategies. *Biological Conservation*, 179, 40–52. <https://doi.org/10.1016/j.biocon.2014.08.017>
- Massachusetts Government. (2026). *Eastern Pearlshell*. <https://www.mass.gov/info-details/eastern-pearlshell>

MBBA. (2006). *Maritimes breeding bird atlas—Guide for atlasers*. <https://www.mba-aom.ca/downloads/mbbaguide.pdf>

McGrath, T., Pulsifer, M., Seymore, R., Doucette, L., Forbes, G., McIntyre, R., Milton, R., Cogan, L., Retallack, M., & Crewe, T. (2021, July). *Nova Scotia silvicultural guide for the ecological matrix*. Nova Scotia Natural Resources. <https://novascotia.ca/ecological-forestry/docs/silvicultural-guide.pdf>

MDCC. (2025a). *Sa'qewe'l kmitkinal – Ancestors Live Here*. Mi'kmawey Debert Cultural Centre. <https://www.mikmaweydebert.ca/ancestors-live-here/>

MDCC. (2025b). Supplementary materials for teaching about the Mi'kmaq. *Mi'kmawey Debert Cultural Centre*. <https://www.mikmaweydebert.ca/sharing-our-stories/education-and-outreach/school-curriculum/supplementary-materials-for-teaching-about-the-mikmaq/>

MDEP. (2022, April). *Reducing acidification in endangered Atlantic salmon habitat*. Maine Department of Environmental Protection. [https://www.maine.gov/dep/water/monitoring/rivers_and_streams/salmon/Third%20year%20of%20clam%20shells%20\(003\).pdf](https://www.maine.gov/dep/water/monitoring/rivers_and_streams/salmon/Third%20year%20of%20clam%20shells%20(003).pdf)

MDNR. (2012). *Brook trout*. Maryland Department of Natural Resources. <https://dnr.maryland.gov/education/Documents/BrookTrout.pdf>

Medinas, D., Marques, J. T., & Mira, A. (2013). Assessing road effects on bats: The role of landscape, road features, and bat activity on road-kills. *Ecological Research*, 28, 227–237. <https://doi.org/10.1007/s11284-012-1009-6>

Meyer, R. (2007). *Pekania pennanti*. In: *Fire Effects Information System*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <https://www.fs.usda.gov/database/feis/animals/mammal/pepe/all.html>

Missouri Botanical Garden. (n.d.). *Goodyera pubescens*. Retrieved January 9, 2026, from <https://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=245922>

Mitsch, W. J., & Gosselink, J. G. (2000). *Wetlands* (third edition).

MOCA. (2025). *Municipality of the County of Antigonish*. Municipality of the County of Antigonish. <https://antigonishcounty.ca/explore-antigonish-county/>

MODG. (n.d.). *Lots to see and do*. Municipality of the District of Guysborough. Retrieved January 7, 2025, from <https://modg.ca/visitors/lots-to-see-and-do>

MODG. (2011, October). *Noise Control By-Law*. Municipality of the District of Guysborough. <https://modg.ca/sites/default/files/pdf/Noise%20Control%20By-Law.pdf>

Moseley, M. (2007). *Records of bats (Chiroptera) at caves and mines in Nova Scotia* (No. 99; Curatorial Report, p. 21). Nova Scotia Museum. <https://ojs.library.dal.ca/NSM/article/view/4030>

MTO. (2009). *Environmental guide for fish and fish habitat* (p. 581). Ontario Ministry of Transportation. https://longpointbiosphere.com/download/fish__water/MTO-Fish-Guide-June-2009-Final.pdf

MTRI. (2019a). *Extant boreal felt GIS database* [Dataset]. Mersey Tobeatic Research Institute.

MTRI. (2019b). *Vole ears GIS database* [Dataset]. Mersey Tobeatic Research Institute.

MTRI. (2022). *Invasive species in Nova Scotia*. Mersey Tobeatic Research Institute. https://nsinvasives.ca/wp-content/uploads/2022/05/NBISC_Invasive-Species_Giude-2022.pdf

Nash, T. I. (2008). *Lichen biology*. Cambridge University Press, 41(6). <https://doi.org/10.1017/CBO9780511790478>

NatureServe. (2024). *Listera australis southern twayblade*. NatureServe Explorer. https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.141348/Listera_australis

NatureServe. (2025a). *Platanthera grandiflora Large Purple Fringed Orchid*. NatureServe Explorer. https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.141092/Platanthera_grandiflora

NatureServe. (2025b). *Pyrola minor Lesser Wintergreen*. NatureServe Explorer. https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.148612/Pyrola_minor

NBDELG. (2021). *Protocol for Wetland Delineation in New Brunswick*. Department of Environment and Local Government Source and Surface Water Management Branch. <https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Wetlands-TerreHumides/ProtocolForWetlandDelineation.pdf>

Neily, P., Basquill, S., Quigley, E., & Keys, K. (2017). *Ecological land classification for Nova Scotia* (FOR 2017-13; p. 298). Nova Scotia Natural Resources. <https://novascotia.ca/natr/forestry/ecological/pdf/Ecological-Land-Classification-guide.pdf>

Neily, P., Basquill, S., Quigley, E., Keys, K., Maston, S., & Stewart, B. (2023). *Forest ecosystem classification for Nova Scotia (2022): Field guide*. Nova Scotia Natural Resources.

Neily, P., & Parsons, G. J. (2017). *A field guide to forest biodiversity stewardship* (FOR 2017-1). Nova Scotia Natural Resources. <https://novascotia.ca/natr/library/forestry/reports/biodiversity-stewardship-guide.pdf>

Niemi, G. J., DeVore, P., Detenbeck, N., Taylor, D., Lima, A., Pastor, J. J., Yount, J. D., & Naiman, R. J. (1990). Overview of case studies on recovery of aquatic systems from disturbance. *Environmental Management*, 14(5), 571–587. <https://doi.org/10.1007/BF02394710>

Nilsson, C., Klaassen, R. H. G., Alerstam, T., & McPeck, M. A. (2013). Differences in speed and duration of bird migration between spring and autumn. *The American Naturalist*, 181(6), 837–845. <https://doi.org/10.1086/670335>

NJDEP. (n.d.). *Alewife (Alosa pseudohareugus)*. New Jersey Department of Environmental Protection. Retrieved August 6, 2025, from <https://dep.nj.gov/njfw/wp-content/uploads/njfw/alewife.pdf>

NOAA. (n.d.). *Sea level trends—NOAA tides & currents*. Retrieved July 30, 2025, from <https://tidesandcurrents.noaa.gov/sltrends/sltrends.html>

Nova Scotia. (1989a). *Special Places Protection Act, R.S.N.S. 1989, c. 438*. <https://nslegislature.ca/sites/default/files/legc/statutes/specplac.htm>

Nova Scotia. (1989b). *Wildlife Act, R.S.N.S. 1989, c. 504*. <https://nslegislature.ca/sites/default/files/legc/statutes/wildlife.pdf>

Nova Scotia. (1995a). *Activities designations regulations, N.S. Reg. 47/1995*. <https://novascotia.ca/JUST/REGULATIONS/regs/envactiv.htm>

Nova Scotia. (1995b). *Environment Act, S.N.S. 1994-95, c. 1*. <https://www.canlii.org/en/ns/laws/stat/sns-1994-95-c-1/latest/sns-1994-95-c-1.pdf>

Nova Scotia. (1995c). *Environmental Assessment Regulations—N.S. Reg. 26/1995*. Nova Scotia Environment and Climate Change. <https://novascotia.ca/just/regulations/REGS/envassmt.htm>

Nova Scotia. (1995d). *Sulphide Bearing Material Disposal Regulations, N.S. Reg. 57/1995*. <https://nslegislature.ca/sites/default/files/legc/statutes/specplac.htm>

Nova Scotia. (1996). *Occupational Health and Safety Act, S.N.S. 1996, c. 7*. CanLII. <https://www.canlii.org/en/ns/laws/stat/sns-1996-c-7/latest/sns-1996-c-7.html>

Nova Scotia. (1998). *Endangered Species Act, SNS 1998, c. 11*. <https://www.canlii.org/en/ns/laws/stat/sns-1998-c-11/latest/sns-1998-c-11.html>

Nova Scotia. (2006). *Wind Turbine Facilities Municipal Taxation Act, S.N.S. 2006, c. 22*. <https://nslegislature.ca/sites/default/files/legc/statutes/windturb.htm>

Nova Scotia. (2009). *Greenhouse Gas Emissions Regulations, N.S. Reg. 260/2009*.
<https://www.novascotia.ca/just/regulations/regs/envgreenhouse.htm>

Nova Scotia. (2012). *Environmental Goals and Sustainable Prosperity Act, S.N.S. 2007, c. 7*.
<https://nslegislature.ca/sites/default/files/legc/statutes/environmental%20goals%20and%20sustainable%20prosperity.pdf>

Nova Scotia. (2015). *Electricity review report*.
<https://energy.novascotia.ca/sites/default/files/files/Final%20Review%20Report.pdf>

Nova Scotia. (2017). *Categorized List of Species at Risk made under Section 12 of the Endangered Species Act S.N.S. 1998, c. 11, N.S. Reg. 146/2017*.
<https://novascotia.ca/just/regulations/regs/eslist.htm>

Nova Scotia. (2018). *Standards for Quantification, Reporting and Verification of Greenhouse Gas Emissions Adoption Regulations, N.S. Reg. 20/2018*.
<https://www.novascotia.ca/just/regulations/regs/envghgstds.htm>

Nova Scotia. (2020). *Air quality regulations, N.S. Reg. 28/2005*.
<https://novascotia.ca/Just/Regulations/regs/envairqt.htm>

Nova Scotia. (2021). *Biodiversity Act, S.N.S. 2021, c. 3*.
<https://nslegislature.ca/sites/default/files/legc/statutes/biodiversity.pdf>

Nova Scotia. (2022). *Provincial Lichen Act, S.N.S. 2022, c. 40*.
<https://nslegislature.ca/sites/default/files/legc/statutes%20HTML/provincial%20lichen.htm>

Nova Scotia. (2025). *Minimum Planning Requirements Regulations, N.S. Reg. 51/2025*.
<https://novascotia.ca/just/regulations/regs/mgaminimum.htm>

NRCan. (2023, May). *Topographic data of Canada—CanVec series*. Natural Resources Canada. <https://open.canada.ca/data/en/dataset/8ba2aa2a-7bb9-4448-b4d7-f164409fe056>

NRCan. (2024). *About renewable energy in Canada*. Natural Resources Canada. Natural Resources Canada. <https://natural-resources.canada.ca/our-natural-resources/energy-sources-distribution/renewable-energy/about-renewable-energy-canada/7295>

NSDFA. (2025). *Nova Scotia freshwater fish species distribution records—Open government portal*. Government of Canada. <https://ouvert.canada.ca/data/dataset/0e2add4d-04d0-2138-35aa-118d2665ce68>

NSDNR. (2025). *Management plan for the blue felt lichen (Pectenium plumbeum) in Nova Scotia* (Nova Scotia Endangered Species Act Recovery Plan Series).

https://novascotia.ca/natr/wildlife/species-at-risk/docs/blue-felt-lichen-management-plan_2025.pdf

NSECC. (n.d.). *Ambient air quality data*. Nova Scotia Environment and Climate Change.

Retrieved December 17, 2024, from <https://novascotia.ca/nse/airdata/>

NSECC. (1993). *Procedure for conducting a pre-blast survey*. Nova Scotia Environment and Climate Change.

NSECC. (2008). *Proposed Melford international terminal environmental assessment*. Nova Scotia Environment and Climate Change.

<https://www.novascotia.ca/nse/ea/melford.international.terminal.asp>

NSECC. (2009a). *Guide to addressing wildlife species and habitat in an EA registration document*. Nova Scotia Environment and Climate Change.

<https://novascotia.ca/nse/ea/docs/EA.Guide-AddressingWildSpecies.pdf>

NSECC. (2009b). *Tracadie River Wilderness Area*.

https://novascotia.ca/nse/protectedareas/wa_tracadieriver.asp

NSECC. (2011a). *1:10,000 primary watersheds of Nova Scotia* [Map]. Nova Scotia Environment and Climate Change.

https://novascotia.ca/nse/water.strategy/docs/waterstrategy_nswatershedmap.pdf

NSECC. (2011b). *1:10,000 secondary and shore direct watersheds of Nova Scotia* [Map].

Nova Scotia Environment and Climate Change.

NSECC. (2011c). *Wetland delineation data form—Nova Scotia*. Nova Scotia Environment and Climate Change. <https://novascotia.ca/nse/wetland/docs/NS.Field.Delineation.Data.Form.pdf>

NSECC. (2011d, February). *Guide to considering climate change in project development in Nova Scotia*. Nova Scotia Environment and Climate Change.

<https://novascotia.ca/nse/ea/docs/development.climate.change.guide.pdf>

NSECC. (2015a). *Groundwater observation well network*. Nova Scotia Environment and Climate Change. <https://novascotia.ca/nse/groundwater/groundwaternetwork.asp>

NSECC. (2015b). *Guide to altering watercourses* (p. 62) [Guide]. Nova Scotia Environment and Climate Change. <https://novascotia.ca/nse/watercourse-alteration/docs/NSE-Watercourse-Alteration-Program-May29.pdf>

NSECC. (2015c). *Nova Scotia watercourse alterations standard*. Nova Scotia Environment and Climate Change. <https://www.novascotia.ca/nse/watercourse-alteration/docs/Watercourse-Alterations-Standard.pdf>

NSECC. (2019). *Nova Scotia wetland conservation policy*. Nova Scotia Environment and Climate Change.
<https://novascotia.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf>

NSECC. (2020a). *Parks and protected areas interactive map*. Nova Scotia - Parks and Protected Areas Map. <https://novascotia.ca/parksandprotectedareas/plan/interactive-map/>

NSECC. (2020b). *Wetlands of special significance database* [Dataset]. Nova Scotia Environment and Climate Change.

NSECC. (2022a). *Our climate, our future: Nova Scotia's climate change plan for clean growth*. Nova Scotia Environment and Climate Change.
<https://climatechange.novascotia.ca/sites/default/files/uploads/ns-climate-change-plan.pdf>

NSECC. (2022b). *Wet areas mapping (WAM)* [Dataset]. Nova Scotia Environment and Climate Change.

NSECC. (2023a). *Goose Harbour Lake wind farm project environmental assessment*. Nova Scotia Environment and Climate Change. <https://www.novascotia.ca/nse/ea/goose-harbour-lake-wind-farm-project/>

NSECC. (2023b). *Guidelines for environmental noise measurement and assessment*. Nova Scotia Environment and Climate Change. <https://novascotia.ca/nse/air/docs/guidelines-environmental-noise-measurement-and-assessment.pdf>

NSECC. (2024, March). *EverWind strait crossing transmission line project environmental assessment*. Nova Scotia Environment and Climate Change.
<https://www.novascotia.ca/nse/ea/everwind-strait-crossing-transmission-line/>

NSECC. (2025a). *A proponent's guide to environmental assessment*. Nova Scotia Environment and Climate Change. <https://novascotia.ca/nse/ea/docs/environmental-assessment-proponent-guide-en.pdf>

NSECC. (2025b). *Environmental assessment supplemental checklist: Wind energy projects*. <https://novascotia.ca/nse/ea/docs/environmental-assessment-supplemental-checklist-wind-energy-projects-en.pdf>

NSECC. (2025c). *Nova Scotia Class I environmental assessment checklist*.
<https://novascotia.ca/nse/ea/docs/environmental-assessment-checklist-class-i-en.pdf>

NSECC. (2025d). *Nova Scotia Environmental Assessment Projects Dashboard* [Interactive Map]. <https://experience.arcgis.com/experience/21caa537081b4e60880c75d317c7e25e>

NSECC. (2025e). *Setapuktuk Wind Project | Environmental Assessment*.
<https://novascotia.ca/nse/ea/setapuktuk-wind/>

NSECC & NSNR. (2022). *Nova Scotia Well Logs Database* | *novascotia.ca* [Dataset].
<https://novascotia.ca/natr/meb/download/dp430.asp>

NSFA. (2005). *Nova Scotia trout management plan*. Nova Scotia Fisheries and Aquaculture.
<https://novascotia.ca/fish/documents/special-management-areas-reports/NSTroutManplandraft05.pdf>

NSNR. (n.d.-a). *Species at risk—Recovery update*. Nova Scotia Natural Resources. Retrieved December 16, 2024, from <https://novascotia.ca/natr/wildlife/species-at-risk/>

NSNR. (n.d.-b). *Wind energy in Nova Scotia*. Retrieved July 29, 2025, from <https://energy.novascotia.ca/renewables/wind-energy>

NSNR. (2009a). *Potential for radon in indoor air*. Nova Scotia Natural Resources.
<https://fletcher.novascotia.ca/DNRViewer/?viewer=Radon>

NSNR. (2009b). *The drop on water: Online interactive groundwater map*. Nova Scotia Natural Resources. <https://fletcher.novascotia.ca/DNRViewer/?viewer=Groundwater>

NSNR. (2012). *Potential boreal felt lichen habitat layer* [Dataset]. Nova Scotia Natural Resources.

NSNR. (2015). *Recovery and Action Plan for Black ash (*Fraxinus nigra*) in Nova Scotia*. Nova Scotia Natural Resources.
https://novascotia.ca/natr/wildlife/biodiversity/pdf/Black_Ash_Recovery_Plan_Nova_Scotia.pdf

NSNR. (2018a). *At-risk lichens – Special management practices*. Nova Scotia Natural Resources. https://novascotia.ca/natr/wildlife/habitats/terrestrial/pdf/SMP_BFL_At-Risk-Lichens.pdf

NSNR. (2018b). *Nova Scotia wet places*. Nova Scotia Natural Resources.
<https://novascotia.ca/natr/wildlife/habitats/nswetlands/>

NSNR. (2019). *Nova Scotia karst risk map*. Nova Scotia Natural Resources.
<https://fletcher.novascotia.ca/DNRViewer/?viewer=Karst>

NSNR. (2020). *Recovery Plan for the Wood turtle (Glyptemys insculpta) in Nova Scotia [Final]*. Nova Scotia Natural Resources. <https://novascotia.ca/natr/wildlife/species-at-risk/docs/Recovery-plan-Wood-turtle.pdf>

NSNR. (2021a). *Acid rock drainage*. Nova Scotia Natural Resources. <https://novascotia.ca/natr/meb/hazard-assessment/acid-rock-drainage.asp>

NSNR. (2021b). *Addendum to recovery plan for the black ash (Fraxinus nigra) in Nova Scotia—Core habitat* (Nova Scotia Endangered Species Act Recovery Plan Series, p. 8). Nova Scotia Natural Resources. https://novascotia.ca/natr/wildlife/species-at-risk/docs/Core_habitat_Addendum_Black_ash.pdf

NSNR. (2021c). *Earthquakes and tsunamis*. Nova Scotia Natural Resources. <https://novascotia.ca/natr/meb/hazard-assessment/earthquakes-tsunamis.asp>

NSNR. (2021d). *Forest vegetation types—TH5*. Nova Scotia Natural Resources. <https://novascotia.ca/natr/forestry/veg-types/th/th5.asp>

NSNR. (2021e). *Mineral resource land-use (MRLU atlas)*. Nova Scotia Natural Resources. <https://novascotia.ca/natr/meb/geoscience-online/interactive-nts-map.asp>

NSNR. (2021f). *Nova Scotia geoscience atlas*. Nova Scotia Natural Resources. https://novascotia.ca/natr/meb/geoscience-online/geoscience_about.asp

NSNR. (2021g). *Nova Scotia interpreted forest inventory [Dataset]*. Nova Scotia Natural Resources. <https://nsgi.novascotia.ca/gdd/>

NSNR. (2021h). *Recovery plan for the eastern waterfan (Peltigera hydrothyria) in Nova Scotia* (Nova Scotia Endangered Species Act Recovery Plan Series). Nova Scotia Natural Resources. <https://novascotia.ca/natr/wildlife/species-at-risk/docs/RECOVERY-PLAN-Eastern-Waterfan.pdf>

NSNR. (2021i). *Recovery plan for the moose (Alces alces americana) in mainland Nova Scotia* (Nova Scotia Endangered Species Act Recovery Plan Series, p. 96). Nova Scotia Natural Resources. <https://novascotia.ca/natr/wildlife/biodiversity/pdf/recoveryplans/mainlandmooserecoveryplan.pdf>

NSNR. (2022a). *An old-growth forest policy for Nova Scotia*. Nova Scotia Natural Resources. <https://novascotia.ca/ecological-forestry/docs/old-growth-forest-policy.pdf>

NSNR. (2022b). *Guidance for bird and bat surveys pre- and post-construction surveys and monitoring – wind energy April 2022*.

NSNR. (2022c). *Nova Scotia pumping test database* (Version DP ME 498) [Dataset]. Nova Scotia Natural Resources. <https://novascotia.ca/natr/meb/download/dp498.asp>

NSNR. (2022d). *Pellet group inventory data collection protocol*. Nova Scotia Natural Resources.

NSNR. (2022e). *Protocol for mainland moose snow tracking survey—2022 update*. Nova Scotia Natural Resources.

NSNR. (2024a). *Hunter and trapper harvest statistics index*. Nova Scotia Natural Resources. <https://novascotia.ca/natr/hunt/furbearer-harvests.asp#bycount>

NSNR. (2024b). *Nova Scotia abandoned mine openings database* (Version 9) [Dataset]. Nova Scotia Natural Resources. <https://novascotia.ca/natr/meb/download/dp010.asp>

NSNR. (2024c). *Nova Scotia groundwater atlas*. Nova Scotia Natural Resources. <https://fletcher.novascotia.ca/DNRViewer/?viewer=Groundwater>

NSNR. (2024d). *Old growth forest policy map* [Dataset]. Nova Scotia Natural Resources. <https://data.novascotia.ca/Lands-Forests-and-Wildlife/Old-Growth-Forest-Policy-Map/fdyh-ypsm>

NSNR. (2024e). *Provincial landscape viewer*. Nova Scotia Natural Resources. <https://nsgi.novascotia.ca/plv/>

NSNR. (2024f). *Significant species and habitats database* [Dataset]. Nova Scotia Natural Resources. <https://novascotia.ca/natr/wildlife/habitats/hab-data/>

NSNR. (2024g, March). *Old forest assessment—Procedures version 1.5*. Nova Scotia Natural Resources.

NSNR. (2024h, August). *Bag limits and open seasons*. Nova Scotia Natural Resources. <https://novascotia.ca/natr/hunt/pdf/bag-limits-open-seasons.pdf>

NSNR. (2025). *Old growth potential index* [Dataset]. Nova Scotia Natural Resources.

NSPI. (2025). *Clean energy*. Nova Scotia Power Incorporated. <https://nspower.ca/cleanandgreen/clean-energy>

NSSA. (2005). *Adopt-A-Stream manual*. Nova Scotia Salmon Association. <http://manual.adoptastream.ca/Manual.html>

NSSA. (2014). "Walking the River" a citizen's guide to interpreting water quality data. Nova Scotia Salmon Association. <http://adoptastream.ca/sites/default/files/Water%20Quality%20-%20April%202014.pdf>

NWWG. (1997). *The Canadian wetland classification system* (B. G. Warner & C. D. A. Rubec, Eds.; Second edition). National Wetlands Working Group. Wetlands Research Centre, University of Waterloo.
<https://nawcc.wetlandnetwork.ca/Wetland%20Classification%201997.pdf>

NYSDPS. (2018). *Construction Traffic and Wind Turbine Delivery Vehicles – Case Number 16-F-0328, Submission 948*. New York State Department of Public Services.
<https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=16-F-0328&CaseSearch=Search>

ODNS. (2024). *Nova Scotia hydrographic network* [Dataset]. Open Data Nova Scotia.
https://data.novascotia.ca/Environment-and-Energy/Nova-Scotia-Hydrographic-Network/dk27-q8k2/about_data

O'Farrell, M. J., & Gannon, W. L. (1999). A comparison of acoustic versus capture techniques for the inventory of bats. *Journal of Mammalogy*, 80(1), 24–30. <https://doi.org/10.2307/1383204>

OLA. (2012). *Proponent's guide: The role of proponents in crown consultation with the Mi'kmaq of Nova Scotia*. Office of L'nu Affairs. <https://www.novascotia.ca/nse/ea/docs/ea-proponents-guide-to-mikmaq-consultation.pdf>

OLA. (2015). *Aboriginal People in Nova Scotia*. Office of L'nu Affairs.
<https://novascotia.ca/abor/aboriginal-people/>

OMNR. (2000). *Conserving the forest interior: A threatened wildlife habitat*. Ontario Ministry of Natural Resources. http://www.lrconline.com/Extension_Notes_English/pdf/forInterior.pdf

Padey, P., Blanc, I., Le Boulch, D., & Xiusheng, Z. (2012). A simplified life cycle approach for assessing greenhouse gas emissions of wind electricity. *Journal of Industrial Ecology*, 16(s1), S28–S38. <https://doi.org/10.1111/j.1530-9290.2012.00466.x>

Parisé, J., & Walker, T. R. (2017). Industrial wind turbine post-construction bird and bat monitoring: A policy framework for Canada. *Journal of Environmental Management*, 201, 252–259. <https://doi.org/10.1016/j.jenvman.2017.06.052>

Perry, R. W., & Thill, R. E. (2007). Roost characteristics of hoary bats in Arkansas. *The American Midland Naturalist*, 158(1), 132–138. [https://doi.org/10.1674/0003-0031\(2007\)158%255B132:RCOHB1%255D2.0.CO;2](https://doi.org/10.1674/0003-0031(2007)158%255B132:RCOHB1%255D2.0.CO;2)

Poot, H., Ens, B. J., de Vries, H., Donners, M. A. H., Wernand, M. R., & Marquenie, J. M. (2008). Green light for nocturnally migrating birds. *Ecology and Society*, 13(2), 47.

Potter, D. N. (2002). *Modelling fisher (martes pennanti) habitat associations in Nova Scotia* [MSc Thesis]. Acadia University.

Power Technology. (2024). *Solving wind's dirty secret: Innovating wind turbine blade disposal*. <https://www.power-technology.com/features/solving-winds-dirty-secret-innovation-in-wind-turbine-blade-disposal/>

Province of Nova Scotia. (2013). *Hurlburt Brook Nature Reserve*. <https://novascotia.ca/parksandprotectedareas/plan/lands-profiles/>

Public Safety Canada. (2024). *Regional hazards: Prince Edward Island*. Get Prepared. <https://www.getprepared.gc.ca/cnt/hzd/rgnl/pe-en.aspx>

Rabin, L. A., Coss, R. G., & Owings, D. H. (2006). The effects of wind turbines on antipredator behavior in California ground squirrels (*Spermophilus beecheyi*). *Biological Conservation*, 131(3), 410–420. <https://doi.org/10.1016/j.biocon.2006.02.016>

Raleigh, R. F. (1982). *Habitat suitability index models: Brook trout* (FWS/OBS-82/10.24; p. 42). US Fish and Wildlife Service.

Reusch, C., Lozar, M., Kramer-Schadt, S., & Voigt, C. C. (2022). Coastal onshore wind turbines lead to habitat loss for bats in Northern Germany. *Journal of Environmental Management*, 310. <https://doi.org/10.1016/j.jenvman.2022.114715>

Reynolds, C. (2011). *The effect of acidification on the survival of American eel*. <https://dalspaceb.library.dal.ca/server/api/core/bitstreams/93f2d635-04dc-40c8-b6ef-b9b491eeec9/content>

Rheult, H., Drapeau, P., Bergeron, Y., & Esseen, P. A. (2002). Edge effects on epiphytic lichen in managed black spruce forest of eastern North America. *Canadian Journal of Forest Research*, 33, 23–32. <https://DOI:10.1139/x02-152>

Robertson, B. A., & Hutto, R. L. (2007). Is selectively harvested forest an ecological trap for olive-sided flycatchers? *The Condor: Ornithological Applications*, 109(1), 109–121. <https://doi.org/10.1093/condor/109.1.109>

Rodewald, P. G., & Brittingham, M. C. (2004). Stopover habitats of landbirds during fall: Use of edge-dominated and early-successional forests. *The Auk*, 121(4), 1040–1055. <https://doi.org/10.1093/auk/121.4.1040>

- Roeleke, M., Blohm, T., Kramer-Schadt, S., Yovel, Y., & Voigt, C. C. (2016). Habitat use of bats in relation to wind turbines revealed by GPS tracking. *Scientific Reports*, 6(1). <https://doi.org/10.1038/srep28961>
- Rydell, J., Bach, L., Dubourg-Savage, M.-J., Green, M., Rodrigues, L., & Hedenström, A. (2010). Mortality of bats at wind turbines links to nocturnal insect migration? *European Journal of Wildlife Research*, 56(6), 823–827. <https://doi.org/10.1007/s10344-010-0444-3>
- Sæþórsdóttir, A. D., & Ólafsdóttir, R. (2020). Not in my back yard or not on my playground: Residents and tourists' attitudes towards wind turbines in Icelandic landscapes. *Energy for Sustainable Development*, 54, 127–138. <https://doi.org/10.1016/j.esd.2019.11.004>
- Scruton, D., & Gibson R.J. (1995, May). *Quantitative electrofishing in Newfoundland and Labrador: Result of workshops to review current methods and recommend standardization of techniques*. Department of Fisheries and Oceans Canada. https://publications.gc.ca/collections/collection_2014/mpo-dfo/Fs97-4-2308-eng.pdf
- Seewagen, C. L., Nadeau-Gneckow, J., & Adams, A. M. (2023). Far-reaching displacement effects of artificial light at night in a North American bat community. *Global Ecology and Conservation*, 48, e02729. <https://doi.org/10.1016/j.gecco.2023.e02729>
- Segers, J. L., & Broders, H. G. (2014). Interspecific effects of forest fragmentation on bats. *Canadian Journal of Zoology*, 92(8), 665–673. <https://doi.org/10.1139/cjz-2014-0040>
- Seifert, H., Westerhellweg, A., & Kröning, J. (2003, April). *Risk analysis of ice throw from wind turbines*. BOREAS 6, Pyhä, Finland. https://www.nhsec.nh.gov/projects/2008-04/documents/app_appendix_26.pdf
- Shannon, G., Crooks, K. R., Wittemyer, G., Fristrup, K. M., & Angeloni, L. M. (2016). Road noise causes earlier predator detection and flight response in a free-ranging mammal. *Behavioral Ecology*, 27(5), 1370–1375. <https://doi.org/10.1093/beheco/arw058>
- Shannon, G., McKenna, M. F., Angeloni, L. M., Crooks, K. R., Fristrup, K. M., Brown, E., Warner, K. A., Nelson, M. D., White, C., Briggs, J., McFarland, S., & Wittemyer, G. (2016). A synthesis of two decades of research documenting the effects of noise on wildlife. *Biological Reviews*, 91(4), 982–1005. <https://doi.org/10.1111/brv.12207>
- Shump, K. A., Jr., & Shump, A. U. (1982). *Lasius cinereus*. *Mammalian Species*, (185), 1–5. <https://doi.org/10.2307/3503878>
- Slough, B. G., Reid, D. G., Schultz, D. S., & Leung, M. C.-Y. (2023). Little brown bat activity patterns and conservation implications in agricultural landscapes in boreal Yukon, Canada. *Ecosphere*, 14(3), e4446. <https://doi.org/10.1002/ecs2.4446>

Squared Consultants Inc. (2025). *GHGenius*. GHGenius. <https://ghgenius.ca/>

Statistics Canada. (2023, November). *Census profile, 2021 census of population*.
<https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E>

Strum Consulting. (2025, November). *Setapuktuk wind project: Environmental Assessment Registration Document*. <https://novascotia.ca/nse/ea/setapuktuk-wind/>

Svec, J. R., Kolka, R. K., & Stringer, J. W. (2005). Defining perennial, intermittent, and ephemeral channels in Eastern Kentucky: Application to forestry best management practices. *Forest Ecology and Management*, 214(1), 170–182.
<https://doi.org/10.1016/j.foreco.2005.04.008>

T'an Weji-sqalia'tiek. (n.d.). *Mi'kmaw Place Names Digital Atlas*. Retrieved January 6, 2025, from <https://placenames.mapdev.ca/>

Tardif, J., & Bergeron, Y. (1992). Analyse écologique des peuplements de frêne noir (*Fraxinus nigra*) des rives du lac Duparquet, nord-ouest du Québec. *Canadian Journal of Botany*, 70(11), 2294–2302. <https://doi.org/10.1139/b92-285>

Tardif, J., & Bergeron, Y. (1999). Population Dynamics of *Fraxinus nigra* in Response to Flood-Level Variations, in Northwestern Quebec. *Ecological Monographs*, 69(1), 107–125.
<https://doi.org/10.2307/2657196>

Taylor, A. R., MacLean, D. A., Neily, P. D., Stewart, B., Quigley, E., Basquill, S. P., Boone, C. K., Gilby, D., & Pulsifer, M. (2020). A review of natural disturbances to inform implementation of ecological forestry in Nova Scotia, Canada. *Environmental Reviews*, 28, 387–414.
<https://doi.org/10.1139/er-2020-0015>

Taylor, P., Brzustowski, J. M., Matkovich, C., Peckford, M. L., & Wilson, D. (2010). radR: an open-source platform for acquiring and analysing data on biological targets observed by surveillance radar | BMC Ecology | Full Text. *BMC Ecology*, 10(22).
<https://doi.org/10.1186/1472-6785-10-22>

TGS. (2024). *Visit Guysborough—A secret worth sharing*. Tourism Guysborough County.
<https://visitguysborough.ca>

Tilman, D., Knops, J., Wedin, D., Reich, P., Ritchie, M., & Siemann, E. (1997). The influence of functional diversity and composition on ecosystem processes. *Science*, 277(5330), 1300–1302. <https://doi.org/10.1126/science.277.5330.1300>

Tittler, R., Hannon, S. J., Norton, M. R., & Tittler, R. (2001). Residual tree retention ameliorates short-term effects of clear-cutting on some boreal songbirds. *Ecological Applications*, 11(6), 1656–1666. [https://doi.org/10.1890/1051-0761\(2001\)011%255B1656:RTRAST%255D2.0.CO;2](https://doi.org/10.1890/1051-0761(2001)011%255B1656:RTRAST%255D2.0.CO;2)

TNS. (2021, January). *2019 Nova Scotia visitor exit survey: Overall results*. Tourism Nova Scotia. <https://app-tourism-dev.apps.ext.novascotia.ca/sites/default/files/2021-01/2019%20VES%20Full%20Year%20Report.pdf>

TNS. (2024). *2022/2023 visitor exit survey: Visitor profile*. Tourism Nova Scotia. https://tourismns.ca/sites/default/files/2024-08/VES22_VisitorProfile.pdf

Trombulak, S. C., & Frissell, C. A. (2000). Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology*, 14(1), 18–30. <https://doi.org/10.1046/j.1523-1739.2000.99084.x>

US EPA. (1995). *AP-42, CH 13.2: Fugitive dust sources*. <https://www3.epa.gov/ttnchie1/ap42/ch13/final/c13s02.pdf>

US EPA. (2013). *Water: Rivers & streams*. United States Environmental Protection Agency. <https://archive.epa.gov/water/archive/web/html/streams.html>

US EPA. (2014). *Near roadway air pollution and health: Frequently asked questions*. US Environmental Protection Agency. https://www.epa.gov/sites/default/files/2015-11/documents/420f14044_0.pdf

US EPA. (2024a). *Aluminum Industry*. Aluminum Industry. <https://www.epa.gov/eps-partnership/aluminum-industry>

US EPA. (2024b). *Health and environmental effects of particulate matter (PM)* [Overviews and Factsheets]. US Environmental Protection Agency. <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>

US FWS. (1988). *National list of plant species that occur in wetlands: Northeast (Region 1)—Documents—USFWS National Digital Library*. US Fish and Wildlife Service. <https://digitalmedia.fws.gov/digital/collection/document/id/1348/>

US FWS. (2009, May 19). *Brook trout*. US Fish & Wildlife Service. <https://www.fws.gov/species/brook-trout-salvelinus-fontinalis>

US FWS. (2022). *Atlantic Salmon (Salmo salar)—Species profile*. USGS Nonindigenous Aquatic Species Database. <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=926>

USDA NRCS. (2003). *Field indicators of hydric soils in the United States: Guide for identifying and delineating hydric soils* (G. W. Hurt, P. M. Whited, & R. F. Pringle, Eds.). US Department of Agriculture. http://fwf.ag.utk.edu/mgray/wfs340/PDF/NRCSHydricSoils_FieldIndicators.pdf

Visit Antigonish. (2025). *Antigonish—Nova Scotia's Free Spirit*. <https://Visitantigonish.Ca/>.
<https://visitantigonish.ca/>

Voigt, C. C. (2021). Insect fatalities at wind turbines as biodiversity sinks. *Conservation Science and Practice*, 3(5), e366. <https://doi.org/10.1111/csp2.366>

Vyn, R. J., & McCullough, R. M. (2014). The effects of wind turbines on property values in Ontario: Does public perception match empirical evidence? *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie*, 62(3), 365–392.
<https://doi.org/10.1111/cjag.12030>

Wellig, S. D., Nusslé, S., Miltner, D., Kohle, O., Glaizot, O., Braunisch, V., Obrist, M. K., & Arlettaz, R. (2018). Mitigating the negative impacts of tall wind turbines on bats: Vertical activity profiles and relationships to wind speed. *PLOS ONE*, 13(3), e0192493.
<https://doi.org/10.1371/journal.pone.0192493>

Wever, E. G., & Vernon, J. A. (1961). The protective mechanisms of the bat's ear. *Annals of Otology, Rhinology & Laryngology*, 70(1), 5–17. <https://doi.org/10.1177/000348946107000101>

Whitaker, D. M., Stauffer, D. F., Norman, G. W., Devers, P. K., Allen, T. J., Bittner, S., Buehler, D., Edwards, J., Friedhoff, S., Giuliano, W. M., Harper, C. A., & Tefft, B. (2010). Factors Affecting Habitat Use by Appalachian Ruffed Grouse. *The Journal of Wildlife Management*, 70(2), 460–471. [https://doi.org/10.2193/0022-541X\(2006\)70%255B460:FAHUBA%255D2.0.CO;2](https://doi.org/10.2193/0022-541X(2006)70%255B460:FAHUBA%255D2.0.CO;2)

Whitman, E., Sherren, K., & Rapaport, E. (2015). Increasing daily wildfire risk in the Acadian Forest Region of Nova Scotia, Canada, under future climate change. *Regional Environmental Change*, 15(7), 1447–1459. <https://doi.org/10.1007/s10113-014-0698-5>

Wills, M. (2021, June 26). *Road Density Threatens Turtle Populations*. JSTOR Daily.
<https://daily.jstor.org/road-density-threatens-turtle-populations/>

Wind Europe. (2017). *Mainstreaming energy and climate policies into nature conservation*. <https://windeurope.org/wp-content/uploads/files/policy/topics/sustainability/WindEurope-Paper-on-the-role-of-wind-energy-in-wildlife-conservation.pdf>

Wright, D. G., & Hopky, G. E. (1998). *Guidelines for the use of explosives in or near Canadian fisheries waters*. <https://publications.gc.ca/collections/Collection/Fs97-6-2107E.pdf>

You, F., Shaik, S., Rokonuzzaman, M., Rahman, K. S., & Tan, W.-S. (2023). Fire risk assessments and fire protection measures for wind turbines: A review. *Heliyon*, 9(9). <https://doi.org/10.1016/j.heliyon.2023.e19664>

Zedler, J. B., & Kercher, S. (2004). Causes and consequences of invasive plants in wetlands: Opportunities, opportunists, and outcomes. *Critical Reviews in Plant Sciences*, 23(5), 431–452. <https://doi.org/10.1080/07352680490514673>

Zimmerling, R. J., Pomeroy, A. C., d'Entremont, M. V., & Francis, C. M. (2013). Canadian estimate of bird mortality due to collisions and direct habitat loss associated with wind turbine developments. *Avian Conservation and Ecology*. <https://doi.org/10.5751/ACE-00609-080210>

Zinck, M. (1998). *Flora of Nova Scotia* (Vol. 1). Nimbus Publishing. <https://nimbus.ca/store/rolands-flora-of-nova-scotia.html?srsId=AfmBOoqJopOY5L1-q5cj6E8uLplKLzIJwEstGcAUTfO-srplCwR1fWF>

APPENDIX A

PROJECT PIDS

PID	Ownership	Within Project Footprint
01217348	Crown	Y
01241744	Private	Y
01241769	Crown	Y
01241777	Private	Y
01241942	Private	Y
01242080	Private	Y
01242296	Private	N
01242338	Private	Y
01242395	Private	Y
01242403	Private	Y
01242411	Private	Y
01242429	Private	Y
01242437	Private	Y
01242478	Crown	Y
01242486	Crown	Y
01242494	Private	Y
01242510	Private	Y
01242528	Private	Y
01242544	Private	N
01242569	Crown	Y
01242577	Private	Y
01242585	Private	Y
01242601	Private	Y
01242619	Private	Y
01242635	Private	Y
01242650	Private	Y
01242668	Private	Y
01242676	Private	Y
01242692	Private	Y
01242718	Private	Y
01253624	Private	Y
01253640	Private	Y
01265529	Crown	Y
01283969	Private	N
01283977	Private	Y
01292218	Private	Y
01296854	Private	Y
01304195	Private	N
01304203	Private	Y
01304211	Private	Y
01304229	Private	Y

PID	Ownership	Within Project Footprint
01304237	Private	Y
01304245	Private	Y
01305747	Private	Y
01310515	Private	Y
01310531	Crown	Y
01310549	Private	Y
01310564	Private	Y
01310572	Private	Y
01310580	Private	Y
01310598	Private	Y
01310606	Private	Y
01310614	Private	Y
01310622	Private	Y
01310630	Private	Y
01310648	Private	Y
01310655	Private	Y
01310663	Private	Y
01310689	Private	N
01310697	Private	Y
01310739	Private	Y
01310846	Private	N
01310978	Private	Y
01310986	Private	Y
10000073	Private	Y
10003101	Private	Y
10006302	Private	Y
10006393	Private	Y
10009504	Private	N
10010775	Private	Y
10011625	Private	Y
10028868	Private	Y
10032100	Private	Y
10033710	Private	Y
10049013	Crown	Y
10049237	Crown	Y
10049245	Crown	Y
10049252	Crown	Y
10049260	Crown	Y
10049278	Crown	Y
10049286	Crown	Y
10049294	Crown	Y

PID	Ownership	Within Project Footprint
10049310	Crown	Y
10049328	Crown	Y
10049336	Crown	Y
10049344	Crown	Y
10049351	Crown	Y
10049690	Crown	Y
10049708	Crown	Y
10049716	Crown	Y
10069268	Private	Y
10069276	Crown	Y
10075042	Private	Y
10089704	Private	Y
10093219	Private	N
10097517	Private	Y
10097525	Private	Y
10104669	Crown	Y
10105716	Crown	Y
10106763	Crown	Y
10115939	Private	Y
10116432	Private	Y
10116440	Private	Y
10119527	Crown	Y
10122257	Crown	Y
10126563	Private	Y
10128411	Private	Y
10130052	Private	Y
10130060	Private	Y
10133957	Private	Y
10134799	Private	Y
10134856	Private	Y
10134864	Private	Y
10134872	Private	Y
10134880	Private	Y
10138543	Private	Y
35002005	Private	N
35002112	Private	N
35002179	Private	Y
35002187	Private	Y
35002203	Private	Y
35002229	Private	Y
35002237	Private	Y

PID	Ownership	Within Project Footprint
35002260	Private	Y
35002286	Private	Y
35002294	Private	Y
35018191	Private	Y
35021567	Private	Y
35021575	Private	Y
35021583	Private	Y
35021591	Private	Y
35021609	Private	Y
35021617	Private	Y
35021641	Private	Y
35021658	Private	Y
35021666	Private	Y
35021682	Municipal	Y
35021690	Crown	Y
35021708	Private	Y
35021716	Private	Y
35021724	Private	Y
35021732	Private	Y
35021740	Private	Y
35021757	Private	Y
35021765	Private	Y
35021773	Private	Y
35021781	Private	Y
35021799	Private	Y
35021807	Private	Y
35022482	Crown	Y
35049055	Crown	Y
35049089	Private	Y
35049295	Municipal	Y
35051424	Municipal	Y
35053800	Private	Y
35053974	Private	Y
35055029	Private	Y
35056100	Private	Y
35056308	Private	Y
35076538	Private	N
35076553	Private	N
35079458	Private	Y
35079474	Private	Y
35096825	Crown	Y

PID	Ownership	Within Project Footprint
35096981	Crown	Y
35096999	Private	Y
35097005	Municipal	Y
35097088	Crown	Y
35106145	Private	N
35106558	Private	Y
35121623	Private	Y
35121631	Private	Y
35121649	Private	Y
35122506	Private	Y
35122639	Private	Y
35122647	Private	Y
35122654	Private	Y
35122662	Private	Y
35122704	Private	Y
35122712	Municipal	Y
35122720	Private	Y
35124726	Private	Y
35126952	Private	N
35130335	Road	Y
35130343	Road	Y
35130350	Road	Y
35130368	Road	Y
35130376	Road	Y
35130384	Road	Y
35130418	Road	Y
35130426	Road	Y
35130434	Road	Y
35130442	Road	Y
35130459	Road	Y
35130467	Road	Y
35130475	Road	Y
35130483	Road	Y
35130491	Road	N
35130509	Road	Y
35130517	Road	Y
35131051	Road	N
35168434	Private	Y
35168442	Private	Y
35180769	Private	Y
35200369	Private	Y

PID	Ownership	Within Project Footprint
35200377	Private	Y
35200385	Private	Y
35200393	Private	Y
35202589	Private	Y
35204007	Crown	Y
35208388	Private	Y
35217710	Private	Y
35219385	Private	Y
35219930	Crown	Y
35222553	Private	Y
35222561	Private	Y
35226562	Private	Y
35226570	Private	Y
35233238	Private	Y
35240035	Private	Y

APPENDIX B

ENGAGEMENT

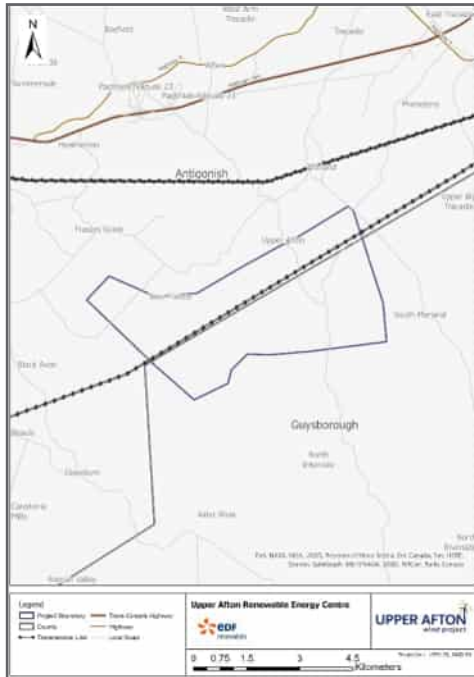


Upper Afton Renewable Energy Centre—Community Open House

NOTICE OF PUBLIC COMMUNITY MEETING

DECEMBER 15, 2021

Chedabucto Lifestyle Complex
(Multi Purpose Room)
60 Green St
Guysborough NS B0H 1N0
5:00-8:00 pm



PROPONENT

EDF Renewables Development Inc.

NAME OF THE PROPOSED PROJECT

Upper Afton Renewable Energy Centre

RENEWABLE SOURCE

On-Shore Wind

PROPOSED CAPACITY (MW)

90 MW

PROPOSED CONNECTION POINT

NS Power 230 kV Transmission Line

PROPOSED LOCATION OF THE PROJECT AND CONNECTION LINE

South of the community of Upper Afton
in County of Antigonish & Guysborough

Join us at our community open house to take part in the conversation about our proposed Upper Afton Renewable Energy Centre.

In advance of the meeting, we wanted to share with you some key project details:

- **EDF Renewables Development Inc plans to submit the proposed Upper Afton Renewable Energy Centre into the Nova Scotia Rate Base Procurement Request for Proposal that will be released in the upcoming weeks.**
- **If approved, the 90 MW Project will interconnect to Nova Scotia Power's existing 230 kilovolt transmission line running across the project area. The Project is located south of the community of the County of Antigonish and the Municipality of the District of Guysborough, Nova Scotia and will include approximately 16 to 17 turbine locations.**
- **The proposed Upper Afton Renewable Energy Centre is in the early stages of planning; therefore, all project information is preliminary.**
- **EDF Renewables Development Inc./ Upper Afton Renewable Energy Centre will host more public meetings as the project planning continues.**
- **The Projects selected by the Procurement Administrator will be awarded with an opportunity to execute a Power Purchase Agreement with Nova Scotia Power Inc.**

EDF Renewables Canada has been developing and operating clean energy projects across the country since 2008. With head offices in Montreal and Toronto, our 100+ employees across Canada focus on ways to build high-quality power projects by establishing long-term business relationships with people who share our mission of delivering renewable solutions to lead the transition to a sustainable energy future. The nature of our business directly benefits the environment, but our commitment doesn't stop in the field. With 2,602 MW of renewable energy put into service, under construction or contracted across the country, we also consider the environment where we work and live. It is a critical part of our culture to take environmental initiatives wherever possible in our host communities.

Our global development experience ensures that we are the trusted partner to develop, build, operate and maintain any renewable energy project. Our goal is to develop, build, and operate the Upper Afton Renewable Energy Centre to meet this high standard of success. The development team looks forward to meeting with you and sharing more about the project and its benefits to the local community. If you cannot attend the meeting, or if you have a question at any time, please contact us at:

CA-upperraftonwindproject@edf-re.com.

PUBLIC COMMUNITY MEETINGS INFORMATION

Upper Afton Renewable Energy Centre is proposing to submit a proposal to The Rate Base Procurement ("RBP") that is aiming to attract innovative Renewable Low-Impact Electricity ("RLE") solutions in Nova Scotia, for approximately 350 megawatts (MW).

This notice is being distributed to notify members of the public of a public community meeting that has been scheduled to discuss the proposed Project. Information regarding EDF Renewables Canada, the Upper Afton Wind Energy Centre, and the meeting details are described below.

This public community meeting is being held as part of the early community engagement requirements of the RFP. The public community meeting will present details about the Upper Afton Wind Energy Centre and its proposed connection line. Representatives of EDF Renewables Canada will be available to discuss the Project. Should Upper Afton Wind Energy Centre be awarded a contract, the Project would need to obtain all required permits and approvals and conduct any further required community engagement activities.

Further details regarding the RFP process are available at <https://novascotiabpp.com/rfp>.

Jérôme Dagenais
Development Coordinator
1010 Rue de la Gauchetière Ouest
Montréal, Québec, QC H3B 2N2
514-397-9997
CA-upperraftonwindproject@edf-re.com

Madalina Udriou
Stakeholder Relations
1010 Rue de la Gauchetière Ouest
Montréal, Québec, QC H3B 2N2
514-397-9997
CA-upperraftonwindproject@edf-re.com

 **edf**
renewables
www.edf-re.com



EDF Renewables Canada Inc.
53 Jarvis Street, Suite 300
Toronto, ON, M5C 2H2



NOTICE OF PUBLIC COMMUNITY MEETING

DECEMBER 15, 2021

5:00-8:00 PM



WINTER 2021

PROJECT UPDATES

- EDF Renewables plans to submit the proposed Upper Afton Renewable Energy Centre into the Nova Scotia Rate Base Procurement Request for Proposal that will be released in the upcoming weeks. The Project seeks to be awarded with an opportunity to execute a Power Purchase Agreement with Nova Scotia Power Inc. (NSPI) for the sale of renewable electricity.
- If approved, the 90 MW Project will interconnect to NSPI's existing 230 kilovolt transmission line running across the project area.
- The Project is located south of the community of Upper Afton in County of Antigonish & Guysborough in Nova Scotia and will include approximately 16 to 17 turbine locations.
- The proposed Upper Afton Renewable Energy Centre is in the early stages of planning; therefore, all project information is preliminary.
- EDF Renewables / Upper Afton Renewable Energy Centre will host more public or virtual meetings as the project planning continues.



VIRTUAL OPEN HOUSE

We have created a virtual open house website where you can learn more about the project, such as:

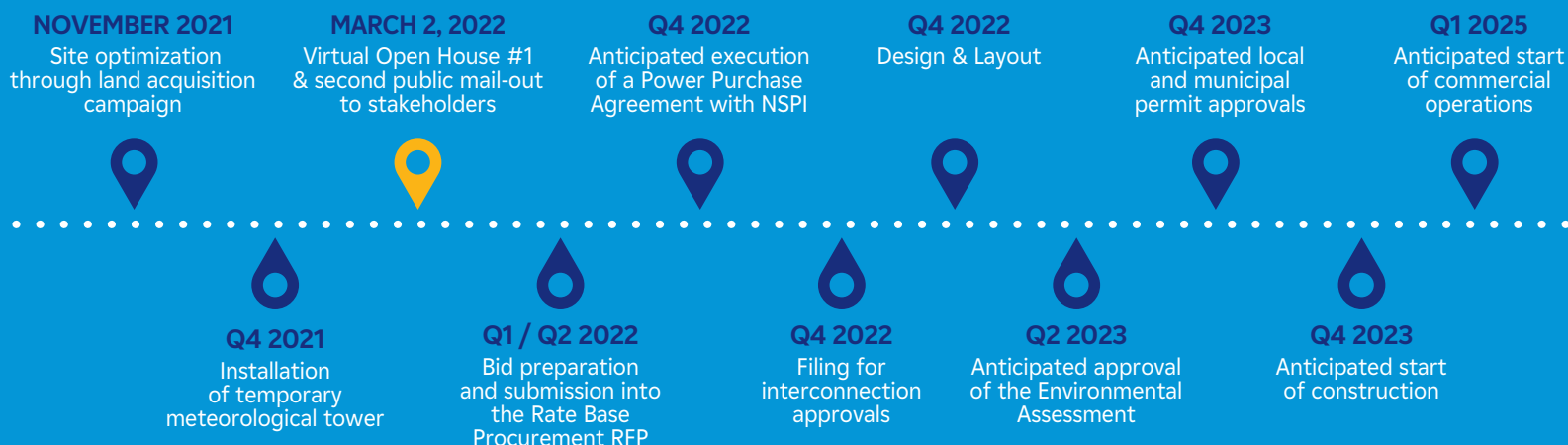
- Updates to the proposed project
- The permitting and engagement processes, including timelines
- Benefits to the local community
- Construction and operations
- And more

You can also ask questions and share your feedback with the project team through the project website, through the virtual open house online platform or via email.

Access to the virtual open house anytime here:
<https://bit.ly/UpperAfton>

We look forward to connecting with you!

PROJECT TIMELINE



Schedule is subject to change

Stay connected.



www.edf-re.com/project/upper-afton-wind/
CA-upperaftonwindproject@edf-re.com
 1-844-576-1139

Jérôme Dagenais
Development Coordinator

Madalina Udriou
Stakeholder Relations

1010 Rue de la Gauchetière Ouest
Montréal, Québec, QC H3B 2N2
514-397-9997
CA-upperaftonwindproject@edf-re.com

 **edf**
renewables
www.edf-re.com

You're Invited!

Upper Afton Wind Project Open Houses

EverWind invites you to join us at one of our upcoming open house information sessions to learn more about the Upper Afton Wind Project, a proposed 176MW wind development involving up to 28 turbines located in Antigonish and Guysborough counties, near the communities of New France, Upper Afton, South Merland and Upper Big Tracadie.

These informal drop-in sessions, featuring poster boards, are an opportunity to meet the team, review early project information, ask questions, and share your feedback in an open and collaborative setting. Community input is an important part of the planning process, and we welcome your participation.

Newly Added Open House Session

Tuesday, Jan. 20, 2026
10:00 a.m. – 12:30 p.m.

St. Patrick's Hall
220 North Intervale Rd, Guysborough

Open House Sessions

Tuesday, Jan. 20, 2026
2:30 – 5:30 p.m.

Paqtneke Community Centre
136 Afton Loop, Antigonish

Wednesday, Jan. 21, 2026
1:30 – 4:30 p.m.

Heatherton & Area Community Centre
42 Summerside Rd, Heatherton

Wednesday, Jan. 21, 2026
6:00 – 8:00 p.m.

Tracadie Community Hall
472 NS-16, Monastery

Do you have questions?

We'd love to hear from you. Email us at info@upperaftonwind.com or visit everwindfuels.com for more information.



SEND YOUR NEWS, PHOTOS, LETTERS AND COMMUNITY EVENTS TO NEWS@GUYSBOROUGHJOURNAL.CA

A-1 GUTTER SYSTEMS INC.

Auld's Cove, NS
Tel: 902-747-2341
Fax: 902-747-2525
Terry Sampson

— FREE Estimates — Blown-In Insulation —
— Spray Foam Insulation — Siding —
— Roofing — Replacement Windows —
— 5" and 6" Seamless Rain Gutters —

"The Best in The Long Run"



JAIME BATTISTE
MEMBER OF PARLIAMENT
CAPE BRETON-CANSO-ANTIGONISH

+1 (902) 567-6275
jaime.battiste@parl.gc.ca



Greg Morrow
MLA - Guysborough-Tracadie

902-333-2777
gregmorrow4gr@gmail.com
9996 HWY 16, Guysborough



ANTIGONISH TAX SERVICES
Chartered Professional Accountants

HOURS: Mon to Fri – 9 a.m. to 5 p.m.
LOCATION: 325 Main Street, Suite B2
TELEPHONE: 902-863-1447



Hon. Michelle Thompson
MLA for Antigonish

325 Main Street, Antigonish
Suite 222
902-863-4266
michellethompsonmla@gmail.com



SEAN FRASER, MP

1-844-641-5886
sean.fraser@parl.gc.ca
/SeanFraserMP
seanfrasermp.ca
#HERETOHELP



IT'S TIME TO TOYOTA

TRI-MAC
46 Paint Street
Port Hawkesbury

TOYOTA

Tundra
CrewMax Reg Bed SR5

Finance for \$474 Bi-Weekly 84 Month Term	Or Lease for \$391 Plus Tax Bi-weekly/60 mos.

Vehicle shown: 2025 Tundra CrewMax Reg Bed SR5

902-625-3040
TRIMACTOYOTA.CA

Province supports research into mental health, addictions

NOVA SCOTIA — The province is supporting Nova Scotia-based research examining how social and environmental factors influence mental health and addictions.

Grants of up to \$100,000 over two years are available for projects

that explore how mental health and addictions intersect with social determinants such as housing, food security, education, employment and social inclusion. A total of \$400,000 in research funding is available through Research

Nova Scotia.

"Mental health and wellness are influenced by many factors, like social environments, access to housing, education and more," said Brian Comer, Minister of Addictions and Mental Health in a news release

on Jan. 12. "Research that is focused on Nova Scotia and what shapes mental health and addiction here at home will help us build a stronger system of care for all."

The government said it continues to work with healthcare providers

and community partners to identify and reduce social barriers that influence health outcomes. This includes investments in food security initiatives, free bus passes for people on income assistance and funding for community organizations delivering mental health and addictions programs.

"This funding has been essential in supporting me to establish

my lab at StFX and has enabled me to start building a program of research that seeks to improve equitable access to mental healthcare in rural Nova Scotia," noted 2025 grant recipient Jill Murphy in the release.

Expressions of interest must be submitted by Feb. 11 at 1 p.m. More information on the grants and how to apply is available at researchns.ca/mharfa.

You're Invited!

Upper Afton Wind Project Open Houses

EverWind invites you to join us at one of our upcoming open house information sessions to learn more about the Upper Afton Wind Project, a proposed 176MW wind development involving up to 28 turbines located in Antigonish and Guysborough counties, near the communities of New France, Upper Afton, South Merland and Upper Big Tracadie.

These informal drop-in sessions, featuring poster boards, are an opportunity to meet the team, review early project information, ask questions, and share your feedback in an open and collaborative setting. Community input is an important part of the planning process, and we welcome your participation.

Newly Added Open House Session

Tuesday, Jan. 20, 2026
10:00 a.m. – 12:30 p.m.

St. Patrick's Hall
220 North Intervale Rd, Guysborough

Open House Sessions

Tuesday, Jan. 20, 2026
2:30 – 5:30 p.m.

Paqtnkek Community Centre
136 Afton Loop, Antigonish

Wednesday, Jan. 21, 2026
1:30 – 4:30 p.m.

Heatherton & Area Community Centre
42 Summerside Rd, Heatherton

Wednesday, Jan. 21, 2026
6:00 – 8:00 p.m.

Tracadie Community Hall
472 NS-16, Monastery

Do you have questions?

We'd love to hear from you. Email us at info@upperaftonwind.com or visit everwindfuels.com for more information.

 **Upper Afton Wind**



**ANTIGONISH
TAX SERVICES**
Chartered Professional Accountants

HOURS: Mon to Fri – 9 a.m. to 5 p.m.
LOCATION: 325 Main Street, Suite B2
TELEPHONE: 902-863-1447

SEAN FRASER, MP

1-844-641-5886
sean.fraser@parl.gc.ca
[/SeanFraserMP](https://www.seanfrasermp.ca)
[seanfrasermp.ca](https://www.seanfrasermp.ca)

#HERETOHELP



**Hon. Michelle Thompson
MLA for Antigonish**

325 Main Street, Antigonish
Suite 222
902-863-4266
michellethompsonmla@gmail.com



[@GregMorrowMla](https://www.gregmorrow.ca)

Greg Morrow
MLA - Guysborough-Tracadie

902-333-2777
gregmorrow4gt@gmail.com
9996 HWY 16, Guysborough



JAIME BATTISTE
MEMBER OF PARLIAMENT
CAPE BRETON-CANSO-ANTIGONISH

+1 (902) 567-6275
jaime.battiste@parl.gc.ca



WWW.GUYSBOROUGHJOURNAL.CA



SUBSCRIBE: It takes cents and makes sense!

Get a one-year subscription to *The Journal* for about a dollar a week (\$65 after taxes, includes print and digital editions).

Full details: www.guysboroughjournal.ca/subscribe.php

**GUYSBOROUGH
JOURNAL**
KEEPING AN EYE ON THE COAST

You're Invited!

Upper Afton Wind Project Open Houses

EverWind invites you to join us at one of our upcoming open house information sessions to learn more about the Upper Afton Wind Project, a proposed 176MW wind development involving up to 28 turbines located in Antigonish and Guysborough counties, near the communities of New France, Upper Afton, South Merland and Upper Big Tracadie.

These informal drop-in sessions, featuring poster boards, are an opportunity to meet the team, review early project information, ask questions, and share your feedback in an open and collaborative setting. Community input is an important part of the planning process, and we welcome your participation.

Newly Added Open House Session

Tuesday, Jan. 20, 2026
10:00 a.m. – 12:30 p.m.

St. Patrick's Hall
220 North Intervale Rd, Guysborough

Open House Sessions

Tuesday, Jan. 20, 2026
2:30 – 5:30 p.m.

Paqtnkek Community Centre
136 Afton Loop, Antigonish

Wednesday, Jan. 21, 2026
1:30 – 4:30 p.m.

Heatherton & Area Community Centre
42 Summerside Rd, Heatherton

Wednesday, Jan. 21, 2026
6:00 – 8:00 p.m.

Tracadie United Baptist Church Hall
472 NS-16, Monastery

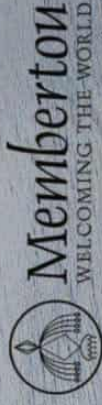
Do you have questions?

We'd love to hear from you. Email us at info@upperaftonwind.com or visit everwindfuels.com for more information.

Welcome / Pjila'si

Upper Afton Wind Project

Community Open House 2026



*Visual simulation of the proposed Upper Afton Wind Project

Land Acknowledgement

This project is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq people, who have been the caretakers of this land since time immemorial and continue to be today.

The Upper Afton Wind Project is being developed in partnership with Mi'kmaq communities, with a shared commitment to Indigenous leadership, respect for rights and knowledge, and meaningful, long-term collaboration.

We also recognize African Nova Scotians as a distinct people whose histories, cultures, and contributions have shaped Nova Scotia for more than 400 years and continue to enrich communities across the province.

About the Membertou Led Indigenous Consortium



- Membertou Development Corporation is **leading a Mi'kmaq Nations consortium with 51% equity ownership** in the wind project.
- The project follows an **Indigenous-majority ownership model**, supporting **meaningful shared leadership and decision-making**.
- The partnership enables long-term **participation in both the development, construction and operation** of the project.
- The consortium structure reflects a commitment to **economic reconciliation, local capacity building, and intergenerational benefits** for participating Mi'kmaq communities.

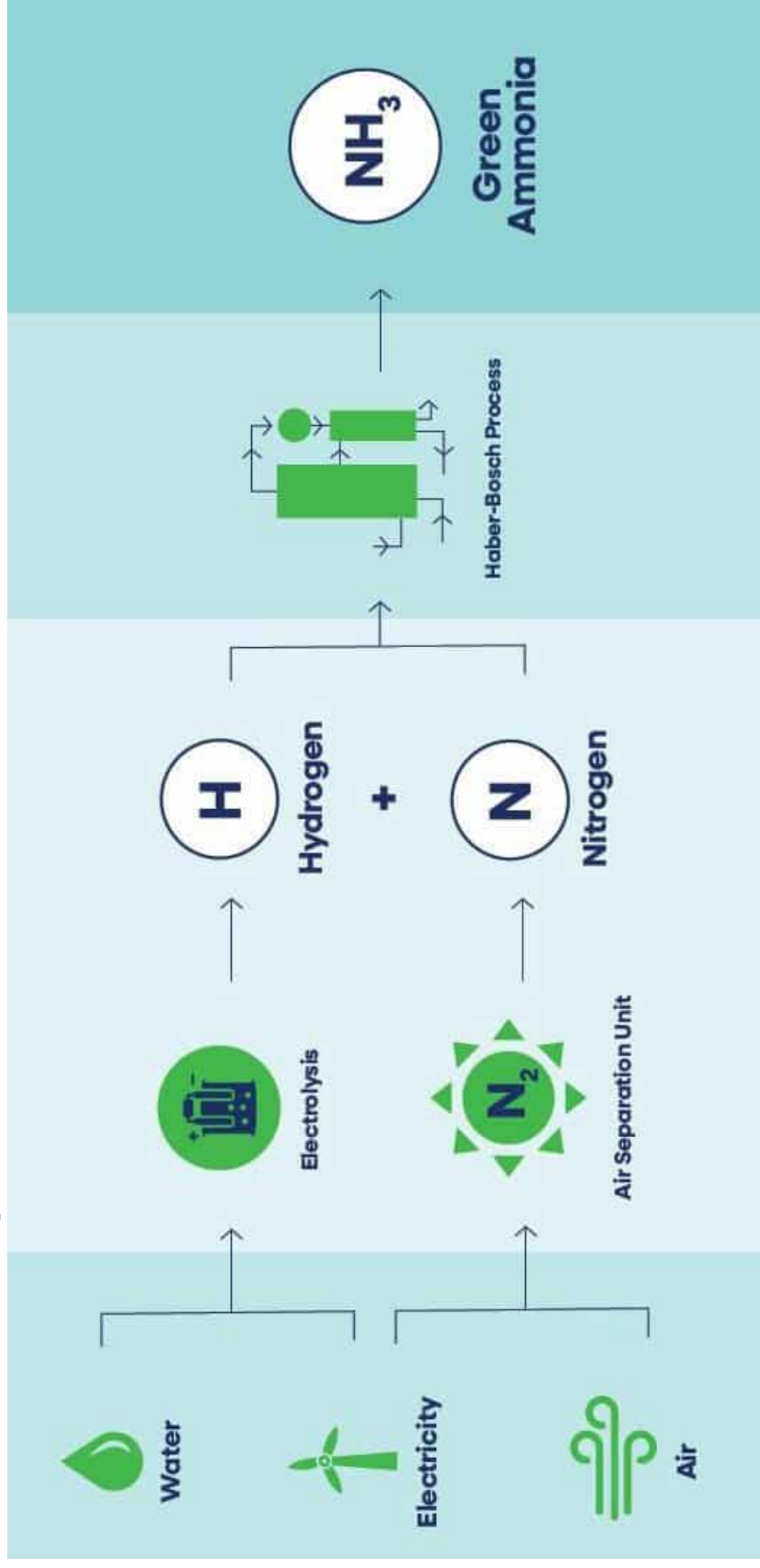


About EverWind

- **Atlantic Canadian company** developing green hydrogen and green ammonia projects across Atlantic Canada.
- Building on **existing marine and energy infrastructure** to deliver clean fuel solutions.
- Supplying **domestic and international markets** with large-scale, low-carbon energy.
- **Team of 100+ employees**, primarily from local communities, supported by technical partners.
- **Experienced developers, owners, and operators** of complex infrastructure projects across North America.
- Committed to **responsible development** grounded in environmental stewardship, Indigenous partnership, community engagement, and **long-term economic benefit**.



Green Hydrogen: Stored Wind Power



Point Tupper Green Fuels Project Overview

Green Hydrogen
& Ammonia Plant

Ammonia Pipeline





Phase 1 Wind Projects



Phase 2 Wind Projects



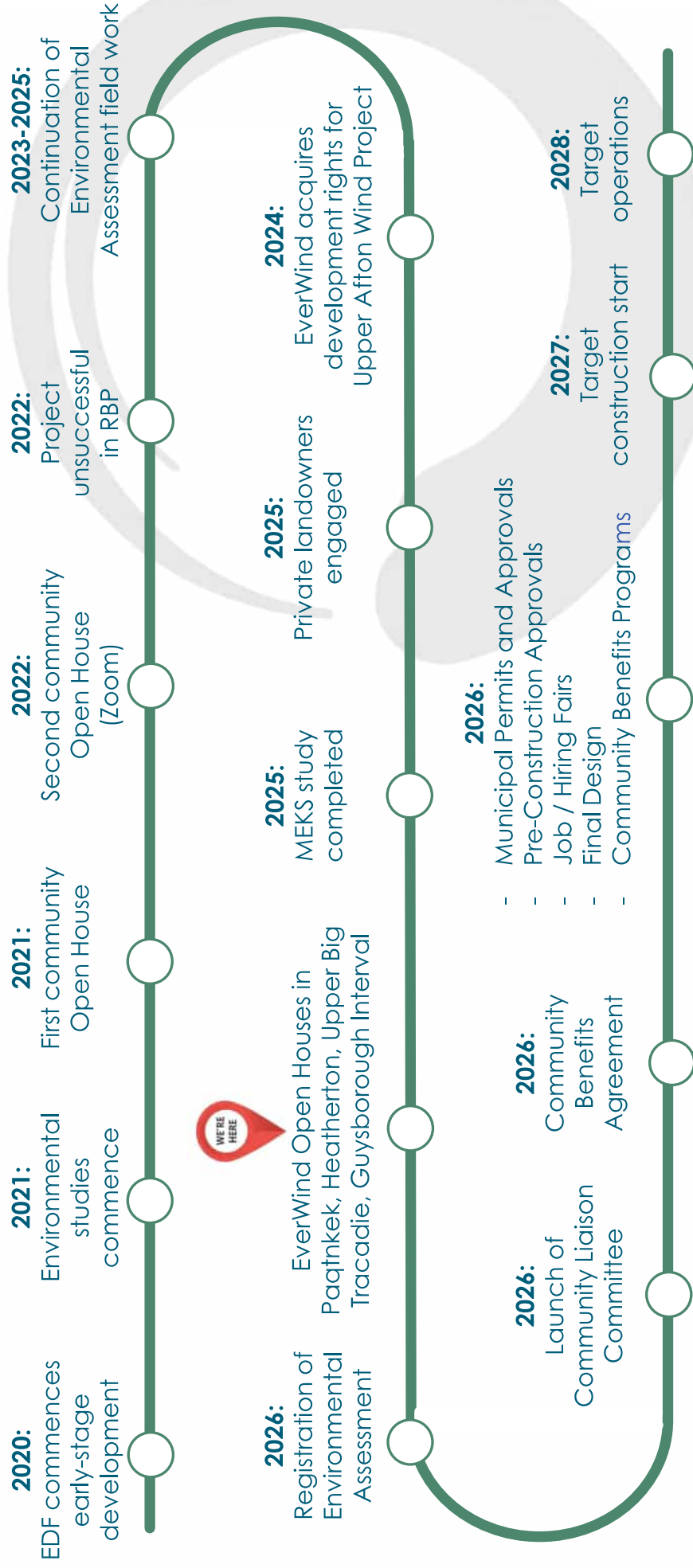
Green Fuels Projects (GFP)

About the Upper Afton Wind Project

The Upper Afton Wind Project was initiated in 2020, with early development work led by EDF Renewables. EverWind, in partnership with a Membertou-led Mi'kmaq Nation consortium, has since taken over development and is proposing a wind energy project of up to 176 MW connected to the Nova Scotia power grid.

Project Capacity	176 MW
Ownership	Membertou-led Indigenous Consortium (Majority) & EverWind (Minority)
# Turbines	Up to 28 turbines
# Turbines on Private / Crown Land	20 Private & 8 Crown
Turbine Model	Goldwind GWH182-8.0
Hub Height	130 m
Total Height	~221 m
Interconnection	Existing NSP HV transmission line

Where We Are & Where We're Going



How a Wind Project is Sited

Choosing where to place wind turbines is a careful, multi-step process. No single factor decides where turbines go. It's about balancing technical, environmental, and community considerations.

When siting a wind project, the project team looks at:

- **Wind resource:** Areas with strong, consistent wind that can reliably generate electricity.
- **Land and terrain:** Land suitability, slope, soil conditions, and safe access for construction and maintenance.
- **Environmental studies:** Detailed studies to understand potential effects on wildlife, wetlands, watercourses, forests, and habitats, and how impacts can be avoided or reduced.
- **Setbacks and regulations:** Provincial and municipal requirements, including minimum distances from homes, roads, water bodies, and other features.
- **Cultural and archaeological considerations:** Studies and engagement to identify and protect areas of cultural, archaeological, or historical importance.
- **Community input:** Local knowledge, feedback, and concerns shared through open houses, engagement sessions, and future Community Liaison Committee discussions.

Siting decisions are refined over time as studies are completed, and community feedback is considered. The goal is to place turbines in locations that are safe, responsible, and respectful of the environment and nearby communities.

Upper Afton Wind Project Site Overview

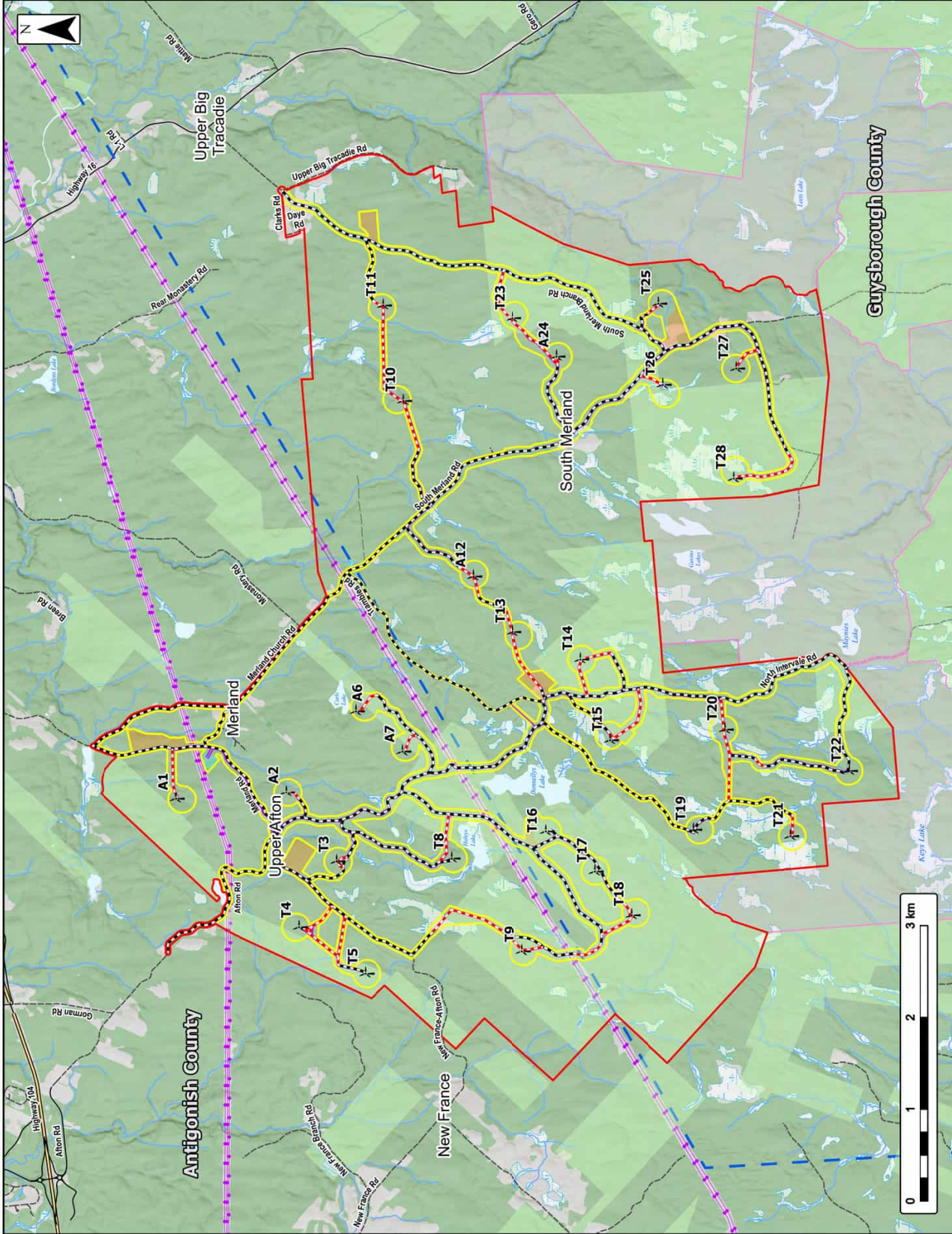


- Utilities (line)**
 - High Voltage Transmission Lines
 - Proposed Turbine Location
 - Collector Line
 - Existing Road
 - Proposed New Road
 - Landform Area
 - Substation
 - County Boundary
 - Tracadie Wilderness Area
 - Crown Land
- Transportation**
 - Trans-Canada Highway
 - Road
 - Unpaved Road
- Water Features**
 - Mapped Stream
 - Mapped Lakes and Rivers
 - Mapped Wetland



Coordinates: 46°00'N, 70°00'W
Scale: 1:40,000
Date: 2026-01-12
Project #: 24-11145
Drawing #: 1
Drawn By: K. Wallace
Checked By: R. Hearn

strum
CONSULTING
VAV



Environmental Assessment

Purpose

- An Environmental Assessment helps proponents plan projects to minimize environment impacts.

EA Registration Documents Include

- Information on the Project (location, phases of development, construction, schedule etc.).
- Indigenous and public engagement.
- Methods and results of baseline studies (desktop, field, predictive modelling etc.).
- Proposed mitigations.
- Significance of adverse effects on Valued Environmental Components (VECs).

Registration

- Public are notified of registration and have 40 days to submit comments.
- The EA is reviewed by a wide variety of provincial and federal departments.
- Regulators evaluate the design and plan of the Project through the EA process, to ensure environmental impacts are identified and managed before a project is constructed.
- Decision made by the Minister of Nova Scotia Environment and Climate Change.

Environmental Studies

- ✓ **Thousands of hours of studies**, completed by scientists, biologists, engineers and other technical experts.
- ✓ Informed by years of local community, regulatory and Indigenous engagement activities and feedback.
- ✓ Cumulative impacts are being considered.



Birds & Bats

- Breeding and migratory surveys, radar & acoustic monitoring, habitat surveys
- Targeted surveys for nightjars



Aquatic Environment

- Fish & fish habitat
- Wetland delineation and functional assessments



Terrestrial Wildlife

- Year-round surveys for terrestrial wildlife
- Targeted mainland moose and wood turtle surveys



Terrestrial Habitat

- Rare plant surveys
- Lichen surveys
- Old growth forest surveys
- Habitat assessments



Atmospheric Environment

- Greenhouse gas (GHG) assessment
- Noise modelling
- Shadow flicker modelling



Geophysical Environment

- Surficial and bedrock geology
- Groundwater



Heritage & Cultural

- Mi'kmaq Ecological Knowledge Study (MEKS)
- Archaeological Resource Impact Assessment (ARIA)



Social & Economic

- Desktop assessments for: local & provincial economy, land use & value, and recreation & tourism



Upper Afton Wind



Memberton
WELCOMING THE WORLD

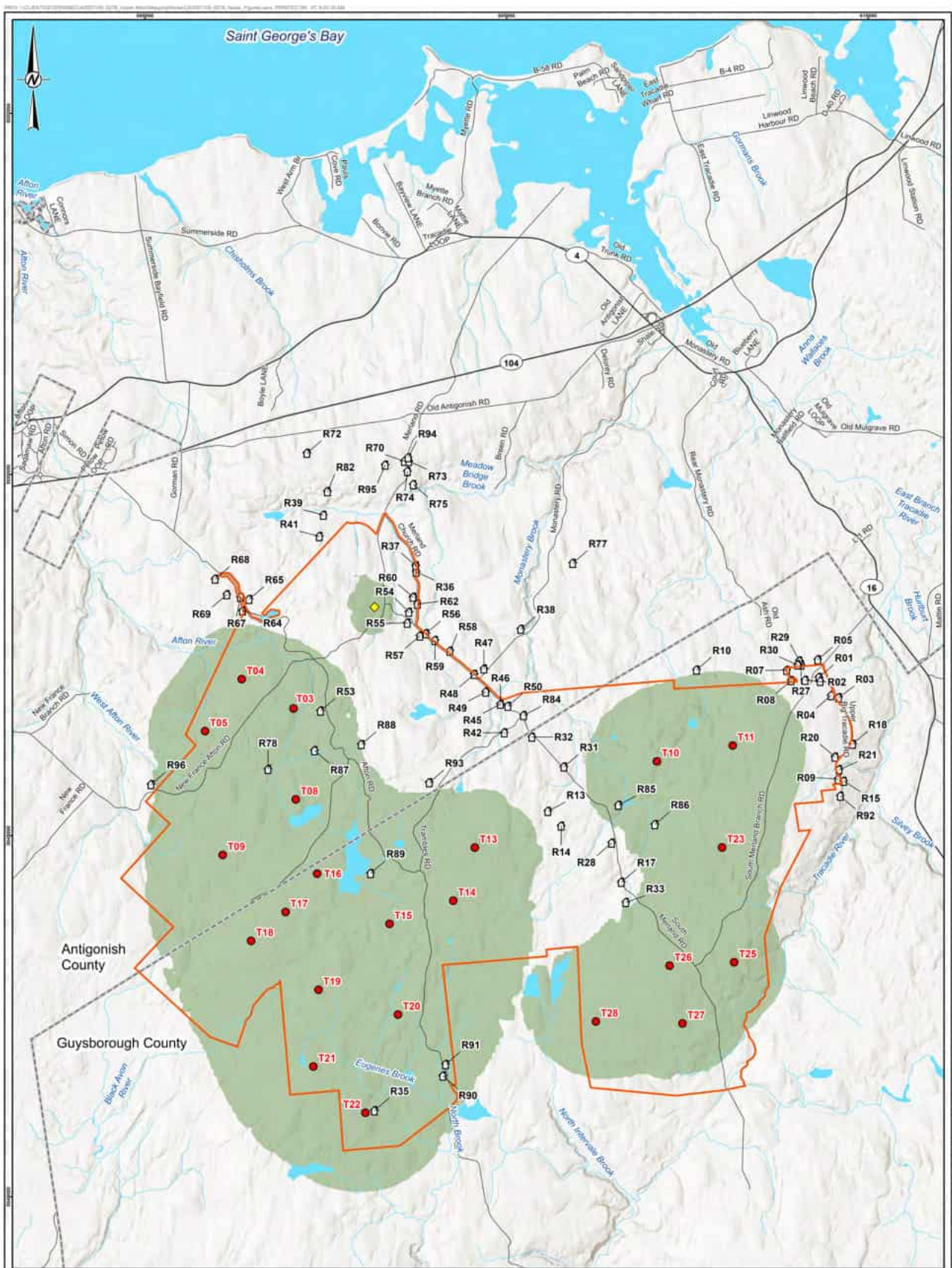


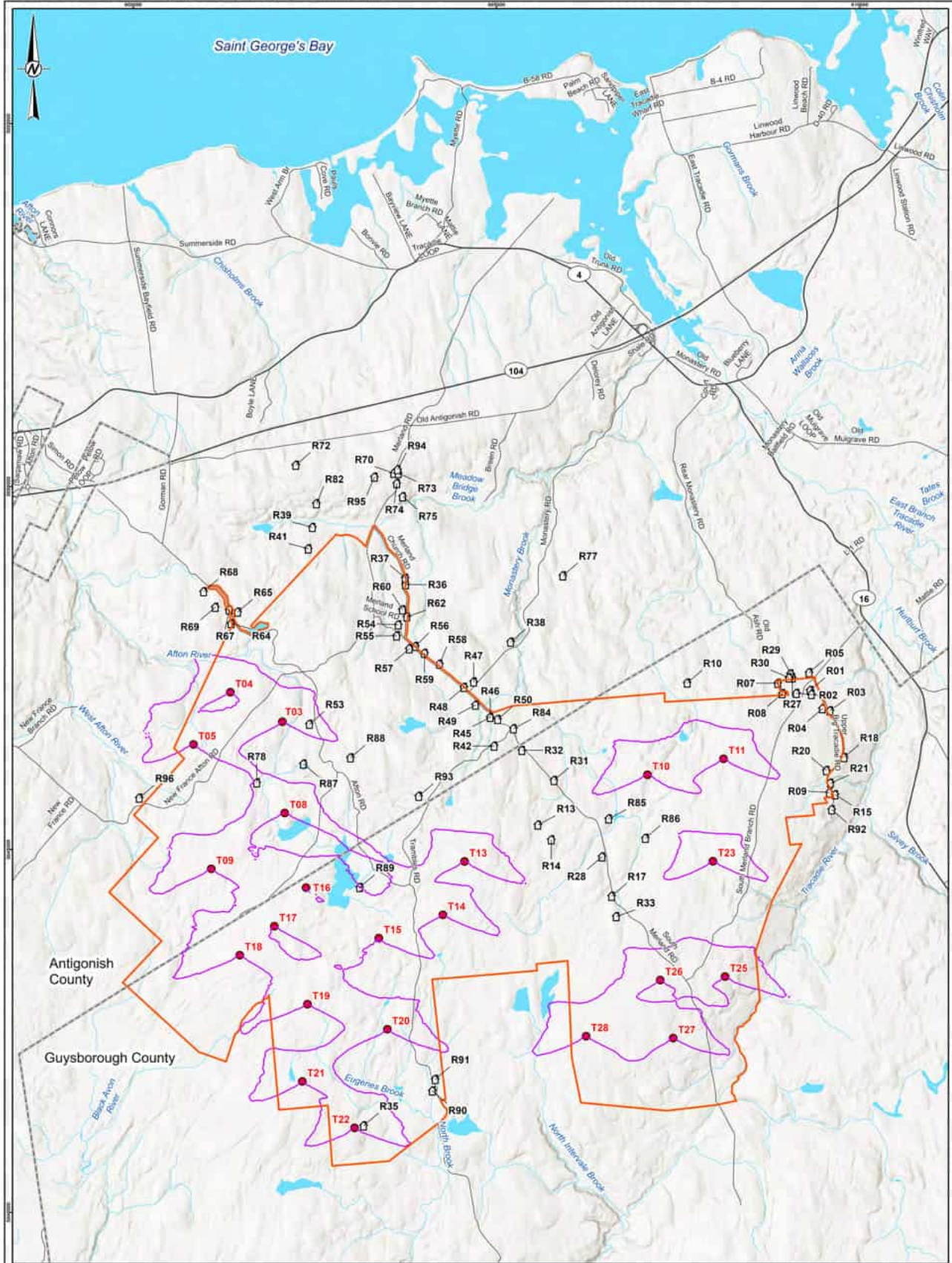
EVERWIND

Environmental Monitoring

- Prior to certain project phases, the following plans will be developed, implemented, and submitted to Nova Scotia Environment and Climate Change:
 - Surface Water Management Plan
 - Erosion and Sediment Control Plan
 - Blasting Management Plan (if blasting is required)
 - Terrestrial Habitat and Wildlife Management Plan
 - Avian and Bat Monitoring Plan
 - Adaptive Management Plan
 - Complaints Resolution Plan
 - Mi'kmaq Communication Plan
 - Contingency Plan
- A second year of radar and acoustic monitoring for birds and bats will be completed prior to operations.
- Two years of monitoring for birds and bats will be completed during operations.
- Two years of monitoring for mainland moose is typically required during operations.
- A Traffic Management Plan will be developed.







- LEGEND**
- POTENTIAL RECEPTOR
 - HIGHWAY
 - LOCAL ROAD
 - WATERCOURSE
 - WATERBODY
 - MUNICIPAL BOUNDARY
 - STUDY AREA
 - TURBINE
 - PREDICTED SHADOW FLICKER (ADJUSTED-CASE)
 - 30 HOURS PER YEAR



REFERENCE(S)
 DIGITAL BASE DATA OBTAINED FROM GEOGRAPHICS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD83 PROJECTION: UTM ZONE 20

CLIENT
 EVERWIND FUELS (EWF)

PROJECT
 UPPER AFTON

CONSULTANT

DATE: 2026-01-14
 DESIGNED: VY
 PREPARED: MV
 REVIEWED: NLH
 APPROVED: KG

TITLE
 SHADOW FLICKER LEVELS

PROJECT NO: CA0057109.6278 CONTROL: REV: 0 FIGURE: 2

Local Benefits: Direct, Indirect & Induced

- We believe our projects are net positives for the local communities in which we work.
- Benefits include:
 - **Billion-dollar Investment** in the Strait Region with various wind projects and Point Tupper plant infrastructure.
 - Contracting opportunities for **Indigenous & local businesses**.
 - **Community Benefits Funds** paid out annually directly to the community through a combination of Proximity Payments, Vibrancy Fund and Bursaries.
 - Increased **local spending** on goods and services during the project's development, construction and operational phases.
 - **Direct economic opportunities** for landowners.
 - Millions in project lifetime paid to municipalities (*Subject to installed nameplate capacity):

Annual Municipal Tax

~\$1.5 million per year*

Project Life Municipal Tax

~\$64 million*

Wind development creates lasting economic spin-offs, supports local services, and delivers **stable, long-term revenue** to local municipalities.



Upper Afton Wind



Memberton
WELCOMING THE WORLD



EVERWIND

Significant Job Creation



200-250 of Direct Jobs During Construction:

- ✓ **Civil installation:** land clearing, road construction, forming, concrete supply, grouting
- ✓ **Electrical installation:** overground installation, electrical testing, instrument installation
- ✓ **Turbine installation:** crane supply, turbine offload, mechanical and electrical work
- ✓ **Local businesses:** to benefit from increased local spending with larger local workforce

~8 Part-Time and Full-Time Jobs during Operations and Maintenance:

- ✓ HV Technicians / Electricians
- ✓ Wind Technicians
- ✓ Road Maintenance Workers
- ✓ Vegetation Management Service Providers
- ✓ Snow & Surface Removal
- ✓ Administrative Support
- ✓ Inventory / Materials Management

Pre-Construction activities to start in 2026. A job fair will be held prior to start of construction.
On-the-job training will be available

Community Liaison Committee (CLC)

The Upper Afton Wind Project is committed to open communication and long-term collaboration with the communities where the project is being developed. As part of that commitment, a Community Liaison Committee (CLC) will be established for the project.

The CLC is a volunteer group made up of people from across the region, including local residents, landowners, municipal representatives, and members of community organizations. Members are selected through a public call for interest.

The CLC provides a way for community members and the project team to connect regularly and share information. Its role includes:

- Supporting ongoing communication throughout project development, construction, and operations.
- Providing a space to share local questions, concerns, and ideas.
- Offering input on potential project impacts and how they can be managed.
- Helping inform community benefit programs and local priorities.

If you are interested in learning more or getting involved in the Upper Afton Wind Project CLC, please email info@upperaftonwind.com.

Community Benefits Agreements Including Funds

Community Vibrancy Fund



Annual community benefits fund earmarked for community organisations

Proximity Payment



Direct payments to homeowners within a specified distance

Bursary Fund



Funds for education and training in the renewables industry, including supporting placements in the Wind Turbine Tech Program @ NSCC

Other Benefits

- ✓ Local job fairs
- ✓ Contracting for Indigenous and local businesses
- ✓ Increased local spending

EverWind commits to \$1,000 per MW to Community Benefit Funds. 176MW = \$176,000* annually



Upper Afton Wind



*Subject to nameplate capacity of final turbines constructed

Decommissioning

Repowering:

- Global trends favour **repowering** due to renewable wind resources
- Technological advances enable **efficient turbine replacements**

Decommissioning

- **All steel** is recyclable
- **>90%** of wind turbine is recyclable today!
- **Emerging technology** for turbine blade recycling
- **Dismantling** and **removal** of the turbines and all other equipment
- Removal of the turbine **foundations** down to 1m below grade
- **Restoration** of the land

Decommissioning Planning ensures sufficient funds to restore land after project end!

Thank you / Wela'lioa

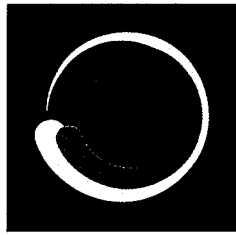
We appreciate you taking the time to join us!

Please fill out a feedback form

Visit upperaftonwind.com to stay up-to-date on the project

Have a follow up question? Email us at info@upperaftonwind.com





EVERWIND

FUELS

Open House Exit Survey

1) How did you hear about this event? (i.e. got an email about this, heard from neighbour, municipal or county councillor, advertisement, website, social media, traditional media in paper or on radio):

email from Mark

2) How helpful was the information you received? Please indicate by circling a number below:

(Not at all helpful)

1

2

3

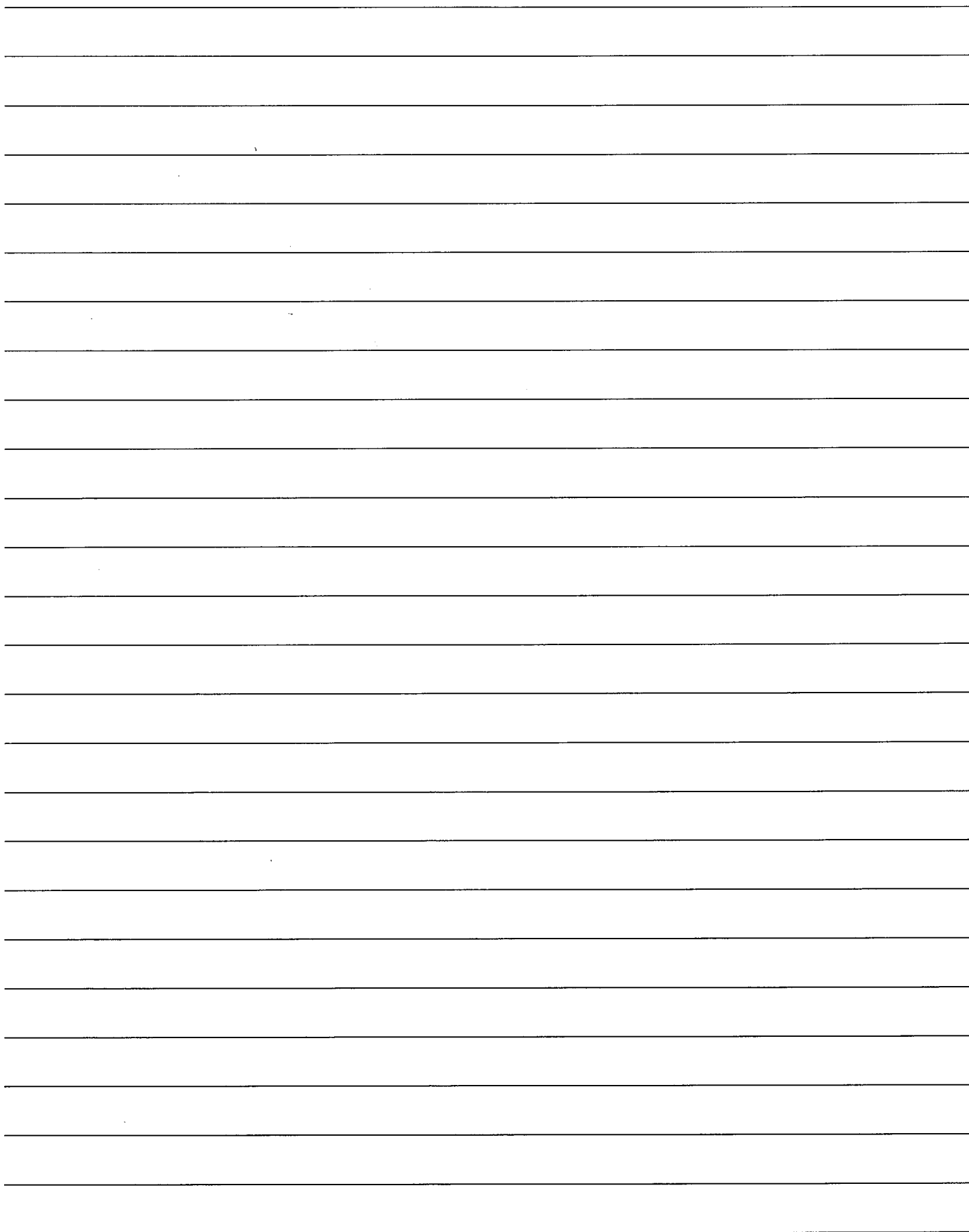
4

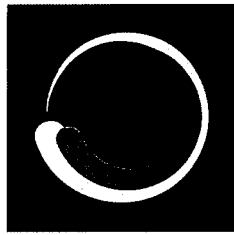
5

(Very helpful)

3) Please provide your comments or feedback on the Project:

- Great information*
- Very visual*
- Knowledgeable staff*
- very approachable and willing to answer questions*





EVERWIND FUELS

Open House Exit Survey

1) How did you hear about this event? (i.e. got an email about this, heard from neighbour, municipal or county councillor, advertisement, website, social media, traditional media in paper or on radio):

NEIGHBOUR

2) How helpful was the information you received? Please indicate by circling a number below:

(Not at all helpful)

1

2

3

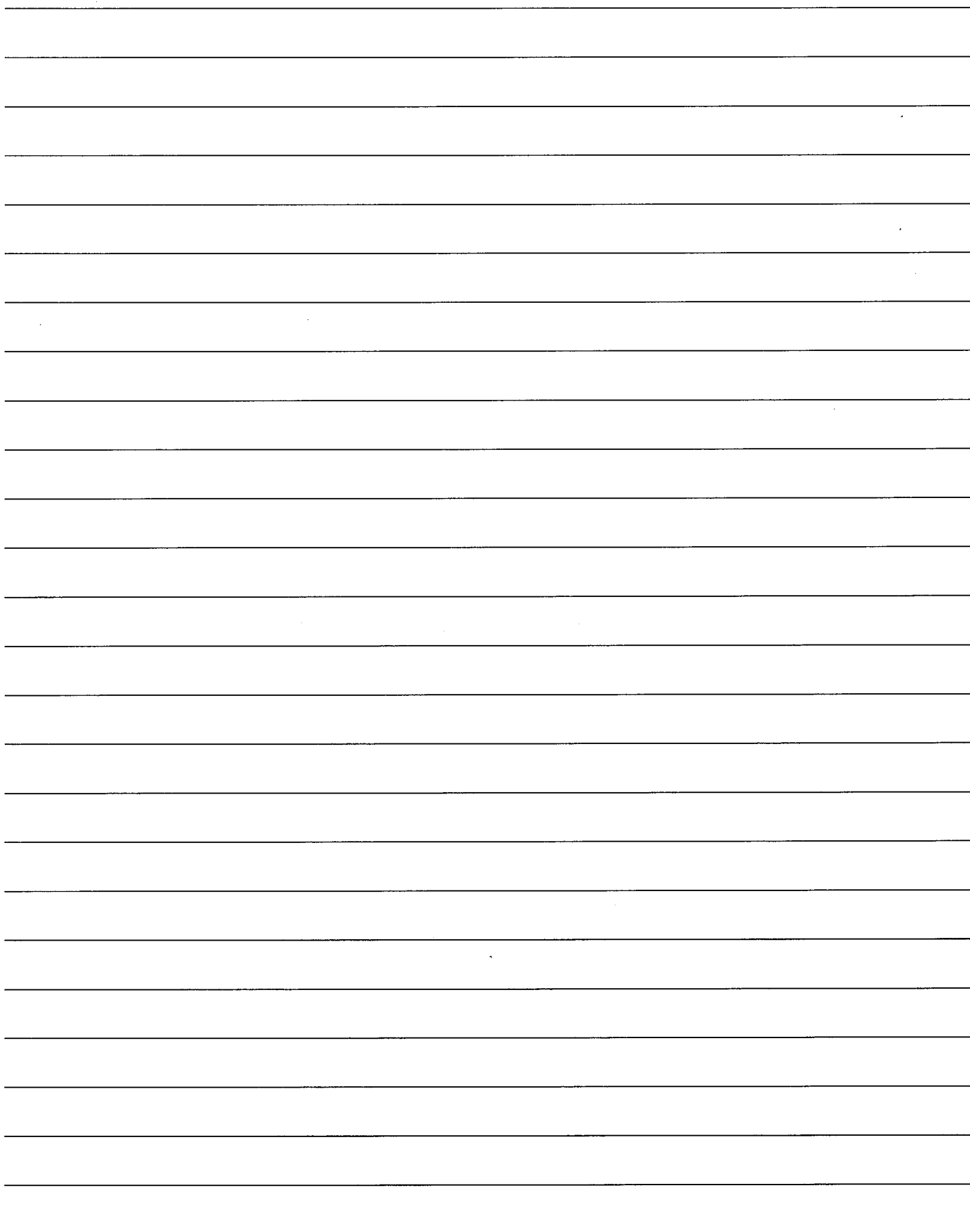
4

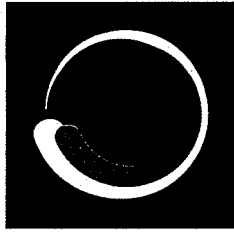
5

(Very helpful)

3) Please provide your comments or feedback on the Project:

GREAT PROJECT





EVERWIND

FUELS

Open House Exit Survey

1) How did you hear about this event? (i.e. got an email about this, heard from neighbour, municipal or county councillor, advertisement, website, social media, traditional media in paper or on radio):

News paper Ad.

2) How helpful was the information you received? Please indicate by circling a number below:

(Not at all helpful)

1

2

3

4

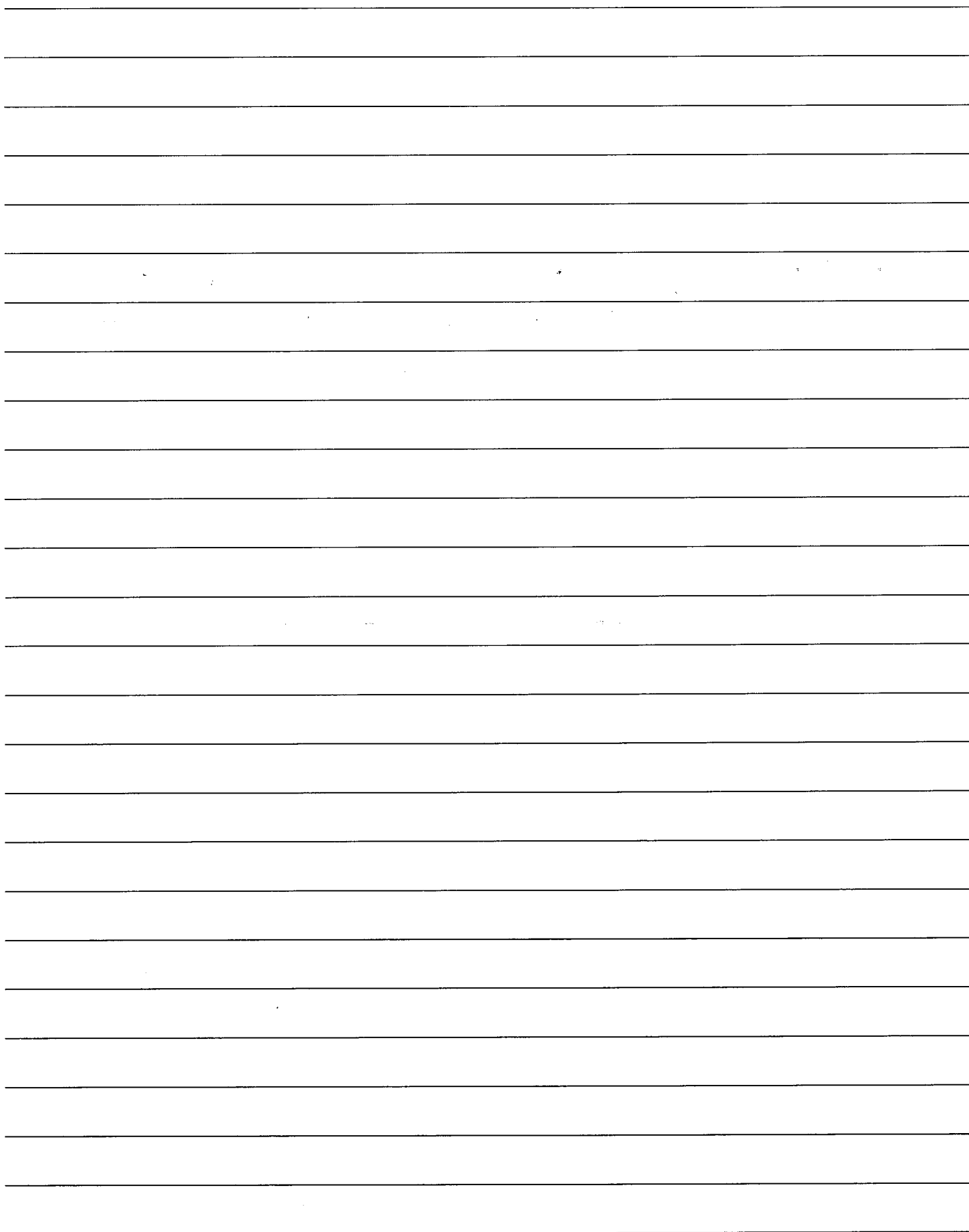
5

(Very helpful)

3) Please provide your comments or feedback on the Project:

Very interesting.

I hope it's done well with every respect paid to the environment & it's inhabitants!





EVERWIND

FUELS

Open House Exit Survey

1) How did you hear about this event? (i.e. got an email about this, heard from neighbour, municipal or county councillor, advertisement, website, social media, traditional media in paper or on radio):

email / trad. media paper advert.

2) How helpful was the information you received? Please indicate by circling a number below:

(Not at all helpful)

1

2

3

4

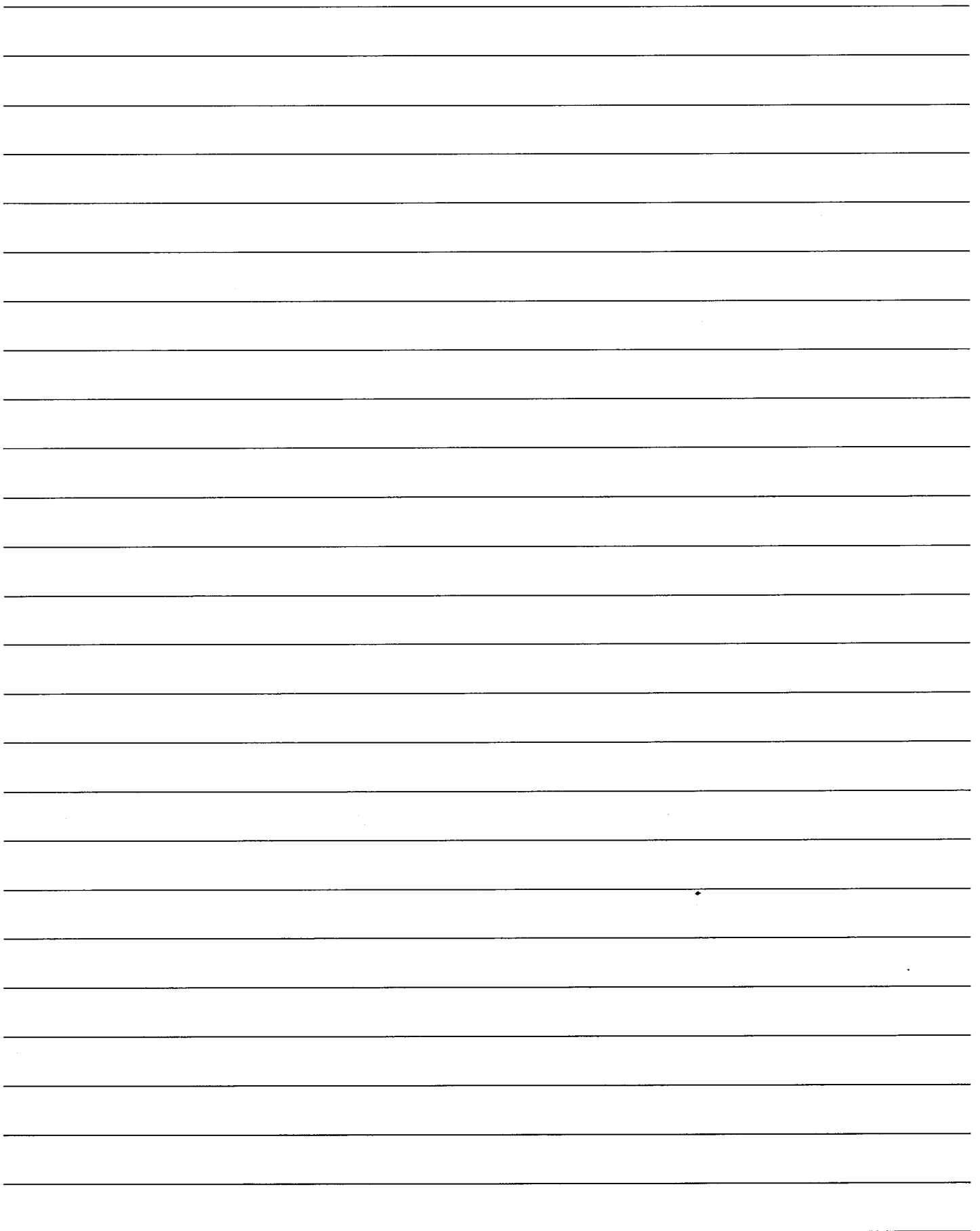
5

(Very helpful)

3) Please provide your comments or feedback on the Project:

*Please err on the side of caution regarding
moose / bat / wildlife habitat.*

*Thanks for well-informed environmental
answers.*



APPENDIX C

WSP ELECTROMAGNETIC INTERFERENCE



EverWind Ltd.

Upper Afton Wind Project

Electromagnetic Interference

2026-02-12

CA0057109.6278





Document distribution

EverWind Ltd.

Upper Afton Wind Project

Electromagnetic Interference

2026-02-12

CA0057109.6278

Prepared for

EverWind Ltd.

1969 Upper Water Street, Suite 2101
Halifax, Nova Scotia – B3J 2V1

Prepared by

WSP Canada
50 Troop Avenue
Dartmouth, Nova Scotia – B3B 1Z1

Quality control	Name	Date	Signature
Prepared by:	Norberto Lopes Hulle	2026-02-11	
Reviewed by:	Garrett Bell	2026-02-12	
Approved by:	Kimberlea Green	2026-02-12	

Table of contents

1.	Electromagnetic Interference - EMI	1
1.1	Assessment Methodology	1
1.2	Engagement Summary	3
Bibliography		6

Table 1.1	Consultation zones, according to RABC & CanWEA guidelines (2025)	1
Table 1.3	Summary of EMI engagement	3

Appendix A – Main Correspondence

1. Electromagnetic Interference - EMI

Under certain conditions, wind turbines can adversely affect radio communication and radar systems. Engaging key stakeholders early in the planning process is strongly advised to confirm that a proposed installation will not result in unacceptable interference, thereby avoiding costly design modifications or project delays during later stages of development (RABC & CanWEA, 2025).

The degree and nature of interference depend on the physical and operational properties of the turbine. Key influencing factors include rotor blade dimensions and aerodynamic design, hub and tower height, tower diameter, and the material composition of both blades and tower structures.

Electromagnetic interference (EMI) generated by a wind turbine is generally categorized into obstruction and reflection. Obstruction occurs when a turbine is positioned along the line-of-sight between a transmitter and a receiver, leading to signal attenuation or complete signal blockage. Reflection arises when the original signal is distorted by reflected energy from turbine surfaces. A subset of reflection interference, known as scatter, is specifically associated with the movement of the rotor blades, which creates rapidly varying reflections (RABC & CanWEA, 2025).

1.1 Assessment Methodology

Early engagement with relevant stakeholders is advised to confirm that a proposed installation will not result in unacceptable interference.

The EMI assessment was conducted following the guidance in *Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems* (RABC & CanWEA, 2025). Using the Industry Canada Spectrum Direct online tool, Industry Canada's publicly accessible database of radio installations was consulted to identify locations of existing radiocommunication and radar systems within consultation zones, as shown in Table 1.1.

Table 1.1 Consultation zones, according to RABC & CanWEA guidelines (2025)

Systems	Consultation Zone
Point-to-Point Systems above 890 megahertz (MHz)	1 km
Broadcast Transmitters (AM, FM, and TV stations)	AM Station: omnidirectional (single tower) antenna system: 5 km directional (multiple towers) antenna system: 15 km

Systems	Consultation Zone
	FM station: 2 km
	TV station: 2 km
Over-the-Air Reception (TV off-air pickup, consumer TV receivers)	Analog TV Station (NTSC): 15 km Digital TV (DTV) station (ATSC): 10 km
Cellular Type Networks, Land Mobile Radio Networks, and Point-to-Point Systems below 890 MHz	1 km
Satellite Systems (Direct to Home, Satellite Ground Stations)	500 m
Air Defence Radars, Vessel Traffic Radars, Air Traffic Control Radars, and Weather Radars	Department of National Defence (DND) Air Defence Radar: 100 km DND or NAV Canada Air Traffic Control Primary Surveillance Radar: 80 km DND or NAV Can Air Traffic Control Secondary Surveillance Radar: 10 km DND Precision Approach Radar: 40 km Canadian Coast Guard Vessel Traffic Radar System: 60 km Military or Civilian airfield: 10 km Environment Canada Weather Radar: 60 km
Very High Frequency OmniRange	15 km

Consultation letters were sent to the licence holders identified through the ISED database search, presenting the Upper Afton Wind Project, including a reference map and a KMZ file, that can be used in GIS environment. The proposed turbine specifications presented were:

- Number of turbines: 28
- Turbine model: Goldwind 182-8.0 MW
 - Tip height: 221.7 m

- Hub height: 130 m
- Rotor configuration: 3 blades
- Rotor/Blade sweep diameter: 183.4 m (blade length: 91.7 m)

1.2 Engagement Summary

Table 1.2 presents the summary of the engagement done. As of February 11 2026, responses received indicated no potential interference with radio communication and radar systems.

It is important to note that response time can vary significantly between stakeholders and that changes to some project features (e.g. layout, turbine dimensions) could require a new assessment by the licence holders. For these reasons, EverWind remains committed to maintaining ongoing communication with stakeholders and to actively addressing concerns raised by them and by the public throughout the life of the Project.

Table 1.2 Summary of EMI engagement

Government Departments, Agencies & Regulators	Notification Letter Date	Conclusion
Industry Canada	2026-02-04: Notification sent 2026-02-05: Phone contact explaining procedure and links are different than provided at RABC-CANWEA guidelines 2026-02-09: Final response	No interference issue anticipated
Department of National Defence (DND)	2025-12-22: Notification sent	-
Royal Canadian Mounted Police	2025-12-22: Notification sent 2026-01-05: Final response	No interference issue anticipated. Requirement to validate with Bell

Government Departments, Agencies & Regulators	Notification Letter Date	Conclusion
Canadian Coast Guard	2025-12-22: Notification sent 2026-01-12: Final response	No interference issue anticipated
Environment Canada	2025-12-22: Notification sent 2026-01-19: First response received 2026-01-22: Updated response received	No interference issue anticipated. If additional turbines are proposed in the vicinity, new assessments may be needed
NAV CANADA	2025-12-22: Notification sent 2025-12-23: Request for data in different format 2026-02-05: Information provided 2026-02-06: confirmation all needed data was received	-
Bell Canada	2026-02-04: Notification sent 2026-02-05: Request was forwarded to internal Bell team 2026-02-06: Requested geographical information to be shared in different format	-

Government Departments, Agencies & Regulators	Notification Letter Date	Conclusion
Eastlink	2026-02-04: Notification sent	-
Rogers Communications Canada Inc.	2026-02-09 Notification sent	-
Seaside Communications	2026-02-04: Notification sent 2026-02-05: Final response received	No interference issue anticipated
Fire service Association of Guysborough	2026-02-04: Notification sent 2026-02-05: Called office and left voice mail 2026-02-06: Returned call and directed to check with Public Safety and Field Communication	No interference issue anticipated. Directed to check with Public Safety and Field Communication.

Bibliography

Journal articles

RABC & CanWEA. (2025). Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems: RABC–CanWEA Guidelines (Updated 2025). RABC-CANWEA-Guidelines-_Updated-2025.

Appendix A – Main Correspondence

This appendix presents the notification letter sent to the stakeholders and relevant communication, including final responses, received, as of February 11 2026.



WSP
50 Troop Ave
Dartmouth, Nova Scotia B3B 1Z1
Canada
wsp.com

2025-12-22
Reference: CA0057109.6278

Environment Climate Change Canada (ECCC)
Wind turbine interference with weather radar
Email: radarsmeteo-weatheradars@ec.gc.ca

Upper Afton Wind Project

Subject: Upper Afton Wind Project – Guysborough and Antigonish Counties, Nova Scotia

Dear ECCC representative,

WSP Canada has been engaged by Everwind to support the proposed Upper Afton Wind Project (the “Project”) in Guysborough and Antigonish Counties, Nova Scotia.

On behalf of our client, WSP is conducting an electromagnetic interference (EMI) assessment related to the placement of 29 wind turbines. As part of this process, we are seeking feedback, operational details, and technical specifications from stakeholders to determine whether the proposed turbine installations could potentially interfere with your existing operations.

The proposed turbine specifications are as follows:

- Number of turbines: 29
- Turbine model: Goldwind 182-8.0 MW
 - Tip height: 221.7 m
 - Hub height: 130 m
 - Rotor configuration: 3 blades
 - Rotor/Blade sweep diameter: 183.4 m (blade length: 91.7 m)

For your reference, a map showing the proposed turbine locations is attached (**Figure 1**). Additionally, a summary of the turbines’ details, including coordinates and elevations, is provided in Table 1, presented below.

Table 1. Proposed Turbine Locations & Specifications

Turbine ID	UTM Coordinates		Base Elevation (m)	Turbine Hub Height (m)	Tip Height (m)	Total Elevation (m)
	E	N				
T1	602737	5048510	135	130	221.7	356.7
T2	602808	5047305	170	130	221.7	391.7
T3	602054	5046761	168	130	221.7	389.7
T4	601337	5047167	154	130	221.7	375.7
T5	600830	5046447	156	130	221.7	377.7
T6	603696	5046552	183	130	221.7	404.7
T7	603257	5046039	196	130	221.7	417.7
T8	602085	5045503	181	130	221.7	402.7
T9	601074	5044734	171	130	221.7	392.7
T10	607077	5046030	176	130	221.7	397.7
T11	608125	5046249	160	130	221.7	381.7
T12	605165	5045268	199	130	221.7	420.7
T13	604560	5044836	210	130	221.7	431.7
T14	604262	5044101	217	130	221.7	438.7
T15	603381	5043780	196	130	221.7	417.7
T15A	603451	5043664	201	130	221.7	422.7
T16	602380	5044475	195	130	221.7	416.7
T17	601943	5043944	194	130	221.7	415.7
T18	601466	5043545	187	130	221.7	408.7
T19	602398	5042868	210	130	221.7	431.7
T20	603497	5042524	198	130	221.7	419.7
T21	602328	5041805	204	130	221.7	425.7
T22	603047	5041166	193	130	221.7	414.7
T23	607979	5044838	172	130	221.7	393.7
T24	607561	5044358	187	130	221.7	408.7
T25	608145	5043249	163	130	221.7	384.7
T26	607254	5043201	189	130	221.7	410.7
T27	607431	5042402	173	130	221.7	394.7
T28	606233	5042429	196	130	221.7	417.7



We appreciate your time and input on this matter. Please let us know if you require any additional information or have concerns regarding potential interference.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Norberto'.

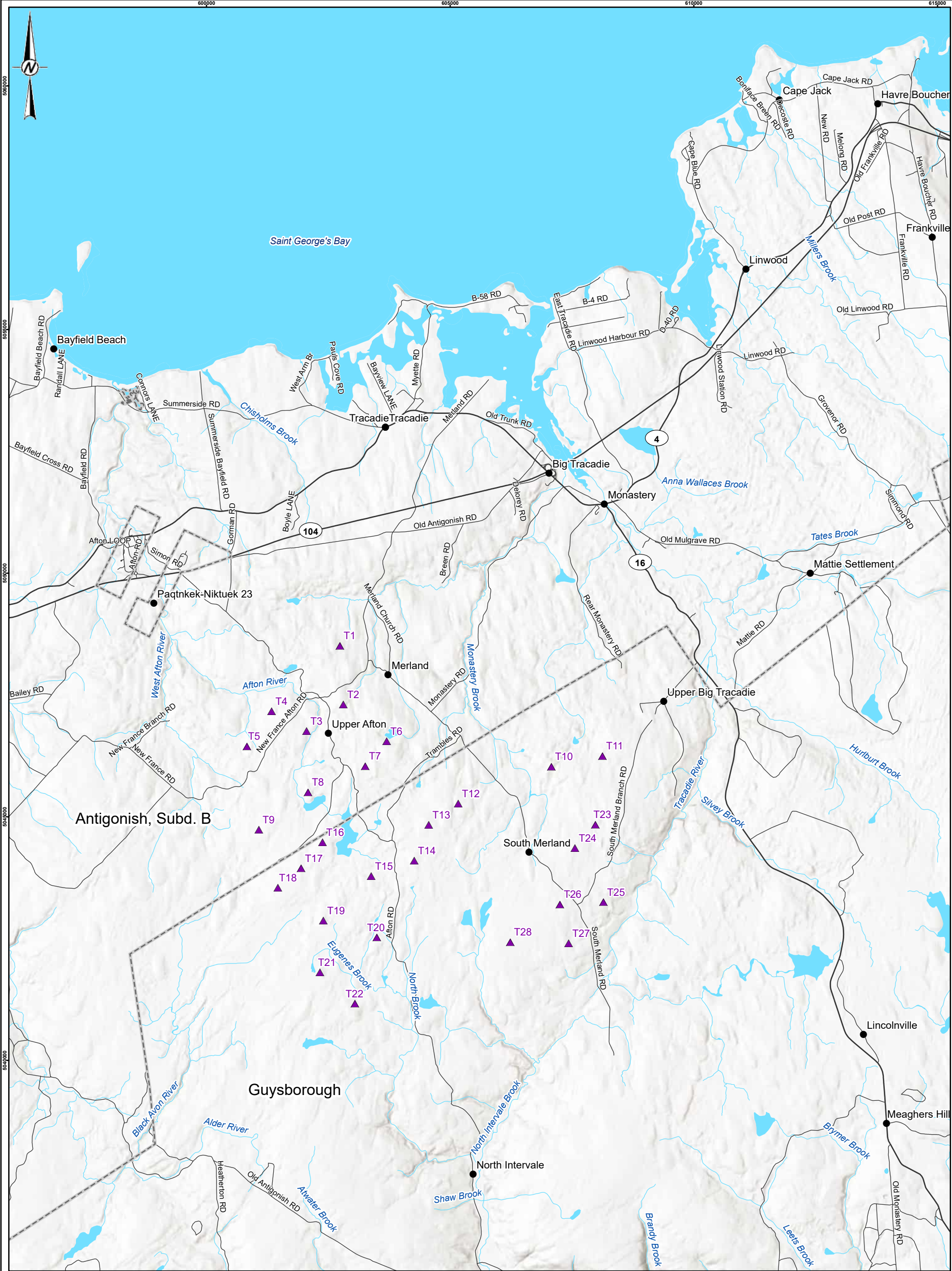
Norberto Lopes Hulle, MSc

He/him

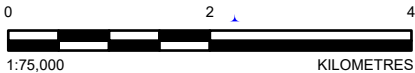
EA Practitioner

WSP Canada

Attachments: Figure 1. Project Location and Turbine Layout



- LEGEND**
- HIGHWAY
 - LOCAL ROAD
 - WATERCOURSE
 - WATERBODY
 - MUNICIPAL BOUNDARY
 - TURBINE LOCATION



CLIENT
EVERWIND FUELS (EWF)

CONSULTANT



YYYY-MM-DD	2025-12-15
DESIGNED	PT
PREPARED	PT
REVIEWED	
APPROVED	

NOTE(S)

REFERENCE(S)
DIGITAL BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD83 PROJECTION: UTM ZONE 20

PROJECT
UPPER AFTON

TITLE
PROJECT LOCATION AND TURBINE LAYOUT

PROJECT NO.
CA0057109.6278

CONTROL

REV.
A

FIGURE
1

RE: Upper Afton Wind Project - Electromagnetic Interference

From Stevens, Brendan (he, him, his | il, le, lui) (ISED/ISDE) <Brendan.Stevens@ised-isde.gc.ca>

Date Mon 2/9/2026 4:03 PM

To Lopes Hülle, Norberto <Norberto.Hulle@wsp.com>

Good Afternoon,

I've completed a search for stations not found in our public database. I have not identified any non-disclosed systems that would require additional consultation for your project according to the RABC document linked below.

Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems - RABC-CCCR

Please be sure to conduct a search of ISED's public database at Search for SMS data to conduct a search for users that may require coordination.

If you have any further questions, please let me know.

Regards,

Brendan Stevens
(he, him, his | il, le, lui)

Spectrum Management Officer | Agent de la Gestion du Spectre
Spectrum Management Operations Branch | Direction générale des opérations de la gestion du spectre
Innovation, Science and Economic Development Canada / Government of Canada | Innovation, Sciences et Développement économique Canada / Gouvernement du Canada
50 Brown Avenue, Dartmouth NS B3B 1X8 | 50, avenue Brown, Dartmouth NS B3B 1X8
brendan.stevens@ised-isde.gc.ca
Telephone | Téléphone +1 (902) 489-0339
Government of Canada | Gouvernement du Canada

Protected A

Norberto Lopes Hülle
WSP

GV 1620-7-3

05 January 2026

SUBJECT: Upper Afton Wind Project - Electromagnetic Interference

Ref. # 2025-12-29_0227

Greetings,

Reference is made to your email request dated December 22, 2025, on your plans for the wind energy project called "Upper Afton" in the province of Nova Scotia.

According to the Radio Advisory Board of Canada (RABC) and Canadian Wind Energy Association (CanWea), the radius of the consultation zone for fixed Land Mobile Radio (LMR) sites is 1 km. The RCMP currently have no "owned" radio towers or Point-To-Point (PTP) microwave links in this area.

However, the **surrounding area is receiving radio coverage from TMR2** operated as a leased system through Bell Canada. It is **required** that you request coordination with Bell who are acting on behalf of RCMP in the province of Nova Scotia with leased towers.

Should you require additional information, please direct any questions or concerns to the undersigned.

Sincerely,

Phil Tanguay

Wind Farm Coordinator,
National Radio Services / Digital Program
Royal Canadian Mounted Police (RCMP) / Government of Canada

windfarm_coordinator@rcmp-grc.gc.ca / Tel: 343-552-1290

Coordonnateur parc éolien,
Services de radio nationaux / Programme Numérique
Gendarmerie royale du Canada (GRC) / Gouvernement du Canada



January 22, 2026

Norberto Lopes Hülle
WSP

Subject: Upper Afton Wind Project

Dear Norberto,

You recently received a letter from us noting that we do not have any objections to your currently proposed Upper Afton Wind Project. While this remains true, we are seeing a rapid increase in the number of wind farm developments near some of our operational weather radars and as a result now need to take a cumulative assessment approach to consider any development in the broader context of wind farms in the area. We remain unconcerned about your project but wanted you to be aware that if additional wind turbines are proposed in the vicinity of the weather radar which might result in cumulative interference on ECCC's weather radar operations, ECCC may need to contact you to discuss potential mitigation measures in the future.

If your Proposed Project is modified in any manner (e.g. number of turbines, turbine height or placement), this preliminary assessment will no longer be valid and an updated analysis will be conducted by ECCC once all the information regarding the revised Proposed Project has been submitted in a timely matter to ECCC at: radarsmeteo-weatherradars@ec.gc.ca.

If the Proposed Project proceeds through the development process and becomes operational or if the Proposed Project does not proceed, we would appreciate being informed so that we may update our records.

Sincerely,

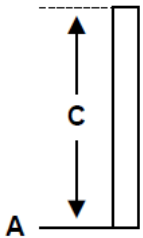
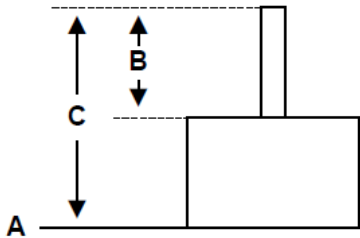


Shannon Kaya

Director, Transformation, Innovation and Engineering Division
Meteorological Service of Canada, Environment and Climate Change Canada



Land Use Proposal Submission Form – General

NAV CANADA file N° / Ref N° 25-5842		Transport Canada File N° / Ref N°	
GENERAL INFORMATION			
Company/Owner Name: EverWind Fuels		Contact Person: Jeff Bonazza	
Address: 2101 Upper Water Street		City: Halifax	Prov: NS
Tel: 902 292 7010		Cell:	Email: jeff.bonazza@everwindfuels.com
Applicant: : EverWind Fuels Company		Contact Person: Jeff Bonazza	
Address: 2101 Upper Water Street		City: Halifax	Prov: NS
Tel: 902 292 7010		Cell:	Email: jeff.bonazza@everwindfuels.com
DETAILS OF PROPOSAL			
- Please provide the data in the highest degree of accuracy available. - For geographic coordinates, provide <u>up to</u> four (4) decimal places of a second. - For ground elevation and tower height, provide <u>up to</u> four (4) decimal places.			
Additional document(s) to be submitted: Map: either 1:50,000 Topographical map (http://atlas.gc.ca/site/english/toporama/index.html) or a Google Earth map/kmz location of the proposed structure needs to be clearly marked; paper or digital surveys are always welcomed.			
Project Identification: Upper Afton Wind Project		Nearest Town: Antigonish	
Street Address, etc.: please refer to attached spreadsheet for location		Province: NS	
Geographic Coordinates of Site in NAD 83: Degrees Minutes Seconds Degrees Minutes Seconds Lat. N 45 / 34 / 57.16 Long. W 061 / 40 / 59.06 For submissions containing more than one set of coordinates, please complete the <u>Multiple Obstacle Template</u> and return in Excel format. (Examples: Linear Structures, Wind Farms, Building Corner Coordinates, etc.)			
Type of Structure:		New Structure? ☒ Yes ☐ No	
Structure alone 		Structure with an addition 	
A. Ground Elevation (Above Sea Level)		443-712	☒ ft ☐ m
B. Structure Height Addition		300.85	☒ ft ☐ m
C. Structure Total Height (Above Ground Level) Include all appurtenances		727.3622	☒ ft ☐ m
Total Height (Above Sea Level) (A + C)		1170-1439	☒ ft ☐ m
Cranes to be used? ☐ Yes ☒ No If Yes: Crane details shall be submitted separately using the Land Use Proposal Submission Form – Crane(s).		Approximate Duration of Construction: 2 years	
Proposed Construction Start Date: Select		If Temporary Structure, indicate Removal Date: Select	

Comments:

Known co-location with/on NAV CANADA Site: ☐ Yes ☒ No

A Third-Party Submission Form may be required for complex applications, fee applicable.

Applicant/Representative Signature

Print Name

Date

Norberto Lopes Hulle

5-Feb-26

Acknowledgement of reading [Detailed Land Use Proposal Guidelines](#) (Submitter's Initials) NLH

For a detailed description on NAV CANADA's requirements and additional information, refer to the NAV CANADA website at www.navcanada.ca > Aeronautical Information > [Land Use Program](#).

NAV CANADA's land use evaluation is based on information known as of the date of this letter and is valid for a period of up to 18 months, subject to any legislative changes impacting land use submissions. Our assessment is limited to the impact of the proposed physical structure on the air navigation system and installations; it neither constitutes nor replaces any approvals or permits required by Transport Canada, other Federal Government departments, Provincial or Municipal land use authorities or any other agency from which approval is required. Innovation, Science and Economic Development Canada addresses any spectrum management issues that may arise from your proposal and consults with NAV CANADA Engineering as deemed necessary.

Please submit by email to landuse@navcanada.ca



Serving a world in motion
Au service d'un
monde en mouvement
navcanada.ca

Z-LDU-100 Version 3.0 14 June 2024

Obstacle Information for Assessment							Upon completion		
Obstacle ID	LAT dd mm ss.ss	LONG -ddd mm ss.ss	Ground Elevation (Feet)	Structure Height (Feet)	Total Height (Feet)	Crane Swing Radius (Feet)	Lighted Y/N	Painted Y/N	Construction Date
Example 1 (Crane) Do Not delete this row	60 39 16.59	-110 36 14.01	1061.0000	463.0000	1524.0000	50.0000	Y	N	22-May-24
T1	45° 34' 57.16" N	061° 40' 59.06" W	442.9134	727.3622	1170.2756		Y	N	1-Apr-28
T2	45° 34' 18.06" N	061° 40' 56.67" W	557.7428	727.3622	1285.1050		Y	N	1-Apr-28
T3	45° 34' 0.84" N	061° 41' 31.86" W	551.1811	727.3622	1278.5433		Y	N	1-Apr-28
T4	45° 34' 14.38" N	061° 42' 4.66" W	505.2494	727.3622	1232.6116		Y	N	1-Apr-28
T5	45° 33' 51.32" N	061° 42' 28.54" W	511.8110	727.3622	1239.1733		Y	N	1-Apr-28
T6	45° 33' 53.2" N	061° 40' 16.31" W	600.3937	727.3622	1327.7559		Y	N	1-Apr-28
T7	45° 33' 36.83" N	061° 40' 36.92" W	643.0446	727.3622	1370.4069		Y	N	1-Apr-28
T8	45° 33' 20.09" N	061° 41' 31.39" W	593.8320	727.3622	1321.1943		Y	N	1-Apr-28
T9	45° 32' 55.71" N	061° 42' 18.59" W	561.0236	727.3622	1288.3859		Y	N	1-Apr-28
T10	45° 33' 34.46" N	061° 37' 40.78" W	577.4278	727.3622	1304.7901		Y	N	1-Apr-28
T11	45° 33' 40.95" N	061° 36' 52.29" W	524.9344	727.3622	1252.2966		Y	N	1-Apr-28
T12	45° 33' 10.81" N	061° 39' 9.56" W	652.8872	727.3622	1380.2494		Y	N	1-Apr-28
T13	45° 32' 57.14" N	061° 39' 37.79" W	688.9764	727.3622	1416.3386		Y	N	1-Apr-28
T14	45° 32' 33.51" N	061° 39' 52.1" W	711.9423	727.3622	1439.3045		Y	N	1-Apr-28
T15	45° 32' 23.56" N	061° 40' 32.92" W	643.0446	727.3622	1370.4069		Y	N	1-Apr-28
T15A	45° 32' 19.78" N	061° 40' 29.82" W	659.4488	727.3622	1386.8111		Y	N	1-Apr-28
T16	45° 32' 46.61" N	061° 41' 18.57" W	639.7638	727.3622	1367.1260		Y	N	1-Apr-28
T17	45° 32' 29.65" N	061° 41' 39.12" W	636.4830	727.3622	1363.8452		Y	N	1-Apr-28
T18	45° 32' 16.98" N	061° 42' 1.37" W	613.5171	727.3622	1340.8793		Y	N	1-Apr-28
T19	45° 31' 54.54" N	061° 41' 18.94" W	688.9764	727.3622	1416.3386		Y	N	1-Apr-28
T20	45° 31' 42.83" N	061° 40' 28.54" W	649.6063	727.3622	1376.9685		Y	N	1-Apr-28
T21	45° 31' 20.15" N	061° 41' 22.97" W	669.2914	727.3622	1396.6536		Y	N	1-Apr-28
T22	45° 30' 59.08" N	061° 40' 50.32" W	633.2021	727.3622	1360.5643		Y	N	1-Apr-28
T23	45° 32' 55.33" N	061° 37' 0.14" W	564.3045	727.3622	1291.6667		Y	N	1-Apr-28
T24	45° 32' 40.03" N	061° 37' 19.81" W	613.5171	727.3622	1340.8793		Y	N	1-Apr-28
T25	45° 32' 3.76" N	061° 36' 53.75" W	534.7769	727.3622	1262.1391		Y	N	1-Apr-28
T26	45° 32' 2.7" N	061° 37' 34.88" W	620.0788	727.3622	1347.4410		Y	N	1-Apr-28
T27	45° 31' 36.72" N	061° 37' 27.35" W	567.5853	727.3622	1294.9475		Y	N	1-Apr-28
T28	45° 31' 38.27" N	061° 38' 22.54" W	643.0446	727.3622	1370.4069		Y	N	1-Apr-28

RE: Upper Afton Wind Project - Electromagnetic Interference

From Network Operations Centre <noc@seaside.ns.ca>
Date Thu 2/5/2026 7:37 PM
To Lopes Hülle, Norberto <Norberto.Hulle@wsp.com>

Hi Noberto,

We appreciate the heads up, and really appreciate the KMZ files.

Your plan would not affect any of our current wireless network.

Thanks,

Gavin Samson
Critical NOC Analyst
Seaside Communications
noc@seaside.ns.ca
902-539-2353

Subject: Upper Afton Wind Project - Electromagnetic Interference
Date: Wed, 4 Feb 2026 22:26:13 +0000
From: Lopes Hülle, Norberto <Norberto.Hulle@wsp.com>
To: support@seaside.ns.ca <support@seaside.ns.ca>

Good afternoon,

Please find attached a notification letter for the proposed Upper Afton Wind Project, located in the Guysborough and Antigonish Counties, Nova Scotia.

For your convenience, a KMZ file with the turbines layout is also attached. A confirmation of receipt would be greatly appreciated.

Please reach out should you have any questions or comments.
Sincerely,

Norberto Lopes Hülle

EA Practitioner

wsp



wsp.com

APPENDIX D

GHG CALCULATIONS

Table 1: Baseline GHG Quantification - Upper Afton Wind Project

Project # 24-11145

Power Generation via Coal			
Parameter/Variable	Value	Unit	Comments
Quantity of Power Generated via Coal	211,066,944	kWh/year	Based on 37% of electricity generated by NSPI in Q3 2025
Emission Factors			
Parameter/Variable	Value	Unit	Comments
Coal Generated Electricity	1.0502	kg CO ₂ e/kWh	[Source: EIA, 2023]
<i>Conversion Factor</i>	0.001	t CO ₂ e/kWh	1 kg = 0.001 Tonnes
Emissions	221,660.60	t CO ₂ e/year	B5*B8*B9
Power Generation via Oil			
Parameter/Variable	Value	Unit	Comments
Quantity of Power Generated via Oil	17,113,536	kWh/year	Based on 3% of electricity generated by NSPI in Q3 2025
Emission Factors			
Parameter/Variable	Value	Unit	Comments
Oil Generated Electricity	1.1089	kg CO ₂ e/kWh	[Source: EIA, 2023]
<i>Conversion Factor</i>	0.001	t CO ₂ e/kWh	1 kg = 0.001 Tonnes
Emissions	18,976.38	t CO ₂ e/year	B14*B17*B18
Power Generation via Natural Gas			
Parameter/Variable	Value	Unit	Comments
Quantity of Power Generated via Natural Gas	79,863,168	kWh/year	Based on 14% of electricity generated by NSPI in Q3 2025
Emission Factors			
Parameter/Variable	Value	Unit	Comments
Natural Gas Generated Electricity	0.4374	kg CO ₂ e/kWh	[Source: EIA, 2023]
<i>Conversion Factor</i>	0.001	t CO ₂ e/kWh	1 kg = 0.001 Tonnes
Emissions	34,933.39	t CO ₂ e/year	B23*B26*B27
Power Generation via Wind			
Parameter/Variable	Value	Unit	Comments
Quantity of Power Generated via Wind	262,407,552	kWh/year	Based on 46% of electricity generated by NSPI in Q3 2025
Emission Factors			
Parameter/Variable	Value	Unit	Comments
Wind Generated Electricity	0	t CO ₂ e/kWh	
Emissions	0.00	t CO ₂ e/year	B32*B35
Total Emissions	275,570.38	t CO₂e/year	B10+B19+B28

Table 2: Construction Phase GHG Quantification - Upper Afton Wind Project

Project # 24-11145

Turbine Transportation			
Parameter/Variable	Value	Unit	Comments
Transportation Vehicle			
Heavy Duty Truck (Diesel)	1 ea		
Distance Travelled (Land)	32,312 km		From manufacturing facility to the Straight of Canso Superport, Mulgrave, NS, to Wind Turbine Laydowns (includes all the wind turbine components for all wind turbines).
Freight Weight	73.85 tonne		Based on weights provided in NREL's 2015 Report [NREL, 2017]. And information provided by EverWind. Estimate of each component: 960 tonnes/13 components
Marine Cargo and Containers (Diesel)	1 ea		
Distance Travelled (Marine)	649,600 km		From Port in Dafeng, China, to Straight of Canso Superport, Mulgrave, NS, (includes 28 WT).
Freight Weight	960.00 tonne		Based on weights provided in NREL's 2015 Report [NREL, 2017].
Emission Factors			
Parameter/Variable	Value	Unit	Comments
Heavy Duty Truck	135 g CO ₂ e/tonne-km		Freight emissions for calculating GHGs from freight (materials delivery, shipment of product to market, etc.) [Source: GHGenius v5.0d].
Conversion Factor	0.000001 t CO ₂ e/tonne-km		1 g = 0.000001 Tonnes
Emissions	322.13 t CO ₂ e/year		B16*B18*B19*B25*B26
Marine Cargo and Containers (Diesel)	15.1 g CO ₂ e/tonne-km		Freight emissions for calculating GHGs from freight (materials delivery, shipment of product to market, etc.) [Source: GHGenius v5.0d]
Conversion Factor	0.000001 t CO ₂ e/tonne-km		1 g = 0.000001 Tonnes
Emissions	9,416.60 t CO ₂ e/year		B21*B22*B28*B29
Tower Foundation and Pedestal			
Parameter/Variable	Value	Unit	Comments
Concrete Production Quantity	2,036,250 kg		Based on a volume of 1,000 m ³ (per Wind Turbine Pad) - provided by the Proponent, and an esimated concrete density of 2,250 kg/m ³
Concrete Truck	2,036 tonne		1 kg = 0.001 Tonnes
	20.25 tonne/truck		Source: Ready Mixed Concrete Association of Ontario, n.d and concrete density of 2,250 kg/m ³
	101 ea		(B34/B35) Required trucks per Turbine Pad
Turbine Pad Steel	81 tonnes/pad		Based on weights provided by the Proponent
Heavy Duty Truck	38 tonne/truck		No more than 49,500 Gross Vehicle Weight (Assumed unladen weight of 11.5 tonnes)
	3 ea		(B39/B40) Required trucks per Turbine Pad
Concrete/Steel Transportation Distances			
Distance Travelled (freight)	718 km		Based on one-way trip from Concrete/Steel Supplier to each Wind Turbine Pad
Distance Travelled (no freight)	718 km		Based on one-way trip from Concrete/Steel Supplier to each Wind Turbine Pad
Emission Factors			
Parameter/Variable	Value	Unit	Comments
Concrete Production	300 g CO ₂ e/kg		0.3 kg CO ₂ e/kg [Source: GHGenius v5.0d].
Concrete Truck (freight)	135 g CO ₂ e/tonne-km		Freight emissions for calculating GHGs from freight (materials delivery, shipment of product to market, etc.) [Source: GHGenius v5.0d].
Concrete Truck (no freight)	1,106 g CO ₂ e/km		Emissions for calculating GHGs where the volume of fuel consumed is unknown but the distance travelled is known [Source: GHGenius v5.0d].
General Steel Production	1.5 t CO ₂ e/tonne		Estimated from the UK's general steel type, excluding stainless steel (Inventory of Carbon & Energy (ICE), Version 2.0).
Heavy Duty Truck (freight)	135 g CO ₂ e/tonne-km		Freight emissions for calculating GHGs from freight (materials delivery, shipment of product to market, etc.) [Source: GHGenius v5.0d].
Heavy Duty Truck (no freight)	1,106 g CO ₂ e/km		Emissions for calculating GHGs where the volume of fuel consumed is unknown but the distance travelled is known [Source: GHGenius v5.0d].
Conversion Factor	0.000001 t CO ₂ e/g		1 g = 0.000001 Tonnes
Concrete Production Emissions	17,104.50 t CO ₂ e/year		B34*B48*B55*28(WT)
Concrete Truck (freight) Emissions	198.25 t CO ₂ e/year		B36*B37*B44*B49*B55
Concrete Truck (no freight) Emissions	80.20 t CO ₂ e/year		B37*B45*B50*B55
Steel Production Emissions	3,402.00 t CO ₂ e/year		B39*B52*28(WT)
Heavy Duty Truck (freight) Emissions	11.05 t CO ₂ e/year		B40*B41*B44*B53*B55
Heavy Duty Truck (no freight) Emissions	2.38 t CO ₂ e/year		B41*B45*B54*B55
Total Tower Foundation and Pedestal	20,798.38 t CO ₂ e/year		SUM(B57,B58,B59,B61,B62,B63)
Total Emissions (Construction Phase)	30,537.11 t CO ₂ e		B11+B26+B29+B64

Table 3: Operation Phase GHG Quantification - Upper Afton Wind Project

Project # 24-11145

Wind Energy			
Parameter/Variable	Value	Unit	Comments
Quantity of Power Generation via Wind	570,451,200	kWh/year	See Equation
$kWh = 176MW \times \frac{365 \text{ days}}{\text{year}} \times \frac{24 \text{ hours}}{\text{day}} \times \text{Capacity Factor} \times \frac{1000 \text{ kW}}{MW} = 570,451,200 \text{ kWh/year}$			
Emission Factors			
Parameter/Variable	Value	Unit	Comments
Wind Generated Electricity	0	t CO ₂ e/kWh	
Emissions	0	t CO ₂ e/year	B5*B8
Maintenance			
Parameter/Variable	Value	Unit	Comments
Nacelle Components Replacement	11,431	kg/Turbine	15% of Nacelle [Source: Source: Padey et al., 2012, (Number Three Wind LLC, 2018)]
Blade Replacement	18,688	kg/Turbine	One Blade [Source: Source: Padey et al., 2012, (Number Three Wind LLC, 2018)]
Emission Factors			
Parameter/Variable	Value	Unit	Comments
General Steel	1.5	kg CO ₂ e/kg	Estimated from the UK's general steel type, excluding stainless steel (Inventory of Carbon & Energy (ICE), Version 2.0).
Conversion Factor	0.001	t CO ₂ e/kg	1 kg = 0.001 Tonnes
Emissions	45.1785	t CO ₂ e/turbine	(B13+B14)*B17*B18
Total Emissions	1,265.00	t CO ₂ e	B9+B19*28 (WT)

APPENDIX E

WSP NOISE ASSESSMENT



Upper Afton Wind Ltd.
Upper Afton Wind Project

Noise Assessment

2026-02-04

Project No. CA0057109.6278 / 1000



Distribution List

1 electronic copy - EverWind Fuels LLC

1 electronic copy - WSP Canada Inc.

Table of Contents

1	INTRODUCTION	1
2	PROJECT DESCRIPTION	1
3	REGULATORY FRAMEWORK	3
3.1	EA Guide	3
3.2	Noise Guidelines	3
4	ASSESSMENT APPROACH	4
4.1	Noise Study Area and Receptors	4
4.2	Ambient Noise Levels	8
4.3	Noise Prediction Methodology	10
5	NOISE EMISSIONS	11
6	ASSESSMENT RESULTS	13
6.1	Broadband Noise – Operations	13
6.2	Low Frequency Noise	18
6.3	Construction Noise	20
7	SUMMARY AND DISCUSSION	21
8	REFERENCES	23

TABLES

Table 1: Project Noise Sources and Operating Modes	2
Table 2: Receptor Locations and Distance to Project Noise Sources	4
Table 3: Representative Ambient Noise Levels	8
Table 4: Noise Model Inputs	10
Table 5: Project Noise Emissions	12
Table 6: Predicted Project and Cumulative Noise Levels	13
Table 7: Compliance Assessment	16
Table 8: Low Frequency Noise Assessment	18

FIGURES

Figure 1: Study Area.....	7
Figure 2: Cumulative Noise Levels.....	15

1 INTRODUCTION

Upper Afton Wind Ltd., comprised of EverWind NS Holdings Ltd. (EverWind) and Membertou Development Corporation, is proposing development of the Upper Afton Wind Project (the Project) in Guysborough County and Antigonish County, Nova Scotia. The Project will be located approximately 27 km east-southeast of the Town of Antigonish.

EverWind retained WSP Canada Inc. (WSP) to prepare an assessment of potential environmental noise effects from the Project in accordance with provincial requirements. The results of the Project noise assessment are presented in this report.

The noise assessment report is structured as follows:

- Section 1 provides a brief introduction.
- Section 2 presents a description of the noise sources proposed for the Project.
- Section 3 describes the provincial regulations applicable to noise from the Project, including compliance criteria.
- Section 4 outlines the assessment approach, including a description of noise receptors, representative ambient noise levels, and methods used to predict Project noise levels.
- Section 5 presents noise emissions for the Project.
- Section 6 presents the results of the Project noise assessment, including comparison of noise level predictions to provincial compliance criteria.
- Section 7 summarizes and discusses the results of the Project noise assessment.

2 PROJECT DESCRIPTION

The Project will consist of 22 Goldwind GWH182 8.0-megawatt (MW) wind turbines, along with a collector system, substation, and operations and maintenance building. There are six alternate turbine locations that are not included in the noise modelling. The Project wind turbines will have a hub height of 130 m and will be outfitted with serrated trailing edge (STE) blades to reduce noise emissions. Each Project wind turbine will also be equipped with a pad-mounted electrical transformer. To ensure compliance with provincial noise regulations, individual Project wind turbines will make use of different operating modes (NPMs, SRM1s, and SRM4s).

The major noise source associated with the Project substation will be a single transformer, with a power rating of 200 MVA. Maximum noise emissions from the Project substation will occur when the transformer operates in oil natural air-forced 2nd-stage cooling (ONAF2) mode.

Table 1 presents the locations of the Project noise sources and the operating modes used when predicting potential Project noise effects. The operating modes specified in Table 1 correspond to the planned maximum noise emissions from each Project source. A map showing the locations of Project noise sources is presented in Section 4 (see Figure 1). Additional details on noise emissions from Project sources are provided in Section 5 (see Table 5).

Table 1: Project Noise Sources and Operating Modes

Source Identification Code ^(a)	Source Description	Universal Transverse Mercator Coordinates (Zone 20T)		Source Operating Mode ^(b)
		Easting (m)	Northing (m)	
T03	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	602054	5046761	SRM4s
T04	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	601337	5047167	SRM4s
T05	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	600830	5046447	SRM4s
T08	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	602085	5045503	SRM4s
T09	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	601074	5044734	SRM1s
T10	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	607077	5046030	SRM1s
T11	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	608125	5046249	NPMs
T13	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	604560	5044836	SRM4s
T14	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	604262	5044101	SRM4s
T15	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	603381	5043780	SRM4s
T16	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	602380	5044475	SRM4s
T17	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	601943	5043944	SRM4s
T18	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	601467	5043545	NPMs
T19	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	602398	5042868	NPMs
T20	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	603497	5042524	NPMs
T21	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	602328	5041805	NPMs
T22	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	603047	5041166	NPMs
T23	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	607979	5044838	SRM4s
T25	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	608145	5043249	SRM4s
T26	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	607254	5043201	SRM4s
T27	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	607431	5042402	SRM4s
T28	Goldwind GWH182 8.0-MW wind turbine with STE blades and pad-mounted transformer	606233	5042429	SRM4s
Substation	substation; one 200 MVA transformer	603173	5048165	ONAF2

(a) Although there are 28 potential turbine locations in the Project, only 22 will be built. This table presents the 22 primary turbines for construction. The other six turbine locations are alternates.

(b) Planned operating mode corresponding to maximum noise emissions.

3 REGULATORY FRAMEWORK

The Province of Nova Scotia provides guidance for assessing potential environmental effects from wind power facilities in the *Guide to Preparing an EA Registration Document for Wind Power Projects in Nova Scotia* (Nova Scotia 2021) and *Environmental Assessment Supplemental Checklist: Wind Energy Projects* (Nova Scotia 2024), which will hereafter be referred to collectively as the EA Guide. The Province of Nova Scotia provides additional guidance for assessing potential environmental noise effects from industrial activities in *Guidelines for Environmental Noise Measurement and Assessment* (Nova Scotia 2023), which will hereafter be referred to as the Noise Guidelines. When preparing the Project noise assessment, WSP considered guidance and compliance criteria from both the EA Guide (Nova Scotia 2021; Nova Scotia 2024) and the Noise Guidelines (Nova Scotia 2023).

3.1 EA Guide

The EA Guide requires that cumulative noise levels, which are calculated by summing ambient noise levels with predicted noise contributions from the Project, not exceed 40 A-weighted decibels (dBA) at receptors within 2 km of the Project (Nova Scotia 2024). The EA Guide defines a receptor as “...an adjacent dwelling including, but not limited to, a building or structure that contains one or more dwellings, educational facility, daycare/nursery, place of worship, hospital, seniors’ residence and could also include a vacant lot where appropriate zoning or permits to build such dwellings have been approved” (Nova Scotia 2021).

The 40 dBA limit from the EA Guide represents the most stringent provincial noise criterion for total or broadband noise from the Project (i.e., noise levels expressed in dBA units, which reflect the frequency sensitivity of the human auditory system). As such, potential broadband noise effects from Project operations were assessed against the limit from the EA Guide.

The EA Guide also requires a description of potential noise effects during construction of the Project, and a discussion of potential effects from low frequency noise (LFN) or infrasound during Project operations. However, the EA Guide does not provide quantitative thresholds or limits for assessing potential effects from construction noise or LFN.

3.2 Noise Guidelines

The Noise Guidelines provide a framework for assessing potential effects from LFN, which may not be fully captured by the broadband dBA metric. The LFN test from the Noise Guidelines consists of two parts.

- The first part of the test compares noise levels expressed in dBA to noise levels expressed in C-weighted decibels (dBC), a unit which emphasizes low frequency content.
- The second part of the test looks for a low frequency tonal component in the one-third octave band frequency spectrum and provides a quantitative method for identifying such a tone.

If the difference between noise levels expressed in dBA and dBC is ≥ 20 **and** one or more low frequency tones is present, then a LFN issue exists. In other words, even if the difference between dBC and dBA noise levels was found to be greater than 20, the absence of a clear tone precludes the presence of a LFN issue.

4 ASSESSMENT APPROACH

4.1 Noise Study Area and Receptors

The EA Guide requires that potential noise effects be assessed at permanent and seasonal receptors located within 2 km of the Project wind turbines (Nova Scotia 2024). WSP established a study area for the noise assessment as a 2 km buffer on the Project noise sources (i.e., wind turbines and substation). All receptors within this study area were considered in the Project noise assessment.

A total of 63 noise receptors were identified within the study area. Another nine noise receptors were identified just outside the study area; these receptors were maintained in the assessment in the interest of fully capturing all potential noise effects.

Table 2 presents locations for each of the 72 receptors considered in the Project noise assessment. For each receptor, Table 2 identifies and provides the distance to the closest Project noise source. As noted above, some receptors are located slightly more than 2 km from the closest Project noise source (i.e., just beyond the 2 km study area). These receptors were maintained in the assessment in the interest of fully capturing all potential noise effects. Figure 1 presents a map showing the locations of the Project noise sources and receptors.

Table 2: Receptor Locations and Distance to Project Noise Sources

Receptor Identification Code ^(a)	Universal Transverse Mercator Coordinates (Zone 20)		Closest Project Noise Source	Distance to Closest Project Noise Source (m)
	Easting (m)	Northing (m)		
R01	609319	5047193	T11	1,522
R02	609129	5047153	T11	1,351
R03	609592	5046913	T11	1,610
R04	609488	5046942	T11	1,529
R05	609304	5047438	T11	1,674
R06	609337	5047139	T11	1,504
R07	608873	5047291	T11	1,283
R08	608936	5047149	T11	1,211
R09	609584	5045785	T11	1,531
R10	607627	5047295	T11	1,158
R13 ^(b)	605572	5045340	T13	1,131
R14	605756	5045136	T13	1,233
R15	609661	5045757	T11	1,613
R17	606587	5044358	T26	1,335
R18	609785	5046269	T11	1,660
R20	609542	5046091	T11	1,426
R21	609598	5045915	T11	1,510
R27	609073	5047365	T11	1,464
R28	606454	5044901	T10	1,289
R29	609048	5047421	T11	1,492
R30	609027	5047366	T11	1,436
R31	605794	5045954	T10	1,285

Table 2: Receptor Locations and Distance to Project Noise Sources

Receptor Identification Code ^(a)	Universal Transverse Mercator Coordinates (Zone 20)		Closest Project Noise Source	Distance to Closest Project Noise Source (m)
	Easting (m)	Northing (m)		
R32	605351	5046367	T13	1,723
R33	606650	5044078	T26	1,065
R35 ^(b)	603173	5041195	T22	129
R36	603751	5048650	Substation	755
R37	603745	5048740	Substation	811
R38	605197	5047860	Substation	2,047 ^(c)
R39	602468	5049439	Substation	1,456
R41	602412	5049144	Substation	1,240
R42	604969	5046427	T13	1,643
R45	604916	5046823	T13	2,019 ^(c)
R46	604916	5046823	T13	2,019 ^(c)
R47	604688	5047311	Substation	1,739
R48	604554	5047236	Substation	1,664
R49	604713	5046991	Substation	1,936
R50	605018	5046794	T13	2,011 ^(c)
R53 ^(b)	602428	5046728	T03	375
R54	603650	5048096	Substation	482
R55 ^(b)	603628	5047944	Substation	506
R56	603886	5047800	Substation	801
R57	603802	5047767	Substation	744
R58	604218	5047557	Substation	1,209
R59	604011	5047705	Substation	956
R60	603708	5048304	Substation	553
R62	603769	5048207	Substation	597
R64	601350	5048114	T04	947
R65	601441	5048273	T04	1,111
R67	601322	5048302	T04	1,135
R68	600971	5048554	T04	1,434
R69	601132	5048339	T04	1,190
R70	603589	5050184	Substation	2,061 ^(c)
R72	602240	5050296	Substation	2,326 ^(c)
R73	603650	5050183	Substation	2,074 ^(c)
R74	603630	5050044	Substation	1,934
R75	603710	5049863	Substation	1,781
R77	605916	5048773	Substation	2,810 ^(c)
R78 ^(b)	601703	5045921	T08	566
R82	602524	5049765	Substation	1,727

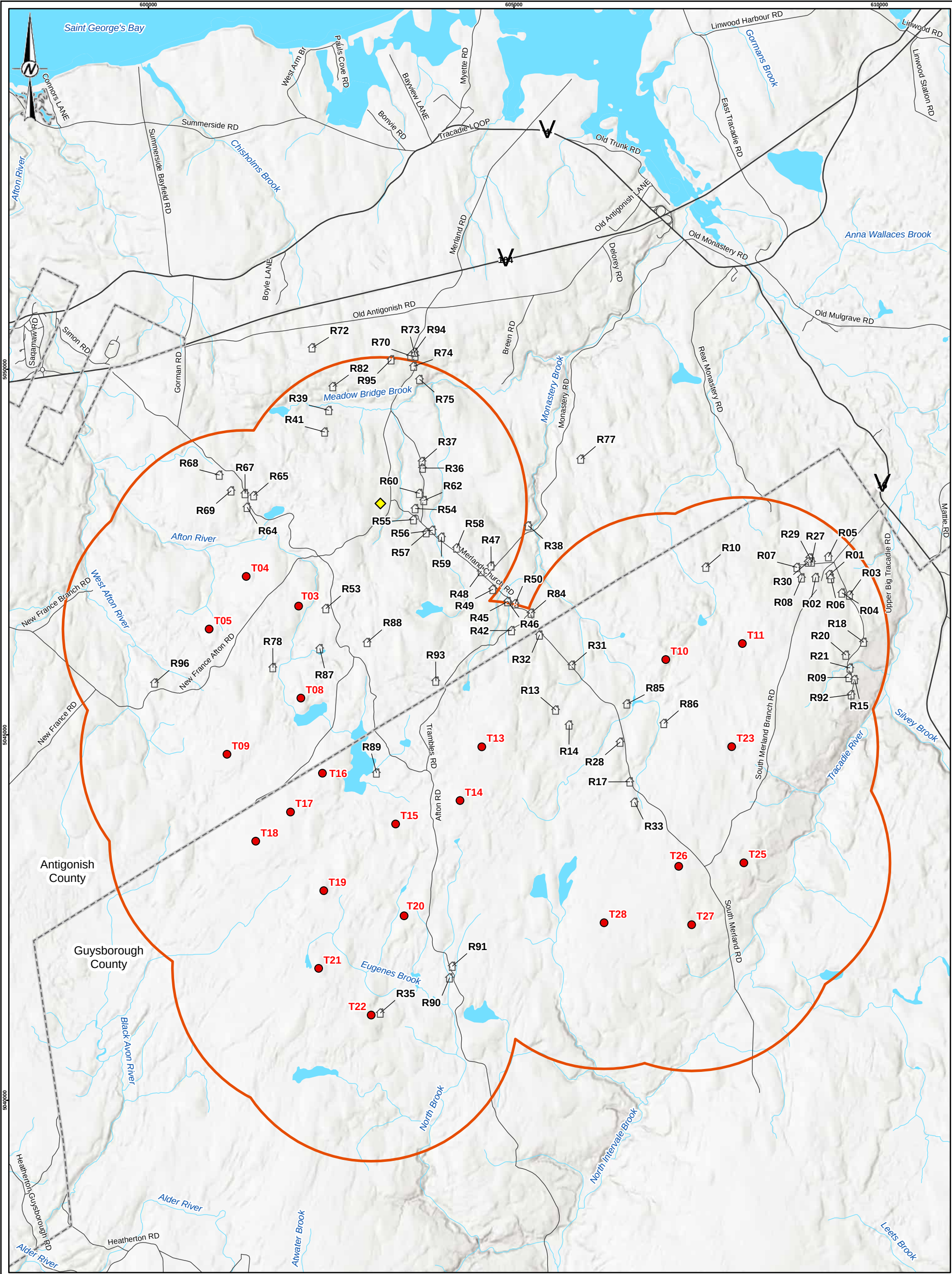
Table 2: Receptor Locations and Distance to Project Noise Sources

Receptor Identification Code ^(a)	Universal Transverse Mercator Coordinates (Zone 20)		Closest Project Noise Source	Distance to Closest Project Noise Source (m)
	Easting (m)	Northing (m)		
R84 ^(b)	605236	5046666	T10	1,948
R85 ^(b)	606547	5045424	T10	805
R86 ^(b)	607052	5045157	T10	873
R87 ^(b)	602345	5046180	T03	650
R88	602993	5046265	T03	1,062
R89 ^(b)	603120	5044479	T16	740
R90 ^(b)	604120	5041676	T20	1,052
R91 ^(b)	604158	5041835	T20	955
R92	609616	5045550	T11	1,647
R93	603932	5045736	T13	1,097
R94	603640	5050235	Substation	2,122 ^(c)
R95	603322	5050132	Substation	1,973
R96	600085	5045710	T05	1,048

(a) The receptor identification codes are not sequential because some locations were removed during the planning process.

(b) The owner of this receptor has an agreement with EverWind waiving the requirement to comply with noise limits.

(c) This receptor is located more than 2 km from the nearest Project noise source but was maintained in the assessment in the interest of fully capturing all potential noise effects.



- LEGEND**
- POTENTIAL RECEPTOR
 - HIGHWAY
 - LOCAL ROAD
 - MUNICIPAL BOUNDARY
 - WATERCOURSE
 - NOISE STUDY AREA
 - WATERBODY
 - NOISE SOURCE**
 - SUBSTATION
 - TURBINE

CLIENT
EVERWIND FUELS (EWF)

CONSULTANT



YYYY-MM-DD	2026-02-03
DESIGNED	VY
PREPARED	MV PT
REVIEWED	VY
APPROVED	AF

REFERENCE(S)
DIGITAL BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD83 PROJECTION: UTM ZONE 20

PROJECT
UPPER AFTON - NOISE REPORT

TITLE
STUDY AREA

PROJECT NO.
CA0057109.6278

CONTROL

REV.
0

FIGURE
1

4.2 Ambient Noise Levels

As discussed in Section 3 of this report, the 40 dBA threshold from the EA Guide (Nova Scotia 2024) applies to cumulative noise levels, which include the noise contribution from existing natural and anthropogenic sources (often called baseline or ambient noise levels), as well as the noise contribution from Project operations (Nova Scotia 2023).

The Noise Guidelines indicate that measured ambient noise levels may sometimes be required in response to specific direction from Nova Scotia Environment and Climate Change (Nova Scotia 2023). However, in quiet rural environments (like the Project study area) where natural noise sources tend to dominate, environmental assessments often establish representative ambient noise levels using a desktop method from Health Canada's *Guidance for Evaluating Human Health Effects in Impact Assessment: Noise* (Health Canada 2023), which will hereafter be referred to as the Health Canada Guidance.

The Health Canada Guidance indicates that an ambient noise level of 35 dBA is generally representative of a quiet rural environment during the nighttime period (Health Canada 2023). Representative ambient noise levels for each receptor are presented in Table 3. The Project noise assessment made use of these representative ambient noise levels when assessing potential effects.

Table 3: Representative Ambient Noise Levels

Receptor Identification Code	Representative Ambient Noise Level ^(a) [dBA]
R01	35
R02	35
R03	35
R04	35
R05	35
R06	35
R07	35
R08	35
R09	35
R10	35
R13	35
R14	35
R15	35
R17	35
R18	35
R20	35
R21	35
R27	35
R28	35
R29	35
R30	35
R31	35
R32	35
R33	35
R35	35
R36	35
R37	35
R38	35

Table 3: Representative Ambient Noise Levels

Receptor Identification Code	Representative Ambient Noise Level ^(a) [dBA]
R39	35
R41	35
R42	35
R45	35
R46	35
R47	35
R48	35
R49	35
R50	35
R53	35
R54	35
R55	35
R56	35
R57	35
R58	35
R59	35
R60	35
R62	35
R64	35
R65	35
R67	35
R68	35
R69	35
R70	35
R72	35
R73	35
R74	35
R75	35
R77	35
R78	35
R82	35
R84	35
R85	35
R86	35
R87	35
R88	35
R89	35
R90	35
R91	35
R92	35
R93	35
R94	35
R95	35
R96	35

(a) Ambient noise levels taken from Health Canada (2023).

4.3 Noise Prediction Methodology

A computer model for the Project noise assessment was developed using the CadnaA® software package, which implements the noise propagation algorithm described in the International Organization for Standardization (ISO) 9613-2 technical standard. The computer model was used to predict noise levels from operation of the Project. Inputs to the computer noise model consisted of source emissions in the form of octave band sound power levels and environmental conditions that are known to influence noise propagation (e.g., ground cover, temperature, humidity, wind conditions). A summary of environmental inputs to the computer models is provided in Table 4.

Table 4: Noise Model Inputs

Parameter	Model Setting	Description / Notes
Standard	ISO 9613-2	Model treated noise sources and noise propagation in accordance with this standard.
Ground Factor	0.7	This value represents the acoustic properties of the ground. A value of 0.0 indicates hard/reflective ground. A value of 1.0 indicates porous/absorptive ground. Values between 0.0 and 1.0 represent a mixture of hard and porous ground.
Temperate	10°C	This is the typical default value for ISO 9613-2 modelling intended to represent nighttime summer conditions.
Relative Humidity	70%	This is the typical default value for ISO 9613-2 modelling intended to represent nighttime summer conditions.
Wind Conditions	1 to 5 m/s from source to receptor	These represent default ISO 9613-2 wind conditions – moderate temperature inversion, wind from source to receptor 100% of the time.
Terrain	included	Model included terrain based on ground elevation contours at 5 m intervals.

When calculating noise levels at receptors, the ISO 9613-2 algorithm used the environmental inputs listed in Table 4 to account for four noise attenuation mechanisms:

- geometric divergence
- atmospheric absorption
- ground absorption
- screening by barriers

Geometric divergence accounts for the fact that a given noise source radiates a finite amount of acoustic energy and as this finite amount of energy propagates into the environment it is spread out over a larger and larger area (i.e., the surface of an ever-expanding sphere). This geometric spreading means that the farther away a receptor is located from a source, the less energy will be received (i.e., the lower the observed noise level).

Atmospheric absorption accounts for the fact that the acoustic energy associated with a given noise source is absorbed via interaction with molecules in the air through which it propagates. Attenuation effects associated with atmospheric absorption are most substantial at high frequencies but can be important at lower frequencies when propagation distances are large.

Ground absorption accounts for the fact that each time the acoustic energy emitted by a noise source interacts with the ground some of it is absorbed. The amount of energy absorbed depends on the type of ground surface. During interactions with hard ground very little energy is absorbed but during interactions with porous ground a substantial amount of energy is absorbed. As a result, if all other factors are held constant, observed noise levels associated with sources operating in an area of hard ground will be higher than observed noise levels associated with sources operating in an area of porous ground.

Screening by barriers accounts for the fact that a physical object (either terrain-based or anthropogenic) placed between a noise source and receptor can block acoustic energy and reduce observed noise levels at the receptor.

According to the ISO 9613-2 standard, the overall accuracy of the propagation algorithm used in the Project noise assessment computer models is ± 3 dBA for distances between source and receptor up to 1 km. The accuracy for propagation distances greater than 1 km is not stated in the standard. Model accuracy also depends on the accuracy of the noise emissions inputs, which is often ± 2 dBA. Accounting for both these independent sources of uncertainty, the overall accuracy of the noise levels predictions presented in the Project noise assessment is expected to be ± 3.6 dBA. Several conservative assumptions regarding propagation conditions, Project operations, and Project noise emissions were made to account for this level of uncertainty.

Each receptor was assumed to be downwind from each source 100% of the time. Because downwind conditions tend to enhance noise propagation, this assumption is conservative and likely overestimates noise effects from the Project.

The Project wind turbines and substation were modelled with maximum noise emissions 100% of the time. Because Project noise sources will often operate with less than maximum noise emissions (e.g., during periods of relatively low wind), this approach is conservative and likely overestimates noise effects from the Project.

Terrain features were the only acoustical screening elements considered in the computer models. Acoustical screening from anthropogenic features (e.g., buildings) and vegetation (e.g., the dense forest that covers most of the study area) was not considered in the computer models. This is a conservative approach that will tend to overestimate noise effects from the Project.

5 NOISE EMISSIONS

As discussed in Section 2, Project noise sources consist of 22 Goldwind GWH182 8.0-MW wind turbines with STE blades and pad-mounted transformers, and a substation consisting of a single 200 MVA electrical transformer. All Project sources were modelled with maximum planned noise emissions.

Noise emissions for the Project wind turbines were provided by Goldwind (the manufacturer) in the form of one-third octave band sound power levels. As discussed in Section 3.2 of this report, the Noise Guidelines provide a test for identifying low frequency tonal components in one-third octave band data (Nova Scotia 2023). WSP applied this test to the emissions data provided by Goldwind and found no tonal components associated with the Project wind turbines. Therefore, Project wind turbines cannot produce LFN issues as defined in Noise Guidelines (Nova Scotia 2023).

As discussed in Section 4.3, computer modelling in accordance with ISO 9613-2 requires that noise emissions be specified in the form of octave band sound power levels. To facilitate computer modelling, WSP processed the one-third octave band data provided by Goldwind to obtain octave band sound power levels for frequency bands from 31.5 to 8 kilohertz (kHz).

Emissions for the Project substation were calculated based on noise specifications provided by the transformer supplier. To facilitate computer modelling, substation noise emissions were established as octave band sound power levels from 31.5 to 8 kHz.

Table 5 presents noise emissions values used to model Project sources. All noise emissions values are presented in the form of octave band sound power levels, expressed in unweighted decibels (dBZ), and total sound power levels expressed in dBA.

Table 5: Project Noise Emissions

Source	Operating Mode ^(a)	Octave Band Sound Power Level (dBZ)									Total Sound Power Level (dBA)
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Goldwind GWH182 8.0-MW wind turbine with STE blades	NPMs	114.5	116.8	117.1	113.5	108.4	103.7	98.2	92.4	85.7	110.5
	SRM1s	113.9	115.9	116.2	112.6	107.4	102.7	97.3	91.6	84.9	109.6
	SRM4s	111.0	113.3	113.2	109.4	104.4	99.7	94.3	88.4	81.5	106.5
substation (one 200 MVA transformer)	ONAF2	101.4	107.4	109.4	104.4	104.4	98.4	93.4	88.4	81.4	104.8
wind turbine pad-mounted transformer ^(b)	natural air cooling and non-mineral oil (KNAN)	90.9	96.9	98.9	93.9	93.9	87.9	82.9	77.9	70.9	94.3

(a) Operating modes for individual Project wind turbines are specified in Table 1.

(b) There is one pad-mounted transformer associated with each Project wind turbine for a total of 22 pad-mounted transformers.

6 ASSESSMENT RESULTS

6.1 Broadband Noise – Operations

For each receptor, Table 6 presents predicted noise levels from Project operations and cumulative noise levels calculated by summing predicted Project noise levels with representative ambient noise levels from Table 3.

Figure 2 presents predicted cumulative noise levels for the entire study area.

Table 6: Predicted Project and Cumulative Noise Levels

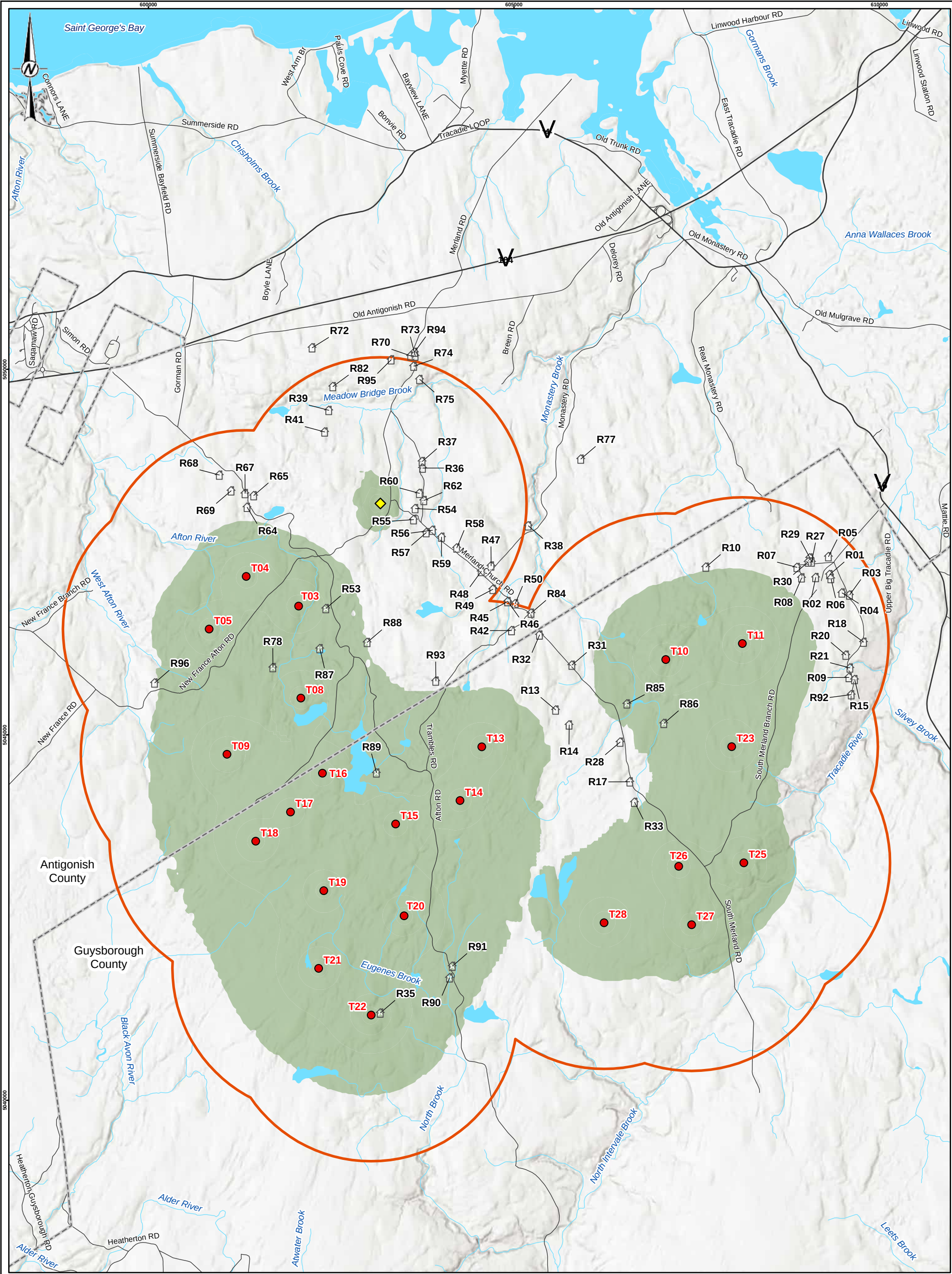
Receptor Identification Code	Project Noise Level – Operations (dBA)	Ambient Noise Level (dBA)	Cumulative Noise Level ^(a) (dBA)
R01	34.1	35	37.6
R02	35.0	35	38.0
R03	30.0	35	36.2
R04	34.2	35	37.6
R05	33.3	35	37.2
R06	34.4	35	37.7
R07	36.0	35	38.5
R08	36.5	35	38.8
R09	34.6	35	37.8
R10	38.1	35	39.8
R13 ^(b)	37.0	35	39.1
R14	37.2	35	39.2
R15	34.4	35	37.7
R17	37.8	35	39.6
R18	33.1	35	37.2
R20	35.1	35	38.1
R21	34.6	35	37.8
R27	34.3	35	37.7
R28	37.9	35	39.7
R29	34.1	35	37.6
R30	34.5	35	37.8
R31	36.5	35	38.8
R32	34.5	35	37.8
R33	38.4	35	40.0
R35 ^(b)	54.6	35	54.6
R36	32.3	35	36.9
R37	31.8	35	36.7
R38	30.3	35	36.3
R39	26.5	35	35.6
R41	29.3	35	36.0
R42	34.4	35	37.7
R45	32.9	35	37.1
R46	32.9	35	37.1
R47	32.2	35	36.8
R48	32.4	35	36.9
R49	32.9	35	37.1

Table 6: Predicted Project and Cumulative Noise Levels

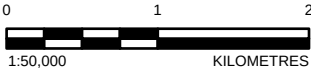
Receptor Identification Code	Project Noise Level – Operations (dBA)	Ambient Noise Level (dBA)	Cumulative Noise Level ^(a) (dBA)
R50	33.3	35	37.2
R53 ^(b)	44.1	35	44.6
R54	36.2	35	38.7
R55 ^(b)	36.0	35	38.5
R56	32.8	35	37.0
R57	33.6	35	37.4
R58	31.9	35	36.7
R59	32.0	35	36.8
R60	34.6	35	37.8
R62	33.9	35	37.5
R64	36.7	35	38.9
R65	35.4	35	38.2
R67	35.1	35	38.1
R68	32.9	35	37.1
R69	34.7	35	37.9
R70	25.9	35	35.5
R72	22.1	35	35.2
R73	25.5	35	35.5
R74	26.1	35	35.5
R75	26.3	35	35.5
R77	28.4	35	35.9
R78 ^(b)	43.0	35	43.6
R82	28.5	35	35.9
R84 ^(b)	33.4	35	37.3
R85 ^(b)	40.2	35	41.3
R86 ^(b)	40.9	35	41.9
R87 ^(b)	42.0	35	42.8
R88	38.3	35	40.0
R89 ^(b)	42.7	35	43.4
R90 ^(b)	40.9	35	41.9
R91 ^(b)	41.2	35	42.1
R92	33.1	35	37.2
R93	37.6	35	39.5
R94	25.6	35	35.5
R95	26.5	35	35.6
R96	38.1	35	39.8

(a) Cumulative noise level is the sum of the predicted Project noise level and the ambient noise level.

(b) The owner of this receptor has an agreement with EverWind waiving the requirement to comply with noise limits.



- LEGEND**
- POTENTIAL RECEPTOR
 - HIGHWAY
 - LOCAL ROAD
 - MUNICIPAL BOUNDARY
 - WATERCOURSE
 - NOISE STUDY AREA
 - WATERBODY
- NOISE SOURCE**
- SUBSTATION
 - TURBINE
- PREDICTED CUMULATIVE NOISE LEVEL**
- 40 A-WEIGHTED DECIBELS (dBA)



REFERENCE(S)

DIGITAL BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD83 PROJECTION: UTM ZONE 20

PROJECT

UPPER AFTON - NOISE REPORT

TITLE

CUMULATIVE NOISE LEVELS

PROJECT NO.
CA0057109.6278

CONTROL

REV.
0

FIGURE
2

CLIENT

EVERWIND FUELS (EWF)

CONSULTANT



YYYY-MM-DD	2026-02-03
DESIGNED	VY
PREPARED	MV PT
REVIEWED	VY
APPROVED	AF

Table 7 assesses Project compliance with the EA Guide (Nova Scotia 2021; Nova Scotia 2024) by comparing cumulative noise levels during Project operations to the 40 dBA noise threshold. The results presented in Table 7 demonstrates that cumulative noise levels are predicted to comply with the EA Guide (Nova Scotia 2021; Nova Scotia 2024) at all receptors where compliance is required.

Table 7: Compliance Assessment

Receptor Identification Code	Cumulative Noise Level (dBA)	EA Guide Noise Threshold (dBA)	Margin of Compliance ^(a) (dBA)	Assessment
R01	37.6	40	2.4	compliant
R02	38.0	40	2.0	compliant
R03	36.2	40	3.8	compliant
R04	37.6	40	2.4	compliant
R05	37.2	40	2.8	compliant
R06	37.7	40	2.3	compliant
R07	38.5	40	1.5	compliant
R08	38.8	40	1.2	compliant
R09	37.8	40	2.2	compliant
R10	39.8	40	0.2	compliant
R13	39.1	n/a ^(b)	n/a ^(b)	n/a ^(b)
R14	39.2	40	0.8	compliant
R15	37.7	40	2.3	compliant
R17	39.6	40	0.4	compliant
R18	37.2	40	2.8	compliant
R20	38.1	40	1.9	compliant
R21	37.8	40	2.2	compliant
R27	37.7	40	2.3	compliant
R28	39.7	40	0.3	compliant
R29	37.6	40	2.4	compliant
R30	37.8	40	2.2	compliant
R31	38.8	40	1.2	compliant
R32	37.8	40	2.2	compliant
R33	40.0	40	0.0	compliant
R35	54.6	n/a ^(b)	n/a ^(b)	n/a ^(b)
R36	36.9	40	3.1	compliant
R37	36.7	40	3.3	compliant
R38	36.3	40	3.7	compliant
R39	35.6	40	4.4	compliant
R41	36.0	40	4.0	compliant
R42	37.7	40	2.3	compliant
R45	37.1	40	2.9	compliant
R46	37.1	40	2.9	compliant
R47	36.8	40	3.2	compliant
R48	36.9	40	3.1	compliant

Receptor Identification Code	Cumulative Noise Level (dBA)	EA Guide Noise Threshold (dBA)	Margin of Compliance ^(a) (dBA)	Assessment
R49	37.1	40	2.9	compliant
R50	37.2	40	2.8	compliant
R53	44.6	n/a ^(b)	n/a ^(b)	n/a ^(b)
R54	38.7	40	1.3	compliant
R55	38.5	n/a ^(b)	n/a ^(b)	n/a ^(b)
R56	37.0	40	3.0	compliant
R57	37.4	40	2.6	compliant
R58	36.7	40	3.3	compliant
R59	36.8	40	3.2	compliant
R60	37.8	40	2.2	compliant
R62	37.5	40	2.5	compliant
R64	38.9	40	1.1	compliant
R65	38.2	40	1.8	compliant
R67	38.1	40	1.9	compliant
R68	37.1	40	2.9	compliant
R69	37.9	40	2.1	compliant
R70	35.5	40	4.5	compliant
R72	35.2	40	4.8	compliant
R73	35.5	40	4.5	compliant
R74	35.5	40	4.5	compliant
R75	35.5	40	4.5	compliant
R77	35.9	40	4.1	compliant
R78	43.6	n/a ^(b)	n/a ^(b)	n/a ^(b)
R82	35.9	40	4.1	compliant
R84	37.3	n/a ^(b)	n/a ^(b)	n/a ^(b)
R85	41.3	n/a ^(b)	n/a ^(b)	n/a ^(b)
R86	41.9	n/a ^(b)	n/a ^(b)	n/a ^(b)
R87	42.8	n/a ^(b)	n/a ^(b)	n/a ^(b)
R88	40.0	40	0.0	compliant
R89	43.4	n/a ^(b)	n/a ^(b)	n/a ^(b)
R90	41.9	n/a ^(b)	n/a ^(b)	n/a ^(b)
R91	42.1	n/a ^(b)	n/a ^(b)	n/a ^(b)
R92	37.2	40	2.8	compliant
R93	39.5	40	0.5	compliant
R94	35.5	40	4.5	compliant
R95	35.6	40	4.4	compliant
R96	39.8	40	0.2	compliant

(a) Margin of compliance is the difference between the noise threshold (i.e., 40 dBA) and the predicted cumulative noise level. A margin of compliance ≥ 0 dBA indicates the Project is compliant with the EA Guide (Nova Scotia 2021; Nova Scotia 2024).

(b) The owner of this receptor has an agreement with EverWind waiving the requirement to comply with noise limits.

6.2 Low Frequency Noise

As discussed in Section 3.1 of this report, the EA Guide requires a discussion of potential effects from LFN or infrasound during Project operations but does not provide quantitative thresholds or limits for assessing such effects (Nova Scotia 2021). In contrast, as discussed in Section 3.2 of this report, the Noise Guidelines provide a two-part quantitative test for identifying and accounting for LFN issues (Nova Scotia 2023). The Project noise assessment made use of the two-part test from the Noise Guidelines to assess potential LFN effects from the Project.

According to the Noise Guidelines, an LFN issue exists if the difference between dBA and dBC noise levels is ≥ 20 **and** there is a low frequency tonal component in at least one of the one-third octave bands. Both parts of the two-part test must be satisfied for a LFN issue to exist.

As discussed in Section 5 of this report, the second part of the LFN test was applied to the one-third octave band emissions spectrum from the Project wind turbines, and no tonal components were identified. As such, the Project is not expected to produce LFN issues as defined in the Noise Guidelines (Nova Scotia 2023). Notwithstanding, Table 8 presents predicted Project noise levels expressed in dBA and predicted Project noise levels expressed in dBC and compares the difference between dBC and dBA levels to the threshold value from the first part of the LFN test. Table 8 indicates the difference between dBC and dBA noise levels is less than 20 at all receptors.

Table 8: Low Frequency Noise Assessment

Receptor Identification Code	First Part of Low Frequency Noise Test				Second Part of Low Frequency Noise Test	Assessment
	Predicted Project Noise Level			Noise Guidelines Threshold Value	Presence of Tonal Component	
	(dBA)	(dBC)	Difference: dBC minus dBA			
R01	34.1	48.7	14.6	20	no	no LFN issue
R02	35.0	47.6	12.6	20	no	no LFN issue
R03	30.0	44.3	14.3	20	no	no LFN issue
R04	34.2	48.6	14.4	20	no	no LFN issue
R05	33.3	48.0	14.7	20	no	no LFN issue
R06	34.4	48.8	14.4	20	no	no LFN issue
R07	36.0	50.1	14.1	20	no	no LFN issue
R08	36.5	50.6	14.1	20	no	no LFN issue
R09	34.6	48.9	14.3	20	no	no LFN issue
R10	38.1	52.1	14.0	20	no	no LFN issue
R13	37.0	51.8	14.8	n/a ^(a)	no	n/a ^(a)
R14	37.2	51.9	14.7	20	no	no LFN issue
R15	34.4	49.2	14.8	20	no	no LFN issue
R17	37.8	52.9	15.1	20	no	no LFN issue
R18	33.1	47.8	14.7	20	no	no LFN issue
R20	35.1	48.5	13.4	20	no	no LFN issue
R21	34.6	48.9	14.3	20	no	no LFN issue
R27	34.3	48.8	14.5	20	no	no LFN issue
R28	37.9	52.7	14.8	20	no	no LFN issue
R29	34.1	48.6	14.5	20	no	no LFN issue

Table 8: Low Frequency Noise Assessment

Receptor Identification Code	First Part of Low Frequency Noise Test				Second Part of Low Frequency Noise Test	Assessment
	Predicted Project Noise Level			Noise Guidelines Threshold Value		
	(dBA)	(dBC)	Difference: dBC minus dBA			
R30	34.5	48.9	14.4	20	no	no LFN issue
R31	36.5	51.1	14.6	20	no	no LFN issue
R32	34.5	49.9	15.4	20	no	no LFN issue
R33	38.4	52.8	14.4	20	no	no LFN issue
R35	54.6	66.7	12.1	n/a ^(a)	no	n/a ^(a)
R36	32.3	46.3	14.0	20	no	no LFN issue
R37	31.8	46.1	14.3	20	no	no LFN issue
R38	30.3	46.3	16.0	20	no	no LFN issue
R39	26.5	41.3	14.8	20	no	no LFN issue
R41	29.3	43.9	14.6	20	no	no LFN issue
R42	34.4	50.1	15.7	20	no	no LFN issue
R45	32.9	48.7	15.8	20	no	no LFN issue
R46	32.9	48.7	15.8	20	no	no LFN issue
R47	32.2	48.4	16.2	20	no	no LFN issue
R48	32.4	48.0	15.6	20	no	no LFN issue
R49	32.9	49.0	16.1	20	no	no LFN issue
R50	33.3	49.0	15.7	20	no	no LFN issue
R53	44.1	57.3	13.2	n/a ^(a)	no	n/a ^(a)
R54	36.2	49.1	12.9	20	no	no LFN issue
R55	36.0	49.1	13.1	n/a ^(a)	no	n/a ^(a)
R56	32.8	47.1	14.3	20	no	no LFN issue
R57	33.6	47.8	14.2	20	no	no LFN issue
R58	31.9	47.3	15.4	20	no	no LFN issue
R59	32.0	46.9	14.9	20	no	no LFN issue
R60	34.6	47.5	12.9	20	no	no LFN issue
R62	33.9	47.1	13.2	20	no	no LFN issue
R64	36.7	51.2	14.5	20	no	no LFN issue
R65	35.4	50.2	14.8	20	no	no LFN issue
R67	35.1	49.8	14.7	20	no	no LFN issue
R68	32.9	48.1	15.2	20	no	no LFN issue
R69	34.7	49.6	14.9	20	no	no LFN issue
R70	25.9	41.1	15.2	20	no	no LFN issue
R72	22.1	37.9	15.8	20	no	no LFN issue
R73	25.5	41.0	15.5	20	no	no LFN issue
R74	26.1	41.4	15.3	20	no	no LFN issue
R75	26.3	41.6	15.3	20	no	no LFN issue

Table 8: Low Frequency Noise Assessment

Receptor Identification Code	First Part of Low Frequency Noise Test				Second Part of Low Frequency Noise Test	Assessment
	Predicted Project Noise Level			Noise Guidelines Threshold Value	Presence of Tonal Component	
	(dBA)	(dBC)	Difference: dBC minus dBA			
R77	28.4	44.5	16.1	20	no	no LFN issue
R78	43.0	56.8	13.8	n/a ^(a)	no	n/a ^(a)
R82	28.5	43.0	14.5	20	no	no LFN issue
R84	33.4	48.7	15.3	n/a ^(a)	no	n/a ^(a)
R85	40.2	54.1	13.9	n/a ^(a)	no	n/a ^(a)
R86	40.9	54.8	13.9	n/a ^(a)	no	n/a ^(a)
R87	42.0	56.0	14.0	n/a ^(a)	no	n/a ^(a)
R88	38.3	53.1	14.8	20	no	no LFN issue
R89	42.7	56.8	14.1	n/a ^(a)	no	n/a ^(a)
R90	40.9	55.1	14.2	n/a ^(a)	no	n/a ^(a)
R91	41.2	55.4	14.2	n/a ^(a)	no	n/a ^(a)
R92	33.1	47.8	14.7	20	no	no LFN issue
R93	37.6	52.1	14.5	20	no	no LFN issue
R94	25.6	40.9	15.3	20	no	no LFN issue
R95	26.5	42.2	15.7	20	no	no LFN issue
R96	38.1	52.9	14.8	20	no	no LFN issue

(a) The owner of this receptor has an agreement with EverWind waiving the requirement to comply with noise limits.

6.3 Construction Noise

As discussed in Section 3.1 of this report, the EA Guide requires a discussion of potential noise effects during construction of the Project but does not provide quantitative thresholds or limits for assessing such effects (Nova Scotia 2021). The Noise Guidelines (Nova Scotia 2023) do not require an assessment of construction noise or provide thresholds/limits for evaluating potential construction noise effects. In the absence of quantitative thresholds or detailed assessment methodology, the Project noise assessment considered construction noise qualitatively.

Potential noise effects during Project construction will vary based on the type of construction activities. The primary noise sources associated with construction will include trucks and other vehicles (used to transport workers and materials to the site), backhoes and graders (for site preparation), blasting, cranes, and smaller equipment such as welding units. Due to their tonal character, back-up alarms installed on mobile equipment are also an important source when assessing potential effects from construction noise. Noise levels at receptors during construction activities will depend primarily on the number, type, and proximity of noise sources. Construction noise levels will decrease as the distance between the receptors and construction activities increases.

Where practical, EverWind will implement the following measures to mitigate potential noise effects during Project construction.

- Conduct construction activities within acceptable timeframes per municipal bylaws.
- Advise nearby residents of noisy activities (e.g., blasting) and schedule these activities to reduce disruption.
- Install appropriate and well-maintained muffler systems on engine-driven equipment.
- Design work areas and travel paths to reduce the amount of time that equipment must operate in reverse and thereby reduce the use of back-up alarms.
- Respond expeditiously to noise complaints and take appropriate action to address such complaints.

Implementation of the measures listed above should be sufficient to mitigate potential noise effects from Project construction to an acceptable level.

7 SUMMARY AND DISCUSSION

A noise assessment was prepared for the Project in accordance with provincial requirements. In particular, the Project noise assessment took guidance from the EA Guide (Nova Scotia 2021; Nova Scotia 2024) and the Noise Guidelines (Nova Scotia 2023). The noise assessment considered potential effects to permanent and seasonal receptors located within approximately 2 km of the Project. The noise assessment considered potential effects associated with Project operations and Project construction.

The Project noise assessment concluded:

- Cumulative noise levels from operation of the Project will comply with the 40 dBA noise threshold from the EA Guide (Nova Scotia 2021; Nova Scotia 2024).
- Operation of the Project will not result in low frequency noise issues as defined in the Noise Guidelines (Nova Scotia 2023).
- Implementation of noise mitigation measures should be sufficient to reduce potential effects from Project construction to acceptable levels.

In summary, the noise assessment predicts that Project construction and operation will comply with all provincial requirements. As such, the Project is not expected to result in unacceptable noise effects.

Signature Page

WSP Canada Inc.

ORIGINAL SIGNED BY

Soheil Tofighiniaki, MSc, MEng
Jr Acoustics and Vibration Consultant

ORIGINAL SIGNED BY

Andrew Faszler, BSc, INCE
Senior Principal

ORIGINAL SIGNED BY

Kimberlea Green
Project Manager

VY/AF/NLH/tt

8 REFERENCES

Health Canada. 2023. Guidance for Evaluating Human Health Effects in Impact Assessment: Noise.

Nova Scotia (Nova Scotia Policy Division Environmental Assessment Branch). 2021. Guide to Preparing an EA Registration Document for Wind Power Projects in Nova Scotia.

Nova Scotia. 2023. Guidelines for Environmental Noise Measurement and Assessment.

Nova Scotia. 2024. Environmental Assessment Supplemental Checklist: Wind Energy Project.

wsp



wsp.com