



ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Sturk Quarry Expansion Project

Prepared for: Prospect Industrial Equipment Sales and Rentals Limited



June 2026

June 30th, 2026

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

Dear Mr. McInnis,

Re: Environmental Assessment Registration Document
Sturk Quarry Expansion Project

Please find enclosed the Environmental Assessment Registration Document for the Sturk Quarry Expansion Project.

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

Sincerely,

A handwritten signature in blue ink that reads "Howard Little". The signature is written in a cursive style with a large, stylized 'H' and 'L'.

EXECUTIVE SUMMARY

Prospect Industrial Equipment Sales and Rentals Limited (Prospect, the “Proponent”) has owned and operated Sturk Quarry in Morristown, Nova Scotia since 2013. The existing quarry, limited to 4 hectares (ha), produces approximately 10,000 to 15,000 tonnes (t) of asphalt and 60,000 to 70,000 t of gravel annually, supporting essential infrastructure and development in the Annapolis Valley and surrounding communities. The Sturk Quarry Expansion Project (the “Project”) is being proposed to expand the quarry by up to 52.9 ha to support continued operations.

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 and the Nova Scotia Class I Environmental Assessment Checklist.

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

- Atmospheric environment
 - Weather, climate, air quality
 - GHGs
 - Sound
- Geophysical environment
 - Geology
 - Hydrogeology/groundwater
- Aquatic environment
 - Surface water, fish and fish habitat
 - Wetlands
- Terrestrial environment
 - Terrestrial vegetation communities and flora
 - Terrestrial fauna
 - Avifauna
- Socioeconomic environment
 - Economy
 - Land use and value
 - Recreation, and tourism
- Archaeological resources

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.

The Proponent will continue to engage with the local community, regulatory agencies and the Mi’kmaq of Nova Scotia, ensuring transparency on the project is maintained and any potential issues or concerns are addressed.

TABLE OF CONTENTS

	<i>page</i>
1.0 PROPONENT DESCRIPTION	1
2.0 PROJECT INFORMATION	1
2.1 Purpose & Need for the Undertaking	2
2.2 Regulatory Framework	2
2.2.1 Federal	2
2.2.2 Provincial	3
2.2.3 Municipal	3
2.3 Funding.....	4
3.0 DESCRIPTION OF THE UNDERTAKING	4
3.1 Geographical Location	4
3.1.1 Siting Considerations.....	4
3.2 Project Proximity to Other Areas	6
3.2.1 Other Known Developments	7
3.3 Project Design and Operation	7
3.3.1 Existing Quarry Operations	7
3.3.2 Development Plan	7
3.4 Decommissioning and Reclamation	11
3.5 Project Schedule	12
4.0 PROJECT SCOPE & ASSESSMENT METHODS	13
4.1 Assessment Scope & Approach.....	13
4.1.1 Identification of Valued Components.....	13
4.1.2 Spatial & Temporal Boundaries.....	14
4.1.3 Species at Risk.....	15
4.1.4 Biophysical Assessment Components and Timing	15
4.2 Potential Project-Valued Component Interactions	16
4.3 Effects Assessment Criteria	16
4.4 Monitoring & Follow-Up	18
5.0 MI'KMAQ OF NOVA SCOTIA	18
5.1 Engagement	19
5.1.1 Summary of Engagement.....	20
6.0 PUBLIC ENGAGEMENT	20
7.0 ATMOSPHERIC ENVIRONMENT	21
7.1 Atmosphere and Air Quality	21
7.1.1 Overview.....	21
7.1.2 Regulatory Context.....	21
7.1.3 Assessment Methodology	21
7.1.4 Assessment Results	22
7.1.5 Effects Assessment.....	25
7.2 Climate Change.....	29
7.2.1 Overview.....	29
7.2.2 Regulatory Context.....	30

7.2.3	Assessment Methodology	30
7.2.4	Sources of Greenhouse Gas Emissions	30
7.2.5	GHG Baseline Conditions	32
7.2.6	Effects Assessment	32
7.3	Sound	34
7.3.1	Overview	34
7.3.2	Regulatory Context	34
7.3.3	Assessment Methodology	35
7.3.4	Sound Assessment Results	35
7.3.5	Effects Assessment	36
8.0	GEOPHYSICAL ENVIRONMENT	38
8.1	Overview	38
8.2	Regulatory Context	38
8.3	Assessment Methodology	39
8.4	Assessment Results	39
8.5	Effects Assessment	41
9.0	FRESHWATER AQUATIC ENVIRONMENT	44
9.1	Surface Water and Fish and Fish Habitat	44
9.1.1	Overview	44
9.1.2	Regulatory Context	45
9.1.3	Desktop Review	46
9.1.4	Field Assessment Methodology	48
9.1.5	Field Assessment Results	50
9.1.6	Effects Assessment	61
9.2	Wetlands	66
9.2.1	Overview	66
9.2.2	Regulatory Context	67
9.2.3	Desktop Review	67
9.2.4	Field Assessment	68
9.2.4.1	Field Assessment Methodology	68
9.2.4.2	Field Assessment Results	71
9.2.5	Effects Assessment	75
10.0	TERRESTRIAL ENVIRONMENT	81
10.1	Terrestrial Vegetation Communities and Flora	81
10.1.1	Overview	81
10.1.2	Regulatory Context	82
10.1.3	Desktop Review	82
10.1.4	Field Assessment Methodology	84
10.1.5	Field Assessment Results	85
10.1.6	Effects Assessment	89
10.2	Terrestrial Fauna	94
10.2.1	Overview	94
10.2.2	Regulatory Context	95
10.2.3	Desktop Review	95

10.2.4	Field Assessment Methods	98
10.2.5	Field Assessment Results	99
10.2.6	Effects Assessment	101
10.3	Avifauna.....	106
10.3.1	Overview.....	106
10.3.2	Regulatory Context.....	106
10.3.3	Desktop Review.....	107
10.3.4	Field Assessment Methodology	109
10.3.5	Avifauna Field Assessment Results	113
10.3.6	Effects Assessment	118
11.0	SOCIO-ECONOMIC ENVIRONMENT	126
11.1	Economy.....	126
11.1.1	Overview and Assessment Methodology	126
11.1.2	Existing Environment.....	127
11.1.3	Effects Assessment	131
11.2	Land Use	133
11.2.1	Overview and Assessment Methodology	133
11.2.2	Existing Land Use.....	134
11.2.2.1	Recreation and Tourism.....	134
11.2.3	Effects Assessment	136
12.0	ARCHAEOLOGICAL RESOURCES	138
12.1	Overview.....	138
12.2	Regulatory Context.....	138
12.3	Assessment Methods	139
12.4	Assessment Results	140
12.5	Effects Assessment	140
13.0	EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT.....	142
13.1	Summary of Effects of the Undertaking on the Environment	142
14.0	EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING.....	148
14.1	Climate Change.....	148
14.1.1	Increased Air Temperature.....	148
14.1.2	Changes in Precipitation.....	148
14.2	Natural Hazards.....	149
14.2.1	Severe Weather Events.....	149
14.2.2	Wildfire.....	150
14.3	Summary of Effects	150
15.0	ACCIDENTS, MALFUNCTIONS, AND UNPLANNED EVENTS	150
15.1	ESC failures.....	151
15.2	Fires and Explosions	151
15.3	Fuel and Hazardous Chemical Spills & Releases	152
15.4	Vehicle Collisions	153
16.0	CUMULATIVE EFFECTS	153
16.1	Overview.....	153
16.2	Cumulative Effects Assessment Methods	153

16.2.1	Selection of Boundaries.....	154
16.3	Cumulative Effects Assessment Conclusion.....	154
17.0	CONCLUSION	155
18.0	CLOSURE	155
19.0	REFERENCES.....	156

LIST OF FIGURES

Figure 7.1: Windrose Plot for Greenwood A Meteorological Station (CYZX) – January 1, 1991, Through December 31, 2020 (ISU, 2025).....	23

LIST OF TABLES

Table 1.1: Proponent and Consultant Contact Information	1
Table 2.1: Federal Regulatory Requirements	2
Table 2.2: Provincial Regulatory Requirements.....	3
Table 2.3: Municipal Requirements.....	4
Table 3.1: Land Parcels within the Study Area	4
Table 3.2: Summary of Minimum Setbacks and Separation Distances	5
Table 3.3: Proximity of the Project to Other Areas.....	6
Table 3.4: General Quarry Activity Schedule	8
Table 3.5: Project Schedule	12
Table 4.1: Temporal Boundaries.....	15
Table 4.2: Temporal Boundaries.....	15
Table 4.3: Biophysical Assessment Components, Timing, and Surveyors.....	16
Table 4.4: Effects Assessment Criteria	17
Table 4.5: Definition of Significant Residual Environmental Effect	17
Table 5.1: Engagement with the Mi'kmaq of Nova Scotia.....	19
Table 7.1: Climate Data from the Greenwood A Meteorological Station (1991 to 2020).....	22
Table 7.2: Summary of Regulations Pertaining to Ambient Air Quality in Nova Scotia	23
Table 7.3: Maximum Ambient Air Quality Conditions at Kentville (2021 to 2025)	24
Table 7.4: Potential Project-Atmospheric Interactions	25
Table 7.5: Atmosphere and Air Quality Residual Effects	29
Table 7.6: Potential Project-GHG Interactions	32
Table 7.7: Climate Change Residual Effects	34
Table 7.8: Summary of Sound Level Regulations and Guidelines.....	34
Table 7.9: Decibel Limits of Construction Equipment Required for the Project	35
Table 7.10: Potential Project-Sound Interactions.....	36
Table 7.11: Sound Residual Effects	38
Table 8.1: Water Well Records within 800 m of the Study Area	41
Table 8.2: Potential Project-Geophysical Interactions	41
Table 8.3: Geophysical Environment Residual Effects	44
Table 9.1: Watercourse Characteristics Within the Study Area	51
Table 9.2: Electrofishing Survey Results	53

Table 9.3: Trapping Survey Results	55
Table 9.4: Fish Species Captured within the Study Area	56
Table 9.5: In-Situ Water Quality Results	58
Table 9.6: Potential Project Interactions for Surface Water and Fish and Fish Habitat	61
Table 9.7: Summary of WBA Results	64
Table 9.8: Surface Water and Fish and Fish Habitat Residual Effects	66
Table 9.9: Classification of Wetland-Associated Plant Species	69
Table 9.10: Indicators of Wetland Hydrology	70
Table 9.11: WESP-AC Version 3.3 Function Parameters	70
Table 9.12: Summary of WESP-AC Assessments Using Version 3.3 for Wetlands within the PDA	73
Table 9.13: Summary of Field-Identified Potential WSS, as Determined by the Presence of Avifauna SAR	75
Table 9.14: Potential Project Interactions with Wetlands	76
Table 9.15: Habitat Alteration Potential for Field-Delineated Wetlands	77
Table 9.16: Wetland Resources Residual Effects	81
Table 10.1: ACCDC Plant and Lichen SOCI Recorded within 5 km of the Study Area	84
Table 10.2: Vegetation Communities Identified within the Study Area	86
Table 10.3: Potential Project-Terrestrial Vegetation Communities and Flora Interactions	89
Table 10.4: Terrestrial Vegetation Communities and Flora Residual Effects	94
Table 10.5: ACCDC Terrestrial Fauna SAR and SOCI within 5 km of the Study Area	96
Table 10.6: Summary of Trail Camera Observations	100
Table 10.7: Potential Project-Terrestrial Fauna Interactions	101
Table 10.8: Terrestrial Fauna Residual Effects	106
Table 10.9: Avian SAR Recorded within five km of the Study Area Per ACCDC	108
Table 10.10: Avian SAR Recorded within MBBA Squares 20LQ67 and 20LQ68	109
Table 10.11: Overview of Avian Surveys Completed for the Project	110
Table 10.12: Potential Project-Avifauna Interactions	118
Table 10.13: Avifauna Residual Effects	126
Table 11.1: Population Characteristics in 2016 and 2021 for Nova Scotia and Kings Subd. A	127
Table 11.2: Age Distribution in 2021 in Nova Scotia, Kings County, and Kings Subd. A	128
Table 11.3: Housing Costs (2021) and Median Individual Income (2020) for Canada, Nova Scotia, Kings County, and Kings Subd. A	128
Table 11.4: Employment Statistics for Canada, Nova Scotia, Kings County, and Kings Subd. A ..	129
Table 11.5: Top Industries for the Employed Labour Force in 2021 in Nova Scotia, Kings County, and Kings Subd. A, Including Number Employed, Rank in Jurisdiction, and % of Total Workforce	130
Table 11.6: Local Businesses within 10 km of the Project and Their Proximity Sorted by Business Type and Distance to the Project	130
Table 11.7: Potential Project-Economy Interactions	132
Table 11.8: Potential Project-Land Use Interactions	136
Table 12.1: Potential Project-Archaeological Resources Interactions	140
Table 12.2: Archaeological Resources Residual Effects	142
Table 13.1: Effects of the Undertaking on the Environment Summary	143

LIST OF ACRONYMS

%	Percent
µg/m ³	Micrograms per cubic metre
µm	Micrometres
1DC	Annapolis River primary watershed
1DC-3	Annapolis River secondary watershed
AAQMS	Ambient air quality monitoring station
AAQS	Ambient air quality standards
ACCDC	Atlantic Canada Conservation Data Centre
AMO	Abandoned mine opening
AP	Aquatic plants
APM	Archaeological Potential Model
AQHI	Air quality health index
ARD	Acid rock drainage
ARIA	Archaeological Resource Impact Assessment
ATV	All-terrain vehicle
B	Breeding season
BMP	Best management practices
CCME	Canadian Council of Ministers of the Environment
CCOHS	Occupational Exposure Limits in Canada/Canadian Centre for Occupational Health and Safety
CEA	Cumulative effects assessment
CH ₄	Methane
CMAR	Centre for Marine Applied Research
CMIP6	Coupled Model Intercomparison Project Phase 6
CO	Carbon monoxide
CO ₂	Carbon dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	Catch per unit effort
CSD	Census subdivision
CYZX	Greenwood A Meteorological Station
dBA	A-weighted decibels
DBH	Diameter at breast height
DFO	Fisheries and Oceans Canada
E	Ephemeral
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EP	Eel pot
ESA	<i>Endangered Species Act</i> (Nova Scotia, 1998)
ESC	Erosion and Sediment Control

ESRI	Environmental Systems Research Institute
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FEC	Forest ecosystem classification
FWAL	Freshwater Aquatic Life
GHG	Greenhouse gas
GPS	Global Positioning System
H ₂ S	Hydrogen sulphide
ha	Hectares
HADD	Harmful alteration, disruption, or destruction
HIS	Habitat suitability index
HT-2000	Halltech Battery Backpack Electrofisher
I	Intermittent
IA	Industrial Approval
IBA	Important Bird Area
IH	Intolerant hardwood
IN	Instream objects/in situ cover
KMK	Kwilmu'kw Maw-klusuaqn Negotiation Office
KMK-ARD	KMK Archaeological Research Division
LAA	Local assessment area
LiDAR	Light detection and ranging
M	Migration
M3	Rural Industrial
MARI	Maritime Archaeological Resource Inventory
masl	Metres above sea level
MBBA	Maritimes Breeding Bird Atlas
MBCA	<i>Migratory Bird Convention Act</i> (Canada, 1994)
MBS	Migratory Bird Sanctuaries
MEKS	Mi'kmaq Ecological Knowledge Study
MT	Minnow trap
MW	Mixedwood
N	Non-breeding season
N1	Resource Zone
N ₂ O	Nitrous oxide
NI	No indicator status
NL	Plants that are not listed
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
NRCan	Natural Resources Canada

NSAQR	Nova Scotia Air Quality Regulations
NSCCTH	Nova Scotia Communities, Culture, Tourism and Heritage
NSECC	Nova Scotia Environment and Climate Change
NSFA	Nova Scotia Freshwater Fish Species Distribution Records
NSNR	Nova Scotia Natural Resources
NSPW	Nova Scotia Public Works
O	Overhead Cover
O ₃	Ozone
OBL	Obligate
OHV	Off-highway vehicle
OLA	Nova Scotia Office of L'nu Affairs
P	Perennial
PC	Point count
PDA	Project Development Area
pH	Potential of hydrogen (measure of acidity/alkalinity)
PID	Property identification number(s)
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
S3S4	American Beech
SAR	Species at risk
SARA	<i>Species at Risk Act</i> (Canada, 2002)
SH	Spruce Hemlock
SMP	Special management practice
SO ₂	Sulphur dioxide
SOCI	Species of conservation interest
SP	Spruce Pine
S-Rank	Subnational rank
t	tonnes
TDS	Total dissolved solids
TH	Tolerant Hardwood
TNS	Tourism Nova Scotia
TRS	Total reduced sulphur
TSS	Total Suspended Solids
UPL	Upland
UTM	Universal Transverse Mercator

VC	Valued components
WAM	Wet Areas Mapping
WBA	Water Balance Assessment
WC	Wet Coniferous
WESP-AC	Wetland Ecosystems Services Protocol – Atlantic Canada
WSS	Wetland of Special Significance

LIST OF DRAWINGS

Drawing 1: Project Location
Drawing 2: Existing Quarry
Drawing 3: Project Area
Drawing 4: Site Sensitivity
Drawing 5: Significant Habitats & Conservation Areas
Drawing 6: Receptors and Surrounding Properties
Drawing 7: Mikmaq Communities
Drawing 8: Ecodistricts
Drawing 9: Surficial Geology
Drawing 10: Bedrock Geology
Drawing 11: Watersheds
Drawing 12A: Desktop Freshwater and Tertiary Watershed
Drawing 12B: Desktop Freshwater and Catchment
Drawing 13: Field Assessed Wetlands and Watercourses
Drawing 14: Wet Areas Mapping
Drawing 15: Fish and Fish Habitat Overview
Drawing 16: Desktop Results - Terrestrial Vegetation Communities, Flora, and Fauna
Drawing 17: Field Results - Terrestrial Vegetation Communities, Flora, and Fauna
Drawing 18: Avifauna Survey Locations
Drawing 19: Avifauna SAR Observations

LIST OF APPENDICES

Appendix A: Mi'kmaq Engagement
Appendix B: Public Engagement
Appendix C: Water Balance Assessment
Appendix D: ACCDC REport
Appendix E: Freshwater Aquatic Environment Photograph Log
Appendix F: Wetland Characteristics and Photograph Log
Appendix G: Flora Inventory
Appendix H: Terrestrial Fauna Photograph Log
Appendix I: Avifauna
Appendix J: Project Team CVs

1.0 PROPONENT DESCRIPTION

Prospect Industrial Equipment Sales and Rentals Limited (Prospect, the “Proponent”) has owned and operated Sturk Quarry in Morristown, Nova Scotia since 2013. The existing quarry, limited to 4 hectares (ha), produces approximately 10,000 to 15,000 t (tonnes) of asphalt and 60,000 to 70,000 t of gravel annually, supporting essential infrastructure and development in the Annapolis Valley and surrounding communities. The Sturk Quarry Expansion Project (the “Project”) is being proposed to expand the quarry by up to 52.9 ha to support continued operations.

The Proponent retained Strum Consulting to undertake the required technical studies, manage technical subconsultants, and undertake regulatory engagement, which have all contributed to the preparation of the Project’s Environmental Assessment (EA) Registration Document. Strum is an independent multi-disciplinary team of consultants with extensive experience undertaking Environmental Assessments (EAs) throughout Atlantic Canada.

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

Table 1.1: Proponent and Consultant Contact Information

Proponent Information	
Project Name	Sturk Quarry Expansion Project
Proponent Name	Prospect Industrial Equipment Sales and Rentals Limited
President	Howard Little
Proponent Contact Information for the EA Registration	Howard Little 902-538-3275 howard.little@howardlittleexcavating.com
Mailing and Street Address	323 Cambridge Mountain Rd Cambridge, Nova Scotia B0P 1G0
Consultant Information	
Name of Consultant	Strum Consulting
Mailing and Street Address	211 Horseshoe Lake Road, Unit #210 Halifax, Nova Scotia B3S 0B9
EA Contact	Kelly O’Neill, Project Manager 902-835-5560 koneill@strum.com

2.0 PROJECT INFORMATION

The Proponent is proposing to expand the operational footprint of the Sturk Quarry, a < 4 ha quarry located at 568 Canaan Road, Morristown, Nova Scotia, by up to 52.9 ha [the Project Development Area (PDA), Drawing 1]. The Sturk Quarry is located on private land and

currently operates under Nova Scotia Environment and Climate Change (NSECC) Industrial Approval (IA) 2013-085441-01.

The Project will expand the operations of the Sturk Quarry outward from the existing quarry boundary. Aside from the larger site footprint, no increases in the scope or frequency of activities are expected compared to current operations. Upon EA approval, the expansion of the quarry will begin in 2026. At the current rate of extraction, it is expected that the land included in the PDA will support aggregate extraction for a period of approximately 40 years.

2.1 Purpose & Need for the Undertaking

The Project is being proposed to allow for continued aggregate production at the Sturk Quarry to meet current and future local demand. The primary benefits of the Project will be a sustained local supply of aggregate to surrounding communities and the Annapolis Valley in Nova Scotia, and continued employment opportunities for the 10 full-time individuals presently employed at the Sturk Quarry.

2.2 Regulatory Framework

2.2.1 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 approvals, permits, notification, and compliance requirements for the Project are provided in Table 2.1.

Table 2.1: Federal Regulatory Requirements

Requirement	Regulatory Body	Status/Comments
<i>Fisheries Act</i> (Canada, 1985b)	Fisheries and Oceans Canada (DFO)	Compliance legislation - there is currently no expectation that an authorization under the <i>Fisheries Act</i> will be required based on Project design.
<i>Species at Risk Act</i> (SARA) (Canada, 2002)	Environment and Climate Change Canada (ECCC), and DFO	Compliance legislation - no SARA permits were acquired for field assessments, and none are expected to be required based on Project design.
<i>Migratory Bird Convention Act</i> (MBCA) (Canada, 1994)	ECCC	Compliance legislation - the requirement to obtain an MBCA permit is not anticipated.
<i>Explosives Act</i> (Canada, 1985a)	Natural Resources Canada (NRCan)	Application for an Explosives Transportation Permit to allow for the transport and use of an explosive; to be applied for. Application for a Temporary Blaster's License or Blaster's Permit; to be applied for.

2.2.2 Provincial

The Project is subject to a Class I EA as defined by the Environmental Assessment Regulations, N.S. Reg. 26/95 (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).
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009).
- Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025b).
- Pit and Quarry Guidelines (NSDEL, 1999).

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
Industrial Approval - <i>Environment Act</i> (Nova Scotia, 1995b) Activities and Designations Regulations	NSECC	The Sturk Quarry currently operates under IA Permit 2013-085441-01. An amendment to the IA will be requested following EA approval.
Alteration Permit - <i>Environment Act</i> (Nova Scotia, 1995b) Activities and Designations Regulations	NSECC	Alteration applications (wetlands only) will be submitted to NSECC following EA approval. Locations requiring alteration are described in Section 9.1.
<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.
Archaeological Resource Impact Assessment Approval	Nova Scotia Communities, Culture, Tourism and Heritage (NSCCTH)	NSCCTH Permit A2025NS130 was obtained to complete the archaeology assessment (Section 12).
<i>Dangerous Goods Transportation Act</i> (Nova Scotia, 1989a) Dangerous Goods Transportation Regulations	Nova Scotia Public Works (NSPW)	Compliance legislation – standards for transportation of dangerous good to protect the public and those moving the goods.
<i>Occupational Health and Safety Act</i> (Nova Scotia, 1996)	Nova Scotia Labour, Skills and Immigration	Compliance legislation - workplace health and safety requirements, including guidelines for blasting (Blasting Safety Regulations).

2.2.3 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
Land Use By-law and Municipal Planning Strategy	Municipality of the County of Kings	Compliance with municipal zoning requirements. No changes to zoning are expected at this time.

2.3 Funding

The Project is privately funded by the Proponent. There are no public funding sources to disclose at this time.

3.0 DESCRIPTION OF THE UNDERTAKING

3.1 Geographical Location

The Project is located within the community of Morristown in Kings County, Nova Scotia (Drawing 1). It is located on private land zoned as M3 (Rural Industrial) and N1 (Resource Zone) under the Municipality of the County of Kings Land Use By-Law. Within the N1 zone, the proponent will conduct aggregate extraction only and, as such, rezoning to M3 is not required. The Project is centered at UTM coordinates (zone 20N) 360501, 4979780.

In developing the EA, a Study Area was established for the Project based on the parcels of land [i.e., property identification (PIDs)] under consideration for development (Table 3.1 and Drawing 2). The Study Area is 74.9 ha and represents the boundary within which field data were collected for the EA.

Table 3.1: Land Parcels within the Study Area

PID	Landowner
55514392	Proponent
55518898 ⁽¹⁾	Proponent
55146393 ⁽¹⁾	Proponent

⁽¹⁾ Partial overlap with the Study Area and PDA

Upon the completion of field assessments (described further in Section 4), the extent and layout of the PDA within the Study Area was determined. The PDA partially overlaps the PIDs described in Table 3.1 and represents the physical footprint where the expansion of the quarry will occur (Drawing 3).

3.1.1 Siting Considerations

The selection of a location for the Project included consideration of land ownership, proximity to the existing quarry site, and the local biophysical and social setting. The Proponent currently owns the two land parcels underlying the existing quarry as well as a third, adjacent parcel to the southwest (Drawing 2). The use of these lands will allow for continued use of existing infrastructure and for operations to expand from the current working face of the quarry, making it a desirable location for the Project.

As part of the planning process, and prior to field studies, an initial constraints analysis was undertaken to identify potential effects of the Project on the environment, nearby residents, and sociocultural resources. The analysis incorporated the following:

- Results of a topographic mapping, aerial imagery, light detection and ranging (LiDAR) imagery, and manual search for potential receptors.
- Locations of known (or having high potential for) species at risk (SAR), sensitive habitat, and confirmed old growth stands to maximize avoidance.
- Locations of known protected areas, significant habitats, wildlife sites, provincial parks, and reserves to ensure avoidance (Drawings 4 and 5).
- Review of regulated setbacks and separation distances (Table 3.2).

The initial constraints analysis was followed by a field program that included biophysical and socioeconomic assessments, as well as engagement with the Mi'kmaq of Nova Scotia, local communities, stakeholders, and government agencies. The results of the field program and engagement inputs were incorporated into the selection of the PDA. Several iterations of the PDA were considered before being finalized for the purposes of this EA.

Table 3.2: Summary of Minimum Setbacks and Separation Distances

Setback Category	Distance	Relevant Regulators
Watercourses	30 m from the bank of a watercourse (operations and blasting)	NSECC
Wetlands	30 m from wetlands, where possible, or otherwise where authorized by NSECC	NSECC, NSNR
Wetlands of Special Significance (WSS)	30 m from WSS, or otherwise where authorized by NSECC	NSECC, NSNR
Important Habitat Features - Old Growth Forests and Talus Slopes	100 m limited development buffer where possible on Crown land	NSNR
Rare Plants and Lichens	Species-specific (Section 10.1)	NSNR
Avifauna	Avoidance of, and setbacks from active nests during blasting; developed in consultation with ECCC and NSNR	ECCC, NSNR
Public Roads	30 m of a public road, unless otherwise authorized by NSPW (blasting and operations)	NSECC
External Property Boundaries	30 m of the boundary of the property on which the quarry is located (operations); 15 m of the property boundary (blasting)	NSECC
Off-site Structure	800 m of an off-site structure, or otherwise where authorized by the structure owner (blasting)	NSECC

Setback Category	Distance	Relevant Regulators
Sound/Noise	As necessary to meet sound / noise guidance based on sound monitoring (operations and blasting)	NSECC

Receptors

Based on a review of aerial imagery and provincial geospatial data, there are two potential receptors identified. One structure (PID 55492243) is a house with an unverified well located approximately 600 m northwest of the nearest point from the PDA (Drawing 6). For the purposes of this assessment, it is assumed that there is a dug well associated with this structure. A letter of allowance has been signed by the owners to permit future quarry blasting within 800 m.

The second potential receptor is a water well identified under the NSECC Well Logs Database (NSECC & NSNR, 2022), located in forested habitat approximately 250 m northeast of the nearest point of the PDA. The well was not verified during field visits, but desktop review identified no associated structure adjacent to or nearby the well. For the purposes of this assessment, the well is determined to be drilled and not a receptor.

Properties surrounding the Project include undeveloped private and Crown land. Agriculture fields, a small quarry site, and a transmission line corridor are within 800 m of the Study Area, with residential developments primarily located > 1 km to the north and east of the Project (along Canaan and Aylesford Roads; Drawing 6).

3.2 Project Proximity to Other Areas

The communities and protected areas nearest to the Project are described in Table 3.3.

Table 3.3: Proximity of the Project to Other Areas

Category	Name	Distance and Direction from Study Area ⁽¹⁾
Community	Morristown	2.5 km NE
	Nicholsville	3.3 km NW
Mi'kmaq Community	Cambridge No. 32	14.0 km E
Protected Water Area (PWA)	McGee Lake and Mill Brook Watershed	14.2 km E
Park or Protected Area	Cloud Lake Wilderness Area	10.9 km SW
	Lake George Provincial Park	6.5 km SE
	Blomidon Provincial Park	45.6 km NE
	Kejimikujik National Park	65.9 km SW
Important Bird Area (IBA)	Southern Bight, Minas Basin (NS020)	30.3 km NE

⁽¹⁾ Distances measured from the Study Area boundary

3.2.1 Other Known Developments

There are 73 mapped pit or quarry developments within 10 km of the Study Area (including the existing Sturk Quarry). These features range in size from 375 m² to 7.5 ha. A small pit is located approximately 450 m to the northeast of the existing Sturk Quarry and is approximately 0.6 ha in size.

3.3 Project Design and Operation

3.3.1 Existing Quarry Operations

The current Sturk Quarry is < 4 ha and produces approximately 60,000 to 70,000 t of gravel and 10,000 to 15,000 t of asphalt annually. In a typical year, 10 individuals are directly employed at the quarry. The quarry also supports 50 full time indirect employees through activities like trucking and excavating. The quarry is accessible via an existing road from Canaan Road, approaching from the north. Infrastructure at the quarry site currently includes an office trailer, weigh-scale, laydown, aggregate processing plant, portable asphalt plant and storage area (visible in Drawing 2). The current active quarry face is in the southeastern portion of existing site, and stockpiles are located on the quarry floor as well as near the processing plant to the north.

The area proposed for expanded operations (the PDA) lies south of the existing site. The quarry's working face is expected to advance further south and west from its current location.

3.3.2 Development Plan

The predicted development of the Project will occur over a 40-year period. Quarrying will occur within the PDA, which will comprise a total disturbed area of 52.9 ha at its maximum extent; with the inclusion of this additional area, the total quarry footprint will be up to 65.9 ha (including the pre-existing footprint, access road, and pre-existing physical components; Drawing 2).

The PDA will gradually be developed to the southwest of the existing quarry site and working face. As the quarry expands, grubbing in forested areas will be completed as necessary, and will be limited to minimize exposed soil and potential for erosion. Clearing will be limited to areas planned for imminent quarrying (i.e., within the following two years). Topsoil and overburden removed during this process will be added to stockpiles on the quarry floor. Quarry expansion will progress slowly, at a rate consistent with aggregate demand. The Project will continue to be operated as per the pre-existing quarry with a planned production rate of approximately 60,000 to 70,000 t of gravel and 10,000 to 15,000 t of asphalt per year, subject to demand.

Project Activities

Quarry activities will include vegetation clearing, grubbing of overburden, drilling and blasting of rock, processing and production (via a portable crushing unit), stockpiling of various aggregate products, and loading, weighing and transportation (i.e., hauling) of aggregate products from the site. The proposed quarry schedule for the Project (Table 3.4) includes drilling and blasting for an approximate 1-month period between April 1 to May 31, processing once blasting has

commenced, typically from June 1 to December 20, and hauling year-round on an as-needed basis.

Table 3.4: General Quarry Activity Schedule

Activity	Month											
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Drilling/Blasting ⁽¹⁾												
Processing												
Hauling												

⁽¹⁾ Drilling and blasting typically occur between April 1 to May 31.

During operations, the quarry will continue to be active five days per week (Monday through Friday), and no activities are anticipated to occur on Saturdays, Sundays, or holidays, unless under special circumstances. All quarry activities will adhere to applicable time of day limits (e.g., noise) in applicable legislation, guidelines, and municipal bylaws. Additional details pertaining to these activities are outlined in the following subsections.

Clearing & Grubbing

Vegetation clearing and overburden grubbing will take place in advance of scheduled extractive work in areas anticipated for short-term (i.e., within two years) progression of the site. When possible, overburden will be strategically stockpiled on the site to reduce double handling of material and may be used to construct berms or be stockpiled on the site for future use in reclamation.

Drilling and Blasting

Blasting will occur once the site is prepared (i.e., cleared and grubbed). A rock drill will be used to drill boreholes into the exposed bedrock according to a specific blast design pattern. Boreholes will then be loaded with explosives and blasted to generate manageable sized rocks that can be further crushed and screened into specific aggregate products. Blasting is expected to occur each year between April 1 and May 31, for a maximum of two weeks.

One structure is located within 800 m of the PDA and is designated a Receptor (Drawing 6). Under the Pit and Quarry Guidelines (NSDEL, 1999), a separation distance of 800 m is required between the working face of the quarry and the base of a structure unless permission is obtained from the property owner to perform the blast. The property owners have signed a letter of allowance to permit blasting within 800 m of the structure.

The Proponent will contract a qualified blasting company to conduct the necessary drilling and blasting to extract rock. The qualified blasting company will be responsible for blast design, methods, and monitoring, and will undertake all blasting operations in accordance with the General Blasting Regulations contained in the *Occupational Health and Safety Act* (Nova Scotia, 1996). No explosives will be stored on the site; explosives will be delivered before the scheduled blasts in the quantity required to perform them.

Processing Activities

Materials will be crushed and screened on the site to produce aggregate products, which will be stockpiled within the quarry area. Processing activities will occur during and following the blasting activity period - from April 1 to December 20 - to prepare for hauling. There will be one processing line at the quarry comprising crushing, sieving, and sorting equipment. No washing process will take place on the site.

Various aggregate products including Type I, Type II, Crusher Run, 4-8" clear stone, concrete stone, oversize armour stone, and shot rock will be produced based on need and stockpiled on the quarry floor by a front-end loader; an excavator will be used for material handling. Equipment such as a front-end loader and excavator will be kept on the site. Aggregate stockpiles will be stable and remain uncovered. Given the dynamic nature of quarry operations, stockpile locations and volumes will vary throughout the year; at present, stockpiled material is generally housed on the quarry floor.

A portable asphalt plant is located on the existing quarry site, across from the scale house.

Production and Transportation

The planned rate of aggregate production is expected to be similar to the existing rate of production (60,000 to 70,000 t of gravel and 10,000 to 15,000 t of asphalt per year), subject to demand. The lowest elevation of the quarry floor is expected to be similar to existing operations at an elevation of approximately 158 masl, and the quarry face will not exceed 20 m in height. The proposed quarry expansion will be developed primarily south and southwest of the existing quarry site.

Hauling typically occurs year-round, with an increase in activity following blasting. There is no planned increase in truck traffic from the quarry expansion and future quarry expansion will continue on an as-needed basis. Stockpiled rock will be loaded onto trucks owned by the Proponent. Prior to leaving the quarry, trucks will report to the weigh-scale and be weighed. An estimated three, 22-tonne truckloads per day (five days per week, 3-5 hours per day) will haul to the quarry via Canaan Road; and an estimated 10-15 standard, 15-tonne tandem trucks, will be loaded daily and will transport aggregate directly from the quarry site to locations throughout (primarily) Kings County. All trucks will follow a similar route to current operations, exiting the quarry and heading north on Canaan Road, then Sturk Road to access Aylesford Road. Trucks then follow Highway 1 to Victoria Road which connects to Highway 101. Routes past this location will depend on the destination of the aggregate. Trucks will primarily be taking this route to access various locations throughout Kings County. All truck loads will be covered to minimize dust and to contain aggregate material.

Material stockpiles for transport will generally be located near the processing plant. Given the dynamic nature of quarry operations, stockpile locations and volumes will vary throughout the year but are likely to continue to be staged in proximity to the site access road for ease of transportation and loading.

Emission and Waste Management

Quarry operations are not expected to result in large quantities of waste material. Prior to quarry expansion, tree clearing activities will be completed and merchantable timber will be removed from the PDA. Overburden and topsoil will be stored within the active quarry area and will be re-used during rehabilitation and reclamation at the end of the quarry's operational phase.

Other typical small-scale waste will be disposed of off-site via local waste handling facilities operated by the local municipality. As appropriate, materials suitable for recycling will be separated, reused, and/or recycled. Washroom facilities are located on the site.

Air Contaminant and Greenhouse Gas Emission Management

Quarry operations are not expected to result in large quantities of air contaminants or greenhouse gas (GHG) emissions. The Project's operation and decommissioning phases will generate GHGs primarily from the combustion of fossil fuels to power light- and heavy-duty equipment (e.g., pickup trucks, loaders, drilling rigs).

Water Management

No active water management measures are required for this project. A pond is present on the high wall of the active quarry site, created during the quarry's first blast in 2013. The pond has gradually filled with rainwater over time; however, it is not currently used as a settling pond or for water management purposes on the property. As quarry operations advance, the pond is expected to naturally drain over time.

Surface water and precipitation that fall within the Project footprint will naturally infiltrate the ground and quarry floor, allowing for water to percolate downward. All infiltration will continue to disperse naturally into the surrounding hydrogeological systems, consistent with existing site conditions.

Solid and Hazardous Waste Management

There will be no long-term storage of fuel on the site. A third-party fuel service contractor will be on the site during operations to re-fuel the equipment. Individual small jerry cans (approximately 25 litres) will be kept onsite with equipment as necessary. Waste fuel or used spill kit materials will be securely stored in a spill-proof container and discarded at an approved facility when removed from site. Operators will remain with equipment at all times when re-fueling activities are taking place.

Regular, small-scale maintenance of the equipment (loaders, excavators, and crushing equipment) may be conducted at the quarry site. Used oil and filters will be removed from the quarry site once maintenance is complete. All larger scale maintenance will be completed off-site. Disposal of hazardous material and refueling procedures will be conducted in accordance with best management practices and regulatory requirements. A contingency plan will be prepared and submitted with the IA amendment application (post EA Approval) and will include procedures for responding to and reporting spills or releases.

Noise Management

Noise is expected to be similar to current operations as rates of blasting and transportation activities will remain the same. Sound levels within the quarry may be monitored as requested by NSECC at the property boundaries of the quarry, in accordance with the Pit and Quarry Guidelines (NSDEL, 1999) and the existing IA.

Blasting will be the primary source of noise generated by the quarry. As previously described, blasting is expected to occur between April 1 and May 31, for a maximum duration of two weeks per year. However, if demand for aggregate exceeds available stockpiles in a given year, a second blast may be required. Blasting will be monitored and will be planned to occur on days where weather conditions are less likely to cause excessive sound levels. Blasting will not occur on Saturdays, Sundays, or holidays.

Noise effects of the Project are further discussed in Section 7.3.

Dust Control

Dust emission and particulate matter levels are expected to be similar to current operations as rates of blasting and transportation activities will remain the same. Dust emission and particulate matter may be monitored at property boundaries adjacent to the quarry, at the request of NSECC, and in accordance with the Pit and Quarry Guidelines (NSDEL, 1999) and the existing IA. Dust is currently being mitigated by using magnesium chloride as dust suppression on all quarry roads. All haul truck loads will be covered once they are on public roads to minimize dust and to contain aggregate material.

The effects of the Project on air quality are further discussed in Section 7.1.

Risk Management

A Project contingency plan will cover identification of key individuals and regulatory contacts, spill prevention, spill procedures, erosion and sediment control (ESC), fire management, and incident reporting procedures. This plan will be provided to NSECC as part of the IA amendment application (post EA approval).

3.4 Decommissioning and Reclamation

Reclamation of the Project will be completed in line with the Pit and Quarry Guidelines (NSDEL, 1999), the Terms and Conditions of the amended IA, and rehabilitation strategies that are consistent with industry standards and best practices. Where practicable, a progressive reclamation approach will be used throughout the development and operation phases of the Project, and a final reclamation plan will be developed and implemented at the conclusion of extraction and site related activities when aggregate reserves have been exhausted within the PDA.

As per the existing IA for the Sturk Quarry, the site Reclamation Plan is updated every three years and submitted to NSECC for review. Additionally, a reclamation bond is maintained to ensure funds are available to rehabilitate the quarry. The value of the reclamation bond is

reviewed and updated in line with the updated reclamation plans to ensure sufficient security is maintained throughout the life of the Project. Both the Reclamation Plan and the associated bond will be reviewed and revised upon submission of the IA amendment application (post EA Approval).

Staged progressive reclamation will occur, where practicable, in areas where aggregate resources are exhausted; however, most of the reclamation is planned to occur in conjunction with decommissioning at the end of the operational window. Reclamation will involve identification of short and long-term goals and options for the site including, but not limited to, the spreading of grubbing piles, sloping, surface contouring, establishing drainage, and revegetation. Reclamation will be completed in accordance with the Pit and Quarry Guidelines (NSDEL, 1999), to the satisfaction of NSECC and other regulatory departments.

Final quarry reclamation will focus on rehabilitation of the site footprint at the conclusion of extraction and related activities when aggregate reserves have been fully exhausted within the PDA. The end land use objectives are based on pre-development site conditions, to the extent possible, and the reclaimed site will plan to support revegetation as well as any potential land use wishes of the landowner.

Prior to fully rehabilitating the site, and when actual conditions representing final extraction limits and site features are known, the Proponent will confirm a final Reclamation Plan for the site and submit it as per the conditions of their IA. The following rehabilitation strategies will be considered to facilitate final reclamation of the site:

- Removal of quarry infrastructure and machinery
- Control erosion and sedimentation
- Surface contouring and drainage patterns
- Site stabilization & revegetation (including considerations to manage invasive plant species) objectives for final land use
- Other reclamation activities

3.5 Project Schedule

The Project schedule, from EA registration to Project decommissioning, is presented in Table 3.5.

Table 3.5: Project Schedule

Project Activity	Timeline
EA Registration	July 2026
Provincial Permitting (Industrial Approval Amendment and wetland alteration approval)	2026, Following EA approval
Operations	2026 – 2066 (40 years)
Reclamation	Progressive reclamation on-going during operations, where possible. Final reclamation will occur when aggregate reserves have been fully exhausted.

4.0 PROJECT SCOPE & ASSESSMENT METHODS

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, N.S. Reg. 93/2025. The Project Team members (the Proponent and Consultant) have engaged with the following regulatory bodies to provide input and advice into the EA scope and planning for the proposed Project:

- ECCC – Canadian Wildlife Service (ECCC-CWS)
- NSCCTH
- NSECC
- NSNR

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 regulators, stakeholders, Mi'kmaq of Nova Scotia, and/or 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 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
- Geophysical environment
 - Geology

- Hydrogeology/groundwater
- Aquatic environment
 - Surface water, fish and fish habitat
 - Wetlands
- Terrestrial environment
 - Terrestrial vegetation communities and flora
 - Terrestrial fauna
 - Avifauna
- Socioeconomic environment
 - Economy
 - Land use and value
 - Recreation, and tourism
- Archaeological resources

4.1.2 Spatial & Temporal Boundaries

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 EA:

- IA Permit Area: The area within which the existing < 4 ha Sturk Quarry operates under NSECC IA 2013-085441-011
- PDA: The area south and southwest of the IA Permit Area that encompasses the proposed Project footprint. It includes the maximum extent of ground disturbance associated with quarry expansion infrastructure. The PDA was designed to avoid sensitive environmental features.
- Study Area: The collection of PIDs where the Project is located. The Study Area represents the area within which the collection of field data occurred.
- Local Assessment Area (LAA): The area which 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 is defined (where necessary) in each VC chapter.

The sizes of the boundaries used in the EA are presented in Table 4.1.

Table 4.1: Temporal Boundaries

Spatial Boundary	Size
IA Permit Area	6.4 ha
PDA	52.9 ha
Study Area	75.0 ha
LAA	VC-Specific (defined in individual VC chapters)
RAA	VC-Specific (defined in individual VC chapters)

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 (Table 4.2). The temporal boundaries of the EA include the operations (40 years) and decommissioning phases of the Project. These boundaries apply to all VCs unless otherwise stated in the individual chapters.

Table 4.2: Temporal Boundaries

Project Phase	Temporal Boundary
Operations	40 + years (beginning Q3/Q4 2026)
Decommissioning	TBD (within two years of cessation of operations)

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 SARA (Canada, 2002) and/or 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 S1, S2, or S3 (or a combination thereof) from the Atlantic Canada Conservation Data Centre (ACCDCC).

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 March 2025 and continued until January 2026. The field components, survey timing, and surveyors that completed the assessments are outlined in Table 4.3.

Table 4.3: Biophysical Assessment Components, Timing, and Surveyors

Survey		Date	Surveyor(s)
Vegetation Classification		Various (completed during vascular plant surveys)	Strum Botanists/Biologists
Rare Plant Surveys		June 10, 11, and 13; August 25, 2025	Strum Botanists
Lichen Survey		March 27, 2025	Strum Lichenologist
Wildlife Surveys	Incidental Observations	All biophysical surveys	All Surveyors
	Bat Maternity Roost Surveys	December 2, 2025	Strum Biologists
	Wood Turtle Surveys	May 20 and 27, 2025	Strum Biologists
	Trail Cameras	December 2, 2025, to January 20, 2026	Strum Biologists
Avian Surveys	Spring Migration	Round 1: April 11, 2025 Round 2: May 6, 2025	Strum Biologists
	Breeding Bird	Round 1: June 6, 2025 Round 2: July 3, 2025	
	Nightjar	Round 1: June 6, 2025 Round 2: July 2, 2025	
	Fall Migration	Round 1: August 22, 2025 Round 2: September 9, 2025 Round 3: October 24, 2025	
Wetland and Watercourse Evaluations		June 2 to 16, and September 26, 2025	Strum Biologists
Fish and Fish Habitat Assessment		Electrofishing: August 7 and 8, 2025 Trapping: August 7 and 8, 2025	
Species at Risk	Incidental	All biophysical surveys	All Surveyors

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 will be the same for all VCs (Table 4.4); however, the magnitude criteria are VC-specific and are provided in the individual chapters.

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

5.0 MI'KMAQ OF NOVA SCOTIA

The Mi'kmaq are the founding people of Nova Scotia and currently live throughout the province, including within 13 Mi'kmaq communities (OLA, 2015). The Project is located within the Mi'kmaq territory called Kespukwiti (Parks Canada, 2025).

The provinces of Nova Scotia, New Brunswick, and 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, 2025).

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, and Aboriginal rights to hunt, fish, and gather for food, social, and ceremonial purposes, more broadly referred to as “traditional” purposes. Mi'kmaq rights are communal rights and are 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 Supreme Court of Canada instruction and subsequent guidance from governments, such as 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, 11 of the 13 Mi'kmaq communities are represented in consultation by Kwilmu'kw Maw-klusuaqn negotiation office (KMK), which reports to the Assembly of Nova Scotia Mi'kmaq Chiefs. At this time, 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 Annapolis Valley First Nation (Kampalijek), specifically the Cambridge Indian Reserve (No. 32). The community has a population 321 living on-reserve and approximately 200 living off reserve (Statistics Canada,

2023). Cambridge Indian Reserve is located approximately 15 km northeast of the PDA (Drawing 7).

5.1 Engagement

As an integral component of any project development activity in Nova Scotia, the Proponent engaged with all 13 of the Nova Scotia Mi'kmaq communities, which was initiated on December 9, 2025. The Proponent sent letters and quarry information sheets to all 13 First Nations and to KMK. A copy of the letter and quarry information sheet can be found in Appendix A. To date, the Proponent has only received correspondence from KMK and held a virtual meeting on February 11, 2026.

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

First Nation / Organization	Representative(s)	Contact Details	Overview of Response
KMK	Shawn Taylor Kristina Buurman	The Proponent has had ongoing engagement with KMK since December 9, 2025, through the distribution of Project mailouts/pamphlets outlining Project and website information; also included was an invitation for further engagement, collaboration, and feedback were also provided. On February 11, 2026, the Proponent met (virtually) with KMK to further introduce the Project. Offers to hold a follow-up meeting in person and virtually have been extended to KMK to discuss various aspects of the Project in more detail. The Proponent is committed to continuing the engagement process post-EA and maintaining a meaningful relationship with KMK.	- Requested the Archaeology report - Requested a MEKS
Native Council of Nova Scotia	Addressed to Chief Lorraine Augustine	Letter and Project information sent dated December 9, 2025	No response received
Annapolis Valley First Nation	Addressed to Chief Gerald Toney	Letter and Project information sent dated December 9, 2025	No response received
Bear River First Nation	Addressed to Chief Carol Dee Potter	Letter and Project information sent dated December 9, 2025	No response received
Eskasoni First Nation	Addressed to Chief Leroy Denny	Letter and Project information sent dated December 9, 2025	No response received

First Nation / Organization	Representative(s)	Contact Details	Overview of Response
Glooscap First Nation	Addressed to Chief Sidney Peters	Letter and Project information sent dated December 9, 2025	No response received
Membertou First Nation	Addressed to Chief Terrance Paul	Letter and Project information sent dated December 9, 2025	No response received
Millbrook First Nation	Addressed to Chief Robert Gloade	Letter and Project information sent dated December 9, 2025	No response received
Paq'tnkek Mi'kmaw Nation	Addressed to Chief Cory Julian	Letter and Project information sent dated December 9, 2025	No response received
Pictou Landing First Nation	Addressed to Chief Tamara Young	Letter and Project information sent dated December 9, 2025	No response received
Potlotek First Nation	Addressed to Chief Wilbert Marshall	Letter and Project information sent dated December 9, 2025	No response received
Sipekne'katik First Nation	Addressed to Chief Michelle Glasgow	Letter and Project information sent dated December 9, 2025	No response received
Wagmatcook First Nation	Addressed to Chief Norman Bernard	Letter and Project information sent dated December 9, 2025	No response received
We'koqma'q First Nation	Addressed to Chief John Leonard Bernard	Letter and Project information sent dated December 9, 2025	No response received
Wasoqopa'q First Nation	Addressed to Chief Deborah Robinson	Letter and Project information sent dated December 9, 2025	No response received

5.1.1 Summary of Engagement

Key issues raised and areas of interest identified through Mi'kmaq engagement were related to the following:

- Request for the Archaeology Report
- Wetlands
- Request for a Mi'kmaq Ecological Knowledge Study (MEKS)

The Proponent will ensure collaboration with the Mi'kmaq on key areas of interest and any additional matters that arise throughout the life of the Project. The Project will have a small footprint constructed entirely on private land with no major waterways impacted by the property or identified within the proposed PDA. Based on these considerations, a Mi'kmaq Ecological Knowledge Study was not completed.

6.0 PUBLIC ENGAGEMENT

The Proponent is committed to transparent, meaningful, and ongoing engagement with the public, stakeholders, and the Mi'kmaw of Nova Scotia. Sturk quarry is locally owned and operated and has a strong presence in the Morristown Community with yearly donations to the community hall, sports groups, and local charities.

As a member of the local community, Sturk Quarry recognizes the value of seeking input from community stakeholders. Between March 18, 2026, and April 17, 2026, Sturk Quarry distributed over 83 letters with Project information sheets to members of the community (Appendix B). Between March 18, 2026, and June 1, 2026, an information pamphlet was displayed at Sams Garage in Morristown, which is a locally operated garage, gas station and convince store.

To date, no negative feedback from the public has been received by the Project Team. Numerous residents have expressed positive attitudes towards the Project. One homeowner requested additional information regarding blasting due to a misunderstanding of the Project location. Upon further communication, it was determined that the homeowner had mistaken Sturk Quarry for a different quarry and subsequently retracted their comment.

Ongoing Engagement

The Proponent will continue to review and address any concerns raised by government representatives, stakeholders, members of the public and the Mi'kmaq of Nova Scotia throughout the duration of the Project.

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)
- Pit and Quarry Guidelines (NSDEL, 1999)

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, 2025c)
- 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 Study Area is primarily located within the South Mountain Ecodistrict (720), with the eastern and western portions located within the Valley Slope Ecodistrict (710; Drawing 8). Both ecodistricts are of the Western Ecoregion (700). These ecodistricts are characterized by a milder climate than other parts of Nova Scotia, with gentle winters, early springs, and warmer summers (Neily et al., 2017).

Table 7.1: Climate Data from the Greenwood A Meteorological Station (1991 to 2020)

Parameter	Climate Normals (1991 to 2020)												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean Temperature (°C)	-5.0	-4.6	-0.6	5.3	11.3	16.4	20.1	19.4	15.1	9.2	4.2	-1.2	7.5
Rainfall (mm)	46.4	43.7	51.5	69.4	77.2	82.2	75.4	79.7	105.7	106.5	105.3	79.6	922.8
Snowfall (cm)	78.2	60.1	45.1	13.3	1.0	0.0	0.0	0.0	0.0	0.2	14.7	55.6	268.1
Precipitation (mm)	103.6	87.3	89.8	83.4	78.1	82.2	75.4	79.7	105.7	106.7	120.1	124.9	1,137.0

Source: (ECCC, 2025c)

To assess the local climate, Climate Normals (1991–2020) were obtained from the Greenwood A meteorological station (Climate ID 8202000), located approximately 12 km from the Study Area (Table 7.1). This is the nearest station with 30-year Climate Normals data. Although conditions at the station may not perfectly match those within the Study Area, its proximity makes it a reliable and representative proxy for understanding local climate patterns.

Between 1991 and 2020, the mean annual temperature was 7.5 degrees Celsius (°C), with a maximum daily mean of 20.1°C (July) and a minimum daily mean of -5.0°C (January). Over this period, the recorded monthly average precipitation was the highest in November and December (120.1 mm and 124.9 mm, respectively), and the average annual precipitation amount was 1,137.0 mm (ECCC, 2025c).

A windrose plot for Greenwood A meteorological station (CYZX) illustrates the wind directions from 1991 to 2020 (Figure 7.1). Wind across all speeds is predominantly generated from the west, northwest, and southwest, with minor flows from the northeast (ISU, 2025).

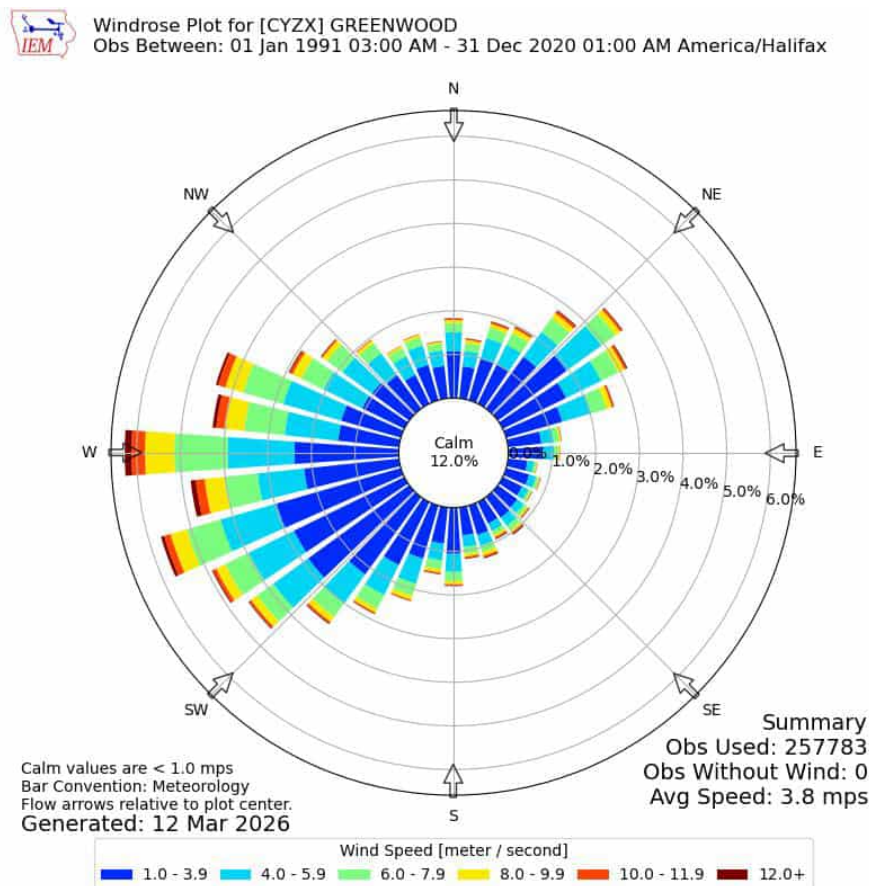


Figure 7.1: Windrose Plot for Greenwood A Meteorological Station (CYZX) – January 1, 1991, Through December 31, 2020 (ISU, 2025)

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 (AAQS) published in the NSAQR set the maximum permissible ground-level concentration limits (Table 7.2).

Table 7.2: Summary of Regulations Pertaining to Ambient Air Quality in Nova Scotia

Contaminant	Averaging Period	Regulatory Threshold ($\mu\text{g}/\text{m}^3$)
		Provincial ⁽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

Contaminant	Averaging Period	Regulatory Threshold ($\mu\text{g}/\text{m}^3$)
		Provincial ⁽¹⁾
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⁾Ambient Air Quality Standards (NS AAQS) (Air Quality Regulations, N.S. Reg. 8/2020).

⁽²⁾Geometric mean.

$\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

Nova Scotia monitors air quality at eight ambient air quality monitoring stations (AAQMSs) located throughout the province (NSECC, n.d.). Measured parameters at these locations may include the following:

- Sulphur dioxide (SO_2)
- Carbon monoxide (CO)
- Nitrogen oxides (NO_x)
- Nitric oxide (NO)
- Fine particulate matter [particulate matter 2.5 micrometres (μm) or less in diameter; $\text{PM}_{2.5}$]
- Ground-level ozone (O_3)
- Total reduced sulphur (TRS)

The NO_2 , O_3 , and $\text{PM}_{2.5}$ 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+, in which scores represent the following health risk categories: Low (1 to 3), Moderate (4 to 6), High (7 to 10), and Very High (10+) (ECCC, 2025a).

The closest AAQMS with available data is the Kentville station, approximately 25 km northeast of the center of the Study Area at 45.06728363° N, 64.47742462° W.

Table 7.3 summarizes the current (baseline) maximum ambient air quality conditions observed at the Kentville AAQMS from 2021 to 2025. The monitored parameters are compared to the current NSAQR.

Table 7.3: Maximum Ambient Air Quality Conditions at Kentville (2021 to 2025)

Parameter	Averaging Period	O_3 (ppb)	SO_2 (ppb)	NO_x (ppb)	NO (ppb)	NO_2 (ppb)	$\text{PM}_{2.5}$ ($\mu\text{g}/\text{m}^3$)	TSP ($\mu\text{g}/\text{m}^3$)	CO (ppb)	H_2S (ppb)
Kentville AAQMS 2021 to 2025	1-hour	72.5	-	33.6	23.9	15.7	111.6	-	-	-
	24-hour	53.5	-	6.5	3.7	5.0	29.9	-	-	-
	Annual	31.1	-	1.3	0.4	0.9	5.5	-	-	-

Parameter	Averaging Period	O ₃ (ppb)	SO ₂ (ppb)	NO _x (ppb)	NO (ppb)	NO ₂ (ppb)	PM _{2.5} (µg/m ³)	TSP (µg/m ³)	CO (ppb)	H ₂ S (ppb)
NS AAQS Schedule A ⁽²⁾	1-hour	82	340	-	-	210	-	-	30,000	30
	24-hours	-	110	-	-	-	-	120	-	6
	Annual	-	20	-	-	50	-	70 ⁽³⁾	-	-
Fraction of NS AAQS Schedule A	1-hour	88.4%	-	-	-	7.5%	-	-	-	-
	24-hours	-	-	-	-	-	-	-	-	-
	Annual	-	-	-	-	1.8%	-	-	-	-

Source: (NSECC, n.d.)

⁽¹⁾Annual averages calculated based on the maximum averaged 24-hour values over a single calendar year.

⁽²⁾Current Ambient Air Quality Standards (NS AAQS) (Air Quality Regulations, N.S. Reg. 8/2020).

⁽³⁾Geometric mean.

ppb = parts per billion

Existing air quality conditions (i.e., baseline data from 2021 to 2025) indicate that the measured contaminants are below their respective NS AAQS Schedule A limits. The reported AQHI typically scores “low” for risk at all times of the year (ECCC, 2025a). It should be noted that the Kentville AAQS does not record SO₂, TSP, CO or H₂S.

7.1.5 Effects Assessment

Project-Atmospheric Interactions

Project activities will interact with the atmospheric environment through fugitive dust and exhaust emissions from construction equipment during all Project phases (Table 7.4).

Table 7.4: Potential Project-Atmospheric Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	X
Decommissioning	
Infrastructure removal	X
Site reclamation	X

Assessment Boundaries

The LAA for the atmospheric environment is a 200 m buffer surrounding the PDA (Drawing 6). This distance was selected as it represents the distance beyond which effects to air quality are

considered sufficiently diffused to no longer represent a potential impact to humans. The RAA for the atmospheric environment VC 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, blasting). 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), defined as the mass of airborne particles with diameters less than 100 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 can affect lung and heart function 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 causing 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 nutrients in soil.
- Damaging sensitive forests and farm crops.
- A variety of effects on flora (described further in Section 10.1).
- Affecting the diversity of ecosystems.
- Contributing to acid rain effects.

Anticipated sources of fugitive dust emissions from the Project are associated with all phases of the Project and may include the following activities:

- Soil and rock disturbance (i.e., clearing/grubbing, grading, drilling and blasting, rehabilitation).
- Wind erosion from soil or rock stockpiles.
- Management of on-site materials (i.e., loading/unloading).
- Transportation of quarry products.

To evaluate the potential effects of fugitive dust emissions, receptors were identified through a review of aerial imagery and the potential for interactions with these emissions was assessed. The travel distance of fugitive dust is influenced by several factors, including the height at which the dust is released, wind conditions, and particle size. Under most standard conditions, fugitive dust above 30 µm settles 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 PDA (US EPA, 2014).

The nearest residential receptor to the Project is approximately 600 m from the PDA. This is beyond the LAA and beyond the extent to which fugitive emissions are anticipated to travel. Further to the impacts of nearby receptors, the Pit and Quarry Guidelines require TSP not to exceed NSAQR at the Property Boundary (NSDEL, 1999). Air quality within the PDA is expected to remain consistent with the existing quarry site conditions (compliant), as no changes to the quarry's operational scope are proposed aside from extending its operating life.

In addition to fugitive dust, quarrying may increase combustion residuals and/or tailpipe exhaust emissions, primarily PM, NO_x, SO₂, and CO, from heavy equipment (e.g., drilling, hauling of product) and explosives (e.g., blasting). The United States Environmental Protection Agency (2014) determined that most roadway emissions are contained within the first 200 m from the emission source. There are no receptors within the LAA, and overall, the Project's impact on air quality is expected to be similar to the existing operation. With appropriate mitigation applied, potential impacts on air quality are expected to be minimal.

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. General mitigation measures for fugitive (dust) emissions include:

- Compact and/or ridge disturbed soil to prevent dust formation, as required.
- Wet or use an approved dust suppressant (e.g., magnesium chloride) during periods of heavy activity and/or dry or windy periods, to reduce the resuspension of dust during quarrying activities, or on unpaved roads, where necessary.
- Ensure a 30 m vegetated buffer will be maintained between the PDA and property boundaries.
- 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 (when feasible).
- Wash down vehicles and equipment using hoses and water to remove accumulated mud/dirt on undercarriages, tracks, or wheel wells, as required.

- Ensure appropriate truck loading and hauling procedures will be followed to reduce the generation of dust during trucking activities. Trucks will abide by posted speed limits.
- 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).

General mitigation measures for exhaust emissions include:

- Require that equipment meet all applicable provincial and air quality regulations and emissions standards.
- Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.
- Remove 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

Given the low to negligible impacts, no additional monitoring is recommended at this time.

Conclusion

The predicted residual effects of the Project on the atmosphere and ambient air quality (after mitigation) are characterized in Table 7.5. Overall, fugitive dust and exhaust emissions are considered medium-term, intermittent, and confined within the LAA.

Table 7.5: Atmosphere and Air Quality Residual Effects

Effect Detail	Fugitive Emissions	Exhaust Emissions
Magnitude of Effect	Low: Some fugitive emissions are anticipated, but they are expected to remain below the maximum permissible ground-level concentrations.	Low: Some exhaust emissions are anticipated, but they are expected to remain below the maximum permissible ground-level concentrations.
Geographic Extent of Effect	LAA	LAA
Frequency of Effect	Intermittent: Effects may occur during the Project's operation and decommissioning phases, but only intermittently.	Intermittent: Effects may occur during the Project's operation and decommissioning phases, but only intermittently.
Duration of Effect	Medium Term: Effects are mainly confined to the construction and decommissioning phases.	Medium Term: Effects are mainly confined to the Project's operation and decommissioning phases.
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		

7.2 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 refers to the long-term shift in weather patterns and conditions, driven largely by changes in temperature and precipitation. It involves alterations in average climate conditions as well as changes in climate 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 to warm the planet to levels that have yet to be experienced (ECCC, 2019c).

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 the sources of GHG contributions from the Project.
- Quantify baseline GHG emissions.
- Mitigate and minimize GHG generation from Project-related activities.

Sources of GHG emissions were identified through a review of the Project phases.

7.2.4 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.

Carbon Dioxide

The primary sources of atmospheric CO₂ are the burning of carbon-containing fossil fuels (i.e., coal, oil, and natural gas), deforestation, and land-clearing activities.

The Project's operation and decommissioning phases will include several activities that are likely to produce CO₂; including, but not limited to:

- Use of heavy equipment (excavators, loaders, haul trucks, bulldozers, drilling rigs, etc.)
- Use of light-duty vehicles and equipment (pick-up trucks).
- Land clearing, including the decay of cut foliage (which releases CO₂ slowly).

Methane

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

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 operation and decommissioning phases require heavy- and light-duty equipment, which can contribute to N₂O emissions. Overall, the production of N₂O associated with this Project is anticipated to be minimal relative 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).

The Project's primary source of halocarbon emissions will be coolants in air-conditioning units in vehicles. Fire-extinguishing agents (containing halocarbons) may also be used in the event of an emergency which requires a fire-fighting response. Overall, halocarbon use is anticipated to be minimal and is 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, rising temperatures increase water evaporation from the Earth's surface and raise atmospheric water vapour concentrations. This increased water vapour, in turn, amplifies the warming from the initial GHGs, causing the cycle to repeat and temperatures to keep rising (ECCC, 2019a).

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

7.2.5 GHG Baseline Conditions

The GHG baseline is a reference of sources, sinks (removal), and reservoirs (storage) occurring in the absence of the Project.

The baseline GHG condition applicable to the Project is the Nova Scotia Industrial carbon footprint, which in 2022 was 796,182.2 tCO₂e (CER, 2024).

7.2.6 Effects Assessment

Project-GHG Interactions

Project activities will emit GHGs during all phases of the Project (Table 7.6).

Table 7.6: Potential Project-GHG Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	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

The Greenhouse Gas Emissions Regulations stipulate that facilities with annual emissions exceeding 10,000 tCO₂e must report their emissions annually (Nova Scotia, 2009). The 10,000 tCO₂e benchmark assesses the magnitude of project-related GHG emissions.

- Low: Project is expected to contribute less than 10,000 tCO₂e annually.
- High: Project is expected to contribute more than 10,000 tCO₂e annually.

Effects

Baseline (based on 2022 data) GHG emissions generated by industry in Nova Scotia are 796,182.2 tCO₂e (CER, 2024). The Greenhouse Gas Emissions Regulations reporting limit (10,000 tCO₂e annually) is 1.3% of this baseline (Nova Scotia, 2009).

The Project's operation and decommissioning phases will generate GHGs primarily from the combustion of fossil fuels to power light- and heavy-duty equipment (e.g., pickup trucks, loaders, drilling rigs). It is anticipated that this equipment will primarily use diesel fuel, which has an emission factor of 2.68×10^{-3} tCO₂e per litre (ECCC, 2024b). The Greenhouse Gas Emissions Regulations reporting limit is 10,000 tCO₂e, equivalent to 3,729,812.39 litres of diesel fuel consumed, which is far more fuel than will be consumed in a given year by the Project (Nova Scotia, 2009).

Note that while some GHG emissions will be produced from on-site blasting (i.e., detonation of ammonia nitrate fuel oil or similar explosive), blasting is anticipated to occur for a maximum of two weeks per year; therefore, this contribution to GHG emissions is expected to be minor.

Mitigation Measures

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

- Incorporate the shortest transport routes where possible to minimize the use of fossil fuels during product transportation.
- Plan 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 from service malfunctioning equipment or equipment generating excess amounts of smoke, odour, or noise until an assessment and necessary repairs can be completed.
- Require regular equipment maintenance to be undertaken to maintain good operations and fuel efficiency.
- Implement an anti-idling policy to limit GHG emissions from vehicles and equipment and limit the use of fossil fuels, where feasible.

Monitoring

No monitoring programs are proposed.

Conclusion

The predicted residual effects of the Project on Climate Change (after mitigation) are characterized in Table 7.7.

Table 7.7: Climate Change Residual Effects

Effect Detail	GHG Emissions
Magnitude of Effect	Low: The Project emissions will be below 10,000 tCO ₂ e.
Geographic Extent of Effect	LAA
Frequency of Effect	Continuous: Effects will occur continuously during operation.
Duration of Effect	Medium Term: Effects are expected throughout the operation and decommissioning phases.
Reversibility of Effect	Irreversible
Significance Level	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	

7.3 Sound

7.3.1 Overview

The assessment of sound considered all Project phases and anticipated sources of sound generated by the Project.

7.3.2 Regulatory Context

Table 7.8 summarizes sound level thresholds presented in the Pit and Quarry Guidelines (NSDEL, 1999).

Table 7.8: Summary of Sound Level Regulations and Guidelines

Regulated By	Regulation/Guidance	Sound Level (dBA)	Hours / Duration
At Property Boundary			
NSECC	Pit and Quarry Guidelines (NSDEL, 1999)	65	Day
		60	Evening
		55	Night
NSECC	Guidelines for Environmental Noise Measurement and Assessment (NSECC, 2023)	53	Day
		48	Evening
		40	Night
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

7.3.3 Assessment Methodology

Sound

The assessment of sound spans all Project phases and covers activities expected to comprise of predominant sources of noise, including the use of light- and heavy-duty equipment (e.g., pickup trucks, loaders, drill rigs, etc.) and blasting.

This assessment contains a discussion of expected noise sources and a qualitative assessment of potential effects on receptors.

7.3.4 Sound Assessment Results

Sound

During quarrying activities (operations and decommissioning), sound will be generated by the operation of light and heavy-duty equipment. A summary of sources and anticipated volumes of sound produced during the Project's life is found in Table 7.9.

Table 7.9: Decibel Limits of Construction Equipment Required for the Project

Equipment	Average Noise Level Ranges (in dBA)
Quarrying	
Dump Truck	84 to 88 ⁽¹⁾
Excavator	97 to 106 ⁽²⁾
Harvesting Equipment (log truck, manual faller, etc.)	85 to 103 ⁽³⁾
Loaders	88 ⁽³⁾
Pickup Trucks	95 ⁽⁴⁾
Tracked Drilling Units	91 to 107 ⁽⁵⁾

⁽¹⁾(WorkSafe BC, 2019)

⁽²⁾(Transport Scotland, 2018)

⁽³⁾(WorkSafe BC, 2016)

⁽⁴⁾(Oregon State Parks, n.d.)

⁽⁵⁾(The Driller, 2005)

Measurements shown are relevant to the decibel level ranges within close proximity (i.e., less than 15 m)

Based on the results in Table 7.9, the range of decibels anticipated for the Project's activities will be between 84 dBA and 107 dBA (from a single piece of equipment within 15 m from the source). In addition to Table 7.9, blasting also produces impulsive noise emissions with a rapid onset and decay (within 1 second). These blasts will vary in power levels based on charge size and blast geometry; however, blasts will continue to be maintained below the thresholds outlined under the existing IA.

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 specifically addressed because sound levels are expected to be comparable to operations (Table 7.10).

Table 7.10: Potential Project-Sound Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	X
Decommissioning	
Infrastructure removal	X
Site reclamation	X

Assessment Boundaries

The LAA for sound includes an 800 m buffer around the PDA (Drawing 6). The 800 m buffer was selected to be respective of blasting guidelines as established under the Pit and Quarry Guidelines (Nova Scotia Environment and Labour, 1999).

Assessment Criteria

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

- **Low:** Project activities to be completed in accordance with the relevant Pit and Quarry Guidelines as well as the Guidelines for Environmental Noise Measurement and Assessment sound level limits (NSDEL, 1999; NSECC, 2023).
- **High:** Project activities predicted to exceed relevant Pit and Quarry Guidelines as well as the Guidelines for Environmental Noise Measurement and Assessment sound level limits (NSDEL, 1999; NSECC, 2023).

Effects

Quarry activities will be limited to daytime hours (7:00 am to 7:00 pm) to minimize noise impacts on off-site receptors at night.

Clearing and grubbing will take place in advance of scheduled extractive work in areas anticipated for short-term (i.e., within two years) progression of the site. Drilling and blasting

will occur once the site is prepared (i.e., cleared and grubbed), and blasting will occur for a maximum of two weeks per year. Once the material is blasted, loaders and excavators will transport quarried materials to the existing quarry site for processing (i.e., crushing and screening).

Sound tends to attenuate at a standard rate of 6 dBA per doubling in distance from a given point source (WKC Group, 2024). Additionally, soft ground cover (e.g., forest floor) can absorb sound, while hard ground cover (e.g., exposed bedrock) can reflect sound. A broken line of sight, as with topographic relief (e.g., hills), forested areas, or operation within an excavated quarry, can further reduce sound from a source. Forested buffers alone can reduce noise by up to 8 dBA per 30 m of vegetated buffer. When relief (e.g., hills or excavation) is incorporated, this noise reduction can reach 15 dBA per 30 m of buffer (USDA, n.d.).

The nearest receptor (residential) is 600 m northwest of the PDA and is surrounded by varying degrees of forest, vegetation, or topographic relief, which is expected to obscure the line of sight between the receptor and the PDA (Drawing 6). As a result, the receptor is expected to experience reduced noise levels relative to the equipment anticipated to be used for the Project. Furthermore, the sound levels are anticipated to be similar to the existing quarry site and will adhere to the Pit and Quarry Guidelines as well as the Guidelines for Environmental Noise Measurement and Assessment sound level limits (NSDEL, 1999; NSECC, 2023).

Blasting can generate impulsive noise; however, it will be limited to blasting hours (8:00 am to 6:00 pm) and will not occur on Saturdays, Sundays, or on statutory holidays. All blasts will follow best management practices, such as the procedure for conducting a pre-blast survey (NSECC, 1993), the Pit and Quarry Guidelines (NSDEL, 1999), and applicable regulations such as the Blasting Safety Regulations (NSECC, 2013). The sound levels are anticipated to be similar to the existing quarry site and will adhere to the Pit and Quarry Guidelines, as well as the Guidelines for Environmental Noise Measurement and Assessment sound level limits (NSDEL, 1999; NSECC, 2023).

Mitigation Measures

To minimize construction sound and the potential disturbance of receptors during operations, the following general mitigation measures will be implemented, as required:

- Use noise suppressants (e.g., mufflers) on vehicles/equipment, where possible.
- Limit unnecessary vehicle idling.
- Maximize construction activities within the recommended daytime hours of 7:00 am to 7:00 pm or 8:00 am to 6:00 pm for blasting.
- Follow the guidelines and requirements in the Blasting Safety Regulations, Pit and Quarry Guidelines, and the procedure for conducting a pre-blast survey (NSDEL, 1999; NSECC, 1993, 2013).

- Ensure noise generated complies with the Department's Guidelines for Environmental Noise Measurement and Assessment (NSECC, 2023).
- Maintain equipment in good working order as recommended by the manufacturer.

Monitoring

Sound levels and blasting will be monitored as described in the IA and Pit and Quarry Guidelines (NSDEL, 1999).

Conclusion

The predicted residual effects of the Project on noise (after mitigation) are characterized in Table 7.11.

Table 7.11: Sound Residual Effects

Effect Detail	Equipment Noise	Blasting Noise
Magnitude of Effect	Low: Quarry activities are anticipated to comply with relevant guidelines.	Low: Blasting activities are anticipated to comply with relevant guidelines.
Geographic Extent of Effect	LAA	LAA
Frequency of Effect	Intermittent: Effects are anticipated during all phases intermittently.	Intermittent: Effects are anticipated during operation intermittently.
Duration of Effect	Medium Term: Effects are expected throughout operations and decommissioning, but not after decommissioning.	Medium Term: Effects are expected throughout operations but end at the start of decommissioning and do 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		

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)

8.3 Assessment Methodology

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

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

The determination of impacts on the geophysical environment was completed based on available desktop information, without field invasive assessments (e.g., geotechnical reports). Furthermore, the well logs database is limited. While the database provides useful details on well characteristics, the accuracy of well locations varies. As a result, the database is valuable for understanding general groundwater conditions but cannot reliably confirm the precise location or existence of individual wells.

8.4 Assessment Results

Topography

The Study Area is primarily located within the South Mountain Ecodistrict (720), with the eastern and western portions located within the Valley Slope Ecodistrict (710) (Drawing 8). Both of these ecodistricts are of the Western Ecoregion (700) (Neily et al., 2017). The Study Area slopes from the south towards the Annapolis Valley to the north.

Within the PDA specifically, elevations range from 155 metres above sea level (masl) on the southern portion to 197 masl on the central portion.

Surficial Geology

Within the Study Area, surficial geology consists of a stony till plain, composed of stony, sandy material (2 m to 20 m thick) derived from local sources and deposited at the base of receding/melting ice sheets (Drawing 9). These surficial features have high erodibility, rapid drainage, high water tables, and are shallow/stony, which can pose limitations for construction (NSNR, 2021e).

Colluvial deposits (also known as talus slopes) are loose deposits of surficial material at the base of steep slopes. These geologic features can pose significant hazards as they are subject

to sudden and rapid slides/failures. No records of colluvial deposits were identified within the Study Area (NSNR, 2021e).

Bedrock Geology

The Study Area is underlain by quartzites of the Goldenville Formation. These Cambrian to Ordovician-aged metasandstone turbidites are massive, grey to greenish-grey and are generally poorly sorted. The Goldenville Formation comfortably overlies the Halifax Formation and is sometimes interbedded with minor slate (Keppie, 2000; NRCan, 2018).

According to the Mineral Resource Land-Use Atlas, there are no occurrences of sulphide-bearing slates within the Study Area (NSNR, 2021d). In addition, a review of the Nova Scotia Karst Risk Map (based on provincial geology maps, sinkhole occurrence data, lidar data, and hydrogeological databases) indicated that the Study Area is within a "Low Risk" region (NSNR, 2019) (Drawing 10).

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

Groundwater Quality and Quantity

The Study Area is underlain by metamorphic bedrock (NSNR, 2021e). Wells located in metamorphic bedrock typically have lower groundwater yields (as compared to sedimentary bedrock), as groundwater can flow only through fractures in the rock. Naturally occurring trace metals such as iron, arsenic, and manganese can be found in all groundwater regions; however, they are more often associated with plutonic and metamorphic groundwater regions (Kennedy & Drage, 2009).

A review of the groundwater risk mapping indicated that the Study Area is split into a "High Risk" zone for arsenic in the south and a "Medium Risk" zone in the north (NSNR, 2021d). The Study Area is in a "High Risk" zone for manganese in well water (surficial and bedrock aquifer) (Kennedy, 2021). In addition, the Study Area is considered a "Low Risk" for uranium in the groundwater (NSNR, 2021d).

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 that may exist near the Study Area; however, there are significant limitations in its spatial accuracy. For the purposes of this assessment, any groundwater wells that had a spatial uncertainty of greater than 1,000 m were not considered/assessed.

Two water wells were identified via desktop within 800 m of the Study Area using the NSECC Well Logs Database (NSECC & NSNR, 2022) (Drawing 10). One of these wells is owned by the Proponent (Well ID: 130104) and was verified in the field. None of the wells are located within the PDA.

Table 8.1: Water Well Records within 800 m of the Study Area

Well Number	Address	Year Installed	Well Depth (m)	Casing Depth (m)	Depth to Bedrock	Static (m)	Yield (Lpm)	Well Type	Water Use
130104	Sturk Road, Morristown (Canaan Road, Nicholsville)	2013	3.29	-	0.2	1.83	90.8	Dug	Commercial
170773	Canaan Road	2017	121.8	8.53	6.09	6.09	4.54	Drilled	Domestic

Source: (NSECC & NSNR, 2022)
'-' No data

The NSNR Pumping Test Database provides long-term yields for select wells throughout the province and includes details on well construction and pumping tests, as well as interpreted hydrogeological properties. The nearest pumping test well within the metamorphic bedrock of the Goldenville Formation was too far away to be considered relevant (over 5 km). However, a provincial assessment of pumping test data from Nova Scotia's metamorphic groundwater region (which includes the Goldenville Formation) indicates a median transmissivity of 1.3 m²/d (Kennedy & Drage, 2009).

8.5 Effects Assessment

Project-Geophysical Interactions

Project activities will primarily interact with the geophysical environment during earthworks (Table 8.2).

Table 8.2: Potential Project-Geophysical Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	-
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	-
Transportation of rock and product	-
Decommissioning	
Infrastructure removal	X
Site reclamation	X

Assessment Boundaries

The LAA for the geophysical environment is an 800 m buffer of the PDA (Drawing 6). The 800 m buffer was selected to be respective of blasting guidelines as established under the Pit and Quarry Guidelines (Nova Scotia Environment and Labour, 1999). 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 during blasting (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 within the PDA will be disturbed during all phases of the quarry development. During these phases, potential impacts related to the geological environment primarily stem from the following:

- Acid rock drainage (ARD)
- Arsenic, manganese and/or uranium-containing bedrock
- Changes in groundwater flow regimes
- Loss of groundwater recharge

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 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 risk mapping, there are no sulphide-bearing slates or formations recorded within the Study Area (NSNR, 2021b). Minor slate can be found in the Goldenville Formation (Section 8.4). If slate bedrock is encountered onsite, these will be tested for their sulphide content as required by the Sulphide Bearing Material Disposal Regulations (NSECC, 1995).

Quarrying activities, primarily blasting, 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-, and/or uranium containing bedrock can mobilize these metals in groundwater and subsequently degrade nearby groundwater well quality. In addition to water quality, groundwater quantity can be affected if blasting activities alter local hydrogeological flow regimes, resulting in groundwater draining from or flowing towards existing wells. As a result of potential impacts to groundwater quality and quantity, wells located within 800 m of blasting activities require monitoring per NSECC's Procedure for Conducting a Pre-Blast Survey (NSECC, 1993).

Two wells were identified in desktop reviews to be located within the LAA, a Proponent-owned well and a private well that is located approximately 250 m to the northwest of the nearest edge of the PDA (Drawing 10). A third well is assumed to be associated with the confirmed structural receptor, approximately 600 m northwest of the nearest point from the PDA. For this purpose of this assessment, we have assumed that this structure has a dug well, as impacts from quarrying activities are greatest to a dug well by potentially impacting water levels or causing temporary sedimentation.

The quarry, which has been operational since 2013, has been historically advancing south and west of the initial quarry area, away from the private well. Prior to blasting, a pre-blast survey has and will continue to be conducted to document baseline conditions and determine if any effects have occurred. Based on historical quarry expansion and no identified historical issues with the drilled domestic well, potential impacts to nearby groundwater well quality and quantity are not anticipated.

Quarrying activities will remove natural areas where groundwater infiltration (recharge) will occur. A Water Balance Assessment (WBA) was commissioned to investigate the Project's impacts on infiltration and runoff. It should be noted that the maximum planned depth of the quarry will remain above the water table, and the quarry floor will be left fractured and permeable to allow precipitation to percolate downward into the underlying aquifer. Ultimately, the WBA indicates that the predicted overall change in runoff is minimal (Appendix C); therefore, it is assumed that within the LAA, changes in groundwater quantity resulting from reduced infiltration will also be minimal.

The quarry floor will be maintained 0.5 m above the maximum annual water table; therefore, direct contact (i.e., direct contamination) or impacts to groundwater (i.e., dewatering) are not anticipated.

Mitigation Measures

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

- Conduct blasting, in accordance with provincial legislation and subject to the 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 (as required).
 - Require that all blasts are conducted and monitored by certified professionals.
 - Notify landowners in advance of any blasting activities within 800 m.
- Limit the PDA and disturbed areas to the extent practical.
- Develop and implement a site-specific ESC Plan.
- Develop and implement a site-specific Groundwater Monitoring Plan.

Monitoring

Groundwater wells within 800 m of blasting activities will be monitored as per the Procedure for Conducting a Pre-Blast Survey (NSECC, 1993).

As outlined in the conditions of the IA, a site-specific ESC Plan and a Groundwater Monitoring Plan will be developed.

Conclusion

The predicted residual effects of the Project on the geophysical environment (after mitigation) are characterized in Table 8.3.

Table 8.3: 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.	Low: One well is located within the LAA (excluding Proponent's well), with no historical impacts. Quarrying will remain above the water table and groundwater will be monitored.
Geographic Extent of Effect	LAA	LAA
Frequency of Effect	Continuous: If present, effects may occur continuously.	Intermittent: Effects may occur during blasting.
Duration of Effect	Medium Term: If present, effects will extend through all phases, but end after decommissioning.	Medium Term: If present, effects will extend through all phases, but end after decommissioning.
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 FRESHWATER AQUATIC ENVIRONMENT

9.1 Surface Water and Fish and Fish Habitat

9.1.1 Overview

The objective of the aquatic assessment was to inform the Project's design and collect the information necessary to assess baseline biophysical data and potential Project-related impacts to surface water and fish and fish habitat. This was accomplished using the following approach:

- Identify surface water and fish and fish habitat within the Study Area using desktop resources.
- Traverse the entirety of the Study Area to ground truth surface water features and provide fish and fish habitat characterization of any identified features.
- Evaluate interactions between the Project and surface water and fish and fish habitat.
- Use the information collected to inform Project design (i.e., avoid/minimize impacts to surface water and fish and fish habitat).
- Use the information collected to 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 Study 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* R.S.C., 1985, c. F-14 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 the death of fish or the Harmful Alteration, Disruption, or Destruction (HADD) of fish habitat, unless such activities are authorized through appropriate regulatory approvals.

The *Fisheries Act* defines the following:

Fish:

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

Fish Habitat:

“waters frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas”.

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.

SARA provides federal protection for species listed as “Endangered”, “Threatened”, or “Special Concern”. These species are determined through the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (ECCC, 2022).

Provincially, the *Endangered Species Act*, S.N.S., 1998, c.11 (ESA) lists species as “Endangered”, “Threatened” or “Vulnerable” (Nova Scotia, 1998). These species also have a subnational (provincial) rank (S-Rank) of “S1”, “S2”, or “S3” (ACCDC, 2026) to further define their status.

9.1.3 Desktop Review

The purpose of the surface water and fish and fish habitat desktop review was to identify watercourses and waterbodies within or near the Study Area using mapped systems, topography, and satellite imagery, and to determine the Study Area’s location within primary and secondary watersheds and its potential fish community.

The desktop review was conducted using the following sources:

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

Surface Water

The Study Area is located entirely within the Annapolis River primary watershed (1DC) and the Annapolis River secondary watershed (1DC-3) (Drawing 11). Aquatic features within the Annapolis River secondary watershed flow into the Annapolis River, which eventually empties into the Bay of Fundy. The Study Area is entirely contained within a single tertiary watershed (1DC-3-NN), which encompasses the South River and its associated drainage area (Drawing 12A).

A review of the federal CanVec Database – Hydrographic Features (NRCan, 2023a) identified three unnamed watercourses within the Study Area. Two of the watercourses are located within the southwest portion of the Study Area (field identified as WC4a and 4b) and one is located in the northeast (field identified as WC1) (Drawing 13). Within the southwest portion of the Study Area, WC4a is the main stem, where WC4b is a small tributary that originates approximately 350 m southwest of the study area and flows north until it joins with WC4a in a mapped wetland (field identified as WL14). WC4a flows north through an additional wetland (field identified as WL17) before exiting the Study Area.

The third unnamed watercourse (WC1) is located in the northeast portion of the Study Area. This watercourse enters the Study Area along its eastern border and flows north before exiting the Study Area.

WC4a and WC1 eventually converge approximately 830 m north of the Study Area and continue flowing north to the South River, approximately 2.6 km from the Study Area. From there, the South River flows northwest, into the Annapolis River.

Other prominent aquatic features near the Study Area include Hutchinson Brook, Mill Brook, and Gould Brook. Hutchinson Brook is a tributary to Annapolis River that flows north and is located approximately 2.9 km outside the eastern boundary of the Study Area. Mill Brook is located approximately 2.4 km northeast of the Study Area and flows north, eventually joining Gould Brook, which is a tributary to Annapolis River.

Throughout the Study Area, WAM data indicates that groundwater ranges from 0 m to >10 m from the surface, with the majority being between 2.01 to 10 m of the surface (Drawing 14). WAM results highlighted the potential for watercourses throughout the Study Area (NSECC, 2022).

Potential Fish Community

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

The Nova Scotia Significant Species and Habitat Database (NSNR, 2024d) contains no records of significant fish species or habitat within 5 km of the Study Area.

The ACCDC database identified no priority fish species within 5 km of the Study Area (Appendix D); the nearest observation record was for Eastern pearlshell (*Margaritifera margaritifera*), a SOCI freshwater mussel, located within 5.2 km of the Study Area.

The Nova Scotia Freshwater Fish Species Distribution Records (NSFA, n.d.) show the following species as potentially present within the Annapolis River primary watershed:

- Alewife (*Alosa pseudoharengus*; S3B)
- American eel (*Anguilla rostrata*; COSEWIC threatened, S3N)
- Banded killifish (*Fundulus disphanus*; S5)
- Brook trout (*Salvelinus fontinalis*; S3)
- Brown bullhead (*Ameiurus nebulosus*; S5)
- Chain pickerel (*Esox niger*; SNA)
- Golden shiner (*Notemigonus crysoleucas*; S4)
- Lake chub (*Couesius plumbeus*; S5)
- Smallmouth bass (*Micropterus dolomieu*; SNA)
- Striped bass (*Morone saxatilis*; COSEWIC endangered, S2S3B, S2S3N)
- Threespine stickleback (*Gasterosteus aculeatus*; S5)
- White perch (*Morone americana*; S5)
- White sucker (*Castostomus commersoni*; S5)
- Yellow perch (*Perca flavescens*; S5)

A review of the CMAR Wild Salmon River Assessment database identified the Annapolis River as having medium significance for supporting the long-term viability of Atlantic salmon – Nova Scotia Southern Upland West population (*Salmo salar*; COSEWIC endangered, S1) (CMAR, n.d.). This indicates that current conditions in Annapolis River, which is approximately 6.7 km from the Study Area, may support Atlantic salmon populations (Weitzman et al., 2025). Based on connectivity between Annapolis River, South River, and the unnamed mapped watercourses within the Study Area, Atlantic salmon – Nova Scotia Southern Upland West population may be present within the Study Area. However, it is important to note that the Study Area is located upstream of the Factorydale Power Dam (Drawing 12A), a hydroelectric facility owned and operated by the Town of Berwick. The Canadian Aquatic Barriers Database (Canadian Wildlife Federation, 2024) identifies this dam as a barrier to fish passage. The Project Team is not aware of any fish passage provisions at this facility.

9.1.4 Field Assessment Methodology

The results of the desktop review were used to inform early planning for Project siting and field survey design. The results of the field surveys have informed Project design (i.e., avoid/minimize impacts to surface water and fish and fish habitat).

Watercourse delineations were completed in conjunction with wetland delineations from June 2 to 12, 2025. WAM data and predicted flow data were provided to field staff to guide the identification and assessment of watercourses within the Study Area. Confirmed watercourses were delineated to their termination point or to the boundary of the Study Area. The

watercourses were characterized using Strum's Baseline Delineation Form, which records the following general survey details:

- Date and time
- Weather
- Watercourse type
- Flow characteristics (direction, velocity, etc.)
- Physical characteristics (width, length, etc.)
- Substrate composition
- Instream cover
- Riparian habitat
- Bank stability and siltation presence
- Photos, global positioning system (GPS) location, etc.
- Fish presence/habitat potential

This information was collected and georeferenced using Survey123, an Environmental Systems Research Institute (ESRI) application for creating, sharing, and analyzing data.

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.

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 on August 7 and 8, 2025. All surveys were conducted under DFO Scientific Licence #360444.

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 (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 two watercourses identified during field surveys (Drawing 15).

- WC1
- WC4A

These locations were selected based on suitability of the habitat to conduct electrofishing surveys (i.e., deep enough to submerge the anode), fish habitat potential, and access considerations. WC1 is a third order stream, and WC4A is a second order stream.

Trapping Surveys

Trapping surveys were conducted between August 7 and 8, 2025 in WC1 and WC4A to supplement electrofishing surveys where habitats could not be waded (due to water depth, unconsolidated substrate, etc.). Minnow traps and eel pots were used to capture and record fish presence over an approximate 24-hour period. 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. The locations of fish traps deployed within the Study Area are shown on Drawing 15.

In-Situ Water Quality

Water quality parameters were measured in-situ during fish collection surveys by Strum personnel using a Hannah Combo pH/Conductivity/total dissolved solids (TDS) Probe at the time of the sampling event/survey. Parameters recorded include water temperature (°C) and pH. Total dissolved solids (TDS; mg/L) were not recorded due to equipment malfunction. Results were analysed using the Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Freshwater Aquatic Life (FWALs).

9.1.5 Field Assessment Results

Five watercourses were identified within the Study Area during field assessments (Drawing 13): one permanent, one intermittent, and three ephemeral features ranging in channel width from 0.30 m to 7.0 m. Characteristics presented are limited to the extent of the watercourse contained within the Study Area (Table 9.1). Representative photographs are provided in Appendix E.

Table 9.1: Watercourse Characteristics Within the Study Area

Watercourse ID	Flow ¹	Velocity Range (m/s)	Channel Width Range (m)	Depth Range (m)	Substrate (%)	Habitat Types	Cover Types ²
WC1	P	0.25 – 0.33	5.0 – 7.0	0.19 – 0.80	Boulder 65 Rubble 35	Riffle-run, Flat, Pool	IN, O
WC2	E	0.05 – 0.25	1.3 – 5.0	0.07 – 0.12	Boulder 30 Rubble 30 Gravel 10 Muck 30	Riffle-run, Pool	O
WC3	E	0 - 0.05	1.2 – 2.2	0.09 – 0.12	Boulder 20 Muck 80	Pool, Fiffle	O
WC4A	I	<0.05	2.9 – 3.4	0 – 0.23	Boulder 30 Muck 70	Flat, Riffle, Run	IN, O
WC4B	I	<0.05	1.3 – 3.0	0.10 – 0.30	Muck 100	Flat, Pool	IN
WC5	E	0 – 0.06	0.3 – 2.5	0.05 – 0.15	Rubble 10 Cobble 5 Silt 50 Muck 35	Run	IN, O

¹Perennial (P) – A stream that flows continuously throughout the year, Intermittent (I) – Streams that go dry during protracted rainless periods when percolation depletes all flow, Ephemerl (E) – A watercourse that flows during snowmelt and rainfall runoff periods only (Svec et al., 2005)

²Cover 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

Perennial (i.e., permanent) aquatic features see flow for most, if not all, 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).

Intermittent watercourse features observe variances in flow throughout the year, either due to changes in their water source or other abiotic factors such as temperature or geological properties (Buttle et al., 2012). Intermittent watercourses are often first and 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. These features also differ in that they can observe partial channelization but will often enter below the surface (Buttle et al., 2012).

Ephemeral features often 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 Study Area, ephemeral conditions within wetlands which are sometimes referred to as “wetland corridors”.

Electrofishing Surveys

The results of the qualitative electrofishing surveys are provided in Table 9.2.

Table 9.2: Electrofishing Survey Results

Location	Survey Date	Upstream Coordinates (UTM)		Downstream Coordinates (UTM)		Fish Species Collected*		Catch Per Species	Total Catch	Total Effort (seconds)	CPUE (fish/300 seconds)
		Easting	Northing	Easting	Northing	Common Name	Scientific Name				
WC1	August 8, 2025	361045	4980141	360981	4980206	American eel	<i>Anguilla rostrata</i>	1	18	1,065.6	5.1
						Brook trout	<i>Salvelinus fontinalus</i>	17			
WC4A	August 7, 2025	360108	4979737	360080	4979657	Brook trout	<i>Salvelinus fontinalus</i>	4	4	737.8	1.63

*One American eel was observed in WC4A, and 10 additional brook trout and 1 American eel were observed in WC1, but evaded capture.

Electrofishing surveys resulted in the capture of two species and 21 individual fish. Brook trout were the most abundant species, accounting for 20 (95.2%) of the total catch. One American eel was captured, accounting for 4.8% of the total catch. WC1, which is located in the northeast portion of the Study Area had the highest CPUE (4.79 fish/300 seconds). Watercourse characteristics were challenging for electrofishing in WC1 due to large boulders, and in WC4A due to poor visibility caused by mucky substrate and low velocity. Consequently, several fish evaded capture. However, no additional species were identified. Representative photographs of fish species captured within the Study Area are provided in Appendix E.

Trapping Surveys

The locations and results of the trapping surveys are provided in Table 9.3.

Table 9.3: Trapping Survey Results

Location	Survey Date	Trapping Location		Fish Species Collected		Catch Per Species	Total Catch Per Trap Type	Total Effort Per Trap Type (hours)	CPUE (per trap)	CPUE (per species)
		Easting	Northing	Common Name	Scientific Name					
WC1	August 8, 2025	361015	4980163	Brook trout	<i>Salvelinus fontinalus</i>	1	MT (5) = 1	MT = 103.35	MT = 0.01	0.01
WC4A (Upstream)	August 7, 2025	360104	4979417	--	--	--	MT (6) = 0 EP (1) = 0	MT = 125.52 EP = 20.83	MT = 0 EP = 0	--
WC4A (Downstream)	August 7, 2025	360074	4979671	Brook trout	<i>Salvelinus fontinalus</i>	1	MT (4) = 1 EP (1) = 0	MT = 84.00 EP = 21.00	MT = 0.01 EP = 0	0.01

In total, the trapping surveys resulted in the capture of two brook trout. The CPUE per trap type and per species was 0.01 in minnow traps in both WC1 and the downstream portion of WC4. No fish were captured in eel pots, or in the upstream portion of WC4A. Representative photographs of fish species captured within the Study Area are provided in Appendix E.

Fish Species Observed

Table 9.4 presents a summary of fish species captured through all electrofishing and trapping surveys within the Study Area, listed in order of abundance.

Table 9.4: Fish Species Captured within the Study Area

Common Name	Scientific Name	COSEWIC	SARA	ESA	S-Rank	Total Catch		Length range (mm)	System	
						Total #	% Catch		WC1	WC4A
Brook trout	<i>Salvelinus fontinalis</i>	--	--	--	S3	22	95.6	50 - 156	17	5
American eel	<i>Anguilla rostrata</i>	Threatened	--	--	S3N	1	4.4	300	1	--
Total Individuals						23	Total Species		18	5

In total, 23 individual fish were captured across two survey locations. Brook trout was the most commonly captured, accounting for 95.65% of the total catch and included young of the year, juvenile, and adults. One American eel was caught, accounting for 4.35% of the total catch. American eel is ranked as S3N and Brook trout are ranked as S3 by the ACCDC.

Priority Species

The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009) was used 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:

- American eel
- Atlantic salmon (Nova Scotia Southern Upland West population)
- Brook trout

American Eel

The American eel is listed as 'Threatened' under COSEWIC and 'S3N' by ACCDC (2025b). American eel are a migratory species with life stages in freshwater, estuary, and marine environments (COSEWIC, 2012). 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, 2012). 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, 2012).

One adult American eel was captured in WC1, and one American eel was observed but evaded capture in WC4A during electrofishing surveys. The closest ACCDC observation is 11.1 ± 0.01 km from the Study Area (ACCDC, 2025b). American Eel have a remarkable ability to move upstream and past physical barriers, even those that would completely block most other fish species. However, the low number of eels captured or observed in the Study Area supports the conclusion that the downstream dam at Factorydale Pond largely functions as a barrier to fish movement.

Atlantic Salmon

The Atlantic salmon – Nova Scotia southern upland subspecies is listed as ‘Endangered’ by COSEWIC and as “S1” by ACCDC (2025b). Southern upland Atlantic salmon are a genetically distinct population of Atlantic salmon that occupy rivers in both the Eastern Shore and South Shore, draining into the Atlantic, as well as Bay of Fundy Rivers south of Cape Split (COSEWIC, 2011). The exact number of rivers that contain southern upland Atlantic salmon is unknown; however, they have been historically considered present in 72 rivers (DFO, 2013b).

For freshwater habitat, Atlantic salmon prefer clear, cool, well-oxygenated waters in streams with bottoms of gravel, cobble, and boulder (COSEWIC, 2010). Gravel and cobble are the preferred substrates for spawning (COSEWIC, 2010). Redd sites, which are depressions dug into the substrate by female salmon to deposit eggs, are typically located in well-aerated areas – a riffle above a pool, or at the tail of pools on the upstream edge of riffles with depths of 10-70 cm (Grant & Lee, 2004). Juvenile and adult salmon use a variety of different habitat types, including freshwater fluvial, lacustrine, and estuarine, however, juvenile Atlantic salmon are typically found in streams where good foraging conditions exist (COSEWIC, 2010). Older parr are usually found in riffles, except during low water levels, high water temperatures, and winter freeze, during which deeper pools are the preferred habitat (Grant & Lee, 2004). As temperatures rise above 22° C, habitat potential decreases, and Atlantic salmon will search for cooler waters (COSEWIC, 2010, p. 201). The maximum temperature that Atlantic salmon will tolerate before exiting a habitat (if possible) is 27.8° C (COSEWIC, 2010). Furthermore, Atlantic salmon prefer a circumneutral pH ranging from 6.5-7.5 (MDEP, 2022).

Atlantic salmon species undertake long feeding migrations to the ocean as older juveniles and adults and return to freshwater streams to reproduce. Marine requirements for Atlantic salmon are not as well understood, but temperature is thought to be important. Atlantic salmon smolts migrate seaward from rivers during May and June (DFO, 2018). Adults return to the rivers in the late fall to spawn (COSEWIC, 2011).

The closest ACCDC observation of SU Atlantic salmon is 32.2 ± 1.0 km from the Study Area (ACCDC, 2025b). Although Atlantic salmon were not captured within the Study Area, suitable habitat may be present in WC1. However, because these watercourses are located upstream of the barrier at Factorydale Pond, it is unlikely that salmon can access these headwaters.

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 (ACCDC, 2025b). 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 highly mobile species that migrate further inland to rivers and lakes during the fall months to spawn. Sea-run brook trout (anadromous individuals) 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).

Five brook trout were captured in WC4A (two adult and three juvenile), and 17 (7 adults and 10 juvenile) were captured in WC1. The closest ACCDC observation is 11.4 ± 0.22 km from the Study Area (ACCDC, 2025b). Given the downstream barrier at Factorydale Pond, it is likely that these fish are part of a resident population capable of completing their lifecycle within these watercourse and nearby habitats.

In-Situ Water Quality

In-situ water quality was recorded opportunistically during fish collection 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 regarding suitable fish habitat.

Where applicable, water quality sampling results are measured against the CCME Guidelines for the Protection of FWAL. The results are provided below in Table 9.5.

Table 9.5: In-Situ Water Quality Results

Location	Sampling Dates	Temperature ($^{\circ}\text{C}$)	pH
WC1	August 7, 2025	17.4	5.96
WC4A	August 7, 2025	13.3	5.96
WC4A	August 8, 2025	13.7	5.98

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

Temperature

Water temperature affects the metabolic rates and biological activity of aquatic organisms, thus influencing the use of habitat by aquatic biota. There are no CCME guidelines related to temperature. 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). All temperatures recorded are considered within the suitable temperature range for cold-water fish species (<20 °C).

pH

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, compared 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, 2024a).

The pH range for watercourses sampled within the Study Area was 5.96 to 5.98, with an average pH of 5.97. All locations exhibited pH levels below the CCME FWAL recommended range (6.5 to 9.0). However, all pH values are within the suitable range for species known within the Study Area.

Assessment of Fish Habitat

The following paragraphs describe fish habitat within each linear watercourse identified in the Study Area and provide an assessment of the quality of the habitat in relation to fish species and life stages present. The results of fish habitat characterizations and fish surveys have been used to define which watercourses provide habitat for fish and which do not. All delineated, linear watercourses are considered provincially regulated watercourses as defined by NSECC guidance (NSECC, 2015b), but not all provincially regulated watercourses are considered fish habitat. Provincially regulated watercourses may contain a bed and bank but are considered

inaccessible to fish based on certain features which would prevent fish from accessing the watercourse (e.g. presence of a permanent barrier, hydrological isolation from down-gradient, fish-bearing systems).

WC1 is a third order, perennial stream that enters the Study Area on the northeast boundary, flows north through a mixedwood forest for approximately 380 m, and exits through the northern boundary, eventually flowing into South River. The bankfull width ranges from 5 to 7 m and the maximum depth recorded was 0.80 m. The dominant habitat type is a riffle-run. Substrate within the channel is dominated by boulder and rubble, which provide abundant instream cover. Electrofishing and trapping were conducted in this watercourse, and brook trout and American eel were captured. The structural complexity within WC1 and abundant cover created by boulders provides suitable American eel and juvenile and adult brook trout habitat. While no optimal trout spawning habitat was identified within the Study Area, the presence of YOY trout would suggest that spawning habitat is nearby. Therefore, fish habitat quality within WC1 is considered high.

WC2 begins as a first order, ephemeral watercourse that originates within the Study Area before it is joined by WC3 and flows northeast through a mixedwood forest for approximately 150 m before joining WC1. WC3 is a first order, ephemeral watercourse that originates from WL8 within the Study Area and flows northeast through mixedwood forest for approximately 85 m before joining WC2. Bankfull widths range from 1.3 to 5.0 m in WC2 and 1.2 to 2.2 m in WC3, and the maximum depth recorded was 0.12 m. The dominant habitat type in WC2 is riffle-run whereas WC3 is dominated by pools. Substrate within the channel of WC2 is dominated by boulder, rubble, and muck, with gravel interspersed, while WC3 is dominated by muck and boulders. Overall, fish habitat quality within these tributaries is considered poor due to lack of habitat diversity, cover, and habitat availability; therefore, the potential for these watercourses to directly support fish is low. Still, WC2 and WC3 are considered fish habitat as they may be seasonally accessed by fish present in WC1.

WC4 is an intermittent first order stream that is split into two segments: WC4A and WC4B. WC4B is a short tributary, approximately 40 m long within the Study Area, that flows into WC4A within WL14. WC4A originates outside of the Study area and enters through the southern boundary. WC4A flows through WL14, which is a fen, and then through WL17, which is a treed swamp, before exiting the Study Area. Between the two wetlands, there is an approximately 200 m segment of WC4A that was completely at the time of watercourse and fishing assessments, creating a seasonal barrier to fish passage to the upstream portion of the watercourse. The bankfull width ranged from 2.9 to 3.4 m in WC4A, and 1.3 to 3.0 m in WC4B. The maximum depth recorded was 0.23 m in WC4A and 0.30 m in WC4B. The dominant habitat type was a flat. Substrate was predominantly muck, with abundant boulder and rubble within the section of WC4A that was dry.

Electrofishing and trapping were conducted in WC4A. Brook trout were captured and an American eel was observed within the watercourse downstream of the dry section. Trapping was conducted upstream of the dry section of the watercourse, and no fish were caught.

Therefore, fish habitat within WC4A upstream of the dry section and WC4B is considered seasonal. Based on these characteristics, fish habitat quality upstream of the seasonal barrier is considered poor, but seasonal connectivity to WC4A means fish may move further upstream during high flow conditions.. Downstream of the barrier, suitable habitat is present for juvenile and adult American eel in the form of fine substrate. Habitat quality within WC4A is poor for brook trout due to the dominance of mucky substrate and low flow conditions.

WC5 is a first order, ephemeral stream that originates from WL15 and flows through WL16, before eventually flowing into WC4A in WL17 after approximately 180 m. The bankfull width ranges from 0.3 to 2.5 m, and the maximum depth recorded was 0.15 m. The dominant habitat type was a run. The substrate is dominated by silt and muck, with rubble and cobble scattered throughout. Overall, fish habitat quality is considered poor due to lack of habitat diversity, cover, and availability; therefore, the potential for this watercourse to directly support fish is low. Still, WC5 is considered fish habitat as it may be seasonally accessed by fish present in WC4A.

9.1.6 Effects Assessment

Project-Surface Water and Fish and Fish Habitat Interactions

Quarry development activities, primarily those that involve earthworks and blasting, have the potential to impact surface water and fish and fish habitat (Table 9.6).

Table 9.6: Potential Project Interactions for Surface Water and Fish and Fish Habitat

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	-
Transportation of rock and product	-
Decommissioning	
Infrastructure removal	-
Site reclamation	X

Assessment Boundaries

The LAA for surface water and fish and fish habitat includes the watercourses present within the Study Area to the confluence with South River (Drawing 15). No RAA is defined for this VC, as the LAA is the maximum expected extent of indirect impacts to surface water, fish, and fish habitat (in the unlikely event of an accident).

Assessment Criteria

The VC-specific definition for magnitude is as follows:

- Negligible: No loss of fish habitat. No expectation for altered hydrology.
- Low: Small loss of fish habitat. Minimal potential for altered hydrology (less than 10% change in flow).
- Moderate: Moderate loss of fish habitat. Altered hydrology expected but can be managed with routine measures (less than 25% change in flow).
- High: Loss of fish habitat. Altered hydrology expected that would be challenging to manage with routine measures (more than 25% change in flow).

Direct Effects

The Project has been sited to avoid all watercourses, and a buffer of 30 m from the PDA to watercourse banks will be maintained (Drawing 3); therefore, no direct habitat destruction or death of fish is anticipated.

Indirect Effects

Indirect effects such as changes in surface water quality and quantity can be farther reaching, extending outside of the Study Area and into the LAA (Drawing 15).

Change in Surface Water Quality

Changes in the quality of surface water can arise from alterations to the surrounding environment such as vegetation clearing, grubbing, stockpiling, and blasting during operations, and site reclamation activities during decommissioning (e.g. spreading grubbing piles, sloping, surface contouring, establishing drainage, and revegetation). Effects 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).

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's overall suitability for sensitive species (Tilman et al., 1997). Sedimentation can lead to infilling of interstitial spaces important to eels as habitat, and may also increase the level of contaminants within sediments (DFO, 2014). Sedimentation can result in negative impacts on brook trout populations and habitat, primarily by smothering eggs, reducing food sources, and destroying essential spawning and cover areas (Alexander & Hansen, 1983).

Erosion and sedimentation can occur throughout the lifecycle of the Project; however, the highest potential for these effects is related to operational activities including vegetation clearing, grubbing, and stockpiling of material. These effects are often foreseeable, and research-based, standardized best management practices (BMPs) can be implemented to mitigate the resulting outcomes and the magnitude at which they are felt. Ensuring that operation of machinery does not fall within a 30 m buffer of any watercourse will assist with mitigating changes in surface water quality in these systems, in addition to adherence to a site-specific ESC Plan.

Quarry surface water runoff and drainage may interact with local surface water features,, potentially increasing contaminants, total suspended solids (TSS) and turbidity in nearby fish habitats. Elevated TSS is a primary water quality concern associated with quarrying activities. However, elevated TSS can be mitigated through BMPs. TSS is currently monitored at the quarry site as per the current IA (2013-085441-01) and will continue to be monitored accordingly as the quarry expands. Additionally, accidental release of deleterious substances from machinery such as fuel, or improper storage of hazardous materials could affect surface water quality, and consequently, fish health and survival. Mitigations relating specifically to accidents and malfunctions (e.g., fuel spills) are described in Section 15.

No active water management measures are required for this Project. A pond is present on the high wall of the active quarry site, created during the quarry's first blast in 2013. The pond has gradually filled with rainwater over time; however, it is not currently used as a settling pond or for water management purposes on the property. As quarry operations advance, the pond is expected to naturally drain over time.

All surface water runoff and drainage occurring on the site is expected to continue to percolate downward into the underlying aquifer, as it has been doing since quarry operations began in 2013. No additional surface water management is expected at this time. Overall, impacts of the Project on surface water quality are considered low.

Change in Surface Water Quantity

Water quantity within aquatic habitats can be altered from changes to contributing drainage areas, which may occur throughout the lifecycle of the Project. Changes in water quantity within watercourses outside of natural variability can have implications on viability of fish habitat to support fish. The Pathways of Effects diagram developed by DFO outlines potential impacts to fish and fish habitat as a result of changes to water level and flow modification (DFO, 2024b). Effects may include changes to, or losses of:

- Habitat structure and cover
- Fish passage
- Wetted area

The probability of these impacts to fish and fish habitat increases with increasing alteration to the natural flow regime. As outlined in the DFO Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada (DFO, 2013a), flow alterations of less than +/- 10% of the magnitude of actual (instantaneous) flow in the river relative to a "natural flow regime" have a low probability of detectable negative impacts to ecosystems. Therefore, for the purpose of this assessment, a predicted change in annual runoff less than +/-10% is unlikely to negatively impact aquatic ecosystems, and impacts are considered low.

A WBA was completed to outline the predicted changes to surface water runoff and the resulting impacts to surface water features and fish habitat within and down-gradient of the Study Area. Methods for the WBA are described in Appendix C.

The proposed quarry expansion area falls within two local watersheds that are expected to be impacted. Watershed A [WS-A (16.3 ha to be impacted)] and Watershed B [WS-B (41.8 ha to be impacted)]. The total contributing drainage area to these local watersheds is 1,105.91 ha for WS-A and 347.95 ha for WS-B (Drawing 12B and Appendix C).

Results of the WBA, including pre- and post-development conditions for WS-A and WS-B are provided in Appendix C and summarized in Table 9.7.

Table 9.7: Summary of WBA Results

Watershed	% Change in Annual Runoff	% Change in Annual Flow	% Change in Annual Infiltration
A	0.98	0.98	-0.81
B	8.56	8.56	-6.22

Based on the assessment results, the change in infiltration for WS-A and WS-B is estimated to decrease by 0.81% and 6.22%, respectively. Meanwhile, changes in surface runoff and flow for WS-A and WS-B are estimated to increase by 0.98% and 8.56%, respectively. The overall cumulative impact to surface runoff due to the proposed quarry footprint (including both watersheds) results in an increase of 2.69%.

Changes to local hydrology in both watersheds are expected to be minimal (less than $\pm 10\%$), indicating a low likelihood of measurable adverse effects on ecosystems. Although surface runoff is projected to increase slightly in both watersheds, this may provide a modest benefit by enhancing habitat connectivity and improving conditions for fish passage.

Blasting can also increase connectivity between surface water and groundwater and create short-term changes in water quality and quantity. To mitigate these risks, controlled blast designs, monitoring programs, and post-blast inspections will be implemented. Maintaining natural drainage patterns, erosion controls, and sediment management will help safeguard both groundwater and surface water resources during project construction and operations. Potential project impacts on surface water quantity are therefore considered low.

Fish Injury and Mortality

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 have lethal and sublethal effects 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 behaviour as a result of noise produced during blasting (Wright & Hopky, 1998).

Given the PDA's proximity to fish-bearing watercourses, additional mitigation measures are required to address potential effects on fish and fish habitat. Setback distances will be determined using the guidance provided by Wright and Hopky (1998), based on the proposed explosive charges. A Blast Management Plan will be developed to ensure that appropriate setbacks are maintained or that suitable mitigation measures are implemented to protect fish and fish habitat from potential blasting impacts. No fish mortality is anticipated as a result of Project activities.

Mitigation Measures

The following mitigation measures will be implemented to avoid and mitigate any potential effects on surface water and fish and fish habitat:

General Mitigation

- Educate Project personnel on the sensitivity of aquatic habitat.
- Flag watercourses and avoid impacts to the watercourse and adjacent riparian habitat to the extent possible.
- Require that Project activities (fueling included) or removal of vegetation shall not be conducted within 30 m of any watercourse.

Changes in Surface Water Quality and Quantity

- Minimize surface run-off containing suspended materials or other harmful substances.
- Direct run-off from construction activities away from wetlands and watercourses.
- Maintain 30 m vegetated buffers around watercourses.
- Ensure machinery on site is clean and maintained and free of fluid leaks.
- Properly install, monitor, and maintain erosion and sediment control devices (i.e., rock check dams).
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff.
- Consider weather advisories and schedule work to avoid intense wet, windy and rainy periods that may result in high flow volumes and/ or increase erosion and sedimentation when possible.
- Implement a Contingency Plan and adhere to the ESC measures as outlined.

Fish Injury or Mortality

- Develop a Blast Management Plan that is informed by the guidance provided in Wright and Hopky (1998).

Monitoring

The Proponent will develop and implement a Contingency Plan and a Blast Management Plan.

Conclusion

After mitigations, predicted residual effects on surface water and fish and fish habitat are characterized in Table 9.8.

Table 9.8: Surface Water and Fish and Fish Habitat Residual Effects

Effect Detail	Change in Surface Water Quality or Quantity	Fish Injury or Mortality
Magnitude of Effect	Low: Erosion and sediment controls and a 30 m buffer are expected to minimize impacts.	Low: No direct impacts to fish habitat. Blast Management Plan is expected to minimize indirect impacts.
Geographic Extent of Effect	LAA	LAA
Frequency of Effect	Continuous: Effects are expected to be continuous during operations once catchment area changes have occurred (as a result of clearing, grubbing, and blasting)	Intermittent: Effects will occur annually during blasting (2 week window)
Duration of Effect	Medium Term: Residual effects are expected to extend through the operations.	Short Term: Effects are expected only during blasting
Reversibility of Effect	Partially Reversible: Mitigations and decommissioning cannot guarantee a return to baseline conditions	Reversible: Return to baseline following blasting is expected
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		

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 through the following approach:

- Identify wetland habitat in the Study Area using desktop resources.
- Ground-truth and delineate wetland habitat within the Study Area.
- Complete functional assessments for delineated wetlands within the Study Area.
- Identify the potential for and confirm the presence of Wetlands of Special Significance (WSS) within the Study 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' (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 9.2.4.2).

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 was conducted to identify the location and extent of potential wetlands within the Study Area. The following sources were reviewed:

- Wetlands Inventory (ECCC, 2024a)
- WSS Database (NSECC, 2020b)
- Nova Scotia Hydrographic Network (ODNS, 2024)
- Provincial Landscape Viewer (NSNR, 2024c)
- Satellite and aerial imagery

The Wetland Inventory (ECCC, 2024a) identified 2 wetlands within the Study Area, which are classified as swamps. The wetlands range in size from 0.4 ha to 0.6 ha (Drawing 13). According to the NSNR WSS database (2020b), there are no WSS located within the Study Area (Drawing 5).

The Provincial Landscape Viewer (NSNR, 2024c) was reviewed to confirm the presence of both wetlands and WSS. The results showed no additional wetlands beyond the polygons identified in the NSNR Wetland Inventory.

9.2.4 Field Assessment

9.2.4.1 *Field Assessment Methodology*

General

Wetland field assessments were completed within the Study Area in June 2025. Surveys included high-level assessments for hydrology, complemented by in-depth wetland delineations and functional assessments. Wetland surveys were done in conjunction with watercourse assessment surveys (Section 9.1).

Field Delineations

Strum ecologists surveyed the Study 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 ESRI software Survey123.

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 9.9) These indicators are used as this region most closely resembles the flora and climate regime of Nova Scotia.

Table 9.9: 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 9.10). Wetland habitat is assessed for signs of hydrology via visual observations across the area and through the assessment of soil pits.

Table 9.10: 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 selected field-delineated wetlands identified in-season within the PDA which will be affected during quarry expansion. Functional assessments were completed using the Wetland Ecosystems Services Protocol – Atlantic Canada (WESP-AC) evaluation technique Version 3.3 in 2025 (Adamus, 2021, 2025). 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 9.11 (WESP-AC Version 3.3).

Table 9.11: WESP-AC Version 3.3 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
	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
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian Habitat

Grouped Wetland Function	Specific Wetland Functions
Transition Habitat	Raptor and Wetland Songbird Habitat
	Pollinator 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 to 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.

For each wetland evaluated, the WESP-AC process calculates the overall score for the grouped wetland functions and the specific wetland functions listed in Table 9.11. 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 9.11 are further combined into “supergroups” for habitat and support 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 in June 2025 identified 17 field-delineated wetlands, either partially or fully within the Study Area (Drawing 13). Wetland characteristics are presented in Appendix F. The PDA was adjusted to best fit the area where quarry activity is proposed to occur, while avoiding impacts to wetland habitat. Within the PDA, 11 wetlands were identified to be

potentially altered during project activities; these wetlands have been carried forward in this document for discussion. Detailed results and a photograph log of each wetland are found in Appendix F.

Of the 11 wetlands identified within the PDA, 10 were classified as swamp. 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 sub-divided into treed swamps or shrub swamps, depending on their physiological makeup.

All identified swamps 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*), sensitive fern (*Onoclea sensibilis*), bristly dewberry (*Rubus hispida*), balsam fir and red maple. Surface water, saturation, water marks, moss trimmed lines and drainage patterns were documented hydrological indicators.

Two treed bogs were observed within the Study 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 large false Solomon's seal (*Maianthemum racemosum*), cinnamon fern, round-leaved sundew (*Drosera rotundifolia*), common Labrador tea (*Rhododendron groenlandicum*), leatherleaf (*Chamaedaphne calyculata*), mountain holly (*Ilex mucronata*), red maple, and black spruce. Trees, when present, were often stunted and scattered throughout.

Functional Assessments – Version 3.3

Functional assessments using WESP-AC Version 3.3 were completed in 2025 by Strum wetland specialists for the 11 wetlands within the Study Area which may be altered over the life of the expanding quarry. A summary is provided in Table 9.12.

Table 9.12: Summary of WESP-AC Assessments Using Version 3.3 for Wetlands within the PDA

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	7.44	9.02	9.14	3.20	1.87	3.35	1.94	0.70	7.14	2.82	5.51	3.82	No
WL2	7.44	3.50	9.13	1.28	1.62	3.47	1.90	0.70	7.25	2.83	5.47	2.90	No
WL3	7.44	3.83	9.15	1.27	1.97	3.89	2.61	0.51	6.48	2.74	5.53	2.71	No
WL4	7.44	4.23	9.14	1.25	1.87	4.32	2.61	0.51	6.43	2.74	5.50	3.94	No
WL6	6.41	3.95	9.87	0.76	3.49	4.72	3.99	4.08	8.53	2.84	6.46	4.47	No
WL7	7.44	3.67	9.39	1.27	1.72	3.66	1.94	0.70	7.28	2.83	5.55	3.66	No
WL8	5.22	3.83	9.87	1.27	2.79	4.54	3.67	4.10	7.99	2.98	5.91	4.57	No
WL9	7.44	3.83	9.40	1.27	1.39	3.84	1.90	0.70	7.43	2.83	5.51	4.61	No
WL11	7.44	3.78	9.42	1.27	1.41	3.79	2.03	0.70	6.99	2.82	5.46	4.86	No
WL12	7.44	3.67	9.42	1.27	1.54	3.67	2.03	0.70	6.99	2.82	5.48	3.67	No
WL13	5.22	3.67	9.69	1.27	2.78	4.30	4.33	4.06	7.58	2.83	5.92	4.28	No

⁽¹⁾ Wetlands of Special Significance determination as dictated by the Functional WSS Interpretation Results within the WESP-AC spreadsheet calculator
⁽²⁾ 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 higher hydrologic function score (72%), and a moderate hydrologic benefit score (90%).

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.

All wetlands had higher (100%) functional water and climate protection scores, and moderate (100%) 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.

Most wetlands scored lower (72%) for the aquatic support functional group, and all wetlands (100%) scored moderate for the 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 (63%), while aquatic habitat group benefit scores were mostly lower (72%).

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 is mostly made up of remote, intact habitat. Majority of wetlands scored moderate (72%) on transition habitat function and all wetlands (100%) scored higher 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, one wetland was later determined to be potential WSS based on the confirmed presence of SAR (Table 9.13). Official WSS designations will be made by NSECC.

Table 9.13: Summary of Field-Identified Potential WSS, as Determined by the Presence of Avifauna SAR

Wetland	Wetland Type(s)	Rationale for Potential WSS Designation
WL5	Treed Bog	Olive-sided flycatcher (<i>Contopus cooperi</i>) heard and seen within wetland during breeding bird season, within suitable breeding habitat.

This wetland is located within the Study Area but not within the PDA; it will be avoided by all Project activity.

9.2.5 Effects Assessment

Project-Wetland Interactions

Quarry development can influence wetland habitats through several pathways. Project activities may alter wetland hydrology by increasing water levels, restricting water flow and causing drying, or a combination of these conditions. Water quality may also be affected if runoff from the quarry enters nearby wetlands. In addition, some wetland vegetation and habitat will be lost where wetlands fall within the PDA (Table 9.14).

Table 9.14: Potential Project Interactions with Wetlands

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	-
Transportation of rock and product	-
Decommissioning	
Infrastructure removal	-
Site reclamation	-

Assessment Boundaries

The LAA for wetlands is the tertiary watershed (Drawing 12A). No RAA is defined for this VC, as the LAA is the maximum expected extent of indirect impacts to wetlands (in the unlikely event of an accident).

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 LAA.
- 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 LAA.

Effects

Effects to wetlands, including both habitat loss and changes in wetland functionality, can occur throughout the life of the Project. Effects might be direct (e.g., habitat loss through removal) 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 neighboring wet areas, resulting in farther reaching impacts on habitat quality (Mitsch & Gosselink, 2000).

A GIS suitability analysis was conducted to design a PDA that would optimize quarry expansion to avoid and minimize loss of wetland area and function, to the greatest extent possible. Table 9.15 outlines the wetlands that have the potential to be altered within the PDA.

Table 9.15: 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	Full	2208	2208	Quarry Expansion
WL2	Treed Swamp	Full	665	665	Quarry Expansion
WL3	Treed Swamp	Full	2479	2479	Quarry Expansion
WL4	Treed Swamp	Full	409	409	Quarry Expansion
WL6*	Treed Swamp	Partial	2085	1760	Quarry Expansion
WL7	Treed Swamp	Full	247	247	Quarry Expansion
WL8	Treed Swamp	Partial	2264	1,165	Quarry Expansion
WL9	Treed Bog	Full	2744	2744	Quarry Expansion
WL11	Treed Bog	Full	3095	3095	Quarry Expansion
WL12	Treed Swamp	Full	310	310	Quarry Expansion
WL13	Treed Swamp	Full	1424	1424	Quarry Expansion
Total Estimated Area with Potential Impact				16,506 m²	

*Wetland extends beyond the Study Area

A total of 18 wetlands were identified within the Study Area. Quarry expansion may directly impact 11 wetlands, of which nine may be completely altered over the lifespan of the quarry, and two may be partially altered. The Project could directly impact up to 1.6 ha (16,506 m²) of wetland habitat, representing 27% of the total wetland area within the Study Area. The remaining seven wetlands, which account for 73% of wetland area within the Study Area, will not be impacted by the Project. Within the LAA, there is predicted to be 538 ha of wetland area. The area proposed for potential alteration represents 0.3% of this total wetland area.

Wetland impacts associated with this Project will take place slowly and over a long operations period (approximately 40 years). The field identified potential WSS (WL5) will be completely avoided and buffered to avoid indirect impacts. The largest delineated wetland (WL10) will also be avoided. Wetland monitoring will occur when quarry activities are within 30 m of any wetland.

Indirect Loss

Indirect loss of wetland habitat occurs through disruption of the hydrology of a wetland through the redirection of surface and subsurface water. The hydrology of a wetland is one of the most important aspects of its overall structure and function. Quarry development in proximity to 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 neighboring wetlands. Based on the results of the WBA (Appendix C), a small increase of surface water runoff is anticipated across the PDA. No indirect effects on wetlands are anticipated until quarry activities encroach within the 30 m buffer, at which point monitoring will be initiated.

The proponent intends to avoid all direct and indirect effects to WL5, the potential WSS and WL10. WL5 is classified as a bog, which typically have a high water table and receive most of their water from precipitation. As a result, the removal of adjacent surface area is expected to have less influence on its hydrology compared to wetlands that are primarily surface-water fed.

The largest wetland within the PDA, WL10, will likewise be avoided. This feature is a treed swamp located in the southern portion of the Study Area. Given the gradual progression of the Project, any changes to the surrounding landscape are expected to occur incrementally, allowing both wetlands to adapt over time and maintain their hydrological function. To further minimize the potential for effects from quarrying activities, a buffer of 30 m will be established around the wetlands.

Changes to Wetland Functionality

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

Erosion and Sedimentation

Erosion and sedimentation can occur throughout the lifecycle of the Project, including during quarrying activities and daily traffic. 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).

Dust

The potential for dust deposition will likely 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).

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 once operations are within 30 m of any wetlands.

Mitigation Measures

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

Habitat Loss

- Mark wetlands clearly 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.
 - A wetland compensation plan will be created.

Erosion and Sedimentation

- Develop a site-specific ESC Plan within the Contingency Plan.
 - The plan will address the type of control structures, proper installation techniques, grading, maintenance and inspection, timing of installation, and revegetation specific for wetlands.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- 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.
- Direct run-off away from wetlands.
- Maintain existing vegetation cover, where possible.

Dust Deposition

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

Invasive 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.
- Avoid travel through wetlands.

Monitoring

Wetland monitoring will occur when quarry activities are within 30 m of any wetland. Any necessary site-specific post-construction wetland monitoring plan will be developed in conjunction with wetland alteration applications.

Conclusion

The predicted residual effects of the Project on wetlands (after mitigation) are characterized in Table 9.16.

Table 9.16: Wetland Resources Residual Effects

	Habitat Loss	Changes in Wetland Function
Magnitude of Effect	Moderate: Direct loss of habitat but wetland area loss will not impact the hydrology of the watershed. WSS will not be impacted.	Low: Project activities have low potential for changes to wetland function with the implementation of mitigation measures.
Geographic Extent of Effect	PDA	PDA
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 compensated for.	Medium Term: Residual effects may extend through the operations.
Reversibility of Effect	Partially Reversible: Mitigations and decommissioning cannot guarantee a return to baseline conditions	Partially Reversible: Mitigations and decommissioning cannot guarantee a return to baseline conditions
Significance Level	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.3 for definitions) Magnitude: Negligible, Low, Moderate, High Frequency: Single Event, Intermittent, Continuous Duration: Short Term, Medium Term, Long Term Reversibility: Reversible, Irreversible, Partially Reversible		

10.0 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 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 the Study 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 update the PDA to avoid or minimize interactions between vegetation communities, flora SAR and SOCI, and the Project.
- Apply mitigation techniques 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 and critical/core habitat.

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 study to provide an initial understanding of the vegetation communities, and flora species potentially 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, 2024c)
- Old-Growth Policy Layer (NSNR, 2026)

- ACCDC Data Report (ACCDC, 2025c)
- Boreal Felt Lichen Habitat Layer (NSNR, 2012a)
- MTRI Vole Ears (*Erioderma mollissimum*) and extant boreal felt lichen (*Erioderma pedicellatum*) GIS databases (MTRI, 2019a, 2019b)
- SARA Critical Habitat Layers (ECCC, 2025b)

Vegetation Communities

The Study Area falls within the Western (700) Ecoregion which spans 16,870 km² of western Nova Scotia (30.5% of the province) (Neily et al., 2017). Climatic conditions within the ecoregion are milder than elsewhere in Nova Scotia with local conditions driven by proximity to the Atlantic Ocean or Bay of Fundy. Elevations in the portion of the Western Ecoregion that includes the Study Area are around 190 masl. Soils are dominated by glacial tills, and white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), and red oak (*Quercus rubra*) are prominent (Neily et al., 2017). Windrow due to hurricanes is a common stand-level disturbance in the Western Ecoregion.

Within the Western Ecoregion, the majority of the Study Area lies within the South Mountain Ecodistrict (Drawing 8). This ecodistrict (4,552 km²) is described as a rugged upland, dominated by pine and spruce forests with shallow and coast textured soils (Neily et al., 2017). Natural disturbance and human land-use, including wildfires and forest harvesting, have had a strong influence on forests in the South Mountain Ecodistrict. Atlantic Coastal Plain Flora, a group of unique plants that occur along the Atlantic coast from Florida to Nova Scotia (including several flora SAR and SOCI), are known to occur in the ecodistrict (although they are more commonly encountered in other parts of the Western Ecoregion) (Neily et al., 2017).

Old Growth Forest

Old-growth forest stands hold high ecological and cultural value and are known to support high levels of biodiversity. There are no stands protected under the Old Growth Forest Policy (NSNR, 2022a) within 5 km of the Study Area.

Flora Species

An ACCDC data report (ACCDC, 2025b) was prepared for the Project to identify known occurrences of SAR and SOCI within and near the Study Area. The report contains no records of flora SAR or SOCI within the Study Area. There are four vascular plant, two non-vascular plant, and six lichen SOCI within 5 km of the Study Area (no flora SAR were identified; Table 10.1; Drawing 16).

The complete ACCDC data report for the Project, which includes species records within 100 km of the Study Area, is provided in Appendix D.

Table 10.1: ACCDC Plant and Lichen SOCI Recorded within 5 km of the Study Area

Scientific Name	Common Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Vascular Plants					
<i>Diphasiastrum complanatum</i>	Northern Ground-cedar	-	-	-	S3S4
<i>Fagus grandifolia</i>	American Beech	-	-	-	S3S4
<i>Neottia bifolia</i>	Southern Twayblade	-	-	-	S3
<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower	-	-	-	S2
Non-Vascular Plants					
<i>Platylomella lescurii</i>	A Moss	-	-	-	S2?
<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss	-	-	-	S1?
Lichens					
<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen	-	-	-	S3S4
<i>Cladonia stygia</i>	Black-footed Reindeer Lichen	-	-	-	S3?
<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen	-	-	-	S3S4
<i>Heterodermia speciosa</i>	Powdered Fringe Lichen	-	-	-	S3S4
<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen	-	-	-	S2S3

In addition to the ACCDC data report (ACCDC, 2025b), several geospatial resources were reviewed to further assess the potential for encountering rare lichens within and near the Study Area and to inform the approach for field surveys. No records of boreal felt lichen (SARA and ESA Endangered) or vole ears lichen (SARA and ESA Endangered) were identified within 5 km of the Study Area in the rare lichen databases maintained by MTRI (2019a, 2019b). Similarly, no areas of high potential for boreal felt lichen occurrence were identified within 5 km of the Study Area in the boreal felt lichen potential habitat layer provided by NSNR (2012a).

There are no buffers for Atlantic Coastal Plains Flora (NSNR, 2024c) or areas of critical habitat for flora (ECCC, 2025b) within 5 km of the Study Area.

10.1.4 Field Assessment Methodology

Vegetation Communities

An inventory of terrestrial vegetation communities in the Study Area was completed during field surveys in 2025 (concurrent with terrestrial flora surveys). Vegetation communities were classified according to the Forest Ecosystem Classification (FEC) for Nova Scotia (Neily et al., 2023). In addition to classifying vegetation communities, observations of the following were recorded if encountered: landscape features such as watercourses, wetlands, and caves/mine shafts; forest stands noted as having old-growth potential; and vegetation communities known

to serve as habitat for rare flora or that provide important lifecycle functions for moose, birds, insects [e.g., milkweed (*Asclepias* spp.)] and bats (e.g., large, hollowed trees and snags).

Wetland characteristics and terrestrial habitat for fauna are described in detail in Sections 9.2 and 10.2, as applicable.

Old growth assessments were not completed for the Project as the Study Area is located on private land.

Flora Species

Vascular flora surveys were completed on June 10, 11, and 13, and August 25, 2025, by a qualified botanist with experience identifying the flora of Nova Scotia. Meandering transects guided by the desktop review were completed on foot throughout the Study Area with additional time spent in areas expected to have elevated potential to serve as habitat for rare flora (e.g., wetlands, riparian areas, mature forests, and seepages). During the surveys, a list of vascular flora species encountered was maintained, and specimens were collected to confirm species identification, if required. Additional information, including GPS coordinates, photographs, and habitat descriptions, was recorded for observations of flora SAR and SOCI, non-native species, and invasives, if observed.

A rare lichen survey was completed on March 27, 2025, by a qualified lichenologist with experience identifying rare lichens in Nova Scotia. Meandering transects were completed on foot while targeting areas with mature trees appropriate for hosting lichen SAR and SOCI. Potential host trees were visually inspected, focusing on tree trunks, branches, and twigs. Detailed information, including GPS coordinates, photographs, descriptions of habitat and host trees, and estimated number of thalli present, was collected for any lichen SAR or SOCI encountered.

If a lichen specimen could not be readily identified in the field, photos and/or specimens were collected and identified later. Specimens were only collected if they were abundant and were not collected if only one or two individuals were observed. If necessary, samples were inspected via microscope and standard chemical spot tests in accordance with Brodo et al. (2001), to determine the species.

In addition to targeted flora surveys, incidental observations of rare flora were also recorded during other biophysical surveys (e.g., wetlands and watercourse assessments), if observed.

10.1.5 Field Assessment Results

Vegetation Communities

During vegetation community assessments, six upland forest groups were identified in the Study Area, comprised of 11 different vegetation types (Table 10.2). One wetland forest group was also observed. Much of the Study Area consists of intact forests, with limited disturbed areas consisting of recent harvests and access trails. Representative points for the vegetation types/communities observed in the Study Area are displayed in Table 10.2.

Table 10.2: Vegetation Communities Identified within the Study Area

Community Type	Forest Group ⁽¹⁾	Vegetation Types/Community	Representative Survey Point
Upland Communities	Intolerant Hardwood (IH)	IH3 (Large-tooth aspen / Christmas fern – New York fern)	VT3
		IH7 (Red maple / Haw-scented fern – Wood-sorrel)	VT14
	Mixedwood (MW)	MW1 (Red spruce – Yellow birch / Evergreen wood fern)	VT5
		MW2 (Red spruce – Red maple – White birch/ Goldthread)	VT6
		MW7 (Balsam fir - Red maple / Wood-sorrel - Goldthread)	VT2
	Spruce Hemlock (SH)	SH4 (Red spruce – White pine / Lambkill / Bracken)	VT10
		SH5 (Red spruce - Balsam fir / Schreber's moss - Stair-step moss)	VT8
		SH5b (Red spruce - Balsam fir / Schreber's moss - Stair-step moss), Balsam fir variant	VT13
	Spruce Pine (SP)	SP4b (White pine / Blueberry / Bracken), Huckleberry variant	VT9
	Tolerant Hardwood (TH)	TH1 (Sugar maple / Wood fern - Hay-scented fern)	VT4
		TH4 (Sugar maple / White ash / Silvery spleenwort – Baneberry)	VT7
Wetland Communities	Wet Coniferous (WC)	WC7 (Tamarack – Black spruce / Lambkill / Sphagnum)	VT11
Anthropogenic	---	Regenerating mixedwood forest stand with evidence of recent harvesting	VT1

⁽¹⁾ FEC Forest Group (Neily et al., 2023)

Upland Vegetation Communities

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, white and gray birch (*Betula papyrifera* and *Betula populifolia*), aspen(s) (*Populus* spp.), and/or balsam fir. Overstory structure, soil attributes, and disturbance history influence the formation of the shrub and herbaceous layer, which is often well developed in areas of deciduous tree cover. Although few fauna occur exclusively in MW forests, their diverse structure and composition creates a range of habitat features for wildlife (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. Canopies are dominated by shade tolerant softwoods such as balsam fir, red spruce, and eastern hemlock. The shrub layer often consists of regenerating conifers and soils are often derived from glacial till. The SH forest group provides habitat for a diverse community of birds and mammals (Neily et al., 2023).

Spruce Pine Forest Group

Vegetation types within the SP forest group are dominated by black spruce and pine species with an understory often composed of ericaceous shrubs. This group frequently occurs in areas of shallow, nutrient-poor soils. Soils are often very to excessively stony, especially when associated with granitic glacial till deposits. Herbaceous cover is low and dependent on light availability.

Tolerant Hardwood Forest Group

This vegetation group is classified as a mid to late successional hardwood vegetation group. The TH vegetation group is generally composed of a closed canopy dominated by sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), 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. Due to the fertile soils of the TH group, rare plants are often associated with this group (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).

In addition to stands in the WC forest group, wet areas and several field delineated wetlands were observed during surveys in the Study Area. Tree species typical of these wetlands include red maple (*Acer rubrum*), white ash (*Fraxinus americana*), paper birch (*Betula papyrifera*), and white pine. Further details on the types, classification, and overall function of wetlands in the Study Area are provided in Section 9.2.

Anthropogenic

The extent of recent human disturbance within the Study Area is generally limited. Signs of recent forest harvesting were observed in the northwestern portion of the Study Area, and access trails extending from the existing quarry (IA Permit Area) bisect the Study Area.

Summary of Vegetation Types

The Study Area is comprised of several vegetation types that fall within the IH, MW, SH, SP, TH, and WC forest groups. The vegetative communities identified within the Study Area are common in the surrounding landscape, except for communities in the TH forest group. This forest group has a limited distribution in the South Mountain Ecodistrict with TH forests mainly found on drumlins and hill crests (Neily et al., 2017). Wetlands, which are known to support rare flora and fauna, are considered in Section 9.2.

Flora Surveys

A total of 135 flora species, including 126 vascular and nine non-vascular plant species, were identified during field surveys. Of these, only one vascular plant SOCI, American beech (S3S4), was observed (no vascular plant SAR observed). No non-vascular plant or lichen SAR or SOCI were during field assessments.

A complete list of field-observed flora species is provided in Appendix G.

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 significantly affected by beech bark disease. Beech bark disease, caused by an invasive insect-fungus complex, 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, 2021c). Three occurrences of American beech were observed in the Study Area, consisting of over 20 individuals (Drawing 17). Many of the American beech trees observed were in poor health and/or showed signs of beech bark disease (e.g., cankers, bark damage).

Invasive Flora

Two species considered to be invasive in Nova Scotia were identified during flora surveys (MTRI, 2022):

- Creeping buttercup (*Ranunculus repens*)
- Multiflora rose (*Rosa multiflora*)

10.1.6 Effects Assessment

Project-Terrestrial Vegetation Communities and Flora Interactions

Project activities, primarily those that involve vegetation clearing or ground disturbance, have the potential to directly and indirectly impact terrestrial vegetation communities and flora (Table 10.3).

Table 10.3: Potential Project-Terrestrial Vegetation Communities and Flora Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	-
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	X
Decommissioning	
Infrastructure removal	-
Site reclamation	X

Assessment Boundaries

The LAA for terrestrial vegetation and flora includes the PDA plus a 100 m buffer (Drawing 6). This distance represents the maximum extent of potential direct and indirect Project-related impacts. The RAA is the Study Area plus a 5 km buffer. This distance was selected to contextualize the impacts of vegetation clearing within the context of the broader landscape.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply for terrestrial vegetation communities and flora. 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 of unique vegetation communities
- Loss of flora SAR or SOCI and impacts on supporting habitat
- Indirect effects

Loss of Unique Vegetation Communities

Project activities will directly impact terrestrial vegetation communities during operations (clearing) within the 52.9 ha PDA. It is expected that land required for expanded quarry operations (e.g., the active quarry site, stockpiles) will experience a long-term loss of vegetation cover due to vegetation clearing, grubbing, and development of the subsurface. Development within the PDA will occur gradually from northeast to southwest as quarry operations expand from the current working face. The rate of quarry expansion is expected to be comparable to historical operations, and it is expected approximately 17% of the PDA will be developed within the first ten years of expansion.

Vegetation within the PDA primarily consists of upland vegetation communities, including mixedwood, hardwood, and softwood forests, with recently harvested and regenerating forest stands also observed. The FEC forest groups identified are abundant throughout the South Mountain Ecodistrict where the Project is located, with the exception of TH communities which are known to have a more restricted distribution (Neily et al., 2017). The forest stand classified as TH4 is located within 300 m of the existing quarry face and may be impacted by the Project, whereas the stand classified as TH1 is outside of the PDA and will be avoided. The types identified in the remainder of the PDA are known to be common within the RAA (communities in the SP, SH, and MW forest groups) (Neily et al., 2017).

Considering the gradual nature of vegetation clearing and relatively small size of the PDA (52.9 ha), the impacts to vegetation communities are expected to be low. The long-term impacts of the Project on vegetation communities will be mitigated through progressive reclamation of the quarry site where practical, and final reclamation of the PDA at the end of the operational window. Final site reclamation will include land surface contouring, establishing drainage, and revegetation to support the establishment of vegetation communities that are representative of the region.

Loss of Flora SAR or SOCI and Impacts on Supporting Habitat

Activities requiring ground disturbance and vegetation clearing have the potential to impact individual occurrences of rare flora species. One flora SOCI, American beech, was observed during field assessments in the Study Area, and no flora SAR were observed.

American Beech

Three occurrences of American beech were observed in the northeastern section of the PDA consisting of eight individuals. The trees are a mix of immature and mature individuals, with

mature trees showing signs of beech bark disease. As the occurrences are located near the current working face of the quarry (within 250 m), it is likely that some of these individuals will be lost due to vegetation clearing within the PDA for quarry expansion. The American beech located near the eastern watercourse will not be impacted.

Additional incidental observations of American beech (> 30 individuals) were recorded in the LAA and RAA during Project surveys outside of the PDA (near the transmission line, Drawing 17), and the ACCDC data report (ACCDC, 2025b) also identifies American beech as being present within the RAA. This indicates that additional habitat capable of supporting this species is present within the LAA and RAA (i.e., the species is not likely habitat limited in this area). Due to the small number of individuals that will be impacted by the Project and the continued availability of supporting habitat, overall impacts to the species are expected to be low.

Indirect Effects

In addition to direct loss of vegetation communities and flora individuals, indirect effects to vegetation may also occur, including the creation of edge habitat, the introduction and spread of invasive species, and impacts due to dust.

Edge Effects

New areas of edge habitat will be created when forested land is cleared to prepare the site for expanded quarry operations. Forest clearing has the potential to alter the microclimate of adjacent areas, including increased solar radiation, temperature, and wind velocity, and reduced humidity (Braithwaite & Mallik, 2012; Hamberg et al., 2009; Rheult et al., 2002). Such “edge effects” can impact the growth and survival of flora individuals adapted to interior forest conditions and can cause a long-term shift in the composition of vegetation communities.

The degree to which vegetation communities and flora are impacted by edge effects varies depending on the species and specific site conditions. Lichens and non-vascular plants are especially sensitive to edge effects and changes in air quality due to being unable to regulate and maintain their water content (Boudreault et al., 2008; Nash, 2008). Multiple studies have shown that edge effects relating to drying of plant material can be observed from 15 m to 70 m (Gauslaa et al., 2019). Edge effects from activities such as forest harvesting can have a negative impact on lichens that extends up to 50 m into the forest (Rheult et al., 2002). No lichen SAR or SOCI, which are known to be particularly sensitive to edge effects, were observed in the PDA during field surveys.

It is expected that the impacts of edge effects due to the Project will be limited to the LAA and will occur intermittently during the operations phase of the Project (as new areas are cleared for expansion).

Dust Deposition

Dust generated by traffic on unpaved roads, blasting, crushing material, and general quarry operations has the potential to impact the growth and health of flora species. For example, vascular plant species can experience reduced rates of photosynthesis when dust is deposited

on the surface of leaves as particulate matter poses a barrier to diffusion and reduces light absorption (Thompson et al., 1984). Lichens can also be impacted by dust deposition due to their sensitivity to air quality. Dust from unpaved roads has been found to change the pH of lichen substrates (i.e., the tree bark they are attached to) and impact individual health and species richness (Degtjarenko, 2016).

The impact of dust on flora species is influenced by duration of exposure and distance from the source of dust production. For instance, one study found that lichens along a gravel road were unaffected by dust within two years, but significant changes to the communities were observed after 10 years (Farmer, 1993). The spread of fugitive dust is influenced by several factors, including the height at which the dust is released, wind conditions, and particle size. Under standard conditions, fugitive dust particles above 30 µm settle out within 100 m of the emission source, whereas finer particles have a slower settling velocity and may travel further (US EPA, 1995).

Flora may be impacted by dust deposition during all Project phases, with the greatest impacts expected during the operations phase and periods of prolonged dry conditions. Impacts are expected to be limited to the LAA and will primarily occur in areas near active quarry operations and adjacent to unpaved roads. The Proponent currently applies a dust suppressant (magnesium chloride) on their roads to mitigate dust onsite. A Project Contingency Plan developed as part of the IA amendment application for the Project (post EA approval) will include additional site-specific measures to manage dust levels.

Introduction and Spread of Invasive Species

Terrestrial flora, particularly rare native flora, may be at risk due to threats from invasive species (BCMECCS, 2018). Non-native species, often introduced to a landscape accidentally by humans, can become invasive when they cause harm to the environment, economy, or human health through rapid reproduction and out-competing of native species (Rutledge et al., 2024). Development projects can lead to the introduction and spread 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.

Two species considered to be invasive in Nova Scotia, creeping buttercup and multiflora rose, as well as several non-native species were observed during field surveys. The overall risk of invasive species is expected to be negligible to low; however, considering that invasive species are known to occur within the PDA and surroundings, mitigation strategies to minimize the risk of non-native and invasive species risk are provided.

Mitigation Measures

To minimize potential effects to terrestrial vegetation communities and flora, the following mitigation measures will be implemented.

- Implement a reclamation program to re-establish native vegetation communities at the end of the operational phase.
- Consult with NSNR and NSECC if an unexpected flora SAR is encountered during operations.
- Mitigate for dust creation using best management practices such as reduced speed limits and dust suppression (e.g., road and site watering).
- Inspect and clean equipment of debris to prevent the introduction and spread of non-native species.
- Implement an ESC Plan to help limit the spread of invasive species.
- Revegetate disturbed areas and exposed soils using native seed mixes, where feasible.
- Complete manual brush clearing (i.e., no herbicides will be used)
- A Project Contingency Plan will be developed and will include site specific measures to prevent sedimentation and erosion. This plan will be provided to NSECC as part of the IA amendment application (post EA approval).

Monitoring

No monitoring programs specific to terrestrial vegetation communities or flora are recommended.

Conclusion

After mitigations, predicted residual effects on terrestrial vegetation communities and flora are characterized in Table 10.4.

Table 10.4: Terrestrial Vegetation Communities and Flora Residual Effects

Effect Detail	Loss of Alteration of Unique Vegetation Communities	Loss of Flora SAR or SOCI and Impacts on Supporting Habitat	Indirect Effects
Magnitude of Effect	Low: Small loss of unique vegetation communities	Low: Small loss of SOCI individuals	Low: Small effect to terrestrial flora due to edge effects.
Geographic Extent of Effect	LAA	LAA	LAA
Frequency of Effect	Intermittent: Effects may occur during initial site preparation and throughout operations	Intermittent: Effects may occur during initial site preparation and throughout operations	Intermittent: Effects may occur during initial site preparation and throughout operations
Duration of Effects	Long Term: Effects may last throughout all phases	Long Term: Effects may last throughout all phases	Medium Term: Effects may occur during site preparation and throughout operations
Reversibility of Effect	Partially Reversible	Partially Reversible	Partially Reversible
Significance Level	Not Significant	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.3 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 resources and field studies to achieve the following objectives:

- Gain an understanding of the potential terrestrial fauna and fauna habitat types present within and near the Study Area.
- Identify fauna SAR and SOCI with elevated potential to occur in the Study Area.
- Undertake surveys for different taxa of terrestrial fauna to document the species present within the Study Area, particularly SAR and SOCI.
- Use the information collected through field studies to update the PDA to avoid or minimize interactions between the Project and terrestrial fauna and their supporting habitat, particularly SAR and SOCI.

- Apply mitigation and operational management practices to minimize effects to terrestrial fauna.

10.2.2 Regulatory Context

Several laws and regulations provide protection for terrestrial fauna (e.g., mammals, 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, 1989c)
- *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, 1989c) 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, 1989c) 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

The desktop review included referencing the following sources:

- ACCDC data report (ACCDC, 2025b)
- Provincial Landscape Viewer (NSNR, 2024c)
- Nova Scotia Special Management Practice (SMP) Zones
- Locations of Known Bat Hibernacula in Nova Scotia (Moseley, 2007)
- Nova Scotia Geoscience Atlas – Abandoned Mine Openings (NSNR, 2024a)

An ACCDC data report (2025a) was prepared for the Project to identify known occurrences of SAR and SOCI within and near the Study Area (Drawing 16). The report contains no records of terrestrial mammal SAR or SOCI within the Study Area. A record of a “bat hibernaculum or bat species occurrence” was identified as occurring near the Study Area. Bat SAR are location sensitive species in Nova Scotia, and confirmation that this record is related to a bat occurrence approximately 3 km from the Study Area was provided by NSNR (SAR Biologist, S. Spencer, personal communication, August 20, 2025). The nearest record of mainland moose (*Alces alces americana*), a mammal SAR (ESA Endangered, S-Rank S1), is 28.7 km from the Study Area.

The ACCDC data report (2025a) includes records of three herpetofauna SAR, wood turtle (*Glyptemys insculpta*), eastern painted turtle (*Chrysemys picta picta*), and snapping turtle (*Chelydra serpentina*), within 5 km of the Study Area. Wood turtles are a location sensitive species in Nova Scotia, and confirmation that records are associated with critical habitat and species occurrences > 4 km for the Study Area was provided by NSNR (SAR Biologist, S. Spencer, personal communication, August 20, 2025). The nearest records associated with eastern painted turtle and snapping turtle are 2.8 km and 1.9 km from the Study Area, respectively. The report does not include any records of herpetofauna SOCI, or terrestrial invertebrate SAR or SOCI within 5 km of the Study Area.

Terrestrial fauna SAR and SOCI recorded within 5 km of the Study Area are presented in Table 10.5 and shown on Drawing 16. The complete ACCDC data report for the Project, which includes species records within 100 km of the Study Area, is provided in Appendix D.

Table 10.5: ACCDC Terrestrial Fauna SAR and SOCI within 5 km of the Study Area

Scientific Name	Common Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Mammals					
-	Bat Species Occurrence ⁽¹⁾	Endangered	Endangered	Endangered	S1
Herpetofauna					
<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3
<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern	Special Concern	-	S4
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2

⁽¹⁾ The species associated with location sensitive bat records are not provided; however, the three regularly occurring resident bat species have the same federal and provincial status' and assessment ranks.

The review of SMP zones for terrestrial fauna using the Provincial Landscape Viewer (NSNR, 2024c) indicates that the Study Area is not within 5 km of any SMP zones for terrestrial mammals (e.g., mainland moose concentration areas). The Significant Habitat layer (NSNR, 2024c) indicates that the Study Area is within 5 km of one watercourse relating to "Species at Risk"; this feature is described in further detail below in relation to wood turtles.

Based on the review of observational datasets described above, additional review of desktop resources was completed for a subset of terrestrial fauna species with potential to occur in the Study Area.

Mammals

Mainland Moose

A review of the provincial Recovery Plan for the Moose (*Alces alces americana*) in Mainland Nova Scotia [the "Mainland Moose Recovery Plan", (NSNR, 2021g)] and correspondence with NSNR (SAR Biologist S. Spencer, personal communication, August 20, 2025) confirmed that

the Study Area is located near (approximately 800 m north) 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, 2021g).

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, while 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 habitat suitability index (HSI)/roads criteria of the core habitat nearest the Project is classified as “7, 8, or 9” (NSNR, 2021g).

No records relating to mainland moose wintering were identified within 5 km of the Study Area in the Significant Habitats database (NSNR, 2024c).

Bat Species

Seven bat species are known to occur in Nova Scotia (Broders et al., 2003), four of which are resident species that reside in the province year-round, and three of which are migratory species that overwinter in the southern United States. Resident species consist of the little brown myotis [also known as little brown bat (*Myotis lucifugus*)], northern myotis [also known as northern long-eared bat (*M. septentrionalis*)], tri-colored bat [also known as eastern pipistrelle (*Perimyotis subflavus*)], and big brown bat (*Eptesicus fuscus*). Migratory species consist of the eastern red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), and silver-haired bat (*Lasionycteris noctivagans*). Three of the resident species (the little brown myotis, northern myotis, and tri-colored bat) have been designated as SAR under SARA and ESA. The designation of these species 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, 2013).

The likelihood of encountering bat species or suitable bat habitat in the Study Area was assessed by reviewing the locations of known bat hibernacula and AMOs. According to the ACCDC report (2026), hoary and silver-haired bat are the nearest identified species, with both being observed 5.5 km from the Study Area.

Locations of Known Bat Hibernacula

An overview of known and recorded bat hibernacula in Nova Scotia (dating to the end 2005) is available from Moseley (2007). No hibernacula from this curatorial database are present within 5 km of the Study Area.

Abandoned Mine Openings

According to the British Columbia Ministry of Environment and Climate Change Strategy, Ecosystems Branch (2019), AMOs may serve as overwintering bat habitat if they have a depth greater than 30 m, are of a suitable type (i.e., shafts, slopes, or adits), and remain accessible

(i.e., not flooded or ponded and not having an intact fill, cap, or plug). Based on a review of the provincial AMO Database (NSNR, 2024a), there are two AMOs within 5 km of the Study Area, (1.0 km north and 2.8 km northeast of the Study Area, Drawing 4). Although the type of AMO is suitable (shaft), one is classified as flooded, and both are of insufficient depth to support overwintering bats.

Herpetofauna

Given their status as a federally and provincially Threatened species and confirmed presence near the Study Area (ACCDC, 2025b), additional desktop resources were reviewed to determine the potential for wood turtles to occur in the Study Area.

Wood Turtles

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, 2020b). Core and critical habitat has been identified for wood turtles in Nova Scotia (NSNR, 2020b), and SMPs have been established that include activity and development limitations in the area (up to 200 m) surrounding wood turtle occurrences (NSNR, 2012b).

One watercourse relating to “Species at Risk” was identified within 5 km of the Study Area in the review of the Significant Habitat Database on the Provincial Landscape Viewer (NSNR, 2024c). Subsequently, a Significant Species and Habitat Database layer provided by NSNR (2024d) was reviewed and confirmed this record is relating to wood turtle habitat. This watercourse is also associated with a wood turtle SMP buffered stream.

10.2.4 Field Assessment Methods

Mammals

Four trail cameras were deployed in the Study Area from December 2, 2025, to January 23, 2026, to capture the presence of terrestrial mammals (including mainland moose) in the absence of human observers (Drawing 17). The cameras were placed in the eastern half of the Study Area in mature mixedwood and softwood forests near existing trails and water features. In addition to trail cameras, incidental observations or signs of terrestrial mammals (dens, scat, tracks, and evidence of foraging) encountered during non-target biophysical field surveys (e.g., wetland and watercourse assessments, flora surveys) were recorded if observed.

Surveys of suitable bat maternity roost habitat and the presence of maternity colonies were completed in nine forest stands in the Study Area [based on the Nova Scotia Forest Inventory (NSNR, 2021f)] in December 2025 (Drawing 17). Meandering transects were completed through forest stands while searching for suitable habitat, active roost trees, and evidence of bat activity (e.g., presence of bats and guano). If a potential or confirmed active roost tree was observed, GPS coordinates, photos, and a description of the host tree and surrounding habitat was recorded. Surveyors conducting flora surveys were also instructed to note features that

may serve as suitable habitat for bat species (e.g., large, hollowed trees and snags that may serve as maternity roosting habitat).

Herpetofauna

Targeted surveys for wood turtles and their supporting habitat were completed in two watercourses in the Study Area (WC4A and WC1). Surveys were completed in May 2025 on days when the ambient air temperature was higher than the water temperature (at least 10°C target) but not higher than 25°C. Transects were surveyed simultaneously by two field biologists walking on each side of the watercourse to a minimum length of 1 km. 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. Two rounds of surveys were conducted along each transect.

All survey tracks were recorded using handheld GPS units, and observation of Nova Scotia's four native turtle species or other herpetofauna SAR or SOCI were recorded and georeferenced in the field, if observed. Upon completion of each transect, a general description of the transect, including the presence of any notable habitat features, was recorded. Incidental observations of herpetofauna or signs thereof (e.g., nests, eggs, shell fragments) were also recorded during other biophysical surveys, if observed.

Terrestrial Invertebrates

Targeted surveys for terrestrial invertebrates were not completed; however, the ACCDC report noted observations of the SAR monarch butterfly (*Danaus plexippus*) and SOCI ocellated darter (*Boyeria grafiana*) within 5.5 km of the Study Area. Surveyors conducting flora surveys were instructed to note features that may serve as suitable habitat for invertebrates, specifically referring to observations of milkweed (which serves as breeding habitat and is an obligatory food source for monarchs).

10.2.5 Field Assessment Results

The Study Area largely consists of intact forest stands, field delineated watercourses, and wetlands (described in further detail in Sections 10.1, 9.1, and 9.2, respectively), with some areas of regenerating (post-harvest) mixedwood stands. The mix of disturbed and intact forest habitat and presence of watercourses suggests that the site may be suitable for a range of terrestrial fauna.

Mammals

Three mammal species were recorded by trail cameras (Table 10.6; photographs provided in Appendix H). One mammal species, American black bear (*Ursus americana*, S-Rank S5), was encountered in the Study Area near WL13 during biophysical surveys. No observations or signs of mammal SAR or SOCI were observed during field surveys or captured by trail cameras.

Table 10.6: Summary of Trail Camera Observations

Trail Camera ID	Description of Surrounding Habitat ⁽¹⁾	Species Observed	Number of Observations ⁽²⁾
BD-06	Old forest road, SP4 (White pine / Blueberry / Bracken)	White-tailed Deer (<i>Odocoileus virginianus</i>)	1
BD-08	Old trail surrounded, SH4 (Red spruce- Balsam fir / Schreber's moss – Stair-step moss)	--	--
G-04	Old trail, MW2 (Red spruce- Red maple- White birch/ Goldthread)	--	--
G-07	Old trail, TH3 (Sugar maple-White ash / Christmas fern)	Red Fox (<i>Vulpes vulpes</i>)	1
		Raccoon (<i>Procyon lotor</i>)	1

⁽¹⁾FEC (Neily et al., 2023)

⁽²⁾A general rule of one-hour between observations was used to separate individual observations.

Although no evidence of mainland moose was observed during biophysical assessments, some areas of suitable general habitat were identified. MW and SH forest stands and several wetlands were identified in the Study Area (described further in Section 9.2 and 10.2), features that are generally considered to provide shelter and forage opportunities of mainland moose (Neily et al., 2023).

No bat signs or evidence bat maternity roosts were observed during target or non-target field surveys.

Herpetofauna

No herpetofauna species or signs thereof (e.g., nests, eggs, shell fragments) were observed during targeted wood turtle surveys or during other biophysical assessments. Habitat assessments completed during wood turtle surveys indicate that WC4A contains areas of suitable wood turtle basking and foraging habitat (watercourse located within an herb dominated wetland). No areas of suitable habitat were identified along WC1 which mainly contained muck detritus and large cobbles.

Terrestrial Invertebrates

There were no observations of invertebrate SAR or SOCI recorded during the field assessments and no milkweed plants were observed during botany surveys 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, 2009) to develop a list of priority species, as detailed in the sections that follow.

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, 2021g). Quarrying has been identified as a high impact threat to mainland moose due to the permanent conversion of land to unsuitable habitat, as well as the potential for sensory disturbance associated with quarry activities (NSNR, 2021g).

No evidence of mainland moose was observed during non-target field surveys or captured by trail cameras; however, the Study Area is located near core habitat that is classified as highly suitable in the Mainland Moose Recovery Plan (NSNR, 2021g).

10.2.6 Effects Assessment

Project-Terrestrial Fauna Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact terrestrial fauna and their habitat (Table 10.7).

Table 10.7: Potential Project-Terrestrial Fauna Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	X
Decommissioning	
Infrastructure removal	X
Site reclamation	X

Assessment Boundaries

The LAA for fauna includes the Study Area and a 5 km buffer (Drawing 5). This distance was selected as it captures the home ranges and short distance migrations of terrestrial fauna between habitat types. The RAA 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

The Project is expected to result in direct and indirect impacts to terrestrial fauna habitat within the 52.9 ha PDA. Habitat loss will occur through vegetation clearing, grubbing, and blasting, which will result in a long-term loss of vegetation cover. These activities will also fragment habitat for terrestrial fauna, which may alter their movement within and use of the PDA. Most effects to fauna habitat will occur gradually as the quarry expands from the current working face over a period of approximately 40 years.

Species of terrestrial fauna will respond differently to habitat alteration caused by the Project. Some species may find new opportunities in disturbed habitats (i.e., foraging), while others are likely to avoid areas with new construction in favour of intact habitats. As a large-ranging species, mainland moose are particularly sensitive to habitat fragmentation, which constrains their habitat use and increases pressures from predators and human interaction (Beazley et al., 2004). Core habitat for mainland moose is located south of the PDA, and much of the area to the north has already been altered for residential and agricultural development. The land required for the Project represents a relatively small expansion of an already highly fragmented area, such that the quarry site is expected to have a low impact on terrestrial fauna due to habitat fragmentation at the scale of the LAA.

Although no individuals or signs of herpetofauna were observed during field assessments, wetlands and watercourses within the Study Area likely offer suitable habitat to common species of reptiles and amphibians. Many herpetofauna species have strong associations with wet areas, depending on wetlands, watercourses, and riparian zones to complete critical life history stages (Canadian Herpetological Society, 2026a, 2026b). The layout of the PDA has been adjusted to avoid direct impacts to all field delineated watercourses as well as several wetlands, which will reduce impacts to terrestrial fauna species that use these areas as habitat.

Overall, effects to fauna habitat as a result of the Project are expected to be low due to the small geographic extent of alteration (52.9 ha) when compared to the level of relatively intact habitat in the southern extent of the LAA. The habitat present in the PDA is characteristic of the region, and alternate habitat for wildlife exists on adjacent undeveloped lands within the LAA. Therefore, although changes in abundance and distribution of fauna species can be expected,

overall changes in fauna populations are not likely to occur as a result of the Project. Long-term impacts to fauna habitat within the PDA will be mitigated through decommissioning and reclamation of the quarry site to match baseline conditions to the extent possible.

Sensory Disturbance

Sensory disturbance to fauna is expected to occur throughout the operations and decommissioning phases due to activities such as vegetation clearing, grubbing, drilling, blasting, and the sorting, crushing, and transportation of aggregate. It is likely that sensory disturbance will cause localized avoidance of the PDA for some fauna species, particularly during active blasting, processing, and hauling windows. All sensory disturbances are expected to be temporary and will not persist beyond Project decommissioning. While the quarry is active, the highest levels of disturbance will occur during periods of drilling and blasting. Drilling and blasting will occur over a two-week period from April to May, and is expected to occur only once per year.

Of the types of sensory disturbance created by the Project, noise is the most likely to affect terrestrial fauna. Although the auditory capabilities of fauna species vary (Shannon, McKenna, et al., 2016) and fauna behaviour in response to noise is largely related to perceived threats, not noise intensity (Bowles, 1995), changes to ambient noise levels and the presence of periodic vibrations from blasting have the potential to adversely affect fauna. Noise can affect behavioural patterns (Patthey et al., 2008), stress fauna (Kight & Swaddle, 2011), cause avoidance behaviour (Ware et al., 2015), and reduce the ability for communication (Duquette et al., 2021). Together, these effects can negatively impact the overall population health of a particular species (Ware et al., 2015).

Drilling, blasting, and heavy equipment will all generate noise. Based on the results in Table 7.9 (Section 7), the range of decibels anticipated for the Project's activities will be between 84 dBA and 107 dBA (from a single piece of equipment within 15 m from the source). A standard pickup truck's average noise level range is 95 dBA (Section 7.3, Table 7.10). Blasting also produces impulsive noise emissions with a rapid onset and decay (within 1 second). The blasts will vary in power levels based on charge size and blast geometry; however, blasts will continue to be maintained below the thresholds as outlined under the existing IA.

A literature review conducted by Shannon et al. (2016) found that an increase in stress and decrease in reproductive success in terrestrial mammals has the potential to occur at noise levels ranging from 52 to 68 dBA. For bat species, a threshold of 88 dBA has been identified for road traffic, beyond which bats are likely to avoid flying over roads, thus limiting both their habitat availability and overall range (Fensome & Mathews, 2016).

The sound generated by the Project will exceed the levels cited by Shannon et al. (2016) for indirect impacts to fauna. As sound attenuates with distance from the source, most impacts due to sound will be limited to the PDA and the surrounding area. Quarry activities will be limited to daytime hours (7:00 am to 7:00 pm), reducing nighttime impacts to fauna. Mitigation measures to reduce the impact of noise on local human receptors, which will also benefit terrestrial fauna, are described further in Section 7.3.

Artificial lighting also has the potential to cause sensory disturbance in terrestrial fauna within the PDA. Nighttime lightning can cause disorientation, or attraction and avoidance behaviour (Longcore & Rich, 2004), which can affect foraging success, reproduction, and communication of wildlife (Longcore & Rich, 2004) and disrupt habitat connectivity (Bliss-Ketchum et al., 2016). The use of lighting for the Project will be limited as quarry activities will be limited to daytime hours (7:00 am to 7:00 pm).

Injury or Mortality

The risk of injury or mortality to terrestrial fauna due to the Project is primarily related to the potential for vehicle collisions during quarry operations. The existing road will naturally extend as the quarry expands, however there are no plans for any additional roads within the PDA. Traffic volumes associated with the Project will be relatively low, with hauling occurring on an as-needed basis throughout the year. There are expected slower periods on site, once drilling, blasting and processing has been completed, meaning trucks and other equipment will be accessing and working at the site but at a much lower frequency, lessening the potential interaction with wildlife.

Road infrastructure and traffic have a negative impact on species that are attracted to roads but lack the speed or reaction time to avoid traffic (e.g., turtles attracted to gravel roadsides for nesting) (Fahrig & Rytwinski, 2009). Ruts, caused by equipment and vehicles, may fill with water in the spring and attract breeding amphibians. Since these ruts tend to dry up in the summer, this presents a potential risk to species that hatch. Small mammals and birds are generally able to avoid collisions with vehicles.

The risk of collisions with wildlife will vary depending on the season and the species. For instance, during winters with deep snow conditions, white-tailed deer are more likely to use roads and trails, putting them at an elevated risk of collisions. Turtles are drawn to the roadside to nest in gravelly road shoulders in June. During spring and summer, North American porcupine (*Erethizon dorsatum*) and striped skunk may forage on roadside vegetation at dawn and dusk, increasing the risk of collisions with those species. As such, the risk of wildlife collisions is present at any time of year.

In addition to vehicle-related injury or mortality, accidents such as fuel spills have the potential to cause indirect mortality to fauna due to exposure of contaminants. Following spill preparedness protocols will help to mitigate risks to terrestrial fauna due to accidental fuel release. Direct mortality to fauna from Project activities is possible but unlikely to occur and only infrequently if at all.

Mitigation Measures

To address the abovementioned effects to terrestrial fauna, the following mitigation measures will be implemented:

Habitat Loss and Fragmentation

- Maintain existing vegetation cover whenever possible, including only clearing areas required for near-term use.
- Revegetate or allow for natural revegetation of cleared areas to the extent possible.
- Target clearing activities outside the active bat window if possible (May 1 to October 31).
- A reclamation program to re-establish habitat to support fauna will be implemented.
- A Project Contingency Plan will be developed and will include site specific best management practices and mitigation methods associated with vegetation removal, dust suppression, progressive reclamation and re-vegetation of the quarry.

Sensory Disturbance

- Pit and Quarry Guidelines (NSDEL, 1999) will be followed to reduce the impact of noise and vibration on wildlife.
- Blasting will be monitored and will be planned to occur on days where weather conditions are less likely to cause excessive sound levels.
- The quarry will operate during daylight hours only to prevent nighttime disturbance.
- A Wildlife Management Plan will be developed as part of the IA amendment application (post EA approval).

Injury or Mortality

- Quarry staff will be made aware of wildlife potential on roads, especially for Project traffic.
- Install traffic signs to alert site users of reduced speed limits (e.g. between 20-40 km/hr in known animal crossings or active sightings) and the potential for wildlife in the area.
- Provide wildlife awareness training to site personnel to reduce interactions between personnel and wildlife.
- Prohibit harassment and feeding of wildlife by Project personnel.
- Vegetation management will be conducted by cutting (i.e., no use of herbicides).
- Waste management will reduce attractants for opportunistic wildlife species.
- Follow spill preparedness protocols and ensure fueling areas are a minimum of 30 m from wetlands and watercourses.
- Store hazardous and non-hazardous waste in designated areas, in appropriate containers to reduce potential for spills and to prevent attracting wildlife.
- Implement spill prevention and Emergency Response Plans to protect fauna and their habitat from accidental spills.

Monitoring

No monitoring programs specific to terrestrial fauna are recommended.

Conclusion

After mitigations, residual effects to terrestrial fauna are characterized as shown in Table 10.8.

Table 10.8: Terrestrial Fauna Residual Effects

Effect Detail	Habitat Loss and Fragmentation	Sensory Disturbance	Injury or Mortality
Magnitude of Effect	Low: Small loss of habitat supporting fauna	Moderate: Moderate impacts to fauna through sensory disturbance	Low: Low impacts to fauna through injury and mortality
Geographic Extent of Effect	LAA	LAA	LAA
Frequency of Effect	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.	Intermittent: Effects occur occasionally or intermittently during one or more phase of the Project.
Duration of Effect	Long Term: Effects will last beyond decommissioning	Medium Term: Effects will end once decommissioning is complete	Medium Term: Effects will end once decommissioning is complete
Reversibility of Effect	Partially Reversible	Reversible	Partially Reversible
Significance Level	Not Significant	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.3 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 Avifauna

10.3.1 Overview

A desktop review and field program were undertaken to gather information on avian species and associated habitat in the Study Area. Objectives were as follows:

- Assess observations, species richness, and habitat utilization by avifauna within the Study Area, year-round.
- Use the information collected to inform and refine the Project design (i.e., avoid impacts to SAR, SOCI, and their habitats).
- Assess migratory bird activity and assess the risks that the Project poses to migratory birds.
- Use the information collected to inform mitigation and management practices.

10.3.2 Regulatory Context

The Project has potential to interact with avifauna species that may be protected under several federal and provincial legislations. Applicable federal and provincial laws and regulations relating to the protection of avifauna include:

- *Species at Risk Act* (Canada, 2002)
- *Migratory Bird Convention Act* (Canada, 1994)

- Migratory Birds Regulations (Canada, 2022)
- *Wildlife Act* (Nova Scotia, 1989c)
- *Endangered Species Act* (Nova Scotia, 1998)

The *Migratory Bird 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, 2022, protect the nests of species listed under Schedule 1 of MBCA for a set period, depending on the species. Under the provincial *Wildlife Act*, it is illegal to destroy or disturb bird nests or eggs without a permit. ESA and SARA prohibit harm to listed SAR along with their habitually occupied spaces and designated core/critical habitat, as defined by each of these Acts.

The Project is also guided by policies, guidelines, and standards that provide guidance on the development of the Project and related survey design. These guidance documents and policies include:

- ECCC-CWS (Atlantic Region) – Wind Energy & Birds EA Guidance Update (ECCC-CWS, 2022).
- NSECC Wetland Conservation Policy (NSECC, 2019).
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009).
- Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007a)
- Various NSNR Special Management Practices (SMPs) and ECCC SAR Management Plans.

10.3.3 Desktop Review

Desktop information was used 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:

- Important Bird Areas (IBAs) (2025)
- ACCDC (2026)
- Maritimes Breeding Bird Atlas (MBBA) (2025)
- Canadian Wildlife Service Migratory Bird Sanctuaries (MBS) (ECCC, 2021)
- NSNR Significant Species and Habitats Database (2024d)
- eBird (2025)
- NS Parks and Protected Areas (NSECC, 2020a)
- Critical Habitat for SAR National Dataset (ECCC-CWS, 2025)

The Study Area forest comprises young to moderately mature softwood, hardwood and mixedwood stands with several wetlands and watercourses also present. As a result of human activity [e.g. harvesting, all-terrain vehicle (ATV) trails], likely all of the forest stands within the Study Area have experienced some degree of disturbance. The Study Area contains both forested and open wetlands, which could provide breeding habitat for wetland-dependent

species. Further detail on habitats present within the Study Area can be found in Sections 9.2 and 10.1

There are no IBAs, migratory bird sanctuaries, critical habitat, parks, or protected areas within 5 km of the Study Area.

ACCDC Report

Status ranks (S-Ranks) from ACCDC were used to determine whether a species is a SOCI based on the time of year in which the species was observed. Species ranks may differ depending on whether a species is observed in the breeding season (B), the non-breeding season (N), or during migration (M). American robin (*Turdus migratorius*), for example, is ranked S5B,S3N, indicating that this species is considered a SOCI in Nova Scotia during its non-breeding (wintering) season but not during its breeding season.

The ACCDC report (ACCDC, 2025b) contains records of three avian SAR (Table 10.9) and three avian SOCI [rose-breasted grosbeak (*Pheucticus ludovicianus*), horned lark (*Eremophila alpestris*), and Wilson's warbler (*Cardellina pusilla*)] within 5 km of the Study Area (Drawing 16).

Table 10.9: Avian SAR Recorded within five km of the Study Area Per ACCDC

Species	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank
Canada Warbler	<i>Cardellina canadensis</i>	Special Concern	Threatened	Endangered	S3B
Eastern Wood-pewee	<i>Contopus virens</i>	Special Concern	Special Concern	Vulnerable	S3S4B
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Special Concern	Special Concern	Threatened	S3B

There were no ACCDC records within the Study Area (Drawing 16). Avian SAR and SOCI records within 100 km of the Study Area are provided in Appendix D.

Maritimes Breeding Bird Atlas Results

The Study Area is located within MBBA squares 20LQ67 and 20LQ68 (Birds Canada, 2025). Records from the first (1986 to 1990) and second (2006 to 2010) editions of the MBBA within these squares are as follows:

- For map square 20LQ67, the first atlas contains no records of possible, probable, and/or confirmed breeders. The second atlas contains records of 49 possible, 10 probable, and 23 confirmed breeders.
- For map square 20LQ68, the first atlas contains records of 11 possible, two probable, and five confirmed breeders. The second atlas contains records of 41 possible, 26 probable, and 26 confirmed breeders.

Between the two squares there were nine avian SAR recorded (Table 10.10).

Table 10.10: Avian SAR Recorded within MBBA Squares 20LQ67 and 20LQ68

Species	Scientific Name	COSEWIC	SARA	ESA	ACDC S-Rank
Barn Swallow	<i>Hirundo rustica</i>	Special Concern	Threatened	Endangered	S3B
Bank swallow	<i>Riparia riparia</i>	Threatened	Threatened	Endangered	S2B
Bobolink	<i>Dolichonyx oryzivorus</i>	Special Concern	Threatened	Vulnerable	S3B
Canada Warbler	<i>Cardellina canadensis</i>	Special Concern	Threatened	Endangered	S3B
Chimney swift	<i>Chaetura pelagica</i>	Threatened	Threatened	Endangered	S2S3B,S1M
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
Olvie-sided Flycatcher	<i>Contopus cooperi</i>	Special Concern	Special Concern	Threatened	S3B
Rusty Blackbird	<i>Euphagus carolinus</i>	Special Concern	Special Concern	Endangered	S2B

Significant Species and Habitats Database

The Significant Species and Habitats Database contained one record within 5 km of the Project, relating to common loon (*Gavia immer*) nesting habitat at Lake George.

10.3.4 Field Assessment Methodology

As outlined in the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009), activities that have the potential to impact migratory avifauna require field surveys. Avifauna surveys, including migratory surveys, were completed given the potential impact to avifauna species through habitat alteration, direct mortality, and sensory disturbance.

Survey methodologies were consistent with the guidance documents Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007a) and ECCC-CWS (Atlantic Region) – Wind Energy & Birds EA Guidance (2022), unless otherwise stated. Although these documents focus on wind energy projects, they provide general guidance on survey methods that can be applicable to other developments such as quarries. These documents helped inform site selection, location spacing, number of survey locations, survey duration, timing and seasonality. Based on these guidance documents and other desktop resources reviewed, the following survey types were selected:

- Spring and fall migration point count surveys.
- Breeding bird point count surveys and area searches.
- Nightjar surveys.

Prior to conducting field surveys, a preliminary desktop survey design was developed using aerial imagery and relevant geospatial data sources (e.g. land cover, topography, depth-to-water, etc.). These resources were used to identify suitable habitat for avifauna species or groups of interest (e.g., SAR, migratory birds, breeding birds, waterfowl, and nightjars).

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. The guidance documents listed above provided criteria for the selection of survey dates, including ideal weather conditions. A summary of all avian surveys completed for the Project is provided in Table 10.11.

Table 10.11: Overview of Avian Surveys Completed for the Project

Survey Type	Survey Rounds	Survey Locations	Dates	Reference for Survey Dates and Methods
Spring migration	2	11	April 11, 2025 May 6, 2025	Wind Turbines and Birds - A Guidance Document for EA (ECCC-CWS, 2007b)
Breeding bird	2	11	June 6, 2025 July 3, 2025	Maritimes Breeding Bird Atlas (Birds Canada, 2025)
Nightjar	2	5	June 6, 2025 July 2, 2025	Canadian Nightjar Survey Protocol (Knight et al., 2019)
Fall migration	3	11	August 22, 2025 September 9, 2025 October 24, 2025	Wind Turbines and Birds - A Guidance Document for EA (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 within the Study Area during spring and fall. A total of 11 point count locations (Drawing 18) were surveyed during spring migration, breeding bird, and fall migration surveys. Two rounds of spring migration surveys were conducted (April 11 and May 6, 2025), and three rounds of fall migration surveys were conducted (August 22, September 9, and October 24, 2025), with rounds spaced out to capture variation in the migration timing of different avian species (i.e., early- and late-season migrants). A third round of fall migration surveys was conducted, since fall migration tends to occur over a longer period than spring migration (Nilsson et al., 2013).

Survey locations were selected based on desktop review and aerial imagery. Relevant desktop layers (e.g., forest and land cover, wetlands, watercourses, flow accumulation, and databases containing rare species records) were used to inform the survey design. 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. Habitat types surveyed included mixedwood, softwood, and hardwood forest, forested wetlands, open wetlands, riparian areas, and developed areas (i.e. the existing quarry). Habitat descriptions for all point count locations are provided in Table 1 (Appendix I).

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). 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 within five hours after sunrise to observe the most active time of day for passerine species. Visual and auditory observations of birds were recorded during each survey, along with relevant behavioural information such as breeding evidence. The estimated distance and direction to target was recorded for each bird observed. Effort was made to conduct surveys when weather conditions were optimal (i.e., low winds and little to no precipitation). Incidental observations were recorded when notable species or behaviours were observed outside of the allotted point count survey duration, or away from designated point count 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.

Breeding Bird Surveys

Two rounds of breeding bird surveys were conducted (June 6 and July 3, 2025), consisting of a combination of point count surveys and area searches. The methodology used and locations surveyed during the breeding bird point count surveys were the same as the spring and fall migration point count surveys. The goal of these surveys was to assess the breeding activity and habitat utilization of birds within the Study Area during the breeding season. In Nova Scotia, the core breeding season for migratory species runs from early-June to late-July for most species. The first round of breeding bird surveys was completed in early-June while the second round was completed in early-July, to increase the likelihood of observing species that start breeding earlier and later in the 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 that focused on notable habitat features (e.g., wetlands, watercourses, and potential SAR habitat) or areas that could benefit from additional survey coverage. Birds observed during area searches were recorded in the same manner as the point count methodology, but with a focus on identifying novel species, SAR and SOCI, and breeding evidence. Two area searches were completed (one for each survey round), lasting for one to two hours 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) were documented. Breeding evidence codes from the MBBA (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).
- 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).

Nightjar Surveys

Common nighthawk (*Chordeiles minor*) and eastern whip-poor-will (*Antrostomus vociferus*) are aerial insectivores belonging to the nightjar family, both of which are considered SAR under SARA and ESA. Both species are known to use a wide range of open to semi-open habitats for nesting, including forest openings, logged areas, fields, barrens, bogs, and burned areas (COSEWIC, 2018; ECCC, 2018). Based on desktop review, common nighthawk may occur within the Study Area. 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.

Two rounds of targeted nightjar surveys were completed (June 6 and July 2, 2025) at five survey locations within and surrounding the Study Area (Drawing 18). Survey methodology was based on the Canadian Nightjar Survey Protocol (Knight et al., 2019). Survey locations were selected in habitats suitable for nightjar nesting and/or foraging, and included open, disturbed areas, harvested areas in various stages of regeneration, wetlands, waterbodies, and the existing quarry. Habitat descriptions for all nightjar survey locations are provided in Table 1 (Appendix I). For the safety of staff completing the surveys at night, all survey locations were accessible by road. Per Knight et al. (2019), effort was made to space survey locations a minimum of 1.6 km apart to avoid overlapping double-counting individuals.

Surveys were completed between one hour before sunset and two hours after sunset, when nightjars are most active. Effort was made to conduct surveys when weather conditions were optimal (i.e., low wind and little to no precipitation) and moon phase was within eight days of a full moon to maximize visibility and the likelihood of detecting nightjars, as per Knight et al. (2019). 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 (e.g., calling or wing-boom display). Details on survey conditions such as wind speed, 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, SAR, and/or SOCI) were recorded as incidentals.

10.3.5 Avifauna Field Assessment Results

Spring Migration Surveys

Two rounds of spring migration surveys were completed on April 11 and May 6, 2025. During these surveys, a total of 245 birds were observed, representing 37 different species (Tables 2 and 3, Appendix I). Migratory activity was highest amongst passerines, with small flocks of species like blue jay (*Cyanocitta cristata*), American robin, and purple finch (*Haemorhous purpureus*) observed moving through the Study Area. No diurnal raptors were observed, and waterfowl activity was low, with only two species [Canada goose (*Branta canadensis*) and mallard (*Anas platyrhynchos*)] observed. One nocturnal raptor [barred owl (*Strix varia*)] was observed near the edge of the existing quarry. The point count locations with the highest avian abundance were PC1 (entrance to the quarry) and PC7 (open fen), while the locations with the highest species diversity were PC7 (open fen) and PC11 (top of the quarry near a small manmade pond) (Drawing 19). All of these locations featured open areas. In addition to attracting migrants, open habitats also provide a better vantage point for the observer (particularly for recording migratory flyovers), which may have contributed to the higher levels of bird activity recorded in these areas.

The most common species were:

- Blue jay
- Dark-eyed Junco (*Junco hyemalis*)
- Black-capped chickadee (*Poecile atricapillus*)
- Purple finch
- American robin

SOCI observed were:

- Kildeer (*Charadrius vociferus*; one)
- Pine siskin (*Spinus pinus*; one)

No avian SAR were observed during spring migration surveys.

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. No observations of breeding evidence were made during spring migration surveys. Observations of probable breeding evidence based on the Maritimes Breeding Bird Atlas (MBBA, 2006) include:

- Black-and-white warbler (*Mniotilta varia*) – pair in suitable habitat.
- Ruffed grouse (*Bonasa umbellus*) – courtship or display.
- Yellow-rumped warbler (*Setophaga coronata*) – pair in suitable habitat.

Breeding Bird Surveys

Two rounds of breeding bird surveys (comprised of point count and area search surveys) were completed on June 6 and July 3, 2025.

Breeding Bird Point Count Surveys

During the breeding bird point count surveys, a total of 259 birds were observed, representing 47 different species (Tables 4 and 5, Appendix I). The survey locations with the highest avian abundance and species diversity were PC2, PC11 and PC1, all of which are within the existing quarry (Drawing 19). The open vantage points provided at these locations likely allowed surveyors to see and hear further, increasing rates of detection. Some species also tend to prefer shrubby, disturbed, edge habitats.

The most common species were:

- Ovenbird (*Seiurus aurocapilla*)
- Black-throated green warbler (*Setophaga virens*)
- Magnolia warbler (*Setophaga magnolia*)
- Blue jay
- Cedar waxwing (*Bombycilla cedrorum*)

SOCI observed were:

- Canada jay (*Perisoreus canadensis*; one)

SAR observed were:

- Eastern wood-pewee (*Contopus virens*; nine)

Seven of the eastern wood-pewee observations were made between PC1 and PC5 and were associated with a watercourse west of the existing quarry (the downstream extension of WC4).. Surveyors noted that these observations are presumed to be attributed to the same one or two individuals that are likely breeding along the watercourse. The other two observations were made at PC10 and PC11 and were associated with a watercourse just outside of the eastern portion of the PDA (WC1 to WC3). These two observations are believed to represent the same individual. WC1 was noted by surveyors as providing suitable habitat for eastern wood-pewee (a permanent watercourse through open, mixedwood and tolerant hardwood forest).

Breeding Bird Area Searches

During the breeding bird area search surveys, a total of 55 birds were observed, representing 20 different species. No new species were identified during areas searches that had not been previously identified during point count surveys. All the species observed were passerines.

The most common species were:

- Ovenbird
- Hermit thrush
- Black-throated green warbler
- Blue jay

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.

Confirmed Breeding Evidence:

- Black-throated blue warbler (*Setophaga caerulescens*) – adult carrying food
- Dark-eyed junco – young observed

Probable Breeding Evidence:

- Common yellowthroat (*Geothlypis trichas*) - pair in suitable habitat, agitated behaviour.
- Northern waterthrush (*Parkesia noveboracensis*) – pair in suitable habitat, agitated behaviour.
- Swamp sparrow (*Melospiza georgiana*) – agitated behaviour.
- Eastern wood-pewee – presumed territory (observed in the same location on two separate occasions within the breeding season).

Probable breeding evidence was observed for one SAR, eastern wood-pewee. This species was observed in the same two areas (which contain suitable breeding habitat) during both rounds of breeding bird surveys, suggesting the establishment of permanent territories.

Nightjar Surveys

Two rounds of nightjar surveys were completed on June 6 and July 2, 2025. Across all surveys, a total of 97 birds were observed, representing 33 different species (Tables 6 and 7, Appendix I). The most common species were:

- American robin
- Common nighthawk
- American crow (*Corvus brachyrhynchos*)
- Hermit thrush (*Catharus guttatus*)
- White-throated sparrow (*Zonotrichia albicollis*)

Common nighthawk was the only nightjar and the only SAR observed (Drawing 19). No SOCI were observed. A total of 10 common nighthawks were observed between two survey locations: CON11 and CON15 (Drawing 19). Observations were made at these two locations

during both rounds of surveys, suggesting probable breeding evidence. Territorial wingboom displays observed at CONI5 also suggest probable breeding evidence. Both CONI1 and CONI5 feature harvested lands, which could provide suitable breeding habitat. Both survey locations are located over 1 km from the Study Area.

No nightjars were observed at CONI4, the survey location within the Study Area, and no nightjars were observed incidentally during any field programs, suggesting that nightjars likely do not utilize the Study Area.

Fall Migration Surveys

Three rounds of fall migration surveys were completed on August 22, September 9, and October 24, 2025. During these surveys, a total of 1,000 birds were observed, representing 62 different species (Tables 8 and 9, Appendix I). Avian abundance and species diversity were highest in September, with 564 individual birds and 56 unique species observed. The survey locations with the highest avian abundance and species diversity were PC2 (existing quarry) and PC7 (open fen) (Drawing 18).

Migratory activity was highest among passerines, with small flocks of species like American robin, blue jay, American goldfinch (*Spinus tristis*), and cedar waxwing observed moving through the Study Area. Flocks of Canada goose were regularly observed flying over the Study Area in September and October. A single shorebird, Wilson's snipe (*Gallinago delicata*), was observed in the existing quarry in September.

The most common species were:

- Black-capped chickadee
- Blue jay
- American robin
- Golden-crowned kinglet (*Regulus satrapa*)
- Canada goose

SOCI observed were:

- Canada jay (three)
- Philadelphia vireo (*Vireo philadelphicus*; one)
- Rose-breasted grosbeak (*Pheucticus ludovicianus*; one)

SAR observed were:

- Canada warbler (two)
- Eastern wood-pewee (two)

The Canada warbler observations were made in the existing quarry, and in forested upland habitat within the Study Area (Drawing 19). Both observations were made during round one, in

late-August. One of the eastern wood-pewee observations was associated with the watercourse west of the existing quarry, where the species was found during the breeding season. This observation was made during round one in late-August, likely representing the same individual that had yet to leave its breeding grounds. The second observation was made in September, in the open fen (WL14) on the western side of the Study Area. The timing of this observation suggests that the individual was likely a migrant passing through the area.

Fall Migration Surveys - Probable and Confirmed Breeding Evidence

No observations of probable or confirmed breeding evidence were made during fall migration surveys.

Incidental Observations

Incidental observations were recorded by birders when notable species were encountered while travelling between designated survey locations, and by staff conducting various other field programs in 2025. A total of 15 birds were observed incidentally, representing seven different species (Tables 10 and 11, Appendix I).

The most common species were:

- Barn swallow (*Hirundo rustica*)
- Olive-sided flycatcher
- Eastern wood-pewee

No SOCI were observed. SAR observed were:

- Barn swallow (five)
- Eastern wood-pewee (two)
- Olive-sided flycatcher (four)

The group of five barn swallows was observed in August, foraging over a manmade pond in the existing quarry (Drawing 19). While this species may utilize foraging habitat within the Study Area, no breeding habitat was identified. The Eastern wood-pewee observations were made in August and September, on the western side of the existing quarry near the weigh shack and the western side of the Study Area. These observations likely represent the same individuals that were heard throughout the breeding season, utilizing the watercourse west of the existing quarry. All four olive-sided flycatcher observations are believed to represent the same individual that was observed in and around the WL5 between May and August. The individual was visually observed in the wetland (described as a heavily disturbed, cutover treed swamp surrounded by mixedwood forest) in early June. The observation of this individual in the same location on two separate occasions within the breeding season indicates probable breeding evidence. No other observations of probable or confirmed breeding evidence were made incidentally.

10.3.6 Effects Assessment

Project-Avifauna Interactions

Project activities, primarily those that involve earth moving or vegetation removal have the potential to impact avifauna (Table 10.12). These activities could result in the following potential effects:

- Habitat loss and alteration
- Sensory disturbances
- Injury and mortality risk

Table 10.12: Potential Project-Avifauna Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	X
Decommissioning	
Infrastructure removal	X
Site reclamation	X

Assessment Boundaries

For the purposes of this assessment, the spatial boundary for avifauna is the LAA which includes a 3 km buffer on the Study Area (Drawing 5). The RAA is not applicable to this assessment.

Assessment Criteria

The VC-specific definition for magnitude is as follows:

- **Negligible:** No loss or alteration of avifauna habitat, no sensory disturbance impacts, and no injuries or mortalities to avifauna are expected.
- **Low:** Small loss or alteration of habitat supporting SAR, SOCI, or/and habitat sensitive avifauna; low exposure to sensory disturbances, and low risk of injuries and mortalities.
- **Moderate:** Moderate loss or alteration of habitat supporting SAR, SOCI, or/and habitat sensitive avifauna; moderate exposure to sensory disturbances; and moderate risk of injuries and mortalities.
- **High:** High loss of or alteration of habitat supporting SAR, SOCI, or/and habitat sensitive avifauna; high exposure to sensory disturbances; and high risk of injuries and mortalities.

Effects

Habitat Loss and Alteration

The Project will cause direct and indirect impacts to bird habitat, including that of SAR, within the PDA and Study Area. The proponent is committed to avoiding all watercourses and has applied a 30 m buffer to their banks. For wetlands, impacts associated with this Project will take place slowly and over an approximately 40-year operational period. The field identified potential WSS (WL5) will be completely avoided and buffered by 30 m to avoid indirect impacts. The largest delineated wetland (WL10) will also be avoided with the same buffer applied. These measures, in addition to the 30 m buffer mentioned above, will aid in reducing direct impacts to wetland specialist species, including SAR such as olive-sided flycatcher (see Section 9.2.4.2 and 10.3.5).

The quarry expansion will increase the overall quarry footprint but will not alter the operational scale of quarry activities (see Section 3.3.2). Habitat will be eliminated gradually over a 40-year period as the operational quarry face expands. It is expected that land required for expanded quarry operations (e.g., the active quarry site, stockpiles) will experience a long-term loss of vegetation cover due to vegetation clearing, grubbing, and development of the subsurface; thus, reducing the quantity and quality of avifauna habitat that currently exists in and around the PDA. The quarry will directly impact up to 52.9 ha, with 9.87 ha (17%) estimated to be impacted in the first 10 years of activities.

Biophysical surveys found that upland forests were the predominant habitat type in the Study Area, with wetlands and riparian zones occurring less frequently.. All upland forests habitat types, except for tolerant hardwood stands, were found to be abundant in the LAA (see Section 10.1.5). The nearest tolerant hardwood stand was 300 m from the active quarry face; hence, may be directly impacted by future clearing activities. Each of these habitat types support varying bird communities and the loss or alteration of uncommon habitats may have greater impact on specialist bird species. Critical SAR habitat was identified for the olive-sided flycatcher, which triggered a potential WSS in its associated wetland (WL5, Section 9.2.4.2).

Within the PDA, habitat removal 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 insectivores.
- Increase in transitional and microhabitats.
- Increase in suitable habitat for barn swallow, common nighthawk, eastern wood-pewee, and olive-sided flycatcher (SAR).
- Decrease in suitable habitat for Canada warbler (SAR).
- Increased avian depredation from raccoons, snakes, small mammals, and other birds (e.g., corvids).
- Decrease in reproductive success for some species.

Bird species that currently use the habitat within the PDA will be displaced during the initial stages of the quarry expansion, most notably during clearing and grubbing activities. These birds will experience changes in habitat availability and may experience associated sensory disturbances. This could potentially cause direct mortality of species if individuals are unable to relocate to alternate suitable habitat, as they may face competition from other bird species to access new habitat and resources. However, there are sufficient areas of suitable nesting habitat in adjacent lands of the LAA, providing diverse relocation options for displaced species.

The Project will alter habitat within the PDA but should not have a significantly negative impact on core habitat and similar habitat for avifauna present in LAA. Alterations will have both negative and positive effects depending on the bird species. Not all alterations will be permanent; for example, some alterations may be revegetated after the quarry is decommissioned. Alterations include the creation of edge habitat and of vertical structures that act as potential nesting habitat for some bird species.

Edge habitat is a transition zone between habitat types that introduces unique edge effects to an area. A substantive amount of edge habitat creation can lead to habitat fragmentation, where the quality of habitat is reduced by having excessive edge habitat. Edge effect refers to changes to abiotic properties, species distributions, species interactions, and other ecological parameters from the creation of a boundary or transition zone between habitats (Porensky & Young, 2012). Edge effect is favourable to some species like habitat generalists since they can use various habitat patch types, adapt easily to disturbance, and thrive off having access to a broad mix of microhabitats (Andr n, 1994). This includes many birds found on the site such as common yellowthroat, song sparrow, and rose-breasted grosbeak (King et al., 2009). Other species, especially those that rely on large, intact tracts of forest habitat, will be negatively impacted by the creation of edge habitat. Edge habitat creation may increase the risks of nest depredation, brood parasitism, or nest abandonment in some species, whilst increasing availability of food and nesting habitat for others (Akresh et al., 2024; Kalukapuge et al., 2024).

Concerns for habitat fragmentation and edge effect center around species that prefer low-light habitats (e.g., larger-eyed birds like owls and thrushes), nesting birds, and habitat specialist species. Examples of these species found on site include SOCI and SAR: pileated woodpecker, Canada warbler, barn swallow, Eastern wood-pewee, olive-sided flycatcher, and common nighthawk. The habitat requirements for these species and the anticipated magnitude of Project effects on said habitat requirements are detailed below.

Increased edge areas may lead to increased depredation on birds and their nests. 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. However, the effect is highly variable and dependent on predator species in the area (W. A. Cox et al., 2012; Zanette & Jenkins, 2000). Predators found on the site included red fox and raccoon (see Section 10.2.5). It is unlikely that the Project will significantly increase depredation rates on birds and their nests given the low presence of predators. Proper management of waste and human-wildlife interactions may help reduce increased predator presence. These mitigation measures will be further outlined in the

Project's future Wildlife Management Plan. Scheduling clearing activities from September to December will also aid in reducing depredation on bird nests by reducing stressors to nesting birds on the site.

Pileated woodpeckers were observed multiple times during the breeding bird and fall migration field seasons (see Tables 4 and 5, 8 and 9, Appendix I). Pileated woodpecker nest cavities are protected under the *Migratory Birds Act*, as per the 2022 updates to the Canadian Migratory Bird Regulations. Their nest cavities are protected as they provide nesting habitat for secondary cavity-nesting species who are incapable of excavating their own cavities (e.g., nuthatches, owls, bluebirds). Hence, the removal of mature trees and snags within the PDA may have negative impacts on the reproductive success of secondary cavity-nesting species.

Canada warblers are a habitat specialist SAR during the breeding season, where it relies on shrub and treed wetlands (COSEWIC, 2020). This species was only found during the fall migration field surveys and was not observed in preferred breeding habitat (see Section 10.3.5); hence, it is unlikely that this SAR is utilizing habitat in the PDA and Study Area for breeding activities and will not be significantly impacted by Project activities.

The remainder of SAR observed on site were all insectivorous birds. In contrast to habitat specialists, insectivorous species may thrive in fragmentated habitats (Andrén, 1994; Tittler et al., 2001). These species have been shown to return in years subsequent to the creation of additional edge habitat due to the increased availability of foraging opportunities and other niche habitats (Tittler et al., 2001). It is also important to note that these species may be adversely affected by Project activities if the quality and quantity of their breeding habitat is altered by the Project.

Barn swallows were observed foraging above the manmade pond in the quarry site (see Section 10.3.5). No breeding habitat for this species was identified during desktop review and field surveys. Procedures to prevent harm to nesting barn swallows will be outlined in the Project's Wildlife Management Plan in the event that barn swallows initiate breeding at the Project site.

Eastern wood-pewees were observed breeding near the watercourses within the Study Area (see Section 10.3.5). This species relies on mature upland forests with high canopy heights and cleared areas for foraging (A. Cox et al., 2023). Wood-pewees may benefit from increased edge and open areas from which they can hunt for flying insects. These birds were likely breeding in the upland forests and hunting over open areas of the watercourses given the locations of Eastern wood-pewee observations in the Study Area. The Proponent has committed to avoiding watercourses via a 30 m buffer, which will aid in maintaining the natural habitat this species prefers. Furthermore, adequate wood-pewee habitat is abundant throughout the LAA, giving the individuals breeding within the Study Area relocation options. As such, this species is predicted to experience a low magnitude of effect from the Project.

Olive-sided flycatchers were observed breeding in WL5, which triggered a potential WSS designation (see Section 10.3.5 and Section 9.2.4). The Proponent has committed to avoiding this wetland via a 30 m buffer, which will aid in reducing disturbance to this species' breeding habitat. Multiple studies have found that olive-sided flycatcher respond positively to forest harvest activities (NSNR, 2021h), although the extent of these benefits is still unclear. In Maritime Canada, this species may benefit from the disturbance introduced by anthropogenic activities like clearing and grubbing in the absence of areas disturbed by natural forest fires, which is the disturbance regime this species typically utilizes in other areas of its range. Olive-sided flycatchers are likely to be minimally affected by Project activities and may benefit from increased disturbance in the LAA.

Common nighthawk was the most abundant SAR found during field surveys due to the execution of targeted nightjar surveys. Given that breeding territories for this species can extend over several kilometres (ECCC, 2016), common nighthawk are expected to interact with the Project even though all observations occurred outside the Study Area. Interactions include using cleared areas, such as the active quarry site and roadsides, as nesting and foraging habitat. Effects on this SAR are likely to be minimal if proper care is taken to investigate cleared areas that have been left undisturbed during the breeding season prior to any Project activities taking place.

Overall, habitat loss and alteration within the PDA are low and will occur at a rate that will minimally impact birds, including SAR. Mitigation measures will assist with preventing harms to birds that utilize habitat within the PDA. Edge habitat created by the Project's operations will be concentrated to active quarry areas.. Edge habitat is already present in the PDA from both natural and anthropogenic sources; additional edge effects introduced by the quarry expansion will be minimal and are unlikely to introduce significant changes to the habitat utilization by the present bird communities in the LAA.

Sensory Disturbance

Sensory disturbance may occur during all Project phases. Noise and light will be concentrated in the PDA but could also extend into the portions of the LAA that are closest to the PDA. Identified sensory disturbances associated with the operation and decommissioning phases of the Project include:

- Noise
- Lighting

Noise

Increased noise levels are expected during all Project phases. Sound sources include heavy machinery and blasting during operations and decommissioning.

Noise production will not be continuous. Operational noise will be primarily generated from drilling and blasting, which will be limited to a two-week window from April to May. Birds are expected to be most sensitive to noise disturbances in the PDA during the ECCC defined nesting period for the area, which extends from mid-April to late August (ECCC, 2024c).

Direct physiological damage causing a temporary decrease in auditory sensitivity can occur at acute noise levels above 93 dBA, while permanent damage to avian auditory systems may not occur until 125 dBA to 140 dBA (Blickley & Patricelli, 2010). Birds can exhibit greater susceptibility to physical hearing damage caused by noise, as most species rely on vocal communication (Blickley & Patricelli, 2010). However, birds have exhibited the ability to recover from acute noise disturbances (Saunders & Tilney, 1982). Effects from noise disturbances are estimated to be low based on the acute nature of noise generated during the Project's operational phase.

Noise generated from Project operations is dependent on quarry production rates. Noise from the heavy machinery and equipment involved in this phase can disrupt normal avian behaviours such as foraging, communication, and reproduction. Based on the results in Section 7.3.4, the range of decibels anticipated for the Project's activities will be between 84 dBA and 107 dBA (from a single piece of equipment within 15 m from the source). A literature review conducted by Shannon et al., (2016), found that birds have the potential to exhibit changes in song characteristics, reproduction, abundance, stress levels, and species richness at levels greater than 45 dBA. Studies have shown that biological responses commenced at 40 to 45 dBA, with a decline in species diversity (i.e. avoidance by sensitive species) and reproductive success at 43 to 58 dBA. The sounds associated with operations, while intermittent, may lead some birds to avoid areas near the active quarry, possibly altering their habitat use patterns during critical breeding or migration periods; however, this effect is anticipated to be low considering there is ample breeding and migratory stopover habitat away from noise generation within the LAA.

On the contrary, some 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 through decreasing nest predation through higher awareness and less flushing (Francis et al., 2009). Hence, while operational noise disturbances may displace some species, others may have increased breeding success.

Overall, while operation-related disturbances are temporary, the noise generated may cause temporary changes in bird distribution, breeding behaviour, and reproductive success during the active phases of the Project. Acute impacts from high noise levels are expected on a short term and intermittent frequency during the operations and decommissioning phases, but birds exposed to these levels would be expected to recover from hearing damage.

Lighting

Light is a source of sensory disturbance that can impact birds by potentially causing disorientation, avoidance, attraction, and mortality (Longcore & Rich, 2004); as well as influencing habitat selection (Adams et al., 2021). Project activities will occur during daylight hours and artificial lighting at night is not expected. Overall, lighting is expected to have low to no impacts to birds in the PDA.

Injury and Mortality Risk

Injury and mortality may occur during all Project phases, but predominantly during operations. The main sources of injury and mortality would be vehicle strikes and direct mortality during vegetation clearing and grubbing.

Direct mortality to eggs and unfledged nestlings could occur if avifauna species choose to nest in anthropogenically-disturbed habitat created by the Project. For example, cleared and grubbed areas can create nesting habitat for common nighthawk. Although direct mortality to eggs and young birds is possible, the risk can be reduced with the implementation of mitigation measures such as thorough checks for ground-nesting birds before any activities in cleared areas.

Direct mortality or injury may also result from vehicle strikes associated with traffic within the PDA. Species at increased risk are grouse, pheasants, and similar species, as these species are known to use roadways for travel, territory establishment, and foraging (Madden & Perkins, 2017; Whitaker et al., 2010). It should be noted that there is existing local traffic within the PDA and traffic volumes are not expected to significantly change with the quarry's expansion. Traffic mitigation measures such as reduced speed limits are effective for reducing bird-vehicle strikes and should continue to remain in place.

Direct and indirect mortality could result from short or long-term exposure to varying levels of contaminants from accidental spills and leaks from equipment. Risks from these situations can be reduced with the implementation of well-established environmental standards and mitigation measures for construction projects and equipment.

Overall, there is a low potential for direct or indirect mortality and injuries to birds from Project activities with the implementation of mitigation measures. The potential for direct mortality is expected to be low and infrequent.

Mitigation Measures

Mitigations to reduce effects on avifauna include:

Habitat Loss and Alteration

- Allow disturbed areas to naturally revegetate, where vegetation maintenance is not required during operations.
- Maintain compatible vegetation in vegetation management during operations [i.e., native successional species like maples (*Acer spp.*), birches (*Betula spp.*), aspen (*Populus spp.*), etc.; Neily et al., 2023].
- Minimize wetland alterations to the extent practicable. Specifically, maintain commitment to 30 m buffer around wetlands (where possible) and watercourses.
- Conduct nest sweeps in the PDA prior to clearing during the breeding bird season.
- During operations, implement set back distances from known and identified avifauna nests within the PDA. Set back distances should be agreed upon in conjunction with NSNR and/or ECCC/CWS.

Sensory Disturbance

- Install mufflers on construction equipment and vehicles to limit noise.
- Avoid acute noise levels during sensitive periods for birds, notably the breeding bird season.

Lighting

- The use of lighting will be limited to one spotlight located at the scale house which will be positioned in a downward orientation to reduce attraction to birds

Injury and Mortality

- Adhere to ECCC guidelines on clearing windows for nesting migratory birds (i.e., outside of the April 15 to August 31 nesting window), where possible. If vegetation and tree clearing activities during the nesting/breeding season cannot be avoided, nest sweeps and area searches will be conducted by a qualified avian biologist to search for any confirmed breeding bird evidence which must be avoided (i.e., active nests and recently fledged juveniles).
- When vegetation and tree clearing activities take place during the non-nesting/breeding season, crew must be aware and look out for nests protected year-round under the 2022 update to the Migratory Bird Regulations (under the MBCA), which includes pileated woodpecker nests. Inactive and unoccupied pileated woodpecker nests are protected for 36 months and cannot be removed or destroyed without following specific ECCC-CWS procedures such as registration and notification under the ECCC Abandoned Nest Registry.
- Manage stockpiles to reduce the attraction of ground and burrow-nesters such as bank swallows. To discourage bank swallows, slopes should be gradual and not vertical (e.g., less than a 70 degree-slope; NSNR, 2020).
- Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities within stockpiles or exposed areas during operations, until chicks can fly, and the nesting areas are no longer being used.
- Minimize soil compaction along with the removal of hummocks, root masses, moss cover, ferns, and other ground vegetation that may provide good concealment of ground nests.
- Establish speed limits for vehicles to mitigate the effect of vehicle-avifauna collisions. Traffic signs will be installed to alert road users of speed limits and the presence of wildlife in the area.
- Maintain all equipment and machinery on site to reduce leaks, spills, noise and vibration emissions associated with malfunctions, and to discourage birds from nesting on sitting equipment (e.g., barn swallows).
- Have designated garbage cans and pack out all waste to avoid attracting avifauna to the Project site. Maintain good housekeeping practices during construction to avoid indirectly feeding birds and potentially attracting nuisance wildlife.
- Develop a spill response plan (within the Contingency Plan) and equip site machinery with spill kits and instruct site personnel on their use.

Monitoring

A site-specific post-construction Wildlife Management Plan will be developed in consultation with government regulators and all other relevant parties. This plan will include mitigation measures, monitoring, and adaptive management frameworks for minimizing impacts to avifauna.

Conclusion

A summary of avifauna residual effects is presented in Table 10.13.

Table 10.13: Avifauna Residual Effects

Effect Detail	Habitat Loss and Alteration	Sensory Disturbance	Mortality and Injury
Magnitude of Effect	Low: Small loss of fauna habitat or small sensory disturbance to fauna.	Low: Small impact on a number of birds in the LAA.	Low: Small impact on a number of birds in the PDA.
Geographic Extent of Effect	LAA	LAA	PDA
Frequency of Effect	Intermittent: Effects may occur during initial site preparation and throughout operations	Intermittent: Effects may occur during initial site preparation and throughout operations	Intermittent: Effects may occur during initial site preparation and throughout operations
Duration of Effects	Medium Term: Habitat loss and alteration occur annual during blasting	Medium Term: Residual impacts of sensory disturbance due to noise and light will end after decommissioning.	Medium Term: Mortality and injury will end after decommissioning
Reversibility of Effect	Partially Reversible	Partially Reversible	Irreversible (Mortality) and Partially Reversible (Injury)
Significance Level	Not Significant	Not Significant	Not Significant
Effects Assessment Ratings (Refer to Table 4.3 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:

- 2021 Population Census – Statistics Canada (2023)
- Public mapping resources
- Economic data from the Proponent

11.1.2 Existing Environment

The Project is in Kings County, within the community boundaries of Morristown and Nicholasville, with additional nearby communities including:

- Lake George (approximately 7 km southeast from the Project centre to the approximate centre of the community)
- Aylesford (approximately 9 km northwest)
- Berwick (approximately 10 km north)
- Greenwood (approximately 13 km west)
- Kingston (approximately 14 km west)
- Coldbrook (approximately 18 km northeast)

The Project is entirely within the Kings County Census Subdivision A (Kings Subd. A) Census Subdivision (CSD) according to Statistics Canada records. Population statistics for the province, Kings County Census Division (Kings County), and Kings Subd. A are presented using the 2016 and 2021 Census of Population (Table 11.1). Notably, Kings Subd. A excludes the population centre of Berwick but does include those of Kingston and Greenwood. The population of the largely rural Kings Subd. A has increased slightly between 2016 and 2021, at approximately one-tenth the growth rate of the province at large. Kings Subd. A has a very similar population density as the province, reflecting a mix of people living in community agglomerations (e.g., Aylesford, Greenwood, and Kingston) and rurally, with some sparsely or completely unoccupied land as well. Incorporating the larger population centres from Wolfville to Kentville and numerous other communities, Kings County has a 61% higher population density than the province and is growing at a lower rate than the province but much faster than Kings Subd. A.

Table 11.1: Population Characteristics in 2016 and 2021 for Nova Scotia and Kings Subd. A

Population Statistics	Nova Scotia	Kings County	Kings Subd. A
Population in 2021	969,383	62,914	22,355
Population in 2016	923,598	60,600	22,234
Population change from 2016 to 2021	+5.0%	+3.8%	+0.5%
Total private dwellings in 2021	476,007	30,366	10,711
Land area	52,825 km ²	2,120 km ²	1,233 km ²
Population density	18.4 people/km ²	29.7 people/km ²	18.1 people/km ²

Source: (Statistics Canada, 2023)

The age distributions in Kings Subd. A and Kings County (Table 11.2) reveal a median age of 45.6 and 47.2, the same as or very close to the provincial median age of 45.6 (Statistics Canada, 2023). Further, 2021 age distribution statistics comparisons (Table 11.2) reveal that both census areas have proportionally very similar numbers of people in all age categories, indicating similar proportions of people of working age, who will join the workforce within the next one or two decades, or who are already or will soon retire.

Table 11.2: Age Distribution in 2021 in Nova Scotia, Kings County, and Kings Subd. A

Age Statistics	Nova Scotia	Kings County	Kings Subd. A
0 to 14 years	136,710 (14.1%)	9,040 (14.4%)	3,680 (16.5%)
15 to 64 years	617,345 (63.7%)	38,985 (62.0%)	13,860 (62.0%)
65+ years	215,325 (22.2%)	14,895 (23.7%)	4,815 (21.5%)
Median age	45.6	47.2	45.6
Total Population	969,380	62,914	22,355

Source: (Statistics Canada, 2023)

Note that due to rounding, total percentages may not equal 100%.

Median housing costs and median household total incomes in 2020 for Kings Subd. A. are compared to the provincial and national values (Table 11.3). This comparison shows that the median dwelling value in Kings Subd. A is consistent with the provincial median, which itself is less than half the national median. Examining relative median total income and median dwelling value across these jurisdictions demonstrates that housing is about as affordable for those on a median income in Kings Subd. A as the median value across in Nova Scotia. The 2021 census data shows that dwellings are apparently more affordable on a median income in Kings Subd. A and Nova Scotia than median values for Canada as a whole. This is corroborated by the percentage of owner households spending over 30% of their income on shelter costs, although this figure may be skewed by legacy homeowners who own their property outright. These trends do not carry over as clearly into the residential rental markets of Nova Scotia and Kings Subd. A. In 2021, fewer residential tenants were spending 30% or more of their household income on shelter costs in Kings Subd. A than both Nova Scotia and Canadian median values, indicating a more affordable rental market. Kings County as a whole is generally close to either the provincial or Kings Subd. A values but likely varies due to the inclusion of larger population centres such as Wolfville, New Minas, and Kentville skewing property values and rental costs closer to the provincial averages.

Table 11.3: Housing Costs (2021) and Median Individual Income (2020) for Canada, Nova Scotia, Kings County, and Kings Subd. A

Housing and Income Statistics	Canada	Nova Scotia	Kings County	Kings Subd. A
Median total income	\$41,200	\$38,000	\$35,600	\$37,200
Median dwelling value	\$618,500	\$250,000	\$250,000	\$240,000
Median total income as a % of median dwelling value	6.7%	15.2%	14.2%	15.5%
Median monthly shelter costs for owned dwellings	\$1,498	\$870	\$870	\$840
% of owner households spending 30% or more of their income on shelter costs	14.8%	9.7%	9.8%	8.8%
Median monthly shelter costs for rented dwellings	\$1,209	\$1,000	\$880	\$890
% of tenant households spending 30% or more of their income on shelter costs	33.2%	34.7%	31.8%	26.8%

Source: (Statistics Canada, 2023)

Most residents in Kings Subd. A (96.8%) use English as their first official spoken language (Statistics Canada, 2023). Because of this, all public outreach and communication for the Project has been and will continue to be in English. There is some knowledge of other languages, though no communication has been requested in other languages.

The Study Area has several fire halls within 15 km and in all directions:

- Aylesford Fire Hall – approximately 9 km northwest from the Study Area center to the fire hall
- Berwick & District Volunteer Fire Department – approximately 10 km north
- Waterville and District Volunteer Fire Department – approximately 13 km northeast
- Kingston District Fire Department – approximately 14 km west
- Aylesford Fire Department: Lake Paul Substation – approximately 14 km southeast

Health and emergency services in the area are accessible to Project workers if the need should arise. The closest location is the Western Kings Memorial Health Centre, approximately 9 km north of the Study Area in Berwick. There are two additional nearby health centre options, the Soldier's Memorial Hospital in Middleton (approximately 23 km west) and the Valley Regional Hospital in Kentville (approximately 25 km east). Notably, both the Soldier's Memorial and Valley Regional Hospitals provide emergency services.

Statistics indicate that the employment rate for Kings County and Kings Subd. A were 51.1% and 52.6%, respectively, similar to the provincial employment rate of 51.9% (Statistics Canada, 2023). The unemployment rate in 2021 for Kings Subd. A was 8.9%, lower than both the provincial and national unemployment rates, while Kings County was between the two values at 11.0% (Table 11.4).

Table 11.4: Employment Statistics for Canada, Nova Scotia, Kings County, and Kings Subd. A

Unemployment Statistics	Canada	Nova Scotia	Kings County	Kings Subd. A
Employment rate	57.1%	51.9%	51.1%	52.6%
Unemployment rate	10.3%	12.7%	11.0%	8.9%

Source: (Statistics Canada, 2023)

The top six industries in Kings County and Kings Subd. A were compared with the province (Table 11.5), as categorized under the North American Industry Classification System 2017 (Statistics Canada, 2023). The highest proportion of workers in Kings Subd. A fall into “public administration” and “health care and social assistance” categories (18.0% and 16.3%, respectively). Other significant industries in MODG include “retail trade”, “manufacturing”, and “construction” (Statistics Canada, 2023).

Table 11.5: Top Industries for the Employed Labour Force in 2021 in Nova Scotia, Kings County, and Kings Subd. A, Including Number Employed, Rank in Jurisdiction, and % of Total Workforce

Industry	Nova Scotia	Kings County	Kings Subd. A
Public administration	42,070 (3, 8.6%)	3,035 (3, 10.0%)	1,905 (1, 18.0%)
Health care and social assistance	70,595 (1, 14.5%)	4,955 (1, 16.4%)	1,730 (2, 16.3%)
Retail trade	58,985 (2, 12.1%)	3,710 (2, 12.2%)	1,255 (3, 11.9%)
Manufacturing	31,210 (7, 6.4%)	2,860 (4, 9.4%)	935 (4, 8.8%)
Construction	35,720 (5, 7.3%)	1,985 (6, 6.6%)	715 (5, 6.8%)
Educational Services	38,425 (4, 7.9%)	2,545 (5, 8.4%)	650 (6, 6.1%)
Others ¹	237,710 (48.8%)	10,610 (35.0%)	3,860 (36.4%)
Total Labour Force 15+ Years¹	487,260	29,705	1,875

Source: (Statistics Canada, 2023)

⁽¹⁾Note that both percentages and total numbers may not sum to 100% due to rounding conducted by Statistics Canada.

There are economic hubs in several directions from the Project, including the Kingston and Greenwood area approximately 14 km west and the larger towns of Kentville and New Minas, with the associated Kentville Business Park, approximately 21 km northeast of the Project. In combination with the numerous smaller communities, there are several nearby businesses that may potentially supply or otherwise benefit (either directly or indirectly) from the Project. A list of such businesses in the area was compiled (Table 11.6). This list of businesses was generated by searches on Google Maps using the keywords “restaurant”, “industrial supplier”, “accommodations”, “grocery”, “fuel station”, and “hardware store”, presenting a representative selection of both the businesses that may serve the Project and its staff. This list is not exhaustive, and there are numerous other businesses in the area that will likely benefit directly or indirectly from the Project through the patronage of the business and its employees, and the increased economic activity in the area.

Table 11.6: Local Businesses within 10 km of the Project and Their Proximity Sorted by Business Type and Distance to the Project

Business	Business Type	Community	Approximate Distance to the Project ⁽¹⁾
Aurora Inn	Accommodations	Kingston	14 km W
Slumber Inn	Accommodations	New Minas	26 km NE
Old Orchard Inn	Accommodations	Grenwich	32 km NE
Irving Oil	Fuel Station	Berwick	10 km N
Petro Canada	Fuel Station	Berwick	10 km N
West Nova Fuels Ltd	Fuel Supplier	Kingston	16 km W
Walmart	General Retail	Greenwood	13 km W
Avery's Farm Market	Grocer	Berwick / Kingston	10 km N / 14 km W
Foodland	Grocer	Berwick	10 km N

Business	Business Type	Community	Approximate Distance to the Project ⁽¹⁾
Jeff's Your Independent Grocery	Grocer	Berwick	10 km N
Burt's Grocer	Grocer	Auburn	10 km NW
Atlantic Superstore	Grocer	Kingston	14 km W
Goucher Farm Market	Grocer	Kingston	14 km W
Home Hardware	Hardware Store	Berwick / Greenwood	10 km N / 13 km W
Fraser's Pro Home Centre	Hardware Store	Berwick	10 km N
Foster's Fire & Safety Ltd.	Industrial supplier	Cambridge	15 km NE
Lutz Equipment	Machinery Repair	Aylesford	5 km N
Lockhart Mechanical & Fabrication	Machinery Repair	Selfridge Corner	10 km NW
Nova International Limited	Machinery Sales	Aylesford	9 km NW
Schurman's Industrial Supplies Ltd.	Mechanical Supplier	Berwick	10 km N
Thai Memory Restaurant	Restaurant	Aylesford	9 km NW
Kellocks Restaurant	Restaurant	Berwick	10 km N
Luigi's Pizza Palace	Restaurant	Berwick	10 km N
Mila Pizza	Restaurant	Berwick	10 km N
North Mountain Fine Coffees	Restaurant	Berwick	10 km N
The Union Street Restaurant	Restaurant	Berwick	10 km N
Gaby's	Restaurant	Greenwood	13 km W
Mama Evelyn Pizzeria	Restaurant	Greenwood	13 km W
Oaken Barrel Pub	Restaurant	Greenwood	13 km W
Chrimaria Family Restaurant Ltd	Restaurant	Kingston	14 km W
Green Elephant Café	Restaurant	Kingston	14 km W
Roof Hound Brewing Co.	Restaurant	Kingston	14 km W

⁽¹⁾All distances were measured from the centre of the Study Area by a straight line and rounded to the nearest whole number.

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
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	X
Decommissioning	
Infrastructure removal	X
Site reclamation	X

Assessment Boundaries

The LAA for economy is Kings County. 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

A primary anticipated effect of the Project is an increased capacity to support ongoing construction and other projects. A local supply of aggregates is critical to affordability as these products have a low per-unit cost, and economic feasibility is highly influenced by trucking distance (Přikryl, 2021). The Project is expected to continue to support, to a greater extent with increased resource availability, public road building, residential and commercial development, and public facilities. With Kings County's population growing, and Kings Subd. A to a lesser extent, ongoing aggregate resource availability is critical to support both the growing population and economy.

The company's employment represents both a direct and indirect economic influence on the region, providing well-paying jobs for people with both general and specialized skills including heavy equipment operation, surveying, blasting management, and more. The Proponent's employees already do, and will continue to a greater degree, provide economic stimulus to the region through their discretionary and non-discretionary spending. The Proponent is committed to sharing economic opportunities with the local community throughout the development and lifespan of the Project through the use of local skilled labour.

Potential work for the Project will include a wide range of backgrounds and specialties ranging from environmental services to general construction and including specialized work in blasting and the operation of heavy and rock processing machinery.

Through initial capital expenditures, the Proponent will invest significantly in sourcing equipment and materials from Nova Scotian suppliers such as crushers and other medium to heavy equipment that are required for operations. Ongoing operational expenses amounting to over \$500,000 per year will support the quarry's supply chain including subcontracted labour, fuel, maintenance supplies, and more. This expenditure will support the Nova Scotian economy through suppliers who work with a range of industries.

Additionally, the proponent will pay a variety of taxes that will support government services in the local community and beyond including municipal property taxes paid to the Municipality of Kings County and provincial and federal income taxes.

When taken together, the direct and indirect financial and economic stimulus have a positive overall impact on the local community, county, and province. The Project's contribution to gross domestic product (GDP) was calculated using modelled figures provided by the Proponent and national and provincial multipliers from Statistics Canada (2026). Applying direct, indirect, and induced GDP multipliers to GDP at market prices for stone mining and quarrying using 2022 figures (the most recent available year), the Project is expected to have a GDP contribution of approximately \$1.8 million per year.

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 recommended.

11.2 Land Use

11.2.1 Overview and Assessment Methodology

Consideration of the baseline conditions and potential Project effects on land use must take into consideration a wide range of land uses within, adjacent to, and nearby the Study Area. This may include uses such as residential habitation (both urban and rural), industrial or commercial activities, agriculture, forestry, protected and resource areas, First Nations, recreation, and tourism.

The assessment of land use 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
- Nova Scotia Visitor Exit Survey (TNS, 2024)
- Review of local government's tourism and recreation website (MCK, n.d.)
- Literature review of quarry impacts on land use

11.2.2 Existing Land Use

The Study Area is comprised of three parcels consisting of exclusively private land owned by the Proponent (52.9 ha). In addition to the quarry already operating adjacent to the Study Area, other nearby land is used for forestry and recreation. There are also residential properties in the surrounding area, with the closest non-participating receptor located 800 m to the PDA. There is no reason to suspect that property values in the Project's vicinity would deviate significantly from the averages for the census subdivision (Table 11.3).

The following provincial and municipal public parks are found within 10 km of the Study Area:

- Lake George Provincial Park, approximately 6.7 km southwest of the Study Area.
- Chute Park in Berwick, approximately 8.2 km north of the Study Area.
- Centennial Park in Berwick, approximately 9.0 km north of the Study Area.

Additionally, Fox Mountain Camping Park, a private campground dedicated primarily to recreational vehicle camping, is located approximately 1.3 km northeast of the Study Area.

There are no Mi'kmaq reserve lands within 10 km of the Study Area. Further consideration of Mi'kmaq resources is included in Section 5.0.

11.2.2.1 Recreation and Tourism

Both recreation and tourism must be considered jointly. While some recreational opportunities may attract locals more often than tourists, and vice versa, the region's natural and cultural offerings are an asset to both groups. Recreational opportunities, therefore, should be understood to apply to both locals and people travelling intra-provincially, interprovincially, or internationally for leisure. The Study Area's surroundings, including the community of Berwick and the Annapolis Valley in general, are home to a variety of recreational and cultural activities.

The region is known for its recreational offerings such as hiking, camping, and biking. ATV or other off-highway vehicle (OHV) use is likely on the nearby trail labelled as Trail no. 102 on the ATV Association of Nova Scotia interactive map (ATVANS, 2025). This trail is classified as a secondary trail and it comes within approximately 750 m of the Study Area at its closest point; records indicate that it is managed by the Mid-Valley ATV Club. There are several notable hikes in the region, including some featured in Michael Hayne's popular Hiking Trails of Nova Scotia (2002), such as trails at Nictaux Falls and the Gaspereau River; however, none are found within 5 km of 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 that is recommended by Hike Nova Scotia as the source for information about Nova Scotia trails. The hike nearest to the Study Area on AllTrails.com is the Factorydale Falls trail approximately 2.7 km to the north (Drawing 12A).

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, 2024e). This and additional approved hunting or trapping

may occur nearby the Study Area per NSNR guidelines, while such activities within the Study Area would have previously also been at the discretion of the landowner. Former hunting blinds were observed during fieldwork and documented by both Strum and archaeologists (see Section 12.0) who surveyed the Study Area. If hunting is allowed to continue within the Study Area remains at the discretion of the property owner, whether the Project proceeds or not. Fish were confirmed in watercourses within or near the Study Area (see Section 9.X) that may be targeted by anglers. There are trails that lead to the edges of nearby lakes that could be used for fishing or waterfowl hunting in this area, although it should be noted that the nearby Crown land would be a far more suitable and likely location to find such recreational activities taking place.

While outdoor opportunities are popular, nearby indoor community or recreation centres are available including the Kings Mutual Century Centre (approximately 9 km from the Study Area) that houses an ice rink, community spaces, ice rink, curling surfaces, and fitness facility, and more.

Kings County and the Annapolis Valley in general have a rich history, with habitation by the Mi'kmaq Peoples for over 10,000 years, and French Acadian settlement over 400 years ago (MCK, n.d.). There are several museums, historical, and cultural attractions describing different parts of the region's history and culture including the Kings County Museum in Kentville, (Kings County Museum, n.d.), Greenwood Military Aviation Museum in Greenwood (Greenwood Military Aviation Museum, n.d.), and the Ross Farm Museum in New Ross (Ross Farm Museum, n.d.).

Many tourists pass near the area on Highway 101 or Highway 1, well-travelled highways that connect Halifax through the Annapolis Valley to the province's south shore, terminating in Yarmouth, NS. Due to the nature of quarrying, neither the existing operation nor the proposed expansion are expected to be visible from areas frequented by recreationalists, whether local or tourist.

Recreation and Tourism Trends

Tourism Nova Scotia's (TNS) 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 TNS research products regarding the places visited within the province, which limits the

understanding of tourism's impact on the communities around the Project. Additionally, no data were found on intra-provincial travel or local use of these resources. The Project's low visibility from surrounding areas, especially those of touristic interest, means that tourists are unlikely to notice the presence of the quarry during visits to the area.

11.2.3 Effects Assessment

Project-Land Use Interactions

Project activities have the potential to interact with land use during all phases of the Project (Table 11.8).

Table 11.8: Potential Project-Land Use Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	X
Decommissioning	
Infrastructure removal	-
Site reclamation	X

Assessment Boundaries

The LAA for Land Use is Kings County. 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 use expected.
- Low: Minor and/or highly localized limitations to surrounding land use.
- Moderate: Moderate and/or locally dispersed limitations to surrounding land use.
- High: High and/or widespread limitations to surrounding land use.

Effects

Due to the nature of quarries digging into the ground, their visibility on the landscape is easily obscured when they are developed on relatively flat terrain, and vegetation or topography contribute to blocking viewplanes. Quarries also have discrete footprints and are generally not inhibitive of other nearby commercial or industrial activities such that the area's ongoing forestry activities will not be disrupted by the Project. None of the existing and permitted users of nearby Crown land PIDs are expected to be impacted by the Project.

Visual Aesthetics

People living and working in the vicinity of the Project are unlikely to see the Project due to the flat topography, recessed nature of an aggregate quarry, and tall vegetation in the area. This should therefore not result in any effects on the visual aesthetics of the area.

Property Value

Property values for existing residential properties are unlikely to be impacted significantly. Research on quarry establishment in the United States found no significant relationship between either the anticipation or establishment of quarries negatively impacted residential home property values (Ford & Seals, 2018). Additionally, the presence of an existing, operational quarry adjacent to the proposed expansion means the area is already accustomed to the activities associated with quarrying and the Project is not a novel introduction to the landscape.

The rural vicinity of the Study Area requires a local source of aggregate for road maintenance. A reliable source of gravel for this road maintenance will help keep costs down, help provide smooth driving surfaces, increase safety, and increase desirability of living in the area (Mbiyana et al., 2023).

Recreation and Tourism

The Project's lack of visibility from the surrounding landscape and distance to areas of touristic interest means that it is unlikely to negatively impact tourism due to either noise or traffic, or by limiting recreational opportunities. ATV riders using nearby ATVANS trails may hear quarrying, although they are unlikely to notice sounds from the quarry over their own motorized vehicles.

Quarries are important to support development of all types including public infrastructure such as roads and trails, and private enterprise including constructing buildings and other projects. Due to the high cost of transporting aggregates, a nearby supply is vital for general construction and infrastructure purposes, making a quarry such as this Project a vital resource to regional development (Stratford Analytics, 2026). As the population in Kings County continues to grow, increased construction of residential properties, commercial services, public infrastructure, and more will require such a source of aggregate. Additionally, recreation often depends on a nearby aggregate source for purposes such as maintaining gravel roads and parking lots to access trails, providing a durable gravel surface for trails, and in the construction of recreational facilities.

The Proponent is committed to engaging with local recreational groups on the continued enjoyment of the region's recreational and tourism attractions, including addressing any safety considerations for recreational use near the Study Area. For Project and public safety, signs will be posted at the property's perimeter, warning people about the active quarry and the dangers present. This will prevent recreationalists from accidentally getting too close to the Project, where their physical health may be in danger from operations. This will not limit recreation opportunities on public land, whether by locals or tourists.

Mitigation Measures

The Project has been designed to minimize potential effects to land use through siting considerations, largely by expanding on an existing quarry where such operations are already part of the landscape. The Project has adequate spatial and topographic separation from receptors to avoid nuisance interactions such as operational noise and dust proliferation.

To minimize impacts to recreation and tourism, the following mitigation measures are planned:

- Engage with nearby landowners and community members.

Monitoring

No specific land use monitoring programs are proposed. The Proponent will maintain ongoing communication with nearby landowners to minimize impacts to nearby properties.

Conclusion

The impact to land use is expected to be negligible, as impacts to nearby properties are minimal while the Project itself will be a substantial source of materials to support growth and development in the area. The effect is therefore considered not significant.

12.0 ARCHAEOLOGICAL RESOURCES

12.1 Overview

An Archaeological Resource Impact Assessment (ARIA) was undertaken to identify areas of elevated potential to encounter archaeological resources within the Study Area. Boreas Heritage Consulting Inc. (Boreas) was retained to conduct the ARIA, which was directed by Colin Hicks and completed in August 2025. The report for the Project was submitted to NSCCTH and received approval on November 14, 2025.

12.2 Regulatory Context

The *Special Places Protection Act* (Nova Scotia, 1989b) provides the Province of Nova Scotia with a mandate to protect important archaeological, historical, and paleontological sites and remains. 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 personnel.

This ARIA was conducted in accordance with the terms of Heritage Research Permit A2025NS130, 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 ARIA is provided in the EA, with the ARIA report provided directly to NSCCTH.

12.3 Assessment Methods

The objectives of the ARIA were to:

- Evaluate archeological potential within the Assessment Area.
- Identify, delineate, and investigate (where recommended) areas considered to exhibit elevated 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, Boreas designed an assessment strategy consisting of a historical background study [including engagement with the KMK Archaeological Research Division (KMK-ARD)], predictive modelling, and field reconnaissance.

The historical background study examined several resources to understand the environmental, archaeological, and historical context of the Study Area. The environmental context of the Study Area was examined to identify past and current environmental influences or conditions that may elevate archaeological potential (e.g., topography, local resources, and potential for agriculture). The archaeological context was examined to identify how people used and occupied the surrounding landscape based on evidence from previously registered archaeological sites and past archaeological work conducted near the Project. The historical context was examined to identify how people used and occupied the local area based on evidence from published archival documents, ethno-historic records, local oral traditions, historic maps, local and/or regional histories, scholarly texts, and available property records. Specifically, the following resources were consulted:

- Historical maps, manuscripts, and other published literature from a variety of sources
- LiDAR and air photos
- The Maritime Archaeological Resource Inventory (MARI)
- Consultation with KMK-ARD regarding traditional Mi'kmaw land use

In Nova Scotia, MARI is maintained by the Nova Scotia Museum on behalf of NSCCTH. Reports from past archaeological assessments and academic research conducted near the Project provide archaeological context, which informs the interpretation and evaluation of any potential archaeological resources identified during the field component of the ARIA. Information about four previously surveyed archaeological sites provided additional context for understanding historical land use and archaeological resources in the Assessment Area. In preparation for field surveys, a predictive modelling exercise was conducted to produce an archaeological potential model (APM) to consider past patterns of land use and settlement, and corresponding potential for archaeological resources across the landscape. The model was developed by incorporating information about proximity to water, slope, aspect, elevation, and proximity to known Indigenous Ancestral and/or archaeological sites. The APM was applied to the Study Area to determine areas of elevated potential that warranted further examination.

The field component of the ARIA involved an on-site visual, non-intrusive examination of the Study Area on August 7, 2025. Parallel pedestrian transects were completed throughout the Assessment Area to visually assess archaeological potential at intervals of approximately 50 to 60 m in areas exhibiting low archaeological potential, and intervals of 20 to 30 m in areas with elevated potential. During surveys, details of observations were documented in field notes, and photographs were captured with location and orientation information. A hand-held GPS unit was used to record coordinates and track logs.

Upon completion of the desktop and field assessment, analysis, and interpretation, the assessment results were summarized in the ARIA (submitted to NSCCTH under separate cover). The ARIA includes recommendations for appropriate resource management strategies specific to each area of elevated potential.

12.4 Assessment Results

Two areas considered to exhibit high potential for encountering archaeological resources were identified during the field component of the ARIA led by Boreas. The HPAs are in a portion of the Study Area that has been avoided through the Project's iterative design process. The remainder of the Study Area was deemed to have a low potential for archaeological resources and no further actions were recommended by Boreas, a recommendation accepted by NSCCTH.

12.5 Effects Assessment

Project-Archaeological Resource Interactions

Project activities could interact with archaeological resources during ground disturbance, including earth-moving activities, during the operations phase (Table 12.1).

Table 12.1: Potential Project-Archaeological Resources Interactions

Project Phase	Potential for Interaction
Operations	
Vegetation clearing	X
Grubbing	X
Stockpiling of topsoil and overburden	X
Drilling and blasting	X
Processing (crushing and screening)	X
Transportation of rock and product	-
Decommissioning	
Infrastructure removal	-
Site reclamation	-

Assessment Boundaries

The LAA for archaeological resources is the Study Area. The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.3 apply to 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 the 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 PDA and will occur during the operations phase. Ground disturbance will also occur during decommissioning but will be limited to areas cleared during operations.

Based on the results of the ARIA, Project activities are considered to have a low potential for encountering archaeological resources throughout most of the Study Area. The two HPAs identified within the Study Area will be avoided by Project activities by ensuring no ground disturbance occurs within these identified areas.

Mitigation Measures

The following mitigation measures are recommended:

- Maintain avoidance of sites with high potential for archaeological resources.
- Conduct shovel testing if it is determined that HPAs cannot be avoided in accordance with Boreas' approved recommendations.
- 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.
- Conduct additional archaeological assessments in areas requiring vegetation clearing or ground disturbance that have not been previously assessed as part of the ARIA. The EA Branch will be provided with the acceptance letter from NSCCTH prior to conducting activities that would disturb newly proposed areas.

Monitoring

No monitoring programs are proposed.

Conclusion

The predicted residual effects of the Project on archaeological resources (after mitigation) are characterized in Table 12.2.

Table 12.2: Archaeological Resources Residual Effects

Effect Detail	Loss of Archaeological Resources
Magnitude of Effects	Low: Activities have a low potential for encountering archaeological resources during ground disturbance.
Geographic Extent of Effects	PDA, Should unlikely impacts to archeological resources occur
Frequency of Effects	Single Event: Should unlikely impacts to archeological resources occur, effects would occur once, during ground disturbance or vegetation clearing for the Project.
Duration of Effects	Medium Term: Should unlikely impacts to archeological resources occur, they would be limited to the clearing and disturbance phase.
Reversibility of Effects	Irreversible: Should unlikely impacts to archeological resources occur, the effects would not be reversible.
Significance Level	Not Significant
Effects Assessment Ratings (Refer to Table 4.3 for definitions) Magnitude: Negligible, 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	Exhaust Emissions	Low: Some exhaust emissions are anticipated, but are expected to be similar to what is already produced on the site.	LAA	Continuous: Effects may occur during the Project's operations and decommissioning phases, but only intermittently and during active quarrying.	Medium Term: Effects are likely to occur during all Project phases.	Irreversible	Not Significant
Climate Change	GHG Emissions	Low: GHG emissions are anticipated, but are expected to be similar to what is already produced on the site.	LAA	Continuous: Effects will occur continuously during quarry operations.	Medium Term: Effects are likely to occur during all Project phases.	Irreversible	Not Significant
Sound	Operational Noise	Low: Operational sound is to be completed in accordance with the relevant Pit and Quarry Guidelines as well as the Guidelines for Environmental Noise Measurement and Assessment sound level.	LAA	Continuous: Effects will occur continuously during quarry operations and are anticipated to increase for a short duration during blasting.	Medium Term: Effects are likely to occur during all Project phases.	Reversible	Not Significant

VC	Effect	Magnitude of Effect	Geographic Extent of Effect	Frequency of Effect	Duration of Effect	Reversibility of Effect	Significance Level
Geophysical Environment	Encountered Geologic Hazard	Moderate: Risk mapping shows the potential for geologic hazards in the Study Area.	LAA	Continuous: If present, effects may occur continuously.	Medium Term: If present, effects will extend through all phases, but end after decommissioning.	Partially Reversible	Not Significant
	Change to Groundwater Quality or Quantity	Moderate: Groundwater wells located within 800 m of the Project Footprint.	LAA	Intermittent: Effects may occur during blasting.	Medium Term: If present, effects will extend through all phases, but end after decommissioning.	Partially Reversible	Not Significant
Surface Water, Fish, and Fish Habitat	Erosion and Sedimentation	Low: Erosion and sediment controls and a 30 m buffer are expected to minimize impacts.	Study Area	Intermittent: Effects may occur during construction and during operations.	Medium Term: Effects may occur during all phases but will not extend beyond decommissioning.	Partially Reversible	Not Significant
	Blasting	Low: Blast Management Plan is expected to minimize impacts.	Study Area	Intermittent: Effects will occur annually during blasting	Short Term: Effects are expected only during blasting, which occurs yearly.	Partially Reversible	Not Significant
	Changes to Water Quality and Quantity	Low: Erosion and sediment controls and a 30 m buffer are expected to minimize impacts.	Study Area	Intermittent: Effects may occur during construction and during operations.	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 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 LAA.	Study 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.	Study 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 and/or Alteration of Vegetation Communities	Low: Small loss of unique vegetation communities.	LAA	Intermittent: Effects may occur during initial site preparation and throughout operations.	Long Term: Effects may last throughout all phases.	Partially Reversible	Not Significant
	Loss of Flora Individuals and/or Impacts to Flora Habitat	Moderate: Small loss of SOCI individuals.	LAA	Intermittent: Effects may occur during initial site preparation and throughout operations.	Long Term: Effects may last throughout all phases.	Partially Reversible	Not Significant

VC	Effect	Magnitude of Effect	Geographic Extent of Effect	Frequency of Effect	Duration of Effect	Reversibility of Effect	Significance Level
	Indirect Effects	Low: Small effect to habitat supporting terrestrial flora SAR and/or SOCI due to edge effects.	LAA	Intermittent: Effects may occur during initial site preparation and throughout operations.	Medium Term: Effects may occur during site preparation and throughout operations.	Partially Reversible	Not Significant
Terrestrial Fauna	Habitat Loss and Fragmentation	Low: Small loss of habitat supporting fauna.	LAA	Intermittent: Effects occur occasionally or intermittently during one or more phase of the Project.	Long Term: Effects will last beyond decommissioning.	Partially Reversible	Not Significant
	Injury and Mortality	Low: Low impacts to fauna through injury and mortality.	LAA	Intermittent: Effects occur occasionally or intermittently during one or more phase of the Project.	Medium Term: Effects will end once decommissioning is complete.	Partially Reversible	Not Significant
	Sensory Disturbance	Moderate: Moderate impacts to fauna through sensory disturbance.	LAA	Intermittent: Effects occur occasionally or intermittently during one or more phase of the Project.	Medium Term: Effects will end once decommissioning is complete.	Reversible	Not Significant
Avifauna	Habitat Loss, Alteration/ Fragmentation, and Edge Effect	Low: Small loss of fauna habitat or small sensory disturbance to fauna.	LAA	Intermittent: Effects may occur during initial site preparation and throughout operations	Medium Term: Habitat loss and alteration occur annual during blasting	Partially Reversible	Not Significant
	Sensory Disturbance – Light and Noise	Low: Small impact on a number of birds in the LAA.	LAA	Intermittent: Effects may occur during initial site preparation and throughout operations	Medium Term: Residual impacts of sensory disturbance due to noise and light will end after 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
	Mortality and Injury	Low: Small impact on a number of birds in the PDA.	PDA	Intermittent: Effects may occur during initial site preparation and throughout operations.	Medium Term: Mortality and injury will end after decommissioning	Mortality is irreversible, injury is reversible if attended to.	Not Significant
Economy	Economic Impact	Positive: Expected to have a positive impact on the economy.	Kings and Annapolis Counties, 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.
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.					
Archaeological Resources	Loss of Archaeological Resources	Low: Activities have a low potential for encountering archaeological resources during ground disturbance.	Study Area	Single Event: Should unlikely impacts to archeological resources occur, effects would occur once, during initial ground disturbance or vegetation clearing for the Project.	Medium Term: Should unlikely impacts to archeological resources occur, they would be limited to the clearing and disturbance phase.	Irreversible: Should unlikely impacts to archeological resources occur, the effects would not be reversible.	Not Significant
Effects Assessment Ratings (Refer to Table 4.3 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 sections examine how aspects of the external environment may impact Project operations, with a focus on extreme weather events and natural hazards. The Project is expected to be operational for up to 40 years, such that the effects of climate change are relevant to the Project. Incorporating climate change and sustainability considerations into the Project's design will increase its resilience, and a series of mitigation strategies to minimize potential impacts have therefore been developed.

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 and altered precipitation regimes are 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). Under the high emissions scenario of the Coupled Model Intercomparison Project Phase 6 (CMIP6), annual average temperatures in the Study Area are expected to increase from the 1971-2000 baseline of 6.0°C to 8.6°C in the 2021-2070 period (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 11.2.2.

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 111 mm/y higher by 2041-2070 relative to the 1971-2000 baseline (ClimateData.ca, 2025). Heavy rainfall events have the potential to impact operations by increasing the risk of overland flooding 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:

- Minimizing alterations to wetlands.
- Maintaining buffers on wetlands and watercourses.
- Maintaining existing drainage and infiltration patterns.

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).

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, and cold temperatures. 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. Lightning strikes have the potential to damage Project infrastructure and are a risk to human health and safety. Fire extinguishers will be located on site in case of fire. The Project will assess working conditions and cease work as necessary when there are risks of lightning strikes at the Project site. The Proponent will ensure site access is maintained in adverse conditions by clearing site roads or providing vehicles that can traverse all conditions.

14.2.2 Wildfire

Wildfire poses a potential risk to the Project during all Project phases. The PDA is surrounded by forest cover; as such, there is potential for naturally occurring and/or 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 (Taylor et al., 2020). In recent years, several large wildfires have occurred in Nova Scotia, which were exacerbated by prolonged dry periods, including the Lake George Fire in 2025 which was in close proximity to the Study Area before it was contained.

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 and that site personnel are trained in its use.
- Consider weather conditions and forecasts when scheduling activities.

14.3 **Summary of Effects**

The environmental effects associated with climate change and natural hazards have the potential to affect all phases of the Project. There are several planning and operational strategies that can mitigate potential effects of the environment on the Project to lower the risk of damage to the Project or interruption of operation. In summary, the effects of the environment on the Project as a result of climate and meteorological conditions, including climate change, will be not significant.

15.0 **ACCIDENTS, MALFUNCTIONS, AND UNPLANNED EVENTS**

Accidents, malfunctions, and unplanned events are events that are not planned or anticipated to be part of any Project phase but could cause a significant adverse environmental effect in the event of occurrence, if not properly mitigated or managed.

This section addresses the accidents, malfunctions, and unplanned events associated with the Project's operations and decommissioning phases that could potentially result in environmental impacts. The circumstances under which the events could occur are described, and proposed risk mitigations are provided in subsequent sections. The risks associated with accidents and malfunctions are determined by both their likelihood and potential consequences. To address these risks, mitigation strategies will be designed and applied throughout the Project's life cycle.

Accidents, malfunctions, and unplanned events considered as part of this EA include the following:

- ESC failures
- Fire and explosions
- Fuel and Hazardous Chemical spills & releases
- Vehicle collisions

15.1 ESC failures

ESCs are implemented to minimize and mitigate the transportation and deposition of sediment from disturbed soils (i.e., excavation) and stockpiled materials to the surrounding environment during all Project phases.

ESC failures may result from extreme rainfall, insufficient or improper installation of control measures, and inadequate maintenance. An ESC failure could potentially lead to the release of suspended solids into environmentally sensitive areas. Such releases can affect both terrestrial and aquatic habitats, including water quality, and, if unmanaged, can contribute to blockage and flooding.

Uncontrolled sediment discharge may occur if ESCs fail. ESCs will be installed and designed in accordance with best management practices and tailored to local site conditions.

ESCs will be an integral component of all phases of the Project and shall be installed prior to site disturbance. Project personnel will monitor weather warnings to stabilize any ESCs before and after extreme events, and regular inspections will be conducted to ensure effectiveness. Any deficiencies will be promptly repaired or reinforced, with additional controls deployed as needed.

15.2 Fires and Explosions

A fire or explosion could potentially occur during any phase of the Project development due to equipment failure, improper handling of fuels or explosives, human error, or as a result of a natural ignition source (such as lightning) striking the Project Area. Immediate concerns relate to worker safety, with secondary risks including habitat loss, impacts to wildlife, and damage to Project infrastructure. Combustion may also produce smoke, particulate matter, and trace gases. Risks associated with explosive use, including accidental detonation or fly rock, could also potentially occur.

The likelihood of fire or explosion will be reduced through careful management of fuels and explosives, chemical storage, and adherence to established handling and transport procedures. Equipment will be regularly inspected to ensure sound operation of hydraulic and electrical systems, and the Project will apply controlled execution of hot-work tasks to prevent and limit ignition potential.

Explosives will be stored and handled by certified third-party blasters in accordance with recognized safety practices and regulatory requirements for hazard management and worker competency. On-site blasting will only be conducted under the direction and control of a certified blaster and will comply with the Blasting Safety Regulations (NSECC, 2013).

A Contingency Plan will be developed as part of the IA and will outline fire and explosion prevention protocols, reporting procedures, and response actions. In the unlikely event of a major incident, local emergency responders would be engaged to support with containing the situation and protecting worker and public safety.

15.3 Fuel and Hazardous Chemical Spills & Releases

During Project activities, fuel and hazardous spills could result from the use, handling, storage and transportation of petroleum products (such as gasoline or diesel, lubricants), chemicals (such as antifreeze), or explosives. Potential spill sources include fuelling activities, product transfer, maintenance activities, equipment malfunction/wear and tear, vehicle collisions, and storage or containment failure, with the potential for off-site environmental effects in the absence of timely response measures. Spill risk is highest during refuelling, product transfer, and mobile equipment maintenance activities. In a worst-case vehicle collision, the entire volume of fuel or chemical could be released into the environment. Improperly managed releases can result in impacts to soil, groundwater, and surface water, potentially impacting habitat quality and exposing wildlife to contaminants through ingestion or uptake.

The likelihood of accidental release will be mitigated by ensuring that hazardous products are stored, handled, transported, and utilized in compliance with applicable regulatory requirements, including implementation of the Workplace Hazardous Material Information System for Classification, labelling and use of Safety Data Sheets (Government of Canada, 2025) and following the Transportation of Dangerous Goods Regulations for road transport (Canada, 2024, 2025). To limit impacts to sensitive environments, fuel storage, refuelling, and mobile equipment maintenance will be located a minimum of 30 m from watercourses, wetlands, and groundwater features. Preventative inspection and maintenance programs will be implemented for all mobile and processing equipment to identify and repair leaks or equipment deficiencies. Equipment servicing will be completed off-site where feasible or, if required, on-site, within designated areas located more than 30 m from watercourses and wetlands.

In the event of a spill or leakage, immediate action will be taken to stop the release, contain and recover the spilled material, and prevent migration to surrounding environments. Response actions will be implemented immediately in accordance with the project-specific contingency plan. Contaminated materials will be transported and disposed of at approved waste disposal facilities. All spills will be reported in accordance with the regulatory requirements.

To minimize the magnitude and extent of potential environmental impacts, mobile equipment and work areas will be equipped with appropriately stocked spill kits, and personnel will be

trained in spill prevention and response procedures to ensure a prompt and effective response in the event of a release.

15.4 Vehicle Collisions

Vehicle collisions represent a potential risk during all phases of the Project due to the frequent movement of vehicles and equipment within the Project Area. Site entrances and extraction and stockpile areas are at higher risk of incidents due to increased traffic. Potential causes of vehicle collisions could include circumstances of increased site activity (i.e., hauling and transport), limited visibility, adverse weather conditions, equipment malfunction, or human error. Vehicle collisions could result in injury to workers or the public, damage to equipment or infrastructure, disruption of site operations or public traffic, and secondary environmental effects such as fuel or chemical releases.

Mitigation measures to limit the probability of an incident and reduce the magnitude and extent of potential effects include complying with all regulations related to transportation, establishing and enforcing safe speed limits on the site, installing of signage in accordance with relevant traffic regulations (especially at site entrances/access points to public roads), and ensuring adequate visibility by ceasing operations in circumstances of inclement weather and low visibility (i.e., darkness) unless sufficient mitigations can be implemented.

The proponent will ensure that employees, suppliers, and clients comply with safety measures, spill prevention protocols, and best management practices during Project activities. With the implementation of preventative measures and appropriate response plans, any interactions with VCs in the event of an accident or malfunction will be limited, and the effects will be quickly contained.

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 to a VC of interest.

16.2 Cumulative Effects Assessment Methods

The goal of a Cumulative Effects Assessment (CEA) is to assess changes to an environmental condition (VC) that could occur based on a combination of the proposed Project with other past, present, or reasonably foreseeable future projects. The CEA is completed using publicly available data, with uncertainties clearly identified, following guidance outlined in the Cumulative Effects Assessment Practitioners Guide (Hegmann et al., 1999). As outlined by Hegmann et al. (1999), a CEA scoping exercise is completed using the following steps:

- Identification of the VCs that will enter the CEA process.
- Determination of spatial and temporal boundaries for the CEA.
- Identification and description of other projects or activities in the spatial boundary (or boundaries).
- Confirmation of which VCs will be carried through the CEA process.

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 is considered. It is not uncommon for data on effects of other projects or activities to be limited, increasing the uncertainty of the CEA predictions.

16.2.1 Selection of Boundaries

To identify other projects for inclusion in the CEA, a 5 km buffer on the Project Area was selected as a conservatively inclusive boundary. For the CEA, Strum considered past projects as those registered, approved, and constructed within the past 10 years, selected from the Environmental Assessment Projects Dashboard (NSECC, 2026). Reasonably foreseeable future projects are those which have been registered with an EA document through NSECC but have not been approved or constructed.

There are no other projects identified that overlap spatially or temporally with the Project and that could interact with it.

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 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 are available to support an assessment of cumulative effects associated with general land use).

16.3 Cumulative Effects Assessment Conclusion

The primary pathways of effects to the environment from the Project include impacts to air quality (dust), noise generation and loss of habitat. The Project’s habitat loss in forest habitats (and therefore effects to species that rely on those habitats), may extend up to 52.9 ha over the next 40 years as the quarry slowly expands into the PDA. As there were no other projects or activities identified within the 5 km buffer that could contribute to effects on the same valued components, the Project would act as the sole source of potential effects.

Through the effects assessment, no significant adverse residual effects were identified to the VCs evaluated. Details of the effects assessment for each VC evaluated can be found in Sections 7 to 12. As a result, cumulative effects are not expected, and residual effects of the Project are not anticipated to contribute to cumulative effects on any valued component.

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 J. A list of the Project Team and their associated roles is provided below.

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DRAWINGS

APPENDIX A

MI'KMAQ ENGAGEMENT

Prospect Industrial Equipment Sales & Rentals Ltd.

323 Cambridge Mountain Road
Cambridge Station, Nova Scotia, B0P 1G0
Telephone: (902) 538-3275 Fax: (902) 538-9232
Email: tanyabanks@howardlittleexcavating.com

December 9, 2025

Sipekne'katik First Nations
552 Church St.
Indian Brook, NS B0N 1W0

Chief Michelle Glasgow,

I'm writing to inform you that Prospect Industrial Equipment Sales & Rentals Ltd. intends to register an expansion of its Sturk aggregate quarry as a Class 1 undertaking under Section 9(1) of the Environmental Assessment Regulations under the *Nova Scotia Environment Act*.

As part of the process, we are contacting government officials, local residents, and the Mi'kmaq community to provide information about the project and invite feedback.

Prospect Industrial Equipment Sales & Rentals Ltd. is a construction company which operates aggregate quarries throughout the Annapolis Valley, which are an important source of aggregate material for many local and regional projects. The Sturk Quarry is in the community of Morristown, Kings County, approximately 10 km northwest of Berwick and roughly the same distance from Aylesford. The company wishes to continue operating the quarry and to expand its footprint in upcoming years, requiring an approval from the Province of Nova Scotia. The scope of operations for the quarry is not expected to change from the present. An Environmental Assessment is currently underway, as required under Part IV of the Nova Scotia Environment Act. The current approved quarry is located at 568 Canaan Rd, Morristown, Kings County, Nova Scotia (PID 55514392, 55518898).

Strum Consulting of Halifax, Nova Scotia, is preparing an Environmental Assessment Registration Document that includes information regarding the environmental and socio-economic implications of the Sturk Quarry, with an anticipated submission to Nova Scotia Environment and Climate Change (NSECC) in early spring 2026. At that time, the document will become available online and publicly accessible locations (e.g. Morristown Community Hall and the Municipal of the County of Kings office) for review and comment for a 30-day period. A public notification will also appear in the Chronicle Herald on the registration date with details of the quarry expansion project and availability of the registration document.

The nearest Mi'kmaq communities to the Quarry is the Annapolis Valley First Nations, located 25 km from the quarry. Boreas Heritage Consulting Inc. completed an Archeological Resource Impact Assessment (Heritage Research Permit A2025NS130) in August 2025.

Prospect Industrial Equipment Sales & Rentals Ltd. extends an invitation to meet and discuss details of the Sturk Quarry project in the coming weeks. Please contact me at your convenience if you would like to schedule a meeting.

Sincerely,

Tanya Banks
Prospect Industrial Equipment Sales & Rentals Ltd.



Meet Wanda: Wanda wonders about WHY pits and quarries are needed and HOW they operate.

Everything we eat, drink, work and play with comes from the earth. That includes the materials we use to build our communities. Did you know some of the most important materials for building our communities are stone, sand and gravel – aggregates – that come from the earth? The roads we drive on, the arenas we skate in and the schools we learn in are built from stone, sand and gravel all from the earth.

Pit

Sand and gravel left behind by glaciers provides some of what we need to build our communities. Glaciers used to cover most of the earth. A glacier is a river of ice. As it moves it pushes millions of tonnes of earth. The freezing, thawing and scraping of the glacier breaks up the earth underneath it. When it melts, glaciers leave behind 'deposits' of sand and gravel. It is this sand and gravel that is dug out in a pit and sold to construct our roads, bike paths, homes, swimming pools, and shopping malls.

Quarry

A quarry makes stone from the solid bedrock of the earth's crust. In a quarry, the glaciers have not done our work for us. Explosives are used to remove the solid rock.

A licence is required in order to establish a Pit or a Quarry. In order to get a licence:

- There must be stone, sand or gravel (resources) in the location.
- The resource must be good enough to use for construction.
- There must be a plan for how the resources will be removed and processed.
- Potential impacts to the water, habitats, vegetation, animals and people must be assessed.
- A plan to protect the water, habitats, vegetation and animals must be provided.
- Where necessary, a plan to monitor the water, habitats, vegetation and animals must be developed.
- A plan for the rehabilitation of the site must be provided.
- Technical experts review the information and decide whether it makes sense to issue the licence and approve the site plans.

The approved site plans instruct the pit or quarry owner how to operate. The quarry owners must monitor, check and inspect that they are operating as the site plan says. They also have to adapt their operations to protect the environment.

Steps involved in the operation of a Quarry

- stripping
- drilling
- blasting
- hauling
- processing
- screening
- washing
- stockpiling
- weighing
- shipping
- rehabilitating

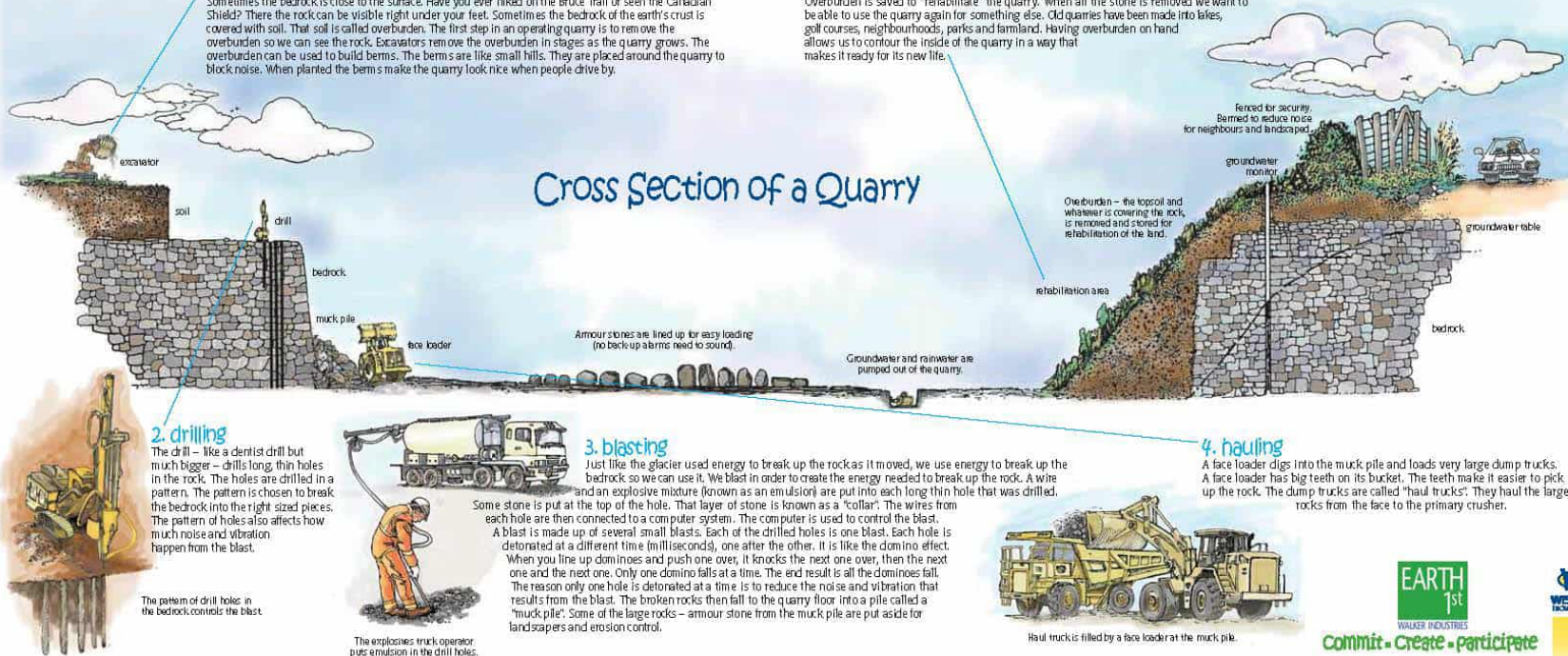
1. stripping

Sometimes the bedrock is close to the surface. Have you ever hiked on the Bruce Trail or seen the Canadian Shield? There the rock can be visible right under your feet. Sometimes the bedrock of the earth's crust is covered with soil. That soil is called overburden. The first step in an operating quarry is to remove the overburden so we can see the rock. Excavators remove the overburden in stages as the quarry grows. The overburden can be used to build berms. The berms are like small hills. They are placed around the quarry to block noise. When planted the berms make the quarry look nice when people drive by.

11. rehabilitating

Overburden is saved to "rehabilitate" the quarry. When all the stone is removed we want to be able to use the quarry again for something else. Old quarries have been made into lakes, golf courses, neighbourhoods, parks and farmland. Having overburden on hand allows us to contour the inside of the quarry in a way that makes it ready for its new life.

Cross Section of a Quarry



2. drilling

The drill - like a dentist drill but much bigger - drills long, thin holes in the rock. The holes are drilled in a pattern. The pattern is chosen to break the bedrock into the right sized pieces. The pattern of holes also affects how much noise and vibration happen from the blast.

The pattern of drill holes in the bedrock controls the blast.

3. blasting

Just like the glacier used energy to break up the rock as it moved, we use energy to break up the bedrock so we can use it. We blast in order to create the energy needed to break up the rock. A wire and an explosive mixture (known as an emulsion) are put into each long thin hole that was drilled. The wires from each hole are then connected to a computer system. The computer is used to control the blast. A blast is made up of several small blasts. Each of the drilled holes is one blast. Each hole is detonated at a different time (in milliseconds), one after the other. It is like the domino effect. When you line up dominoes and push one over, it knocks the next one over, then the next one and the next one. Only one domino falls at a time. The end result is all the dominoes fall. The reason only one hole is detonated at a time is to reduce the noise and vibration that results from the blast. The broken rocks then fall to the quarry floor into a pile called a "muck pile". Some of the large rocks - armour stone from the muck pile are put aside for landscapers and erosion control.

4. hauling

A face loader digs into the muck pile and loads very large dump trucks. A face loader has big teeth on its bucket. The teeth make it easier to pick up the rock. The dump trucks are called "haul trucks". They haul the large rocks from the face to the primary crusher.



Haul truck is filled by a face loader at the muck pile.

EARTH
1st
WALKER INDUSTRIES
Commit • Create • Participate

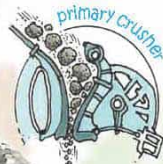


Steps involved in the operation of a Quarry continued...

5. processing plant

The processing plant is made up of crushers, screens and conveyors. The crushers take big rocks and make smaller stones. Screens sort the stone into various sizes. Conveyors move the rock from crushers to screens and from screens to stockpiles. The first crusher in the processing plant is called the "primary crusher". It crushes the largest rocks. The jaw crusher chews up rock just like your jaw chews up food.

haul truck dumps into the enclosed primary crusher



6. screening

Screens are sieves with different sized holes in them. The top screen has larger holes and the size of the holes in the next screen are smaller and the next screen the holes are smaller again. This sorts the stones passing through the screens into different sizes. The screens are just like the strainer in your kitchen. The strainer lets you wash vegetables. The water passes through the holes but the vegetables stay in the strainer.



7. washing

Some stones need to have a shower to wash the dust off before they are used. Stones take their shower in the wash plant. Water sprays on the stone as it moves through the wash plant. The water from the wash plant goes to a pond where it sits still for awhile. Have you ever put muddy water in a jar before? If you shake it up the water turns grey. All the mud particles scatter in the water. When you let that jar sit over night the mud particles settle to the bottom of the jar. The water becomes clearer. That is what happens in the settling pond. The fine stone particles settle out and the water becomes clear. The clear water can be reused to wash more stone. The fine stone particles can be used to improve the soil on farm fields.

8. stockpiling

The stones that are sorted by the screens are put into different piles known as stockpiles. Dump trucks are used to transport stone to the customer. A yard loader is used to load the dump trucks. The yard loader has a flat blade on its bucket. The flat blade makes it easier to pick up the small stones.



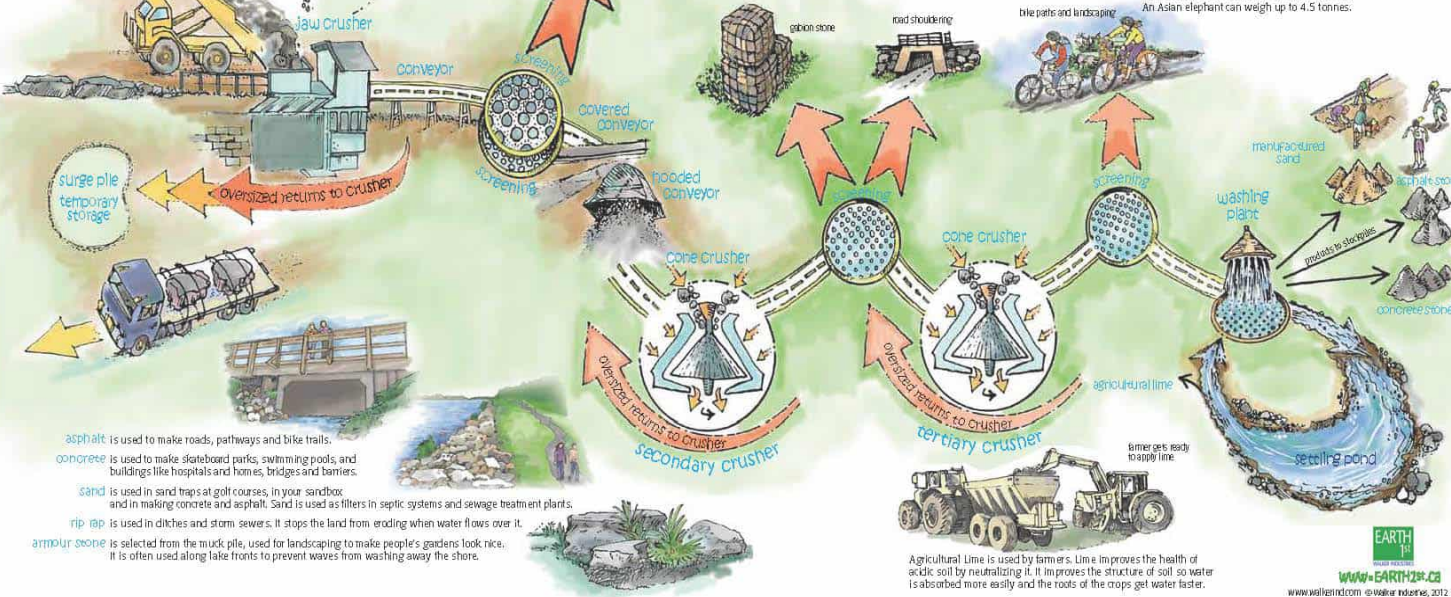
9. weighing

Once the trucks are loaded they are weighed. Stone, sand and gravel is sold by weight.



10. shipping

A dump truck can carry 18-23 tonnes of stone to a construction site. It takes 18,000 tonnes of stone to build one kilometer of a two lane road. An Asian elephant can weigh up to 4.5 tonnes.



December 9, 2025
Annapolis Valley First Nation
29 Toney Blvd
Cambridge NS B0P 1G0

Chief Deborah Robinson,

I'm writing to inform you that Prospect Industrial Equipment Sales & Rentals Ltd. intends to register an expansion of its Sturk aggregate quarry as a Class 1 undertaking under Section 9(1) of the Environmental Assessment Regulations under the Nova Scotia Environment Act.

As part of the process, we are contacting government officials, local residents, and the Mi'kmaq community to provide information about the project and invite feedback.

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Sincerely,

Tanya Banks
Prospect Industrial Equipment Sales & Rentals Ltd.

APPENDIX B

PUBLIC ENGAGEMENT

Prospect Industrial Equipment Sales & Rentals Ltd.

323 Cambridge Mountain Road
Cambridge Station, Nova Scotia, B0P 1G0
Telephone: (902) 538-3275 Fax: (902) 538-9232
Email: tanyabanks@howardlittleexcavating.com

April 9, 2026

Morristown Community Members,

50 years ago, while trucking to Newfoundland for Eassons Transport, Howard traded his pickup truck for a 40-acre piece of land with gravel on it, with the intention to sell a little gravel on weekends. Soon after, his dad gave him an old farm truck which he restored and installed a dump body on for gravel deliveries. Then with a loan, and a trade in with his only car, he bought a backhoe. In 1976 he started his business full time and started hiring help under Howard E Little Excavating Limited. Today his company has expanded to include several sister companies, one being Prospect Industrial Equipment Sales and Rentals Limited. Howard E Little Excavating along with its sister companies employ 50+ people and bids on multi-million-dollar projects, operates several gravel and topsoil pits, an asphalt plant and paving operation, bin rentals with our company, Tri-County Waste and multiple other services! There is no question that Howard has put his heart and soul into his business and the company has a strong reputation for doing the job right! Howard is thankful to his staff, suppliers and customers for being part of the business' success.

I'm writing to inform you that Prospect Industrial Equipment Sales & Rentals Ltd. (Prospect) intends to register an expansion of its Sturk aggregate quarry as a Class 1 undertaking under Section 9(1) of the Environmental Assessment Regulations under the *Nova Scotia Environment Act*. As part of the process, we are contacting government officials, local residents, and the Mi'kmaq community to provide information about the project and invite feedback.

Project Overview

The Sturk Quarry is in the community of Morristown, Kings County, approximately 10 km northwest of Berwick and roughly the same distance from Aylesford. Prospect wishes to continue operating the quarry and to expand its footprint in upcoming years, requiring an approval from the Province of Nova Scotia. The scope of operations for the quarry is not expected to change from the present. An Environmental Assessment is currently underway, as required under Part IV of the Nova Scotia Environment Act. The current approved quarry is located at 568 Canaan Rd, Morristown, Kings County, Nova Scotia (PID 55514392, 55518898).

Strum Consulting of Halifax, Nova Scotia, is preparing an Environmental Assessment Registration Document that includes information regarding the environmental and socio-economic implications

of the Sturk Quarry, with an anticipated submission to Nova Scotia Environment and Climate Change (NSECC) in spring 2026. At that time, the document will become available online for review and comment for a 30-day period. A public notification will also appear in the Chronicle Herald on the registration date with details of the quarry expansion project and availability of the registration document.

Onsite activities include:

- Site preparation including overburden removal and stockpiling
- Resource excavation via drilling and blasting (estimated to occur between April 1 and May 31st of each year, during a 3–6-week period).
- Crushing and Screening (frequency depending on market demand),
- Stockpiling of the aggregate material onsite for use all year around,
- Transportation/Trucking, and
- Reclamation and closure (approximately 30 years)

Environmental Assessment

The Project is subject to provincial regulatory review by Nova Scotia Environment & Climate Change (NSECC) under the Nova Scotia Environmental Assessment (EA) Regulations (Section 49 of the *NS Environment Act*). An EA is a decision-making tool used to promote sustainable development, while protecting and conserving the environment, by evaluating the potential environmental and socio-economic effects of a project. It is a well-defined process in Nova Scotia that includes environmental and socio-economic baseline studies. Consultation is important and includes the public, Mi'kmaq, and all levels of government during the assessment. Public and stakeholder input helps Sturk Quarry address public concerns prior to registration of the project and submission of the assessment report to the government. Once the EA has been submitted (i.e. registered), the public has a further opportunity to provide comments to the government on the final submitted documents. For more information on the EA process, please visit: <https://novascotia.ca/nse/ea/faqs.asp>

In preparation for the EA process, numerous field programs have occurred within the Study Area. The Sturk quarry expansion layout has been intentionally designed to avoid all watercourses on the property and avoid the largest wetland. Additional setbacks have been applied to minimize impacts to other environmental features including wetlands, flora and fauna. Prospect is committed to expanding their quarry in an environmentally responsible way.

Habitat Assessments Highlights

- Five watercourses were delineated (all are being avoided for impacts)
- Electrofishing and minnow trapping was conducted on the 5 watercourses. In total, 22 Brook Trout (both juvenile and adult) and 1 American Eel (adult) were captured.
- Eleven wetlands were delineated, classified (treed swamp) and assessed.
- No rare plants or lichens were observed during field surveys.

- Avian Surveys were completed. Nine Surveys in total: Spring Migration (2), Breeding Birds (2), Nightjar (2) and Fall Migration (3). SAR Observations: Olive-sided flycatcher & Eastern wood-pewee. SOCI Observations: Canada jay, Kildeer and Pine siskin.
- A Wildlife Survey was completed along with Trail Cameras: Four trail cameras were deployed for 7 weeks. The cameras were placed in areas with mature, soft wood trees near existing trails and water features with results showing one occurrence each of White-tailed Deer, Red Fox and Raccoon.
- Turtle Surveys were completed and no observations of turtles were found.
- A Bat Maternity Roost Survey was completed. No maternity bat roosts were identified in the direct study area.
- A Water Balance Assessment was completed and shows that there will be a small increase to the watersheds through surface water runoff. No negative impacts are expected to the local watersheds.
- An Archaeological Resource Impact Assessment was completed, no archaeological features or areas of significant cultural modification were encountered within the Study Area, which is considered to exhibit low potential for encountering archaeological resources.
- Any dug or drilled wells within 800m of the Project Development Area will be monitored. Blasting will be in compliance with the General Blasting Safety Regulations of Nova Scotia and the Nova Scotia Pit and Quarry Guidelines.
- Sturk Quarry will monitor blasting noise for the lifetime of the quarry. Dust emissions and air quality will be monitored and controlled in accordance with the applicable requirements. Dust suppression measures are already in place and will continue for the life of quarry.

Decommissioning and reclamation constitute the final phase of the project to return the area to a condition that is consistent with the natural surroundings and community use.

Decommissioning will involve the removal of all waste, equipment, and structures from the quarry property. Reclamation will aim to control erosion and sedimentation, restore soil capability, contour, and re-vegetation. Final reclamation will be done in consultation with the community, government, and other stakeholders.

Prospect Industrial Equipment Sales & Rentals Ltd. extends an invitation to discuss details of the Sturk Quarry project and values your input on the project. We will be collecting feedback on the project to incorporate into the Environmental Assessment Registration Document until April 17th. Please submit any questions or comments to tanyabanks@howardlittleexcavating.com or feel free to contact me at your earliest convenience if you would like to schedule a meeting.

Sincerely,

Tanya Banks
Prospect Industrial Equipment Sales & Rentals Ltd.



Meet Wanda: Wanda wonders about WHY pits and quarries are needed and HOW they operate.

Everything we eat, drink, work and play with comes from the earth. That includes the materials we use to build our communities. Did you know some of the most important materials for building our communities are stone, sand and gravel – aggregates – that come from the earth? The roads we drive on, the arenas we skate in and the schools we learn in are built from stone, sand and gravel all from the earth.

Pit

Sand and gravel left behind by glaciers provides some of what we need to build our communities. Glaciers used to cover most of the earth. A glacier is a river of ice. As it moves it pushes millions of tonnes of earth. The freezing, thawing and scraping of the glacier breaks up the earth underneath it. When it melts, glaciers leave behind 'deposits' of sand and gravel. It is this sand and gravel that is dug out in a pit and sold to construct our roads, bike paths, homes, swimming pools, and shopping malls.

Quarry

A quarry makes stone from the solid bedrock of the earth's crust. In a quarry, the glaciers have not done our work for us. Explosives are used to remove the solid rock.

A licence is required in order to establish a Pit or a Quarry. In order to get a licence:

- There must be stone, sand or gravel (resources) in the location.
- The resource must be good enough to use for construction.
- There must be a plan for how the resources will be removed and processed.
- Potential impacts to the water, habitats, vegetation, animals and people must be assessed.
- A plan to protect the water, habitats, vegetation and animals must be provided.
- Where necessary, a plan to monitor the water, habitats, vegetation and animals must be developed.
- A plan for the rehabilitation of the site must be provided.
- Technical experts review the information and decide whether it makes sense to issue the licence and approve the site plans.

The approved site plans instruct the pit or quarry owner how to operate. The quarry owners must monitor, check and inspect that they are operating as the site plan says. They also have to adapt their operations to protect the environment.

Steps Involved in the operation of a Quarry

- stripping
- drilling
- blasting
- hauling
- processing
- screening
- washing
- stockpiling
- weighing
- shipping
- rehabilitating

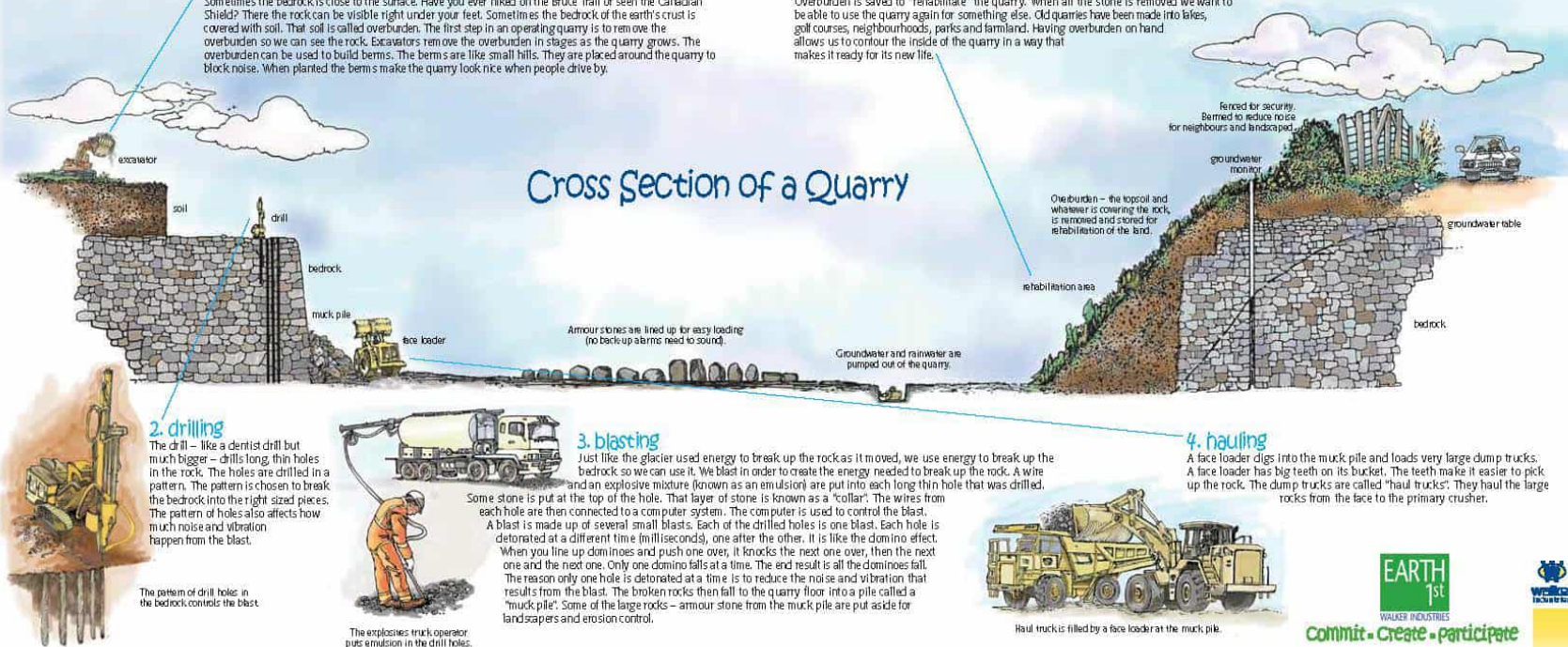
1. stripping

Sometimes the bedrock is close to the surface. Have you ever hiked on the Bruce Trail or seen the Canadian Shield? There the rock can be visible right under your feet. Sometimes the bedrock of the earth's crust is covered with soil. That soil is called overburden. The first step in an operating quarry is to remove the overburden so we can see the rock. Excavators remove the overburden in stages as the quarry grows. The overburden can be used to build berms. The berms are like small hills. They are placed around the quarry to block noise. When planted the berms make the quarry look nice when people drive by.

11. rehabilitating

Overburden is saved to "rehabilitate" the quarry. When all the stone is removed we want to be able to use the quarry again for something else. Old quarries have been made into lakes, golf courses, neighbourhoods, parks and farmland. Having overburden on hand allows us to contour the inside of the quarry in a way that makes it ready for its new life.

Cross Section of a Quarry



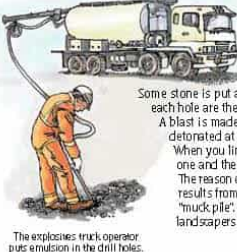
2. drilling

The drill - like a dentist drill but much bigger - drills long, thin holes in the rock. The holes are drilled in a pattern. The pattern is chosen to break the bedrock into the right sized pieces. The pattern of holes also affects how much noise and vibration happen from the blast.

The pattern of drill holes in the bedrock controls the blast.

3. blasting

Just like the glacier used energy to break up the rock as it moved, we use energy to break up the bedrock so we can use it. We blast in order to create the energy needed to break up the rock. A wire and an explosive mixture (known as an emulsion) are put into each long thin hole that was drilled. The wires from each hole are then connected to a computer system. The computer is used to control the blast. A blast is made up of several small blasts. Each of the drilled holes is one blast. Each hole is detonated at a different time (in milliseconds), one after the other. It is like the domino effect. When you line up dominoes and push one over, it knocks the next one over, then the next one and the next one. Only one domino falls at a time. The end result is all the dominoes fall. The reason only one hole is detonated at a time is to reduce the noise and vibration that results from the blast. The broken rocks then fall to the quarry floor into a pile called a "muck pile". Some of the large rocks - armour stone from the muck pile are put aside for landscapers and erosion control.



The employee's truck operator puts emulsion in the drill holes.

4. hauling

A face loader digs into the muck pile and loads very large dump trucks. A face loader has big teeth on its bucket. The teeth make it easier to pick up the rock. The dump trucks are called "haul trucks". They haul the large rocks from the face to the primary crusher.



Haul truck is filled by a face loader at the muck pile.

EARTH
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WALKER INDUSTRIES
Commit • Create • Participate

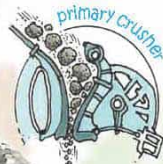


Steps involved in the operation of a Quarry continued...

5. processing plant

The processing plant is made up of crushers, screens and conveyors. The crushers take big rocks and make smaller stones. Screens sort the stone into various sizes. Conveyors move the rock from crushers to screens and from screens to stockpiles. The first crusher in the processing plant is called the "primary crusher". It crushes the largest rocks. The jaw crusher chews up rock just like your jaw chews up food.

haul truck dumps into the enclosed primary crusher



6. screening

Screens are sieves with different sized holes in them. The top screen has larger holes and the size of the holes in the next screen are smaller and the next screen the holes are smaller again. This sorts the stones passing through the screens into different sizes. The screens are just like the strainer in your kitchen. The strainer lets you wash vegetables. The water passes through the holes but the vegetables stay in the strainer.



7. washing

Some stones need to have a shower to wash the dust off before they are used. Stones take their shower in the wash plant. Water sprays on the stone as it moves through the wash plant. The water from the wash plant goes to a pond where it sits still for awhile. Have you ever put muddy water in a jar before? If you shake it up the water turns grey. All the mud particles scatter in the water. When you let that jar sit over night the mud particles settle to the bottom of the jar. The water becomes clearer. That is what happens in the settling pond. The fine stone particles settle out and the water becomes clear. The clear water can be reused to wash more stone. The fine stone particles can be used to improve the soil on farm fields.

8. stockpiling

The stones that are sorted by the screens are put into different piles known as stockpiles. Dump trucks are used to transport stone to the customer. A yard loader is used to load the dump trucks. The yard loader has a flat blade on its bucket. The flat blade makes it easier to pick up the small stones.



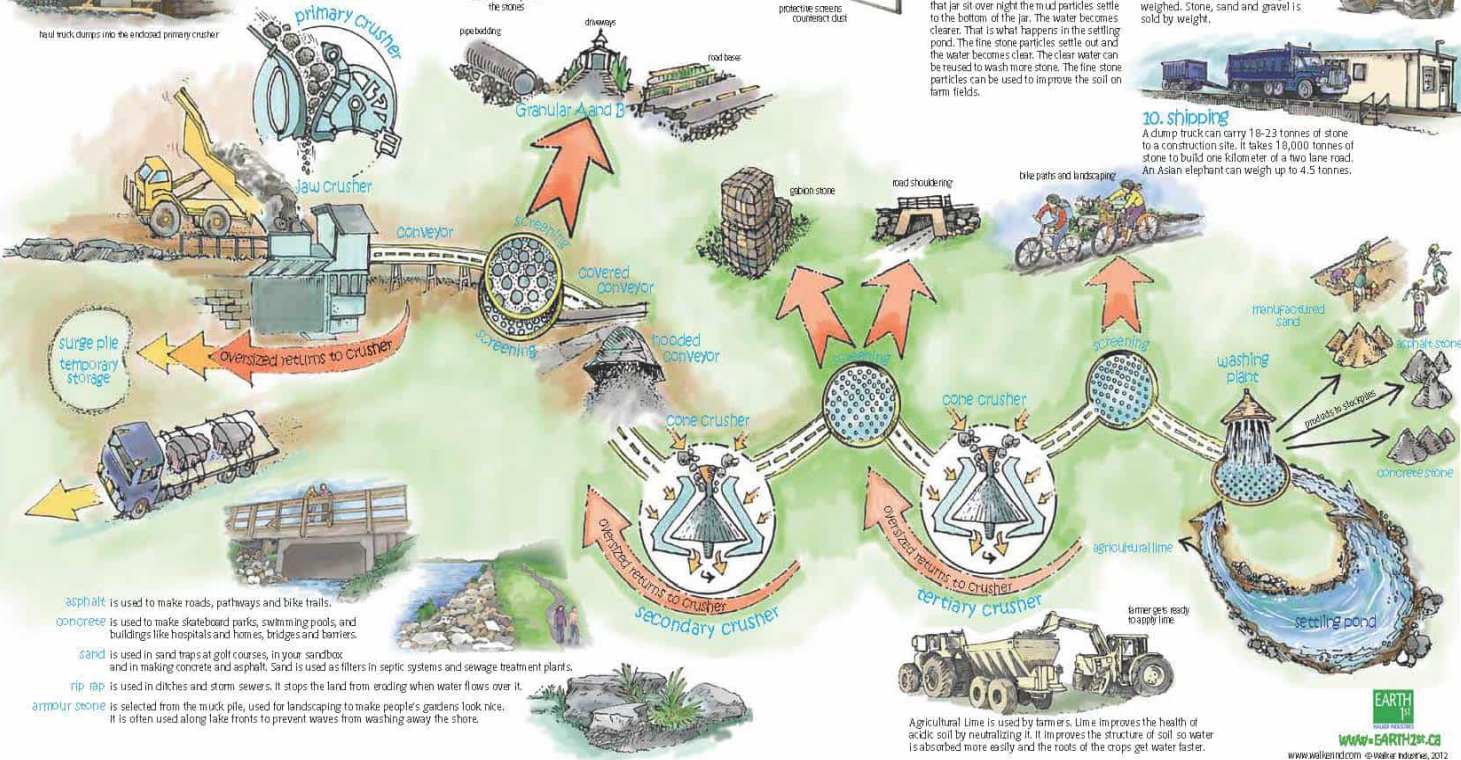
9. weighing

Once the trucks are loaded they are weighed. Stone, sand and gravel is sold by weight.



10. shipping

A dump truck can carry 18-23 tonnes of stone to a construction site. It takes 18,000 tonnes of stone to build one kilometer of a two lane road. An Asian elephant can weigh up to 4.5 tonnes.



APPENDIX C

WATER BALANCE ASSESSMENT

strum

CONSULTING



**WATER BALANCE ASSESSMENT
Sturk Quarry Expansion Project**

June 26, 2026

June 26, 2026

Prospect Industrial Equipment Sales and Rentals Limited

**Re: Water Balance Assessment
Sturk Quarry Expansion Project**

Attached is the Water Balance Assessment report prepared for the Sturk Quarry Expansion Project.

We trust this to be satisfactory at this time. Once you have had an opportunity to review this correspondence, please contact us to address any questions you may have.

Thank you,



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TABLE OF CONTENTS

	<i>page</i>
1.0 INTRODUCTION	1
1.1 Proposed Development	1
2.0 METHODOLOGY	2
2.1 Historical Data Review	2
2.2 Water Balance	2
2.3 Climate and Precipitation Assessment.....	3
2.4 Evapotranspiration.....	4
2.5 Infiltration and Runoff	5
3.0 WATER BALANCE RESULTS.....	6
4.0 CONCLUSIONS.....	9
5.0 STATEMENT OF QUALIFICATIONS AND LIMITATIONS.....	10
6.0 REFERENCES.....	12

LIST OF FIGURES

Figure 2.1: Climate Normals for the Study Area (1994 to 2023)	4

LIST OF TABLES

Table 1.1: Land Use for Pre- and Post-Development Sub-Watersheds	2
Table 2.1: Main Climate Stations Near the Project Location	3
Table 2.2: Climate Normals Representative for the Project Area (1991 to 2020).....	4
Table 2.3: Weighted Runoff Coefficients and Infiltration Factors for Pre- and Post-Development.....	6
Table 3.1: Pre- and Post-Development Water Balance Results	7

LIST OF APPENDICES

Appendix A: Drawings
Appendix B: Data Tables

1.0 INTRODUCTION

Strum Consulting was commissioned by Prospect Industrial Equipment Sales and Rentals Limited (Prospect) to conduct a Water Balance Assessment (the “Assessment”) for the Sturk Quarry Expansion Project (the “Project”). The Project will consist of expanding the Sturk Quarry on three parcels of undeveloped land [Property Identifications (PIDs) 55518898, 55514392, and 55146393]. This Project consists of an up to 52.9-hectare (ha) expansion of an existing quarry (Sturk Quarry), the development of which will span approximately 40 years. This Project aims to meet the local demand for aggregate material and ensure a long-term supply is available to service the Annapolis Valley and the surrounding areas.

The proposed quarry expansion will exceed four hectares in total area and will therefore require environmental registration as a Class I Undertaking under Schedule A of the Nova Scotia Environmental Assessment Regulations, N.S. Reg. 93/2025, and requires the registration of an Environmental Assessment (EA) Registration Document.

This report describes the Assessment for the proposed expanded quarry footprint in a climate normal year for operations. The objective of the Assessment is to understand the overall hydrologic conditions and water management at Sturk Quarry under pre- and post-development conditions. The Assessment was prepared as an appended document in support of the EA for the Project.

1.1 Proposed Development

The Sturk Quarry is located in Morristown, Nova Scotia and consists of an existing quarry (3.99 ha; Drawing 1, Appendix A). The proposed expansion area for the Sturk Quarry is 52.9 ha, in addition to the existing 3.99 ha, totaling a Project Area of 56.9 ha (Drawing 1, Appendix A).

The topography of the expansion Project Area generally slopes towards the northwest and northeast, and drainage flows ultimately to the Annapolis River. Elevations within the Project Area range from 155 metres above sea level (masl) on the southern portion to 197 masl on the central portion (Drawing 1, Appendix A).

The proposed expansion footprint is located at a catchment divide (A and B; Drawing 2, Appendix A) with 16.3 ha and 41.8 ha within sub-watershed A and B (labeled WS-A and WS-B), respectively. Land cover in the Project Area was assessed to support the evaluation of vegetation types, impervious areas, runoff, infiltration, and evapotranspiration (Drawing 2, Appendix A). Land use for pre- and post-quarry expansion is summarized in Table 1.1. The expansion alters entirely forested areas within both catchment areas.

The catchment areas are contained within a larger tertiary watershed (1DC-3-NN) that flows to the Annapolis River. The total area of the tertiary watershed is 10,948 ha; the expansion of the quarry would result in less than a 1% change of the tertiary watershed.

Table 1.1: Land Use for Pre- and Post-Development Sub-Watersheds

Sub-Watershed	Land Cover Type	Pre-Development Area (ha)	Post-Development Area (ha)
WS-A	Forested	993.06	976.76
	Urban, Quarry, Transport Corridor	26.70	43.00
	Water	84.19	84.19
	Agriculture	1.96	1.96
	Total	1,105.91	
WS-B	Forested	326.61	284.85
	Urban, Quarry, Transport Corridor	7.52	49.28
	Water	7.23	7.23
	Agriculture	6.59	6.59
	Total	347.95	

As the quarry expansion will impact both WS-A and WS-B, a water balance was completed for both catchment areas to quantify the potential effects of quarry development on surface water runoff to surrounding watercourses and wetlands.

2.0 METHODOLOGY

2.1 Historical Data Review

Historical records were reviewed as part of the Assessment. The primary sources of information include:

- Land use
- GeoNOVA Interactive geologic and topographic maps
- Environment and Climate Change (ECCC) historical climate data
- Online reports

2.2 Water Balance

A monthly water balance was developed for pre- and post-development scenarios based on the Thornthwaite and Mather (1957) method and general watershed hydrological processes. This method incorporates climatic conditions, evapotranspiration, surface runoff, infiltration, and estimated streamflow contributions. The total volume of water at a point in a watercourse is described as:

$$P - Q - ET - G - W = \Delta S \quad (Eq. 1)$$

Where,

- P is precipitation.
- Q is streamflow.
- ET is evapotranspiration.
- G is the net groundwater contributions.
- W is total withdrawals from the upstream watershed.
- ΔS is the net change in storage over the time period.

The Thornthwaite-Mather method was used to calculate the potential and actual evapotranspiration (AET) amounts, soil moisture storage, and total surplus, while Equation 1 was used to represent the watershed-scale water balance. All groundwater contributions were assumed to return to the local watershed where their source infiltration occurred. Furthermore, the quarry floor will not be deeper than the groundwater table. As a result, for this monthly water balance, this term was assumed to be zero. Additionally, total withdrawals from the upstream watershed were assumed to be zero. Actual evapotranspiration was calculated using the Thornthwaite-Mather soil moisture accounting method.

The Thornthwaite-Mather water balance method requires precipitation, temperature, site latitude, vegetation type, and soil type to determine actual evapotranspiration, water holding capacity, and soil moisture retention. The soil water-holding capacity depends on soil type, soil structure, and land cover.

The water balance considers precipitation, evapotranspiration, surface runoff, infiltration, and change in storage. Actual evapotranspiration was calculated using the Thornthwaite-Mather soil moisture accounting method. For months when air temperatures are below 0°C, evapotranspiration was considered negligible. Furthermore, the snow-and-rain temperature threshold was set to 0°C, meaning that temperatures below 0°C are considered snowfall. The maximum melt rate was set to 0.5 mm per day. For the winter periods, the infiltration was reduced to 50%.

2.3 Climate and Precipitation Assessment

Data from the ECCC climate station Greenwood A (Climate ID: 8202000) were used to characterize the climatic conditions for the Project Area based on a climate normal period from 1991 to 2020 (Tables 2.1 and 2.2). The climate station is located approximately 12 km northwest of the Project Area.

Table 2.1: Main Climate Stations Near the Project Location

Station Name	Record Length	Latitude (°)	Longitude (°)	Distance from Study Area (km)	Elevation (m)
Greenwood A	1942-11-01 to Present	45.9833	-64.9167	11.9	28

km: kilometre
 m: metre

Based on a climate normals period (1991 to 2020), the climate normal precipitation is approximately 1,137 mm, and the mean air temperature is 7.5°C (Table 2.2). Air temperatures typically drop below zero between December and March each year. Precipitation tends to decrease in the summer and increase in the late fall and early winter. Air temperature follows a seasonal sinusoidal pattern, with maximum temperatures exhibited during summer (Figure 2.1).

Table 2.2: Climate Normals Representative for the Project Area (1991 to 2020)

Climate Normal for 30 years (1991 to 2020)													Year
Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean Temperature (°C)	-5.0	-4.6	-0.6	5.3	11.3	16.4	20.1	19.4	15.1	9.2	4.2	-1.2	7.5
Rainfall (mm)	46.4	43.7	51.5	69.4	77.2	82.2	75.4	79.7	105.7	106.5	105.3	79.6	922.8
Snowfall (cm)	78.2	60.1	45.1	13.3	1.0	0.0	0.0	0.0	0.0	0.2	14.7	55.6	268.1
Precipitation (mm)	103.6	87.3	89.8	83.4	78.1	82.2	75.4	79.7	105.7	106.7	120.1	124.9	1,137.0

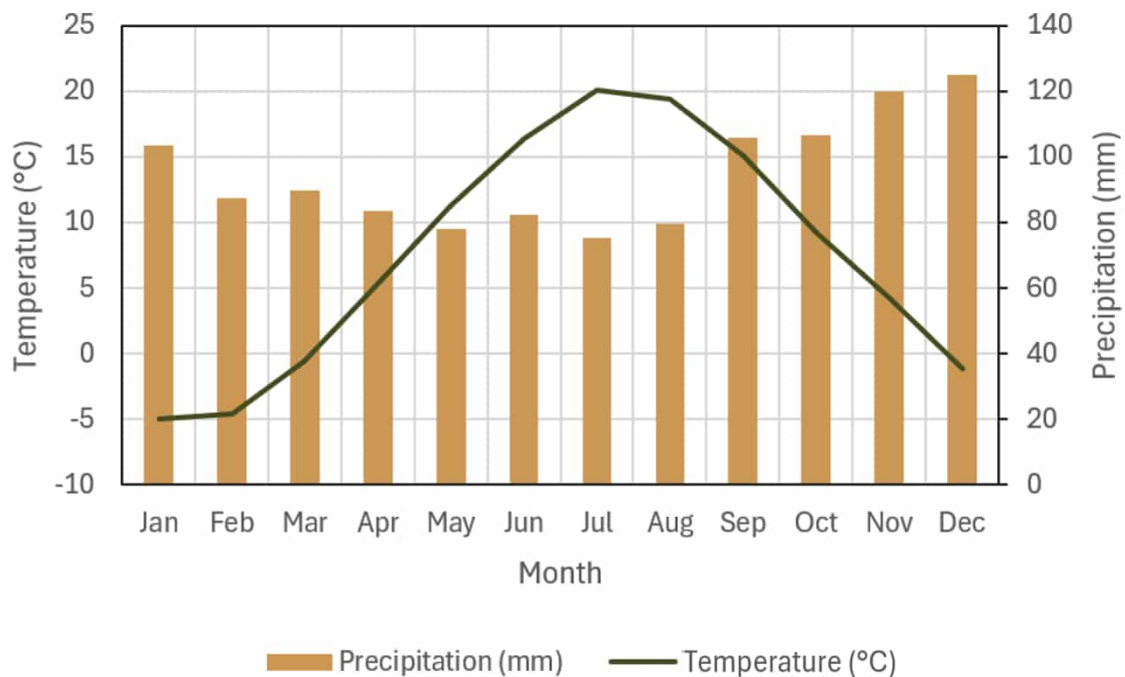


Figure 2.1: Climate Normals for the Study Area (1994 to 2023)

2.4 Evapotranspiration

Monthly potential evapotranspiration (PET) rates were calculated using the Thornthwaite equation (1948) based on average monthly temperatures, daylight hours, and latitude (Eq. 2).

$$PET \text{ (unadjusted)} = 16 \left(\frac{10T}{I} \right)^\alpha \quad (Eq. 2)$$

Where,

T is the average monthly temperature (°C).
 I is the heat index per month (unitless).
 PET is the potential evapotranspiration (mm).
 α is calculated using Equation 2 (unitless).

$$\alpha = 6.75 \times 10^{-7} I^3 - 7.71 \times 10^{-5} I^2 + 1.792 \times 10^{-2} I + 0.49239 \quad (Eq. 3)$$

PET is adjusted to account for daylight hours in the applicable local climate zone. The adjustment factor is calculated using Equation 4 and PET is then adjusted using Equation 5.

$$\text{Adjustment Factor} = \frac{\text{Days}}{30} * \frac{\text{Daylight hours}}{12} \quad (Eq. 4)$$

$$PET \text{ (adjusted)} = PET \text{ (unadjusted)} * \text{adjustment factor} \quad (Eq. 5)$$

The calculated actual evapotranspiration (AET) is determined based on PET and changes in the storage capacity.

2.5 Infiltration and Runoff

Precipitation that falls on the ground surface can be characterized by either infiltration or surface runoff. Infiltration and surface runoff are directly related to land cover, topography, and underlying soil types. Runoff coefficients can be used to describe the fraction of precipitation that generates surface runoff and are commonly selected based on specific land use types and slope (ODOT, 2014; MTO, 2023).

Runoff coefficients were calculated based on land use for pre- and post-development conditions. The runoff coefficients for each land use type were chosen using runoff coefficients presented in the MTO Hydrotechnical Design Charts (MTO, 2023) and Ontario Ministers of Environment Stormwater Management Planning and Design Manual (ODOT, 2014). Runoff coefficients for pre- and post-development are shown in Table 2.3.

Table 2.3: Weighted Runoff Coefficients and Infiltration Factors for Pre- and Post-Development

Watershed	Land Cover Type	Pre-Development Area (ha)	Post-Development Area (ha)	Runoff Coefficient
A	Forested	993.06	976.76	0.40
	Urban, Quarry, Transport Corridor	26.70	43.00	0.70
	Water	84.19	84.19	1.00
	Agriculture	1.96	1.96	0.50
	Weighted Runoff	0.46	0.46	-
	Infiltration Factor	0.54	0.54	
B	Forested	326.61	284.85	0.40
	Urban, Quarry, Transport Corridor	7.52	49.28	0.70
	Water	7.23	7.23	1.00
	Agriculture	6.59	6.59	0.50
	Weighted Runoff	0.43	0.48	-
	Infiltration Factor	0.57	0.52	

Soil moisture storage was calculated based on the water-holding capacity of the soil types in both watersheds. Although the annual change in soil moisture storage is assumed to be zero (OMOE, 2003), soil moisture is calculated monthly to determine AET in areas that experience seasonal declines in soil moisture (e.g., during summer).

3.0 WATER BALANCE RESULTS

The existing quarry covers 3.99 ha and lies entirely within WS-A, with plans to expand by up to 52.9 ha into WS-A and WS-B. Surface runoff from the proposed quarry expansion will follow local topography and ultimately drain into the Annapolis River. Tables 3.1 and 3.2 present the assessment results for pre- and post-development scenarios. Detailed calculations are included in Appendix B.

The calculated annual AET using the Greenwood A climate normals from 1991 to 2020 is 556.5 mm. Based on the Assessment results, the change in infiltration for WS-A and WS-B is estimated to be -0.81% and -6.22%, respectively. The changes in runoff for WS-A and WS-B are estimated at 0.98% and 8.56%, respectively (Table 3.1). The overall cumulative impact to surface runoff due to the proposed quarry footprint (including both watersheds) results in a change of 2.69%.

Table 3.1: Pre- and Post-Development Water Balance Results

Sub-watershed	Pre/Post	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AET		0.0	0.0	0.0	27.4	69.6	104.8	129.3	108.2	76.1	40.5	14.8	0.0
WS-A	Pre-Development Infiltration (m ³)	15,665	17,117	18,837	575,035	766,319	383,159	191,580	95,790	47,895	25,311	331,005	101,757
	Post-Development Infiltration (m ³)	15,538	16,978	18,684	570,386	760,123	380,061	190,031	95,015	47,508	25,106	328,329	100,815
	% Change	-0.81											
	Pre-Development Runoff (m ³)	25,956	28,361	31,211	349,435	634,877	317,438	158,719	79,360	39,680	20,970	274,230	168,408
	Post-Development Runoff (m ³)	26,209	28,638	31,516	352,845	641,072	320,536	160,268	80,134	40,067	21,174	276,906	170,051
	% Change	0.98											
WS-B	Pre-Development Infiltration (m ³)	5,219	5,703	6,276	191,591	255,323	127,662	63,831	31,915	15,958	8,433	110,285	33,864
	Post-Development Infiltration (m ³)	4,895	5,348	5,886	179,680	239,450	119,725	59,862	29,931	14,966	7,909	103,428	31,758
	% Change	-6.22											
	Pre-Development Runoff (m ³)	7,585	8,288	9,121	102,116	185,531	92,766	46,383	23,191	11,596	6,128	80,139	49,214
	Post-Development Runoff (m ³)	8,234	8,997	9,901	110,853	201,404	100,702	50,351	25,176	12,588	6,652	86,995	53,425
	% Change	8.56											

Table 3.2: Pre- and Post-Development Flow Results

Sub-watershed	Pre/Post	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WS-A	Pre-Development Flow (m ³ /s)	0.0097	0.0117	0.0117	0.1348	0.2370	0.1225	0.0593	0.0296	0.0153	0.0078	0.1058	0.0629
	Post-Development Flow (m ³ /s)	0.0098	0.0118	0.0118	0.1361	0.2393	0.1237	0.0598	0.0299	0.0155	0.0079	0.1068	0.0635
	% Change	0.98											
WS-B	Pre-Development Flow (m ³ /s)	0.0028	0.0034	0.0034	0.0394	0.0693	0.0358	0.0173	0.0087	0.0045	0.0023	0.0309	0.0184
	Post-Development Flow (m ³ /s)	0.0031	0.0037	0.0037	0.0428	0.0752	0.0389	0.0188	0.0094	0.0049	0.0025	0.0336	0.0199
	% Change	8.56											

4.0 CONCLUSIONS

Prospect is proposing the expansion of Sturk Quarry on PIDs 55518898, 55514392, and 55146393. The current quarry encompasses approximately 3.99 ha and is proposed to expand by up to 52.9 ha over approximately 40 years.

A Water Balance Assessment was completed for the local catchment areas to evaluate the potential impacts of the proposed quarry expansion on local hydrology. The results of this Assessment indicate that the proposed quarry expansion will have minimal impact on local hydrology.

5.0 STATEMENT OF QUALIFICATIONS AND LIMITATIONS

This Report (the "Report") has been prepared by Strum Consulting (the "Consultant") for the benefit of Prospect Industrial Equipment Sales and Rentals Limited (the "Proponent") in accordance with the agreement between the Consultant and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations, and conclusions contained in the Report (collectively, the "Information"):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations")
- represents the Consultant's professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to the Consultant which has not been independently verified
- has not been updated since the date of issuance of the Report, and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued
- must be read as a whole, and sections thereof should not be read out of such context
- was prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental, or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

The consultant shall be entitled to rely upon the accuracy and completeness of information that was provided and has no obligation to update such information. Consultant accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental, or geotechnical conditions, is not responsible for any variability in such conditions, geographically or overtime.

Consultant agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but Consultant makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

The Report is to be treated as confidential and may not be used or relied upon by third parties, except:

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

Consultant accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss, or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information ("improper use of the Report"), except to the extent those parties have obtained the prior written consent of Consultant to use and rely upon the Report and the Information. Any damages arising from improper use of the Report or parts thereof shall be borne by the party making such use.

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

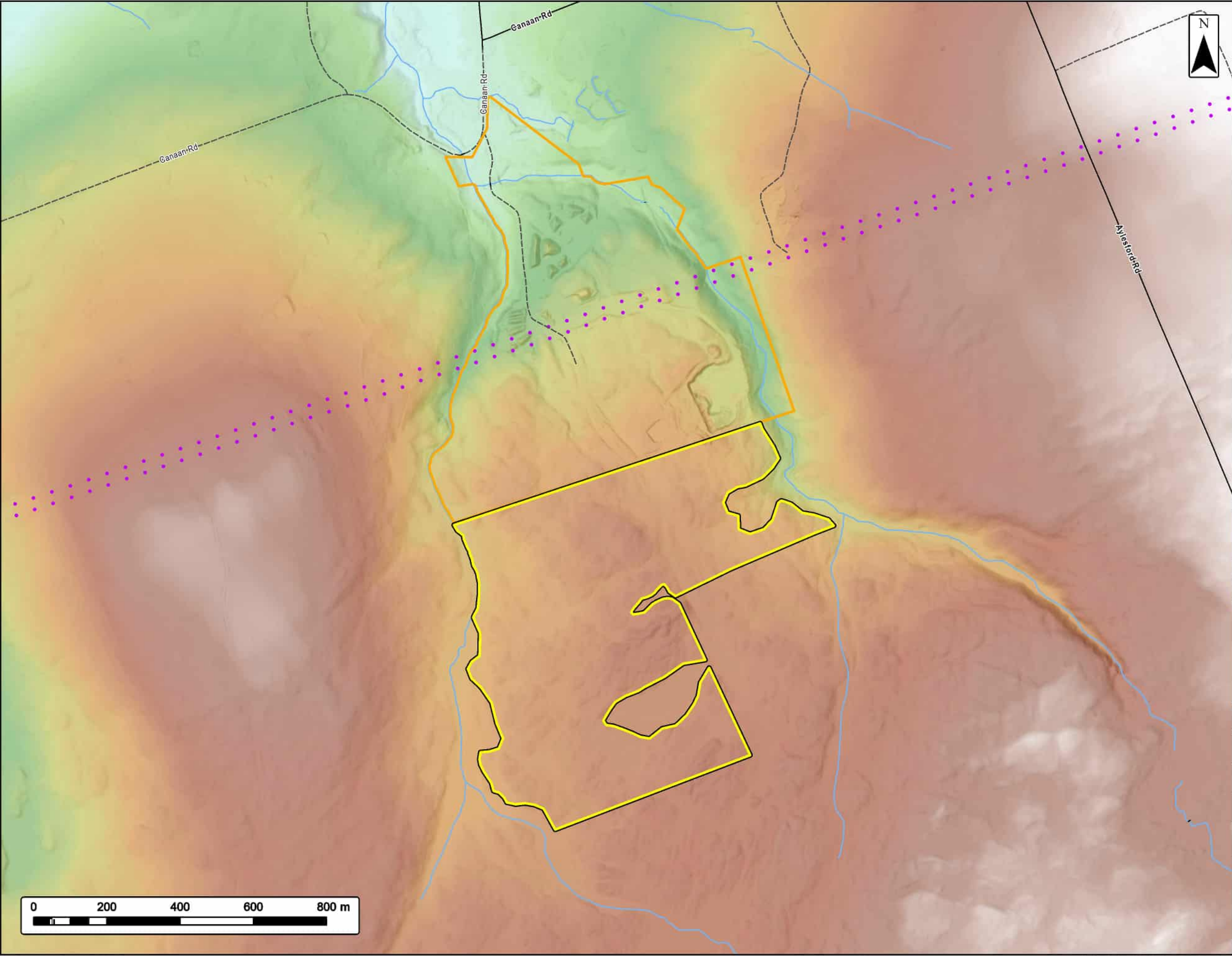
Should additional information become available, Strum requests that this information be brought to our attention immediately so that we can re-assess the conclusions presented in this report. This report was prepared by Kathryn Smith, PhD, P.Eng., Water Resources Engineer and reviewed by François Gascon, P.Eng., Environmental Engineer.

6.0 REFERENCES

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APPENDIX A

DRAWINGS



Sturk Quarry Expansion

Existing Quarry & Expansion Area

Proposed Quarry Expansion

Existing Quarry Boundary

Transportation

Road

Unpaved Road

Utilities (Line)

Existing Transmission Lines

Mapped Watercourses

Elevation (m)

235

210

195

175

160

140

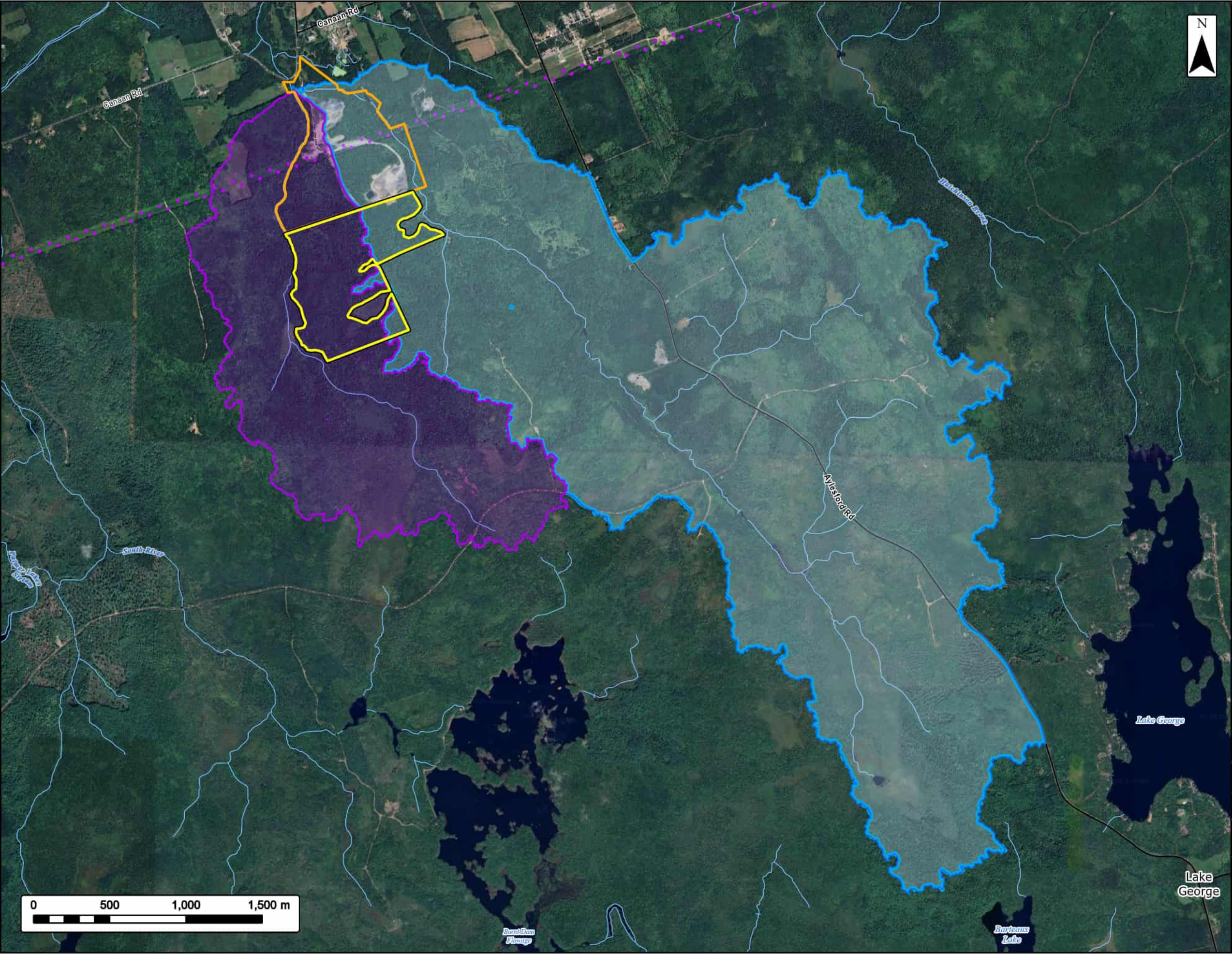
125

90

Coordinate System: NAD 1983 CSRS UTM Zone 20H

Sources: Esri, NASA, NGA, USGS, GeoNOVA, NSRIIR, ACCDC, IBA Canada, CHWI, HERE, Garmin

Date:	2/4/2026	Project #:	24-10948
Scale:	1:10,000	Drawing #:	1
Drawn By:	P. Opra		
Checked By:	K. Smith		



Sturk Quarry Expansion

Catchment Areas

Proposed Quarry Expansion	
Existing Quarry Boundary	
Catchment Areas	
WS-A	
WS-B	
Transportation	
Road	
Unpaved Road	
Utilities (Line)	
Existing Transmission Lines	
Mapped Watercourses	

Coordinate System: NAD 1983 CSRS UTM Zone 20H
Sources: © OpenStreetMap (and) contributors, CC-BY-SA, Esri, NASA, NGA, USGS, GeoIKWA, HSHRR, ACCDC, IBA Canada, CHW, HERE, Garmin

Date:	2/4/2026	Project #:	24-10948
Scale:	1:24,000	Drawing #:	2
Drawn By:	P. Opra		
Checked By:	K. Smith		

APPENDIX B

DATA TABLES

Table 1: Climate Normal Thornthwaite Potential Evapotranspiration

Project # 24-10948

Month	Mean Temperature (T)	Precipitation	Heat Index (I)	Thornthwaites Constant (a)	Unadjusted Potential Evapotranspiration (PET)	Days (θ)	Daylight Hours (h)	Adjustment Factor	Adjusted PET
Unit	°C	mm	-	-	mm	day	hr	-	mm
January	-5.0	103.6	0.00	1.06	0.00	31	9.20	0.79	0.00
February	-4.6	87.3	0.00	1.06	0.00	28	10.40	0.81	0.00
March	-0.6	89.8	0.00	1.06	0.00	31	12.00	1.03	0.00
April	5.3	83.4	1.09	1.06	24.67	30	13.60	1.13	27.95
May	11.3	78.1	3.44	1.06	54.91	31	14.90	1.28	70.45
June	16.4	82.2	6.04	1.06	81.39	30	15.60	1.30	105.81
July	20.1	75.4	8.22	1.06	100.92	31	15.20	1.31	132.09
August	19.4	79.7	7.79	1.06	97.21	31	14.00	1.21	117.19
September	15.1	105.7	5.33	1.06	74.59	30	12.50	1.04	77.70
October	9.2	106.7	2.52	1.06	44.18	31	10.90	0.94	41.47
November	4.2	120.1	0.77	1.06	19.29	30	9.50	0.79	15.27
December	-1.2	124.9	0.00	1.06	0.00	31	8.80	0.76	0.00
Annual	7.5	1136.9	35.19	-	-	365	-	-	587.94

Table 2: Land Cover and Runoff Coefficient

Project # 24-10948

Watershed	Land Cover Type	Pre-Development				Post-Development			
		Area (ha)*	Runoff Coefficient	Weighted Runoff Coefficient	Infiltration Factor	Area (ha)*	Runoff Coefficient	Weighted Runoff Coefficient	Infiltration Factor
Watershed A	Forested	993.06	0.40	0.4531	0.5469	976.76	0.40	0.4575	0.5425
	Urban, Quarry, Transport Corridor	26.70	0.70			43.00	0.70		
	Water	84.19	1.00			84.19	1.00		
	Agriculture	1.96	0.50			1.96	0.50		
	Total	1105.91	-			1105.91	-		
Watershed B	Forested	326.61	0.40	0.4208	0.5792	284.85	0.40	0.4569	0.5431
	Urban, Quarry, Transport Corridor	7.52	0.70			49.28	0.70		
	Water	7.23	1.00			7.23	1.00		
	Agriculture	6.59	0.50			6.59	0.50		
	Total	347.95	-			347.95	-		
Total Area (Check)		1453.86				1453.86			

*Including the 3.99 ha existing quarry footprint in Watershed A.

Table 3: Watershed A Water Balance Results

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total Precipitaiton (mm)	103.60	87.30	89.80	83.40	78.10	82.20	75.40	79.70	105.70	106.70	120.10	124.90	1,136.90
Total Available Water (m ³)	1,145,722.76	965,459.43	993,107.18	922,328.94	863,715.71	909,058.02	833,856.14	881,410.27	1,168,946.87	1,180,005.97	1,328,197.91	1,381,281.59	12,573,090.79
Total Surplus (mm)	5.18	5.66	6.23	69.74	126.70	63.35	31.68	15.84	7.92	5.38	55.33	33.91	426.91
Total Surplus (m ³)	57,286.14	62,594.51	68,884.37	771,215.49	1,401,195.44	700,597.72	350,298.86	175,149.43	87,574.72	59,542.24	611,865.63	374,996.90	4,721,201.45

Pre-Development	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
AET (mm)	0.00	0.00	0.00	27.41	69.58	104.78	129.76	110.15	76.11	40.47	14.83	0.00	573
Infiltration (mm)	2.8	3.1	3.4	38.1	69.3	34.6	17.3	8.7	4.3	2.3	29.9	18.4	232
Infiltration (corrected for winter) (mm)	1.4	1.5	1.7	52.0	69.3	34.6	17.3	8.7	4.3	2.3	29.9	9.2	232
Pre-Development Infiltration (m ³)	15,665	17,117	18,837	575,035	766,319	383,159	191,580	95,790	47,895	25,311	331,005	101,637	2,569,349
Net Precipitation as Runoff (mm)	2.3	2.6	2.8	31.6	57.4	28.7	14.4	7.2	3.6	1.9	24.8	15.2	192
Pre-Development Surface Runoff (m ³)	25,956	28,361	31,211	349,435	634,877	317,438	158,719	79,360	39,680	20,970	274,230	168,408	2,128,645
Number of Days	31	28	31	30	31	30	31	31	30	31	30	31	---
Flow (m ³ /s)	0.0097	0.0117	0.0117	0.1348	0.2370	0.1225	0.0593	0.0296	0.0153	0.0078	0.1058	0.0629	---

Post-Development	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Infiltration (mm)	2.8	3.1	3.4	37.8	68.7	34.4	17.2	8.6	4.3	2.3	29.7	18.2	230
Infiltration (corrected for winter) (mm)	1.4	1.5	1.7	51.6	68.7	34.4	17.2	8.6	4.3	2.3	29.7	9.1	230
Post-Development Infiltration (m ³)	15,538	16,978	18,684	570,386	760,123	380,061	190,031	95,015	47,508	25,106	328,329	100,815	2,548,576
Net Precipitation as Runoff (mm)	2.4	2.6	2.8	31.9	58.0	29.0	14.5	7.2	3.6	1.9	25.0	15.4	194
Post-Development Surface Runoff (m ³)	26,209	28,638	31,516	352,845	641,072	320,536	160,268	80,134	40,067	21,174	276,906	170,051	2,149,418
Number of Days	31	28	31	30	31	30	31	31	30	31	30	31	---
Flow (m ³ /s)	0.0098	0.0118	0.0118	0.1361	0.2393	0.1237	0.0598	0.0299	0.0155	0.0079	0.1068	0.0635	---

Surface Runoff Difference (m ³)	253	277	305	3,410	6,196	3,098	1,549	774	387	205	2,676	1,643	20,773
Percentage Runoff Change (%)	0.98%												
Infiltration Difference	-127	-138	-152	-4,649	-6,196	-3,098	-1,549	-774	-387	-205	-2,676	-822	-20,773
Percentage Infiltration Change (%)	-0.81%												

Flow Difference (m ³ /s)	0.0000946	0.0001144	0.0001137	0.0013156	0.0023132	0.0011952	0.0005783	0.0002891	0.0001494	0.0000764	0.0010325	0.0006136	---
Percentage Flow Change (%)	0.98%												

Table 4: Watershed B Water Balance Results

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total Precipitaiton (mm)	103.60	87.30	89.80	83.40	78.10	82.20	75.40	79.70	105.70	106.70	120.10	124.90	1,136.90
Total Available Water (m ³)	360,475.56	303,759.81	312,458.55	290,189.79	271,748.47	286,014.39	262,353.84	277,315.66	367,782.50	371,261.99	417,887.21	434,588.78	3,955,836.56
Total Surplus (mm)	5.18	5.66	6.23	69.74	126.70	63.35	31.68	15.84	7.92	4.18	54.73	33.61	424.81
Total Surplus (m ³)	18,023.78	19,693.94	21,672.90	242,645.38	440,854.22	220,427.11	110,213.56	55,106.78	27,553.39	14,561.10	190,423.33	116,941.10	1,478,116.58

Pre-Development	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
AET (mm)	0.00	0.00	0.00	27.41	69.58	104.78	129.76	110.15	76.11	40.47	14.83	0.00	573
Infiltration (mm)	3.0	3.3	3.6	40.4	73.4	36.7	18.3	9.2	4.6	2.4	31.7	19.5	246
Infiltration (corrected for winter) (mm)	1.5	1.6	1.8	55.1	73.4	36.7	18.3	9.2	4.6	2.4	31.7	9.7	246
Pre-Development Infiltration (m ³)	5,219	5,703	6,276	191,591	255,323	127,662	63,831	31,915	15,958	8,433	110,285	33,864	856,059
Net Precipitation as Runoff (mm)	2.2	2.4	2.6	29.3	53.3	26.7	13.3	6.7	3.3	1.8	23.0	14.1	179
Pre-Development Surface Runoff (m ³)	7,585	8,288	9,121	102,116	185,531	92,766	46,383	23,191	11,596	6,128	80,139	49,214	622,058
Number of Days	31	28	31	30	31	30	31	31	30	31	30	31	---
Flow (m ³ /s)	0.0028	0.0034	0.0034	0.0394	0.0693	0.0358	0.0173	0.0087	0.0045	0.0023	0.0309	0.0184	---

Post-Development	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Infiltration (mm)	2.8	3.1	3.4	37.9	68.8	34.4	17.2	8.6	4.3	2.3	29.7	18.3	231
Infiltration (corrected for winter) (mm)	1.4	1.5	1.7	51.6	68.8	34.4	17.2	8.6	4.3	2.3	29.7	9.1	231
Post-Development Infiltration (m ³)	4,895	5,348	5,886	179,680	239,450	119,725	59,862	29,931	14,966	7,909	103,428	31,758	802,839
Net Precipitation as Runoff (mm)	2.4	2.6	2.8	31.9	57.9	28.9	14.5	7.2	3.6	1.9	25.0	15.4	194
Post-Development Surface Runoff (m ³)	8,234	8,997	9,901	110,853	201,404	100,702	50,351	25,176	12,588	6,652	86,995	53,425	675,278
Number of Days	31	28	31	30	31	30	31	31	30	31	30	31	---
Flow (m ³ /s)	0.0031	0.0037	0.0037	0.0428	0.0752	0.0389	0.0188	0.0094	0.0049	0.0025	0.0336	0.0199	---

Surface Runoff Difference (m ³)	649	709	780	8,737	15,873	7,937	3,968	1,984	992	524	6,856	4,211	53,220
Percentage Runoff Change (%)	8.56%												
Infiltration Difference	-324	-355	-390	-11,911	-15,873	-7,937	-3,968	-1,984	-992	-524	-6,856	-2,105	-53,220
Percentage Infiltration Change (%)	-6.22%												

Flow Difference (m ³ /s)	0.000242	0.000293	0.000291	0.003371	0.005926	0.003062	0.001482	0.000741	0.000383	0.000196	0.002645	0.001572	-
Percentage Flow Change (%)	8.56%												

APPENDIX D

ACCDC REPORT

Data Report 9179: Kings County, NS

Prepared 24 March, 2026

Kristen Tenwolde

Table of contents

1	Preface	2
1.1	Data List	2
1.2	Additional Information	3
2	Rare and Endangered Species	4
2.1	Flora	4
2.2	Fauna	4
3	Special Areas	5
3.1	Managed Area(s)	5
3.2	Significant Area(s)	5
4	Rare Species Lists	6
4.1	Flora	6
4.2	Fauna	6
4.3	Location-Sensitive Species	8
4.4	Source Bibliography	9
5	Rare Species within 100 km	10
5.1	Source Bibliography (100 km)	30



Map 1. A 100 km buffer around the study area

1 Preface

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is a member of the NatureServe network, a collaborative alliance of natural heritage programs and conservation data centres operating across all 50 U.S. states, nine Canadian provinces, three territories, and several countries in Central and South America. Established over five decades ago, the NatureServe network employs a standardized and scientifically rigorous methodology for the collection, analysis, and dissemination of biodiversity data. Since its founding in 1997, the AC CDC has served as the authoritative source of information on species at risk and ecological communities within the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although AC CDC operates as a non-governmental organization, it receives core funding and support from six federal agencies and four provincial governments and is supplemented by external grants and data processing fees.

In response to formal requests and for a service fee, the AC CDC queries its database and provides customized data reports detailing the known occurrences of rare and endangered flora and fauna within a defined area of interest. These reports are further supplemented by spatial information on protected and conserved areas and sites identified as ecologically significant or sensitive. This service supports evidence-based decision-making in environmental assessments, land-use planning, and natural resource management and is vital to the conservation of biodiversity in Atlantic Canada.

1.1 Data List

Included datasets:

Table 1: Included Datasets

Filename	Contents
KingsCountyNS_9179ob.xls	Rare or legally protected Flora and Fauna in your study area
KingsCountyNS_9179ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area

The Atlantic Canada Conservation Data Centre (AC CDC) makes every effort to ensure the accuracy of the data it manages; however, it assumes no responsibility for any errors or omissions in the data provided. By accepting data from the AC CDC, recipients agree to the following terms of use:

1. Data must be used only by qualified personnel who are aware of landowner sensitivities and the potential risks that disclosure of rare and/or endangered species locations may pose to those species.
2. Data may be used only by the designated Data User. Any third-party requiring access must submit a separate request to the AC CDC.
3. Data must be deleted and no longer used 12 months after receipt. Continued use requires submission of a new request for updated data.
4. All data provided reflects the contents of the AC CDC's database at the time of the request.
5. Each record includes an estimate of locational uncertainty, which must be considered when assessing the record's relevance to a specific location. Please refer to the accompanying Data Dictionary for further details.
6. AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area of interest.
7. The absence of a taxon does not imply that the species is absent from the area of interest.

1.2 Additional Information

The accompanying Data Dictionary provides metadata for the data provided.
Please direct any additional questions about AC CDC data to the following individuals:

Table 2: AC CDC Contacts

Department	Name	Title	Phone	Email
Plants, Lichens, Ranking Methods, All other Inquiries	Sean Blaney	Senior Scientist / Executive Director	(506) 364-2658	sean.blaney@accdc.ca
Animals (Fauna)	John Klymko	Zoologist	(506) 364-2660	john.klymko@accdc.ca
Data Management, GIS	Charity Robicheau	Senior Conservation Data Analyst	NA	charity.robicheau@accdc.ca
Billing	Jean Breau	Financial Manager / Executive Assistant	(506) 364-2657	jean.breau@accdc.ca

Additional contacts:

- Questions on the biology of Federal Species at Risk: AC CDC (506) 364-2658
- Questions on Species at Risk regulations: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060
- Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196

New Brunswick: For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

Nova Scotia: For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886.

To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Table 3: NS DLF Regional Biologists

Region	Name	Phone	Email
Western	Emma Vost	(902) 670-8187	Emma.Vost@novascotia.ca
Western	Sarah Spencer	(902) 541-0081	Sarah.Spencer@novascotia.ca
Eastern	Harrison Moore	(902) 497-4119	Harrison.Moore@novascotia.ca
Eastern	Maureen Cameron-MacMillan	(902) 295-2554	Maureen.Cameron-MacMillan@novascotia.ca
Central	Shavonne Meyer	(902) 893-0816	Shavonne.Meyer@novascotia.ca
Central	Kimberly George	(902) 890-1046	Kimberly.George@novascotia.ca

Prince Edward Island: For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept of Communities, Land and Environment: (902) 569-7595.

2 Rare and Endangered Species

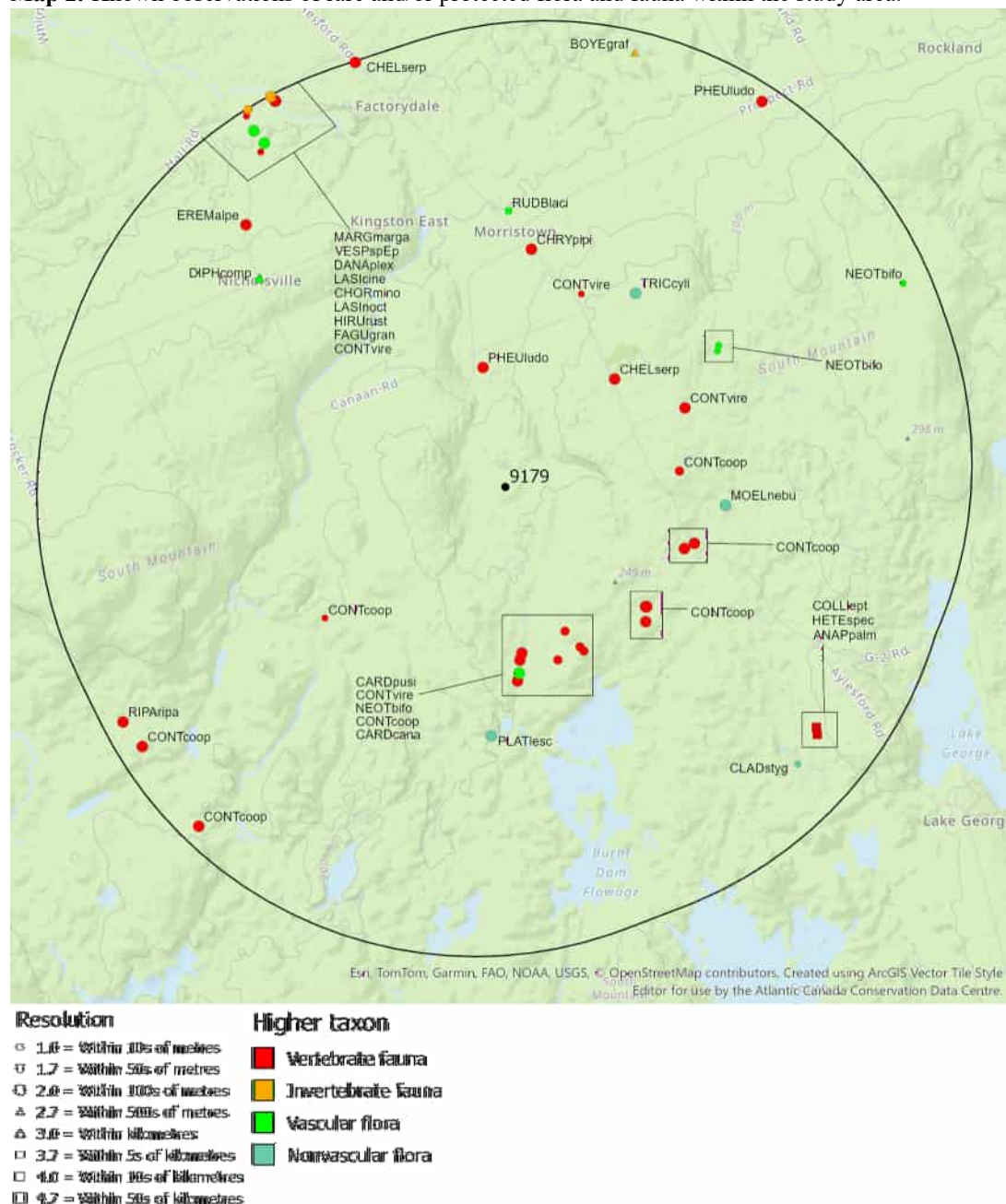
2.1 Flora

The study area contains 10 records of 4 vascular and 7 records of 7 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 Fauna

The study area contains 46 records of 14 vertebrate and 4 records of 3 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List), excluding 'location-sensitive' species'. Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2. Known observations of rare and/or protected flora and fauna within the study area.



3 Special Areas

3.1 Managed Area(s)

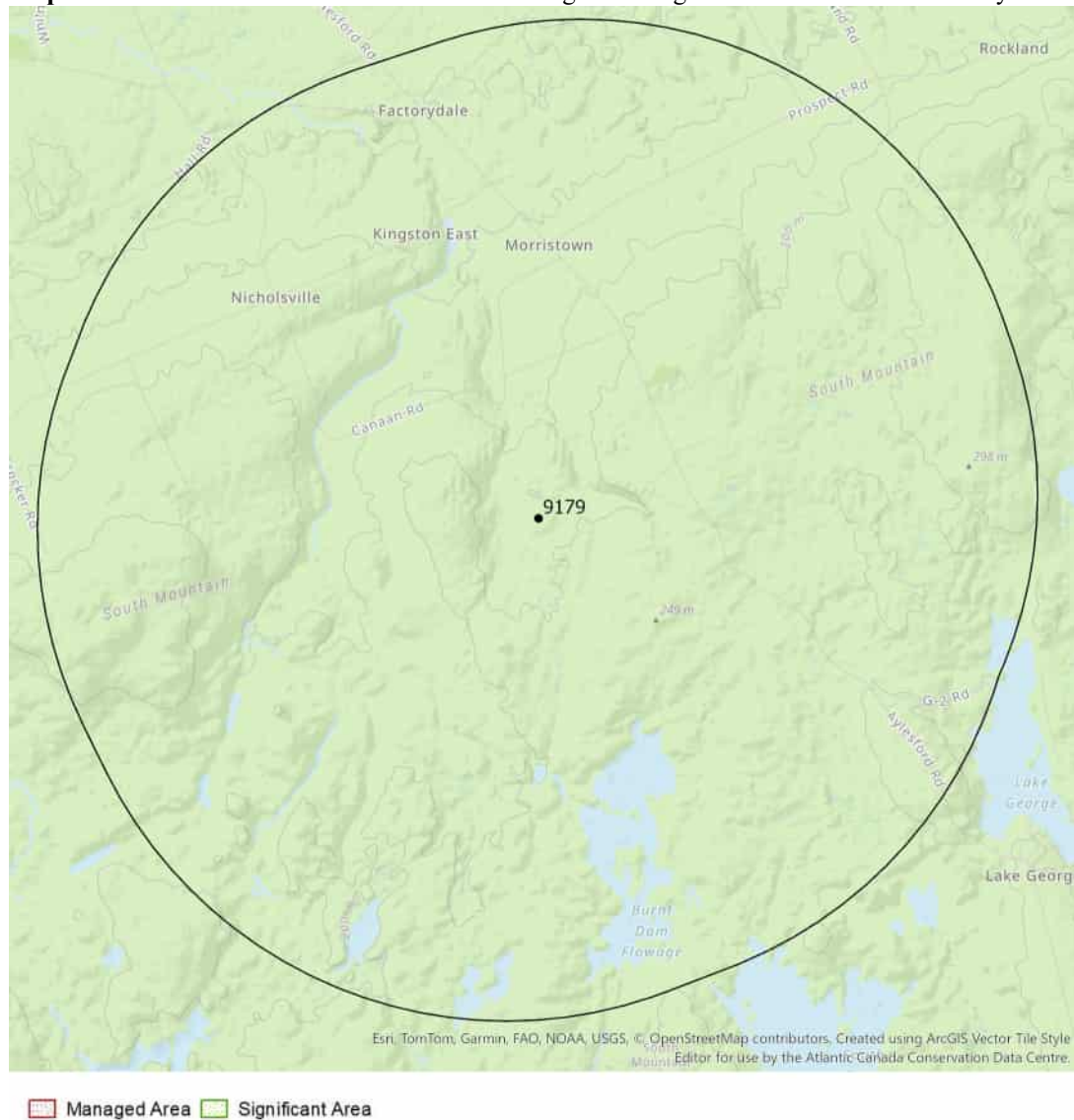
The GIS scan identified no managed areas in the vicinity of the study area (Map 3).

3.2 Significant Area(s)

The GIS scan identified no biologically significant sites in the vicinity of the study area (Map 3).

Significant Areas are sites with a conservation designation and management that qualifies them for listing in the Canadian Protected and Conserved Areas Database (CPCAD; [link](#)). The absence of a “Significant Area” within a site or region does not indicate an absence of ecologically significant properties.

Map 3. Boundaries and/or locations of known Managed and Significant Areas within the study area.



4 Rare Species Lists

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area are listed in order of concern, beginning with legally listed taxa. The number of observations per taxon and the distance in kilometers from the study area centroid to the closest observation ($\pm$ the precision, in km, of the record) are provided. [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community.

Note: Records are from attached files *ob.xls*/*ob.shp only.

4.1 Flora

Table 4: Flora

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss	NA	NA	NA	S2?	1	2.8 $\pm$ 0.2
N	<i>Platylomella lescurii</i>	a Moss	NA	NA	NA	S2?	1	3.0 $\pm$ 0.2
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen	NA	NA	NA	S2S3	1	2.6 $\pm$ 0.08
N	<i>Cladonia stygia</i>	Black-footed Reindeer Lichen	NA	NA	NA	S3?	1	4.8 $\pm$ 0.01
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen	NA	NA	NA	S3S4	1	4.7 $\pm$ 0.01
N	<i>Heterodermia speciosa</i>	Powdered Fringe Lichen	NA	NA	NA	S3S4	1	4.7 $\pm$ 0.01
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen	NA	NA	NA	S3S4	1	4.8 $\pm$ 0.01
P	<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower	NA	NA	NA	S2	1	3.3 $\pm$ 5.0
P	<i>Neottia bifolia</i>	Southern Twayblade	NA	NA	NA	S3	6	2.2 $\pm$ 0.2
P	<i>Fagus grandifolia</i>	American Beech	NA	NA	NA	S3S4	2	5.0 $\pm$ 0.2
P	<i>Diphasiastrum complanatum</i>	Northern Ground-cedar	NA	NA	NA	S3S4	1	3.9 $\pm$ 1.0

4.2 Fauna

Table 5: Fauna

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Lasionycteris noctivagans</i>	Silver-haired Bat	Endangered	NA	NA	SUB,S1M	1	5.4 $\pm$ 0.1
A	<i>Lasiurus cinereus</i>	Hoary Bat	Endangered	NA	NA	SUB,S1M	2	5.4 $\pm$ 0.1
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S3B	1	5.4 $\pm$ 0.15
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Endangered	S2S3B	9	2.0 $\pm$ 0.01
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	2	1.8 $\pm$ 0.1
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Endangered	S3B	1	5.4 $\pm$ 0.01
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	16	1.9 $\pm$ 0.04
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Special Concern	Threatened	S3S4B	1	5.4 $\pm$ 0.01
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	4	2.2 $\pm$ 0.05
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern	Special Concern	NA	S4	1	2.9 $\pm$ 0.2

Table 5: Fauna (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Vespertilionidae sp. not Eptesicus</i>	Bat species not Big Brown Bat	NA	NA	NA	S1S2	4	5.4 ± 0.1
A	<i>Cardellina pusilla</i>	Wilson's Warbler	NA	NA	NA	S3B,S4M	1	2.1 ± 0.15
A	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	NA	NA	NA	S3S4B	2	1.5 ± 0.15
A	<i>Eremophila alpestris</i>	Horned Lark	NA	NA	NA	SHB,S5M,S4N	1	4.4 ± 0.15
I	<i>Danaus plexippus</i>	Monarch	Endangered	Endangered	Endangered	S2?B,S3M	1	5.5 ± 0.05
I	<i>Margaritifera margaritifera</i>	Eastern Pearlshell	NA	NA	NA	S2S3	1	5.4 ± 0.2
I	<i>Boyeria grafiana</i>	Ocellated Darner	NA	NA	NA	S3S4	2	5.4 ± 0.5

4.3 Location-Sensitive Species

The Department of Natural Resources in each Maritimes province considers a number of species “location sensitive.” Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are highlighted below.

Table 6: Nova Scotia Location Sensitive Species

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Alces alces americana</i>	Moose – Mainland population	NA	Endangered	No
<i>Fraxinus nigra</i>	Black Ash	NA	Threatened	No
<i>Emydoidea blandingii</i>	Blanding’s Turtle - Nova Scotia pop.	Endangered	Endangered	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Yes
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.	NA	Vulnerable	No
<i>Bat Hibernaculum or bat species occurrence</i>	NA	[Endangered]1	[Endangered]1	Yes
<i>Snake hibernaculum</i>	NA	[Threatened] ²	[Threatened] ²	No

Occurrences between **October 15 – April 15** are considered location sensitive. 1 *Myotis lucifugus*, *Myotis septentrionalis*, and *Perimyotis subflavus* are all **Endangered** under the Federal Species at Risk Act and the NS Endangered Species Act.

2 *Thamnophis sauritus* (Eastern Ribbonsnake) is **Threatened** under both Acts.

4.4 Source Bibliography

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications, or presentations in which this dataset makes a significant contribution.

Table 7: Source Bibliography

# recs	Citation
13	Brazner, J. 2016. Nova Scotia Forested Wetland Bird Surveys. Nova Scotia Department of Lands and Forestry.
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1	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
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1	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
1	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.

5 Rare Species within 100 km

A 100 km buffer around the study area contains 73738 records of 162 vertebrate and 2964 records of 81 invertebrate fauna; 19860 records of 315 vascular and 7677 records of 259 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from the study area centroid to the closest observation ($\pm$ the precision, in km, of the record).

Table 8: Species within 100 km

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Coregonus huntsmani</i>	Atlantic Whitefish	Endangered	Endangered	Endangered	S1	172	36.3 $\pm$ 1.0	NS
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1183	10.3 $\pm$ 0.1	NS
A	<i>Myotis septentrionalis</i>	Northern Myotis	Endangered	Endangered	Endangered	S1	111	10.4 $\pm$ 0.1	NS
A	<i>Perimyotis subflavus</i>	Tricolored Bat	Endangered	Endangered	Endangered	S1	205	18.4 $\pm$ 0.1	NS
A	<i>Emydoidea blandingii</i> pop. 1	Blanding's Turtle - Nova Scotia population	Endangered	Endangered	Endangered	S1	11200	16.3 $\pm$ 1.8	NS
A	<i>Salmo salar</i> pop. 1	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered	NA	S1	516	100.0 $\pm$ 0.01	NB
A	<i>Salmo salar</i> pop. 6	Atlantic Salmon - Nova Scotia Southern Upland population	Endangered	NA	NA	S1	34	32.2 $\pm$ 1.0	NS
A	<i>Eubalaena glacialis</i>	North Atlantic Right Whale	Endangered	Endangered	NA	S1	1	81.3 $\pm$ 50.0	NS
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	697	40.6 $\pm$ 0.02	NS
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1B	58	31.1 $\pm$ 0.5	NS
A	<i>Dermochelys coriacea</i> pop. 2	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered	NA	S1S2N	4	64.1 $\pm$ 1.0	NS
A	<i>Morone saxatilis</i> pop. 2	Striped Bass - Bay of Fundy population	Endangered	NA	NA	S2S3B,S2S3N	172	28.1 $\pm$ 1.0	NS
A	<i>Lasionycteris noctivagans</i>	Silver-haired Bat	Endangered	NA	NA	SUB,S1M	19	16.9 $\pm$ 0.02	NS
A	<i>Lasiurus borealis</i>	Eastern Red Bat	Endangered	NA	NA	SUB,S1M	9	27.0 $\pm$ 0.1	NS
A	<i>Lasiurus cinereus</i>	Hoary Bat	Endangered	NA	NA	SUB,S1M	70	11.4 $\pm$ 0.1	NS
A	<i>Asio flammeus</i>	Short-eared Owl	Threatened	Special Concern	NA	S1B	40	37.7 $\pm$ 7.07	NS
A	<i>Limosa haemastica</i>	Hudsonian Godwit	Threatened	NA	NA	S1M	150	35.8 $\pm$ 0.5	NS
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2	1684	10.4 $\pm$ 0.01	NS
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Threatened	Endangered	S2B	8	45.5 $\pm$ 7.07	NS
A	<i>Thamnophis saurita</i> pop. 3	Eastern Ribbonsnake - Atlantic population	Threatened	Threatened	Threatened	S2S3	2512	31.2 $\pm$ 0.01	NS
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S2S3M	1948	11.7 $\pm$ 0.15	NS
A	<i>Acipenser oxyrinchus</i> pop. 2	Atlantic Sturgeon - Maritimes populations	Threatened	NA	NA	S2S3N	67	27.8 $\pm$ 5.0	NS
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S3B	1816	100.0 $\pm$ 1.61	NS
A	<i>Hydrobates leucorhous</i> pop. 1	Leach's Storm-Petrel - Atlantic Population	Threatened	NA	NA	S3B	26	68.0 $\pm$ 0.2	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Limnodromus griseus ssp. 1</i>	Short-billed Dowitcher hendersoni/griseus	Threatened	NA	NA	S3M	1568	25.7 ± 0.2	NS
A	<i>Anguilla rostrata</i>	American Eel	Threatened	NA	NA	S3N	1059	11.2 ± 0.01	NS
A	<i>Tringa flavipes</i>	Lesser Yellowlegs	Threatened	NA	NA	S3S4M	1011	18.0 ± 2.81	NS
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened	NA	SHB	9	38.5 ± 7.07	NS
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened	NA	SUB	69	13.9 ± 0.2	NS
A	<i>Bubo scandiacus</i>	Snowy Owl	Threatened	NA	NA	SUN	48	25.5 ± 1.8	NS
A	<i>Salmo salar pop. 12</i>	Atlantic Salmon - Gaspé - Southern Gulf of St. Lawrence population	Special Concern	NA	NA	S1	1	97.5 ± 0.2	NS
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1B	13	16.8 ± 0.15	NS
A	<i>Botaurus exilis</i>	Least Bittern	Special Concern	Threatened	NA	S1B	7	25.9 ± 0.2	NS
A	<i>Passerculus sandwichensis princeps</i>	Ipswich Sparrow	Special Concern	Special Concern	NA	S1B	2	42.6 ± 0.2	NS
A	<i>Bucephala islandica pop. 1</i>	Barrow's Goldeneye - Eastern Population	Special Concern	Special Concern	NA	S1N,SUM	36	16.3 ± 1.8	NS
A	<i>Balaenoptera physalus pop. 1</i>	Fin Whale - Atlantic population	Special Concern	Special Concern	NA	S2S3	3	73.3 ± 1.0	NB
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Endangered	S2S3B	1334	10.3 ± 0.01	NS
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2S3B	365	11.5 ± 0.04	NS
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Special Concern	Threatened	Vulnerable	S2S3B	1571	100.0 ± 0.07	NS
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern	Special Concern	NA	S2S3M	18	33.9 ± 0.05	NS
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	1496	1.8 ± 0.1	NS
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Endangered	S3B	1468	100.0 ± 0.25	NB
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	1490	1.9 ± 0.04	NS
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N	1102	100.0 ± 0.1	NS
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S3N	70	21.0 ± 1.5	NS
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Special Concern	Threatened	S3S4B	974	100.0 ± 1.8	NS
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	1823	10.0 ± 0.05	NS
A	<i>Phocoena phocoena pop. 1</i>	Harbour Porpoise - Northwest Atlantic Population	Special Concern	NA	NA	S4	34	22.3 ± 6.67	NS
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern	Special Concern	NA	S4	1570	10.0 ± 0.2	NS
A	<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	Special Concern	Special Concern	NA	SNR	1	79.1 ± 0.2	NS
A	<i>Anarhichas lupus</i>	Atlantic Wolffish	Special Concern	Special Concern	NA	SNR	2	70.0 ± 0.2	NS
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk	NA	NA	S1?B,SUM	3	83.1 ± 0.15	NB
A	<i>Fulica americana</i>	American Coot	Not At Risk	NA	NA	S1B	32	60.8 ± 7.07	NS
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk	NA	NA	S1B	4	80.3 ± 0.1	NB
A	<i>Astur cooperii</i>	Cooper's Hawk	Not At Risk	NA	NA	S1B,S1N	37	21.5 ± 0.2	NS
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Not At Risk	NA	Vulnerable	S1B,S3M	477	100.0 ± 0.15	NB
A	<i>Lynx canadensis</i>	Canada Lynx	Not At Risk	NA	Endangered	S2S3	42	14.2 ± 1.8	NS
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk	NA	NA	S2S3	1	81.0 ± 0.01	NB
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk	NA	NA	S3	89	21.8 ± 0.5	NS
A	<i>Megaptera novaeangliae pop. 2</i>	Humpback Whale - Western North Atlantic Population	Not At Risk	NA	NA	S3	6	21.1 ± 0.2	NS
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk	NA	NA	S3B	274	53.9 ± 1.05	NS
A	<i>Lagenorhynchus acutus</i>	Atlantic White-sided Dolphin	Not At Risk	NA	NA	S3S4	3	70.9 ± 0.05	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Ammospiza nelsoni</i>	Nelson's Sparrow	Not At Risk	NA	NA	S3S4B	177	100.0 ± 0.15	NS
A	<i>Buteo lagopus</i>	Rough-legged Hawk	Not At Risk	NA	NA	S3S4N	8	55.8 ± 0.2	NS
A	<i>Sialia sialis</i>	Eastern Bluebird	Not At Risk	NA	NA	S4B	174	13.8 ± 0.2	NS
A	<i>Calidris canutus rufa</i>	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2S3M,SUN	927	35.8 ± 0.5	NS
A	<i>Odobenus rosmarus pop. 5</i>	Atlantic Walrus - Nova Scotia - Newfoundland - Gulf of St Lawrence population	X	NA	NA	SX	1	63.6 ± 5.0	NS
A	<i>Alces alces americana</i>	Moose	NA	NA	Endangered	S1	161	28.6 ± 0.2	NS
A	<i>Sorex dispar kirklandi</i>	a long-tailed shrew	NA	NA	NA	S1	4	42.6 ± 0.5	NS
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker	NA	NA	NA	S1?	3	73.0 ± 0.1	NB
A	<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	NA	NA	NA	S1B	1	96.7 ± 3.22	NB
A	<i>Oxyura jamaicensis</i>	Ruddy Duck	NA	NA	NA	S1B	18	27.7 ± 0.2	NS
A	<i>Gallinula galeata</i>	Common Gallinule	NA	NA	NA	S1B	19	47.9 ± 7.07	NS
A	<i>Bartramia longicauda</i>	Upland Sandpiper	NA	NA	NA	S1B	9	16.2 ± 0.25	NS
A	<i>Uria aalge</i>	Common Murre	NA	NA	NA	S1B	11	23.9 ± 0.2	NS
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher	NA	NA	NA	S1B	53	12.1 ± 0.15	NS
A	<i>Cistothorus palustris</i>	Marsh Wren	NA	NA	NA	S1B	18	47.9 ± 7.07	NS
A	<i>Mimus polyglottos</i>	Northern Mockingbird	NA	NA	NA	S1B	133	12.3 ± 0.25	NS
A	<i>Toxostoma rufum</i>	Brown Thrasher	NA	NA	NA	S1B	24	14.5 ± 0.25	NS
A	<i>Salmo salar</i>	Atlantic Salmon	NA	NA	NA	S1B,S1N	22	11.4 ± 0.01	NS
A	<i>Charadrius semipalmatus</i>	Semipalmated Plover	NA	NA	NA	S1B,S3S4M	2580	21.8 ± 0.2	NS
A	<i>Anas acuta</i>	Northern Pintail	NA	NA	NA	S1B,S4M	68	100.0 ± 0.2	NS
A	<i>Vireo gilvus</i>	Eastern Warbling Vireo	NA	NA	NA	S1B,SUM	24	13.2 ± 0.15	NS
A	<i>Passerina cyanea</i>	Indigo Bunting	NA	NA	NA	S1B,SUM	60	28.8 ± 7.07	NS
A	<i>Vespertilionidae sp.</i>	bat species	NA	NA	NA	S1S2	190	11.7 ± 0.1	NS
A	<i>Vespertilionidae sp. not Eptesicus</i>	Bat species not Big Brown Bat	NA	NA	NA	S1S2	282	10.4 ± 0.1	NS
A	<i>Calidris minutilla</i>	Least Sandpiper	NA	NA	NA	S1S2B,S2S4M	1860	25.7 ± 0.2	NS
A	<i>Poocetes gramineus</i>	Vesper Sparrow	NA	NA	NA	S1S2B,SUM	83	10.9 ± 0.01	NS
A	<i>Pluvialis dominica</i>	American Golden-Plover	NA	NA	NA	S2?M	314	35.7 ± 0.24	NS
A	<i>Empidonax traillii</i>	Willow Flycatcher	NA	NA	NA	S2B	60	10.5 ± 0.15	NS
A	<i>Somateria mollissima</i>	Common Eider	NA	NA	NA	S2B,S3M,S2N	549	100.0 ± 0.2	NS
A	<i>Numenius phaeopus hudsonicus</i>	Whimbrel	NA	NA	NA	S2M	339	34.9 ± 0.2	NS
A	<i>Martes americana</i>	American Marten	NA	NA	Endangered	S2S3	91	14.3 ± 0.02	NS
A	<i>Rallus limicola</i>	Virginia Rail	NA	NA	NA	S2S3B	47	100.0 ± 0.15	NS
A	<i>Icterus galbula</i>	Baltimore Oriole	NA	NA	NA	S2S3B	146	13.6 ± 0.2	NS
A	<i>Morone saxatilis</i>	Striped Bass	NA	NA	NA	S2S3B,S2S3N	36	20.0 ± 0.2	NS
A	<i>Pinicola enucleator</i>	Pine Grosbeak	NA	NA	NA	S2S3B,S5N	128	16.2 ± 7.07	NS
A	<i>Calidris melanotos</i>	Pectoral Sandpiper	NA	NA	NA	S2S3M	384	25.7 ± 0.2	NS
A	<i>Phalaropus fulicarius</i>	Red Phalarope	NA	NA	NA	S2S3M	5	73.6 ± 11.0	NB
A	<i>Asio otus</i>	Long-eared Owl	NA	NA	NA	S3	24	37.7 ± 7.07	NS
A	<i>Perisoreus canadensis</i>	Canada Jay	NA	NA	NA	S3	697	14.4 ± 0.01	NS
A	<i>Poecile hudsonicus</i>	Boreal Chickadee	NA	NA	NA	S3	482	100.0 ± 0.15	NB
A	<i>Salvelinus fontinalis</i>	Brook Trout	NA	NA	NA	S3	200	11.3 ± 0.22	NS
A	<i>Sorex maritimensis</i>	Maritime Shrew	NA	NA	NA	S3	2	36.1 ± 1.0	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming	NA	NA	NA	S3	21	42.6 ± 0.5	NS
A	<i>Pekania pennanti</i>	Fisher	NA	NA	NA	S3	21	22.1 ± 0.2	NS
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird	NA	NA	NA	S3?B	353	11.4 ± 0.15	NS
A	<i>Setophaga pinus</i>	Pine Warbler	NA	NA	NA	S3?B	69	12.3 ± 0.15	NS
A	<i>Vireo philadelphicus</i>	Philadelphia Vireo	NA	NA	NA	S3?B,S4M	79	23.7 ± 0.25	NS
A	<i>Setophaga striata</i>	Blackpoll Warbler	NA	NA	NA	S3?B,S5M	116	100.0 ± 0.07	NS
A	<i>Pluvialis squatarola</i>	Black-bellied Plover	NA	NA	NA	S3?M	2625	35.8 ± 0.5	NS
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper	NA	NA	NA	S3?M	3044	25.8 ± 0.2	NS
A	<i>Spatula discors</i>	Blue-winged Teal	NA	NA	NA	S3B	210	100.0 ± 0.07	NS
A	<i>Charadrius vociferus</i>	Killdeer	NA	NA	NA	S3B	708	100.0 ± 0.07	NS
A	<i>Tringa semipalmata</i>	Willet	NA	NA	NA	S3B	1316	21.8 ± 0.5	NS
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake	NA	NA	NA	S3B	23	37.3 ± 0.03	NS
A	<i>Sterna paradisaea</i>	Arctic Tern	NA	NA	NA	S3B	51	62.7 ± 7.07	NS
A	<i>Fratercula arctica</i>	Atlantic Puffin	NA	NA	NA	S3B	50	73.6 ± 11.0	NB
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	NA	NA	NA	S3B	73	15.8 ± 7.07	NS
A	<i>Piranga olivacea</i>	Scarlet Tanager	NA	NA	NA	S3B	72	11.1 ± 0.15	NS
A	<i>Molothrus ater</i>	Brown-headed Cowbird	NA	NA	NA	S3B	238	14.3 ± 0.25	NS
A	<i>Alosa pseudoharengus</i>	Alewife	NA	NA	NA	S3B	28	16.1 ± 0.2	NS
A	<i>Phalacrocorax carbo</i>	Great Cormorant	NA	NA	NA	S3B,S3N	51	22.3 ± 14.0	NS
A	<i>Botaurus lentiginosus</i>	American Bittern	NA	NA	NA	S3B,S4M	357	100.0 ± 0.15	NS
A	<i>Spatula clypeata</i>	Northern Shoveler	NA	NA	NA	S3B,S4M	157	100.0 ± 0.07	NS
A	<i>Mareca strepera</i>	Gadwall	NA	NA	NA	S3B,S4M	171	100.0 ± 0.07	NS
A	<i>Falco sparverius</i>	American Kestrel	NA	NA	NA	S3B,S4M	380	11.8 ± 0.01	NS
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs	NA	NA	NA	S3B,S4M	2222	100.0 ± 0.24	NS
A	<i>Gallinago delicata</i>	Wilson's Snipe	NA	NA	NA	S3B,S4M	623	12.4 ± 0.25	NS
A	<i>Cardellina pusilla</i>	Wilson's Warbler	NA	NA	NA	S3B,S4M	163	15.5 ± 7.07	NS
A	<i>Passerella iliaca</i>	Fox Sparrow	NA	NA	NA	S3B,S4M	93	28.7 ± 7.07	NS
A	<i>Leiothlypis peregrina</i>	Tennessee Warbler	NA	NA	NA	S3B,S5M	357	15.5 ± 0.1	NS
A	<i>Branta bernicla</i>	Brant	NA	NA	NA	S3M	20	34.0 ± 0.2	NS
A	<i>Arenaria interpres</i>	Ruddy Turnstone	NA	NA	NA	S3M,S1N	963	35.8 ± 0.5	NS
A	<i>Calidris alba</i>	Sanderling	NA	NA	NA	S3M,S2S3N	2247	35.8 ± 0.5	NS
A	<i>Podiceps auritus pop. 2</i>	Horned Grebe - Western population	NA	Special Concern	NA	S3N	60	11.7 ± 1.8	NS
A	<i>Calidris maritima</i>	Purple Sandpiper	NA	NA	NA	S3N	262	14.6 ± 10.0	NS
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull	NA	NA	NA	S3N	7	63.2 ± 0.53	NS
A	<i>Lanius borealis</i>	Northern Shrike	NA	NA	NA	S3N	47	25.5 ± 0.2	NS
A	<i>Astur atricapillus</i>	American Goshawk	NA	NA	NA	S3S4	156	13.9 ± 0.01	NS
A	<i>Picoides arcticus</i>	Black-backed Woodpecker	NA	NA	NA	S3S4	118	15.2 ± 7.07	NS
A	<i>Sorex albibarbis</i>	Eastern Water Shrew	NA	NA	NA	S3S4	1	97.8 ± 1.0	NB
A	<i>Glaucomys volans</i>	Southern Flying Squirrel	NA	NA	NA	S3S4	17	25.4 ± 0.25	NS
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	NA	NA	NA	S3S4B	345	11.3 ± 0.15	NS
A	<i>Phaeucticus ludovicianus</i>	Rose-breasted Grosbeak	NA	NA	NA	S3S4B	683	1.5 ± 0.15	NS
A	<i>Setophaga tigrina</i>	Cape May Warbler	NA	NA	NA	S3S4B,S4M	169	19.9 ± 0.57	NS
A	<i>Mergus serrator</i>	Red-breasted Merganser	NA	NA	NA	S3S4B,S4N	238	16.4 ± 7.07	NS
A	<i>Bucephala albeola</i>	Bufflehead	NA	NA	NA	S3S4N	275	25.8 ± 0.2	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Loxia curvirostra</i>	Red Crossbill	NA	NA	NA	S4	390	10.9 ± 0.01	NS
A	<i>Spinus pinus</i>	Pine Siskin	NA	NA	NA	S4	675	10.3 ± 0.01	NS
A	<i>Cathartes aura</i>	Turkey Vulture	NA	NA	NA	S4B	321	15.8 ± 7.07	NS
A	<i>Actitis macularius</i>	Spotted Sandpiper	NA	NA	NA	S4B	962	15.2 ± 7.07	NS
A	<i>Alca torda</i>	Razorbill	NA	NA	NA	S4B	37	32.0 ± 0.25	NS
A	<i>Setophaga castanea</i>	Bay-breasted Warbler	NA	NA	NA	S4B	590	10.5 ± 0.01	NS
A	<i>Melanitta perspicillata</i>	Surf Scoter	NA	NA	NA	S4M,S3N	68	21.4 ± 0.2	NS
A	<i>Melanitta deglandi</i>	White-winged Scoter	NA	NA	NA	S4M,S3N	35	100.0 ± 0.2	NS
A	<i>Calcarius lapponicus</i>	Lapland Longspur	NA	NA	NA	S4N	7	17.3 ± 0.2	NS
A	<i>Aythya americana</i>	Redhead	NA	NA	NA	SHB	1	75.1 ± 0.2	NS
A	<i>Leucophaeus atricilla</i>	Laughing Gull	NA	NA	NA	SHB	12	69.3 ± 0.05	NS
A	<i>Progne subis</i>	Purple Martin	NA	NA	NA	SHB	9	29.3 ± 7.07	NS
A	<i>Eremophila alpestris</i>	Horned Lark	NA	NA	NA	SHB,S5M,S4N	39	16.4 ± 7.07	NS
A	<i>Morus bassanus</i>	Northern Gannet	NA	NA	NA	SXB	85	23.7 ± 0.2	NS
I	<i>Bombus bohemicus</i>	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	14	19.3 ± 0.05	NS
I	<i>Danaus plexippus</i>	Monarch	Endangered	Endangered	Endangered	S2?B,S3M	1351	10.1 ± 0.27	NS
I	<i>Barnea truncata</i>	Atlantic Mud-piddock	Threatened	Threatened	NA	S1	11	43.0 ± 0.2	NS
I	<i>Bombus suckleyi</i>	Suckley's Cuckoo Bumble Bee	Threatened	NA	NA	SH	3	73.8 ± 5.0	NS
I	<i>Alasmodonta varicosa</i>	Brook Floater	Special Concern	Special Concern	Threatened	S3	2	58.4 ± 0.1	NS
I	<i>Bombus terricola</i>	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	341	100.0 ± 0.5	NB
I	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle	Special Concern	Special Concern	Endangered	SH	4	23.7 ± 2.5	NS
I	<i>Gomphurus ventricosus</i>	Skillet Clubtail	Special Concern	Endangered	NA	SH	2	71.4 ± 1.0	NS
I	<i>Epeoloides pilosulus</i>	Macropis Cuckoo Bee	Data Deficient	Endangered	Endangered	S1	2	23.6 ± 5.0	NS
I	<i>Cicindela formosa generosa</i>	Big Sand Tiger Beetle	NA	NA	NA	S1	1	25.9 ± 1.0	NS
I	<i>Quedius spelaeus</i>	Spelean Rove Beetle	NA	NA	NA	S1	1	57.9 ± 5.0	NS
I	<i>Erora laeta</i>	Early Hairstreak	NA	NA	NA	S1	3	86.1 ± 2.5	NS
I	<i>Ophiogomphus anomalus</i>	Extra-Striped Snaketail	NA	NA	NA	S1	8	79.5 ± 0.05	NS
I	<i>Atlanticoncha ochracea</i>	Tidewater Mucket	NA	NA	NA	S1	11	70.3 ± 1.0	NS
I	<i>Polygonia satyrus</i>	Satyr Comma	NA	NA	NA	S1?	12	50.1 ± 2.5	NS
I	<i>Eristalis brousii</i>	Hourglass Drone Fly	NA	NA	NA	S1S2	1	56.8 ± 0.2	NS
I	<i>Boloria chariclea grandis</i>	Purple Lesser Fritillary	NA	NA	NA	S1S2	2	57.1 ± 2.5	NS
I	<i>Somatochlora brevicincta</i>	Quebec Emerald	NA	NA	NA	S1S2	1	85.4 ± 1.0	NS
I	<i>Hippodamia tredecimpunctata tibialis</i>	Thirteen-spotted Lady Beetle	NA	NA	NA	S2	9	72.0 ± 0.2	NB
I	<i>Satyrium acadica</i>	Acadian Hairstreak	NA	NA	NA	S2	1	80.5 ± 2.5	NS
I	<i>Polygonia comma</i>	Eastern Comma	NA	NA	NA	S2	31	22.0 ± 0.2	NS
I	<i>Coenagrion resolutum</i>	Taiga Bluet	NA	NA	NA	S2	11	56.8 ± 0.2	NS
I	<i>Pantala hymenaea</i>	Spot-Winged Glider	NA	NA	NA	S2?B	8	7.2 ± 0.2	NS
I	<i>Nymphalis l-album j-album</i>	Compton Tortoiseshell	NA	NA	NA	S2S3	31	56.8 ± 0.2	NS
I	<i>Aglais milberti</i>	Milbert's Tortoiseshell	NA	NA	NA	S2S3	19	15.2 ± 2.5	NS
I	<i>Somatochlora kennedyi</i>	Kennedy's Emerald	NA	NA	NA	S2S3	6	71.4 ± 1.0	NS
I	<i>Somatochlora williamsoni</i>	Williamson's Emerald	NA	NA	NA	S2S3	6	6.9 ± 0.4	NS
I	<i>Williamsonia fletcheri</i>	Ebony Boghaunter	NA	NA	NA	S2S3	4	77.0 ± 0.01	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	<i>Stylurus scudderii</i>	Zebra Clubtail	NA	NA	NA	S2S3	25	19.9 ± 0.1	NS
I	<i>Alasmodonta undulata</i>	Triangle Floater	NA	NA	NA	S2S3	19	62.5 ± 0.1	NS
I	<i>Margaritifera margaritifera</i>	Eastern Pearlshell	NA	NA	NA	S2S3	45	20.9 ± 0.2	NS
I	<i>Strophiona nitens</i>	Chestnut Bark Long-horned Beetle	NA	NA	NA	S3	5	6.8 ± 0.4	NS
I	<i>Psephenus herricki</i>	Herrick's Water Penny Beetle	NA	NA	NA	S3	2	60.5 ± 0.2	NS
I	<i>Lebia ornata</i>	Ornate Harp Ground Beetle	NA	NA	NA	S3	1	64.9 ± 0.2	NS
I	<i>Hippodamia parenthesis</i>	Parenthesis Lady Beetle	NA	NA	NA	S3	8	50.3 ± 0.05	NS
I	<i>Disonychia pensylvanica</i>	Pennsylvania Flea Beetle	NA	NA	NA	S3	1	18.9 ± 0.2	NS
I	<i>Omophron americanum</i>	American Round Sand Beetle	NA	NA	NA	S3	5	86.4 ± 0.01	NS
I	<i>Chrysochus auratus</i>	Dogbane Leaf Beetle	NA	NA	NA	S3	6	61.1 ± 0.2	NS
I	<i>Naemia seriata</i>	Seaside Lady Beetle	NA	NA	NA	S3	87	23.6 ± 0.2	NS
I	<i>Pachyrhinus elegans</i>	Elegant Broad-nosed Weevil	NA	NA	NA	S3	2	64.9 ± 0.2	NS
I	<i>Elateroides lugubris</i>	Sapwood Ship-timber Beetle	NA	NA	NA	S3	1	95.2 ± 0.2	NS
I	<i>Chilocorus stigma</i>	Twice-stabbed Lady Beetle	NA	NA	NA	S3	24	56.6 ± 0.05	NS
I	<i>Myzia pullata</i>	Streaked Lady Beetle	NA	NA	NA	S3	9	71.7 ± 0.2	NB
I	<i>Iphthiminus opacus</i>	Cloudy Darkling Beetle	NA	NA	NA	S3	2	72.4 ± 0.2	NB
I	<i>Monochamus marmorator</i>	Balsam Fir Sawyer	NA	NA	NA	S3	3	73.8 ± 0.2	NB
I	<i>Dicerca tenebrosa</i>	Dark Jewel Beetle	NA	NA	NA	S3	2	54.3 ± 0.2	NS
I	<i>Dicerca tuberculata</i>	Swollen Jewel Beetle	NA	NA	NA	S3	1	80.9 ± 9.73	NS
I	<i>Astylopsis sexguttata</i>	Six-speckled Long-horned Beetle	NA	NA	NA	S3	2	92.2 ± 0.25	NS
I	<i>Satyrrium calanus falacer</i>	Falacer Hairstreak	NA	NA	NA	S3	64	13.5 ± 0.1	NS
I	<i>Callophrys lanoraieensis</i>	Bog Elfin	NA	NA	NA	S3	28	17.3 ± 0.56	NS
I	<i>Strymon melinus</i>	Gray Hairstreak	NA	NA	NA	S3	22	19.0 ± 2.5	NS
I	<i>Ophiogomphus aspersus</i>	Brook Snaketail	NA	NA	NA	S3	4	58.0 ± 0.1	NS
I	<i>Ophiogomphus mainensis</i>	Maine Snaketail	NA	NA	NA	S3	13	29.1 ± 0.2	NS
I	<i>Ophiogomphus rupinulensis</i>	Rusty Snaketail	NA	NA	NA	S3	30	58.0 ± 0.1	NS
I	<i>Epitheca princeps</i>	Prince Baskettail	NA	NA	NA	S3	20	52.8 ± 1.0	NS
I	<i>Somatochlora forcipata</i>	Forcinate Emerald	NA	NA	NA	S3	9	53.9 ± 1.0	NS
I	<i>Enallagma vernale</i>	Vernal Bluet	NA	NA	NA	S3	3	68.5 ± 1.0	NS
I	<i>Polygonia interrogationis</i>	Question Mark	NA	NA	NA	S3B	191	18.4 ± 0.1	NS
I	<i>Lepturopsis biforis</i>	Two-spotted Long-horned Beetle	NA	NA	NA	S3S4	2	35.0 ± 0.2	NS
I	<i>Cecropterus pylades</i>	Northern Cloudywing	NA	NA	NA	S3S4	1	88.6 ± 0.01	NB
I	<i>Amblyscirtes hegon</i>	Pepper and Salt Skipper	NA	NA	NA	S3S4	24	37.3 ± 2.5	NS
I	<i>Argynnis aphrodite</i>	Aphrodite Fritillary	NA	NA	NA	S3S4	2	72.2 ± 0.01	NS
I	<i>Argynnis aphrodite winni</i>	Aphrodite Fritillary	NA	NA	NA	S3S4	37	18.4 ± 0.1	NS
I	<i>Polygonia faunus</i>	Green Comma	NA	NA	NA	S3S4	24	28.1 ± 1.0	NS
I	<i>Oeneis jutta ascerta</i>	Jutta Arctic	NA	NA	NA	S3S4	26	55.1 ± 0.1	NS
I	<i>Aeshna clepsydra</i>	Mottled Darner	NA	NA	NA	S3S4	32	15.1 ± 1.0	NS
I	<i>Aeshna constricta</i>	Lance-Tipped Darner	NA	NA	NA	S3S4	34	22.2 ± 0.2	NS
I	<i>Boyeria grafiana</i>	Ocellated Darner	NA	NA	NA	S3S4	20	19.9 ± 0.1	NS
I	<i>Gomphaeschna furcillata</i>	Harlequin Darner	NA	NA	NA	S3S4	54	21.4 ± 0.2	NS
I	<i>Somatochlora franklini</i>	Delicate Emerald	NA	NA	NA	S3S4	6	57.1 ± 0.2	NS
I	<i>Erythrodiplax berenice</i>	Seaside Dragonlet	NA	NA	NA	S3S4	5	65.8 ± 0.1	NS
I	<i>Nannothemis bella</i>	Elfin Skimmer	NA	NA	NA	S3S4	38	28.4 ± 0.1	NS

Table 8: Species within 100 km (continued)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	<i>Sympetrum danae</i>	Black Meadowhawk	NA	NA	NA	S3S4	4	62.9 ± 0.2	NS
I	<i>Enallagma vesperum</i>	Vesper Bluet	NA	NA	NA	S3S4	24	32.5 ± 0.01	NS
I	<i>Amphiagrion saucium</i>	Eastern Red Damsel	NA	NA	NA	S3S4	10	62.2 ± 0.2	NS
I	<i>Cupido comyntas</i>	Eastern Tailed Blue	NA	NA	NA	S4	38	23.0 ± 0.3	NS
I	<i>Pachydiplax longipennis</i>	Blue Dasher	NA	NA	NA	S4	40	23.7 ± 0.2	NS
I	<i>Enallagma geminatum</i>	Skimming Bluet	NA	NA	NA	S4	6	32.3 ± 0.2	NS
I	<i>Tricholochmaea sablensis</i>	Sable Island Leaf Beetle	NA	NA	NA	SH	1	86.8 ± 0.05	NS
I	<i>Icaricia saepiolus amica</i>	Greenish Blue	NA	NA	NA	SH	2	86.7 ± 2.5	NS
I	<i>Chlosyne nycteis</i>	Silvery Checkerspot	NA	NA	NA	SH	4	66.3 ± 2.5	NS
N	<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1	15	46.4 ± 1.0	NS
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	15	48.6 ± 0.5	NS
N	<i>Peltigera hydrothyria</i>	Eastern Waterfan	Threatened	Threatened	Threatened	S1	902	36.1 ± 0.01	NS
N	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened	Threatened	Threatened	S3	261	11.2 ± 0.01	NS
N	<i>Pannaria lurida</i>	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S3	598	19.8 ± 0.01	NS
N	<i>Fuscopannaria leucosticta</i>	White-rimmed Shingle Lichen	Threatened	NA	NA	S3	209	100.0 ± 0.01	NS
N	<i>Heterodermia squamulosa</i>	Scaly Fringe Lichen	Threatened	NA	NA	S3	208	14.4 ± 0.2	NS
N	<i>Pectenaria plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	749	100.0 ± 0.5	NS
N	<i>Sclerophora peronella</i> (Atlantic pop.)	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern	NA	S3S4	203	15.2 ± 0.2	NS
N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk	NA	NA	S2S3	49	44.0 ± 4.0	NS
N	<i>Fissidens exilis</i>	Pygmy Pocket Moss	Not At Risk	NA	NA	S4	21	11.6 ± 0.2	NS
N	<i>Notothylas orbicularis</i>	Round Hornwort	NA	NA	NA	S1	2	41.4 ± 0.2	NS
N	<i>Radula obconica</i>	a scalewort	NA	NA	NA	S1	1	51.3 ± 0.2	NS
N	<i>Aloina brevirostris</i>	Short-Beaked Rigid Screw Moss	NA	NA	NA	S1	2	57.9 ± 2.5	NS
N	<i>Homalotheciella subcapillata</i>	Few-haired Moss	NA	NA	NA	S1	1	79.1 ± 0.2	NS
N	<i>Orthotrichum gymnostomum</i>	Aspen Bristle Moss	NA	NA	NA	S1	1	9.1 ± 0.2	NS
N	<i>Orthotrichum pallens</i>	Pale Bristle Moss	NA	NA	NA	S1	1	72.6 ± 0.1	NS
N	<i>Platydictya minutissima</i>	Small Willow Moss	NA	NA	NA	S1	1	26.4 ± 0.2	NS
N	<i>Seligeria calcarea</i>	Chalk Brittle Moss	NA	NA	NA	S1	2	82.2 ± 0.2	NB
N	<i>Seligeria diversifolia</i>	a Moss	NA	NA	NA	S1	1	72.7 ± 0.1	NB
N	<i>Sematophyllum demissum</i>	a Moss	NA	NA	NA	S1	2	44.7 ± 1.6	NS
N	<i>Tetradontium brownianum</i>	Little Georgia	NA	NA	NA	S1	7	68.2 ± 0.1	NB
N	<i>Cyrtio-hypnum minutulum</i>	Tiny Cedar Moss	NA	NA	NA	S1	1	72.1 ± 0.1	NS
N	<i>Blennothallia crispa</i>	Crinkled Jelly Lichen	NA	NA	NA	S1	1	63.6 ± 0.05	NS
N	<i>Umbilicaria vellea</i>	Grizzled Rocktripe Lichen	NA	NA	NA	S1	2	68.6 ± 1.0	NB
N	<i>Usnea perplexans</i>	Powdered Beard Lichen	NA	NA	NA	S1	3	43.8 ± 1.0	NS
N	<i>Heterodermia leucomela</i>	Elegant Fringe Lichen	NA	NA	NA	S1	1	98.4 ± 0.01	NS
N	<i>Scytinium dactylinum</i>	Brown-buttoned Jellyskin Lichen	NA	NA	NA	S1	2	23.1 ± 0.05	NS
N	<i>Flavoparmelia baltimorensis</i>	Rock Greenshield Lichen	NA	NA	NA	S1	2	58.7 ± 0.2	NS
N	<i>Cetrariella delisei</i>	Snowbed Icelandmoss Lichen	NA	NA	NA	S1	1	72.0 ± 1.0	NB
N	<i>Lathagrium cristatum</i>	Fingered Jelly Lichen	NA	NA	NA	S1	6	54.1 ± 0.05	NS
N	<i>Ephebe hispidula</i>	Dryside Rockshag Lichen	NA	NA	NA	S1	1	33.9 ± 0.05	NS
N	<i>Ephebe perspinulosa</i>	Thread Lichen	NA	NA	NA	S1	2	27.9 ± 0.2	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Fuscopannaria praetermissa</i>	Moss Shingles Lichen	NA	NA	NA	S1	1	52.4 ± 0.05	NS
N	<i>Parmotrema perforatum</i>	Perforated Ruffle Lichen	NA	NA	NA	S1	55	70.5 ± 0.01	NS
N	<i>Polychidium muscicola</i>	Eyed Mossthorns Woollybear Lichen	NA	NA	NA	S1	15	19.1 ± 0.2	NS
N	<i>Pseudevernia consocians</i>	Common Antler Lichen	NA	NA	NA	S1	2	74.8 ± 0.05	NS
N	<i>Psorula rufonigra</i>	Blue-edged Scale Lichen	NA	NA	NA	S1	1	58.5 ± 8.0	NS
N	<i>Spilonema revertens</i>	Rock Hairball Lichen	NA	NA	NA	S1	5	41.2 ± 0.01	NS
N	<i>Sticta limbata</i>	Powdered Moon Lichen	NA	NA	NA	S1	12	46.2 ± 0.01	NS
N	<i>Lathagrium fuscovirens</i>	Crumpled Rock Tarpaper Lichen	NA	NA	NA	S1	2	51.9 ± 0.05	NS
N	<i>Dermatocarpon miniatum</i>	Common Stippleback Lichen	NA	NA	NA	S1	2	21.4 ± 0.01	NS
N	<i>Leptogium hibernicum</i>	Hibernia Jellyskin Lichen	NA	NA	NA	S1	1	92.0 ± 0.01	NS
N	<i>Peltigera lepidophora</i>	Scaly Pelt Lichen	NA	NA	NA	S1	11	24.1 ± 0.5	NS
N	<i>Hypogymnia hultenii</i>	Powdered Honeycomb Lichen	NA	NA	NA	S1	3	76.2 ± 0.5	NS
N	<i>Aloina rigida</i>	Aloe-Like Rigid Screw Moss	NA	NA	NA	S1?	4	56.6 ± 0.1	NS
N	<i>Imbricium muehlenbeckii</i>	Muehlenbeck's Bryum Moss	NA	NA	NA	S1?	2	35.7 ± 0.01	NS
N	<i>Cirriphyllum piliferum</i>	Hair-pointed Moss	NA	NA	NA	S1?	2	24.5 ± 0.2	NS
N	<i>Conardia compacta</i>	Coast Creeping Moss	NA	NA	NA	S1?	2	67.9 ± 1.5	NB
N	<i>Tortula obtusifolia</i>	a Moss	NA	NA	NA	S1?	1	74.2 ± 0.1	NB
N	<i>Didymodon tophaceus</i>	Olive Beard Moss	NA	NA	NA	S1?	2	63.6 ± 0.01	NS
N	<i>Grimmia anodon</i>	Toothless Grimmiid Moss	NA	NA	NA	S1?	2	73.1 ± 3.0	NS
N	<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss	NA	NA	NA	S1?	3	18.1 ± 0.2	NS
N	<i>Meesia triquetra</i>	Three-ranked Cold Moss	NA	NA	NA	S1?	3	71.3 ± 0.01	NS
N	<i>Paludella squarrosa</i>	Tufted Fen Moss	NA	NA	NA	S1?	3	63.3 ± 0.01	NS
N	<i>Schistostega pennata</i>	Luminous Moss	NA	NA	NA	S1?	2	71.9 ± 0.01	NS
N	<i>Timmia norvegica</i>	a moss	NA	NA	NA	S1?	3	68.0 ± 0.1	NB
N	<i>Plagiomnium ellipticum</i>	Marsh Leafy Moss	NA	NA	NA	S1?	1	15.4 ± 0.01	NS
N	<i>Enchylium limosum</i>	Lime-loving Tarpaper Lichen	NA	NA	NA	S1?	2	63.5 ± 0.2	NS
N	<i>Euopsis granatina</i>	Lesser Rockbud Lichen	NA	NA	NA	S1?	1	36.5 ± 1.33	NS
N	<i>Scytinium intermedium</i>	Forty-five Jellyskin Lichen	NA	NA	NA	S1?	1	63.6 ± 4.0	NS
N	<i>Melanelia culbersonii</i>	Appalachian Camouflage Lichen	NA	NA	NA	S1?	1	70.0 ± 0.05	NS
N	<i>Peltigera malacea</i>	Veinless Pelt Lichen	NA	NA	NA	S1?	1	73.7 ± 1.0	NB
N	<i>Peltigera venosa</i>	Fan Pelt Lichen	NA	NA	NA	S1?	1	95.0 ± 1.0	NB
N	<i>Reboulia hemisphaerica</i>	Purple-margined Liverwort	NA	NA	NA	S1S2	2	22.2 ± 0.2	NS
N	<i>Arrhenopterum heterostichum</i>	One-sided Groove Moss	NA	NA	NA	S1S2	3	49.0 ± 5.0	NS
N	<i>Brachythecium turgidum</i>	Thick Ragged Moss	NA	NA	NA	S1S2	3	23.5 ± 3.0	NS
N	<i>Dicranoweisia crispula</i>	Mountain Thatch Moss	NA	NA	NA	S1S2	1	74.1 ± 0.1	NB
N	<i>Didymodon rigidulus</i>	Rigid Screw Moss	NA	NA	NA	S1S2	10	67.7 ± 0.15	NS
N	<i>Didymodon ferrugineus</i>	Rusty Beard Moss	NA	NA	NA	S1S2	1	68.4 ± 0.1	NB
N	<i>Hygrohypnum montanum</i>	a Moss	NA	NA	NA	S1S2	2	73.3 ± 1.0	NB
N	<i>Hypnum pratense</i>	Meadow Plait Moss	NA	NA	NA	S1S2	1	15.4 ± 3.0	NS
N	<i>Mnium thomsonii</i>	Thomson's Leafy Moss	NA	NA	NA	S1S2	1	53.1 ± 2.0	NS
N	<i>Plagiothecium latebricola</i>	Alder Silk Moss	NA	NA	NA	S1S2	3	61.4 ± 5.0	NS
N	<i>Platydictya confervoides</i>	a Moss	NA	NA	NA	S1S2	1	53.7 ± 0.01	NS
N	<i>Sematophyllum marylandicum</i>	a Moss	NA	NA	NA	S1S2	3	67.8 ± 0.1	NS
N	<i>Timmia megapolitana</i>	Metropolitan Timmia Moss	NA	NA	NA	S1S2	2	74.5 ± 1.6	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Tortula mucronifolia</i>	Mucronate Screw Moss	NA	NA	NA	S1S2	2	49.8 ± 3.0	NS
N	<i>Syntrichia papillosa</i>	a Moss	NA	NA	NA	S1S2	3	11.3 ± 0.2	NS
N	<i>Hamatocaulis vernicosus</i>	a Moss	NA	NA	NA	S1S2	5	71.3 ± 0.2	NS
N	<i>Haplocladium microphyllum</i>	Tiny-leaved Haplocladium Moss	NA	NA	NA	S1S2	1	52.0 ± 3.2	NS
N	<i>Enchylium bachmanianum</i>	Bachman's Jelly Lichen	NA	NA	NA	S1S2	2	39.9 ± 0.2	NS
N	<i>Sclerophora amabilis</i>	Collared Glass-whiskers Lichen	NA	NA	NA	S1S2	6	47.2 ± 0.2	NS
N	<i>Cladonia sulphurina</i>	Greater Sulphur-cup Lichen	NA	NA	NA	S1S2	7	78.2 ± 0.2	NB
N	<i>Heterodermia galactophylla</i>	Branching Fringe Lichen	NA	NA	NA	S1S2	5	33.2 ± 0.2	NS
N	<i>Peltigera ponojensis</i>	Pale-bellied Pelt Lichen	NA	NA	NA	S1S2	7	71.2 ± 1.0	NB
N	<i>Pilophorus cereolus</i>	Powdered Matchstick Lichen	NA	NA	NA	S1S2	3	73.2 ± 3.0	NS
N	<i>Rhizoplaca subdiscrepans</i>	Scattered Rock-posy Lichen	NA	NA	NA	S1S2	13	47.8 ± 0.2	NS
N	<i>Parmotrema reticulatum</i>	Netted Ruffle Lichen	NA	NA	NA	S1S2	17	24.2 ± 0.2	NS
N	<i>Parmeliella parvula</i>	Poor-man's Shingles Lichen	NA	NA	NA	S1S2	1	76.4 ± 0.1	NS
N	<i>Punctelia caseana</i>	Case's Speckled-back Lichen	NA	NA	NA	S1S2	5	68.1 ± 0.2	NB
N	<i>Radula tenax</i>	Tenacious Scalewort	NA	NA	NA	S1S3	2	35.4 ± 0.2	NS
N	<i>Aphanorrhagma serratum</i>	Lidded Earth Moss	NA	NA	NA	S1S3	1	24.4 ± 0.2	NS
N	<i>Ephemerum crassinervium</i>	Thick-nerved Earth Moss	NA	NA	NA	S1S3	2	17.7 ± 0.2	NS
N	<i>Tortula acaulon</i>	Cuspidate Earth Moss	NA	NA	NA	S1S3	8	10.8 ± 0.2	NS
N	<i>Physcomitrium immersum</i>	a Moss	NA	NA	NA	S1S3	8	17.7 ± 0.2	NS
N	<i>Chaenotheca hygrophila</i>	a lichen	NA	NA	NA	S1S3	9	51.5 ± 0.2	NS
N	<i>Umbilicaria polyrhiza</i>	Ballpoint Rocktripe Lichen	NA	NA	NA	S1S3	1	90.0 ± 0.01	NS
N	<i>Lecanora polytropia</i>	a lichen	NA	NA	NA	S1S3	8	37.4 ± 1.0	NS
N	<i>Acarospora sinopica</i>	a cracked lichen	NA	NA	NA	S1S3	2	96.5 ± 0.2	NS
N	<i>Xylopsora friesii</i>	a Lichen	NA	NA	NA	S1S3	2	68.6 ± 1.0	NB
N	<i>Peltigera neckeri</i>	Black-saddle Pelt Lichen	NA	NA	NA	S1S3	4	59.4 ± 0.01	NS
N	<i>Usnea fragilescens</i>	Inflationary Beard Lichen	NA	NA	NA	S1S3	2	43.8 ± 1.0	NS
N	<i>Usnea chaetophora</i>	Articulated Beard Lichen	NA	NA	NA	S1S3	2	44.2 ± 0.05	NS
N	<i>Stereocaulon intermedium</i>	Pacific Brain Foam Lichen	NA	NA	NA	S1S3	14	13.3 ± 0.01	NS
N	<i>Moerckia flotoviana</i>	Flotow's Ruffwort	NA	NA	NA	S2	1	64.0 ± 0.01	NS
N	<i>Anacamptodon splachnoides</i>	a Moss	NA	NA	NA	S2	6	11.3 ± 0.2	NS
N	<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss	NA	NA	NA	S2	1	69.9 ± 0.2	NS
N	<i>Usnea flavocardia</i>	Blood-splattered Beard Lichen	NA	NA	NA	S2	1	85.6 ± 4.5	NS
N	<i>Cystocoleus ebeneus</i>	Rockgossamer Lichen	NA	NA	NA	S2	7	36.5 ± 0.26	NS
N	<i>Cladonia wainioi</i>	False Reindeer Lichen	NA	NA	NA	S2	3	71.9 ± 0.2	NB
N	<i>Scytinium imbricatum</i>	Scaly Jellyskin Lichen	NA	NA	NA	S2	5	39.8 ± 0.2	NS
N	<i>Nephroma arcticum</i>	Arctic Kidney Lichen	NA	NA	NA	S2	4	57.9 ± 0.5	NS
N	<i>Nephroma resupinatum</i>	a lichen	NA	NA	NA	S2	14	20.2 ± 0.2	NS
N	<i>Placynthium flabellulosum</i>	Scaly Ink Lichen	NA	NA	NA	S2	11	19.1 ± 0.05	NS
N	<i>Anaptychia crinalis</i>	Hanging Fringed Lichen	NA	NA	NA	S2	1	93.1 ± 1.0	NB
N	<i>Cololejeunea biddlecomiae</i>	Biddlecome's Pouncewort	NA	NA	NA	S2?	1	14.6 ± 0.2	NS
N	<i>Anomodon viticulosus</i>	a Moss	NA	NA	NA	S2?	1	21.3 ± 0.2	NS
N	<i>Weissia muhlenbergiana</i>	a Moss	NA	NA	NA	S2?	7	11.6 ± 0.2	NS
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss	NA	NA	NA	S2?	12	21.1 ± 0.2	NS
N	<i>Ptychostomum pendulum</i>	Drooping Bryum	NA	NA	NA	S2?	1	57.9 ± 2.5	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Drepanocladus polygamus</i>	Polygamous Hook Moss	NA	NA	NA	S2?	10	10.6 ± 0.2	NS
N	<i>Pseudocampyllum radicale</i>	Long-stalked Fine Wet Moss	NA	NA	NA	S2?	3	15.4 ± 3.0	NS
N	<i>Climacium americanum</i>	American Tree Moss	NA	NA	NA	S2?	10	61.6 ± 0.2	NS
N	<i>Dicranum condensatum</i>	Condensed Broom Moss	NA	NA	NA	S2?	6	15.4 ± 3.0	NS
N	<i>Ditrichum rhynchostegium</i>	a Moss	NA	NA	NA	S2?	6	69.7 ± 1.0	NS
N	<i>Fissidens bushii</i>	Bush's Pocket Moss	NA	NA	NA	S2?	24	18.5 ± 0.2	NS
N	<i>Fontinalis hypnoides</i>	a moss	NA	NA	NA	S2?	2	72.4 ± 0.5	NS
N	<i>Fontinalis sullivantii</i>	Sullivant's Water Moss	NA	NA	NA	S2?	4	63.1 ± 0.01	NS
N	<i>Grimmia olneyi</i>	a Moss	NA	NA	NA	S2?	10	67.6 ± 0.3	NS
N	<i>Grimmia anomala</i>	Mountain Forest Grimmia	NA	NA	NA	S2?	1	54.5 ± 1.5	NS
N	<i>Hygrohypnum bestii</i>	Best's Brook Moss	NA	NA	NA	S2?	6	26.1 ± 0.01	NS
N	<i>Philonotis marchica</i>	a Moss	NA	NA	NA	S2?	2	67.7 ± 0.15	NS
N	<i>Physcomitrium collenchymatum</i>	a Moss	NA	NA	NA	S2?	1	23.6 ± 0.1	NS
N	<i>Platydictya jungermannioides</i>	False Willow Moss	NA	NA	NA	S2?	3	68.4 ± 0.1	NB
N	<i>Rhytidium rugosum</i>	Wrinkle-leaved Moss	NA	NA	NA	S2?	2	68.1 ± 1.0	NB
N	<i>Saelania glaucescens</i>	Blue Dew Moss	NA	NA	NA	S2?	2	74.1 ± 0.1	NB
N	<i>Tortella fragilis</i>	Fragile Twisted Moss	NA	NA	NA	S2?	1	68.0 ± 0.1	NB
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss	NA	NA	NA	S2?	5	12.0 ± 0.2	NS
N	<i>Anomobryum julaceum</i>	Slender Silver Moss	NA	NA	NA	S2?	4	68.2 ± 1.0	NB
N	<i>Rauiella scita</i>	Smaller Fern Moss	NA	NA	NA	S2?	16	67.6 ± 0.1	NS
N	<i>Cyrtomnium hymenophylloides</i>	Short-pointed Lantern Moss	NA	NA	NA	S2?	8	68.0 ± 0.1	NB
N	<i>Platylomella lescurii</i>	a Moss	NA	NA	NA	S2?	19	12.4 ± 0.2	NS
N	<i>Phyliscum demangeonii</i>	Black Rock-wafer Lichen	NA	NA	NA	S2?	7	36.5 ± 0.2	NS
N	<i>Calypogeia neogaea</i>	Common Pouchwort	NA	NA	NA	S2S3	3	37.2 ± 0.2	NS
N	<i>Porella pinnata</i>	Pinnate Scalewort	NA	NA	NA	S2S3	2	12.4 ± 0.2	NS
N	<i>Oxyrrhynchium hians</i>	Light Beaked Moss	NA	NA	NA	S2S3	7	23.5 ± 5.0	NS
N	<i>Platydictya subtilis</i>	Bark Willow Moss	NA	NA	NA	S2S3	7	12.7 ± 0.01	NS
N	<i>Plagiomnium rostratum</i>	Long-beaked Leafy Moss	NA	NA	NA	S2S3	10	23.7 ± 2.0	NS
N	<i>Scorpidium revolvens</i>	Limprichtia Moss	NA	NA	NA	S2S3	3	63.4 ± 0.01	NS
N	<i>Rhynchostegium serrulatum</i>	Dark Beaked Moss	NA	NA	NA	S2S3	1	66.5 ± 2.0	NS
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen	NA	NA	NA	S2S3	18	2.6 ± 0.08	NS
N	<i>Moelleropsis nebulosa ssp. frullaniae</i>	Blue-gray Moss Shingle Lichen	NA	NA	NA	S2S3	2	80.9 ± 0.5	NS
N	<i>Ramalina thrausta</i>	Angelhair Ramalina Lichen	NA	NA	NA	S2S3	18	47.2 ± 1.0	NS
N	<i>Usnea ceratina</i>	Warty Beard Lichen	NA	NA	NA	S2S3	4	46.0 ± 0.05	NS
N	<i>Usnea hirta</i>	Bristly Beard Lichen	NA	NA	NA	S2S3	6	50.7 ± 0.2	NS
N	<i>Usnea scabrata</i>	Straw Beard Lichen	NA	NA	NA	S2S3	1	98.1 ± 1.0	NS
N	<i>Usnea rubicunda</i>	Red Beard Lichen	NA	NA	NA	S2S3	9	52.0 ± 0.05	NS
N	<i>Ahtiana aurescens</i>	Eastern Candlewax Lichen	NA	NA	NA	S2S3	82	43.0 ± 0.01	NS
N	<i>Usnocetraria oakesiana</i>	Yellow Band Lichen	NA	NA	NA	S2S3	25	19.9 ± 0.01	NS
N	<i>Catinaria atropurpurea</i>	a lichen	NA	NA	NA	S2S3	2	72.0 ± 0.2	NB
N	<i>Cetraria muricata</i>	Spiny Heath Lichen	NA	NA	NA	S2S3	1	88.0 ± 0.01	NS
N	<i>Cladonia incrassata</i>	Powder-foot British Soldiers Lichen	NA	NA	NA	S2S3	4	44.9 ± 0.2	NS
N	<i>Cladonia mateocyatha</i>	Mixed-up Pixie-cup	NA	NA	NA	S2S3	7	28.3 ± 1.2	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Cladonia parasitica</i>	Fence-rail Lichen	NA	NA	NA	S2S3	3	50.0 ± 1.2	NS
N	<i>Scytinium tenuissimum</i>	Birdnest Jellyskin Lichen	NA	NA	NA	S2S3	10	46.8 ± 0.1	NS
N	<i>Melanelia hepaticon</i>	Rimmed Camouflage Lichen	NA	NA	NA	S2S3	2	76.7 ± 0.2	NB
N	<i>Melanohalea septentrionalis</i>	Northern Camouflage Lichen	NA	NA	NA	S2S3	8	52.5 ± 0.6	NS
N	<i>Myelochroa aurulenta</i>	Powdery Axil-bristle Lichen	NA	NA	NA	S2S3	12	31.2 ± 2.3	NS
N	<i>Hypotrachyna minarum</i>	Hairless-spined Shield Lichen	NA	NA	NA	S2S3	39	41.6 ± 0.05	NS
N	<i>Parmeliopsis ambigua</i>	Green Starburst Lichen	NA	NA	NA	S2S3	3	29.9 ± 2.0	NS
N	<i>Racodium rupestre</i>	Rockhair Lichen	NA	NA	NA	S2S3	4	59.5 ± 0.01	NS
N	<i>Umbilicaria polyphylla</i>	Petalled Rocktripe Lichen	NA	NA	NA	S2S3	3	29.9 ± 2.0	NS
N	<i>Usnea cavernosa</i>	Pitted Beard Lichen	NA	NA	NA	S2S3	5	25.6 ± 0.2	NS
N	<i>Usnea mutabilis</i>	Bloody Beard Lichen	NA	NA	NA	S2S3	4	51.9 ± 0.25	NS
N	<i>Fuscopannaria sorediata</i>	a Lichen	NA	NA	NA	S2S3	20	58.7 ± 0.2	NS
N	<i>Stereocaulon subcoralloides</i>	Coralloid Foam Lichen	NA	NA	NA	S2S3	1	69.8 ± 1.0	NB
N	<i>Dimelaena oreina</i>	Golden Moonglow Lichen	NA	NA	NA	S2S3	11	47.8 ± 0.2	NS
N	<i>Hypotrachyna revoluta</i>	Granulating Loop Lichen	NA	NA	NA	S2S3	7	21.7 ± 0.01	NS
N	<i>Cetraria arenaria</i>	Sand-loving Icelandmoss Lichen	NA	NA	NA	S2S3	35	10.8 ± 0.01	NS
N	<i>Cladonia coccifera</i>	Eastern Boreal Pixie-cup Lichen	NA	NA	NA	S2S3	1	13.3 ± 0.01	NS
N	<i>Cladonia deformis</i>	Lesser Sulphur-cup Lichen	NA	NA	NA	S2S3	12	35.0 ± 3.0	NS
N	<i>Cladonia phyllophora</i>	Felt Lichen	NA	NA	NA	S2S3	2	20.9 ± 4.5	NS
N	<i>Hypotrachyna afrorevoluta</i>	Pustulate Revolute Loop Lichen	NA	NA	NA	S2S3	89	37.5 ± 0.01	NS
N	<i>Usnea flammea</i>	Coastal Bushy Beard Lichen	NA	NA	NA	S2S3	2	48.7 ± 0.05	NS
N	<i>Jubula pennsylvanica</i>	a liverwort	NA	NA	NA	S3	19	18.1 ± 0.2	NS
N	<i>Anomodon tristis</i>	a Moss	NA	NA	NA	S3	24	35.0 ± 0.2	NS
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss	NA	NA	NA	S3	6	48.0 ± 0.01	NS
N	<i>Rostania occulta</i>	Crusted Tarpaper Lichen	NA	NA	NA	S3	10	23.0 ± 0.2	NS
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen	NA	NA	NA	S3	84	10.5 ± 0.01	NS
N	<i>Solorina saccata</i>	Woodland Owl Lichen	NA	NA	NA	S3	21	53.9 ± 0.05	NS
N	<i>Fuscopannaria ahlneri</i>	Roughened Shingle Lichen	NA	NA	NA	S3	59	23.7 ± 0.01	NS
N	<i>Scytinium lichenoides</i>	Tattered Jellyskin Lichen	NA	NA	NA	S3	37	100.0 ± 0.5	NS
N	<i>Leptogium milligranum</i>	Stretched Jellyskin Lichen	NA	NA	NA	S3	43	21.0 ± 0.2	NS
N	<i>Nephroma bellum</i>	Naked Kidney Lichen	NA	NA	NA	S3	19	49.7 ± 8.0	NS
N	<i>Placynthium nigrum</i>	Common Ink Lichen	NA	NA	NA	S3	3	54.3 ± 0.2	NS
N	<i>Platismatia norvegica</i>	Oldgrowth Rag Lichen	NA	NA	NA	S3	1	73.1 ± 0.01	NS
N	<i>Punctelia appalachensis</i>	Appalachian Speckleback Lichen	NA	NA	NA	S3	236	19.1 ± 0.2	NS
N	<i>Viridothelium virens</i>	a lichen	NA	NA	NA	S3	7	33.6 ± 0.5	NS
N	<i>Ephebe lanata</i>	Waterside Rockshag Lichen	NA	NA	NA	S3	15	19.1 ± 0.01	NS
N	<i>Phaeophyscia adiastrata</i>	Powder-tipped Shadow Lichen	NA	NA	NA	S3	26	21.4 ± 0.01	NS
N	<i>Phaeophyscia pusilloides</i>	Pompom-tipped Shadow Lichen	NA	NA	NA	S3	20	25.7 ± 0.05	NS
N	<i>Peltigera collina</i>	Tree Pelt Lichen	NA	NA	NA	S3	8	15.1 ± 0.1	NS
N	<i>Metzgeria conjugata</i>	Rock Veilwort	NA	NA	NA	S3?	4	14.7 ± 0.53	NS
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss	NA	NA	NA	S3?	8	19.6 ± 0.2	NS
N	<i>Calliergon giganteum</i>	Giant Spear Moss	NA	NA	NA	S3?	3	15.4 ± 3.0	NS
N	<i>Drummondia prorepens</i>	a Moss	NA	NA	NA	S3?	12	13.8 ± 0.2	NS
N	<i>Elodium blandowii</i>	Blandow's Bog Moss	NA	NA	NA	S3?	5	15.4 ± 0.01	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Mnium stellare</i>	Star Leafy Moss	NA	NA	NA	S3?	3	57.0 ± 1.5	NS
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss	NA	NA	NA	S3?	4	82.9 ± 5.0	NB
N	<i>Sphagnum riparium</i>	Streamside Peat Moss	NA	NA	NA	S3?	4	37.3 ± 0.2	NS
N	<i>Pseudotaxiphyllum distichaceum</i>	a Moss	NA	NA	NA	S3?	2	45.5 ± 4.8	NS
N	<i>Hypotrachyna catawbiensis</i>	Powder-tipped Antler Lichen	NA	NA	NA	S3?	63	39.5 ± 0.5	NS
N	<i>Cladonia stygia</i>	Black-footed Reindeer Lichen	NA	NA	NA	S3?	25	16.7 ± 0.2	NS
N	<i>Anomodon rugelii</i>	Rugel's Anomodon Moss	NA	NA	NA	S3S4	11	12.6 ± 0.01	NS
N	<i>Dichelyma capillaceum</i>	Hairlike Dichelyma Moss	NA	NA	NA	S3S4	11	17.5 ± 0.2	NS
N	<i>Dicranum leioneuron</i>	a Dicranum Moss	NA	NA	NA	S3S4	2	77.2 ± 0.1	NB
N	<i>Encalypta ciliata</i>	Fringed Extinguisher Moss	NA	NA	NA	S3S4	3	49.8 ± 3.0	NS
N	<i>Encalypta procera</i>	Slender Extinguisher Moss	NA	NA	NA	S3S4	7	36.9 ± 0.2	NS
N	<i>Fissidens taxifolius</i>	Yew-leaved Pocket Moss	NA	NA	NA	S3S4	19	12.9 ± 0.2	NS
N	<i>Myurella julacea</i>	Small Mouse-tail Moss	NA	NA	NA	S3S4	3	41.2 ± 0.01	NS
N	<i>Sphagnum platyphyllum</i>	Flat-leaved Peat Moss	NA	NA	NA	S3S4	5	25.3 ± 0.01	NS
N	<i>Splachnum ampullaceum</i>	Cruet Dung Moss	NA	NA	NA	S3S4	4	48.0 ± 0.01	NS
N	<i>Thamnobryum alleghaniense</i>	a Moss	NA	NA	NA	S3S4	48	10.0 ± 0.2	NS
N	<i>Tomentypnum nitens</i>	Golden Fuzzy Fen Moss	NA	NA	NA	S3S4	4	63.4 ± 0.01	NS
N	<i>Schistidium agassizii</i>	Elf Bloom Moss	NA	NA	NA	S3S4	6	17.4 ± 0.01	NS
N	<i>Hylocomiastrum pyrenaicum</i>	a Feather Moss	NA	NA	NA	S3S4	5	24.6 ± 0.2	NS
N	<i>Bryoria pseudofuscescens</i>	Mountain Horsehair Lichen	NA	NA	NA	S3S4	22	43.8 ± 1.5	NS
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen	NA	NA	NA	S3S4	108	10.4 ± 0.01	NS
N	<i>Enchylium tenax</i>	Soil Tarpaper Lichen	NA	NA	NA	S3S4	7	37.5 ± 0.01	NS
N	<i>Sticta fuliginosa</i>	Peppered Moon Lichen	NA	NA	NA	S3S4	71	100.0 ± 0.5	NS
N	<i>Arctoparmelia incurva</i>	Finger Ring Lichen	NA	NA	NA	S3S4	73	15.2 ± 0.2	NS
N	<i>Scytinium teretiusculum</i>	Curly Jellyskin Lichen	NA	NA	NA	S3S4	29	11.9 ± 0.2	NS
N	<i>Leptogium acadiense</i>	Acadian Jellyskin Lichen	NA	NA	NA	S3S4	68	18.1 ± 0.5	NS
N	<i>Scytinium subtile</i>	Appressed Jellyskin Lichen	NA	NA	NA	S3S4	53	13.2 ± 0.01	NS
N	<i>Felipes leucopellaeus</i>	a lichen	NA	NA	NA	S3S4	8	44.1 ± 0.2	NS
N	<i>Bacidia laurocerasi</i>	a Lichen	NA	NA	NA	S3S4	5	71.2 ± 1.0	NB
N	<i>Chaenotheca brachypoda</i>	a stubble lichen	NA	NA	NA	S3S4	7	47.2 ± 0.01	NS
N	<i>Cladonia floerkeana</i>	Gritty British Soldiers Lichen	NA	NA	NA	S3S4	10	41.7 ± 0.01	NS
N	<i>Vahliaella leucophaea</i>	Shelter Shingle Lichen	NA	NA	NA	S3S4	39	19.1 ± 0.05	NS
N	<i>Heterodermia speciosa</i>	Powdered Fringe Lichen	NA	NA	NA	S3S4	193	16.6 ± 0.01	NS
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen	NA	NA	NA	S3S4	429	100.0 ± 0.2	NS
N	<i>Melanohalea olivacea</i>	Spotted Camouflage Lichen	NA	NA	NA	S3S4	10	29.3 ± 1.0	NS
N	<i>Parmelia fertilis</i>	Fertile Shield Lichen	NA	NA	NA	S3S4	32	16.8 ± 0.01	NS
N	<i>Parmeliopsis hyperopta</i>	Gray Starburst Lichen	NA	NA	NA	S3S4	4	48.7 ± 0.05	NS
N	<i>Parmotrema perlatum</i>	Powdered Ruffle Lichen	NA	NA	NA	S3S4	73	23.2 ± 0.01	NS
N	<i>Peltigera hymenina</i>	Cloudy Pelt Lichen	NA	NA	NA	S3S4	1	50.3 ± 1.5	NS
N	<i>Sphaerophorus fragilis</i>	Fragile Coral Lichen	NA	NA	NA	S3S4	7	85.3 ± 3.08	NS
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen	NA	NA	NA	S3S4	178	10.1 ± 0.2	NS
N	<i>Stereocaulon condensatum</i>	Granular Soil Foam Lichen	NA	NA	NA	S3S4	22	11.1 ± 0.2	NS
N	<i>Physcia caesia</i>	Blue-gray Rosette Lichen	NA	NA	NA	S3S4	4	37.8 ± 0.2	NS
N	<i>Physcia tenella</i>	Fringed Rosette Lichen	NA	NA	NA	S3S4	5	77.6 ± 0.02	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen	NA	NA	NA	S3S4	674	10.8 ± 0.01	NS
N	<i>Evernia prunastri</i>	Valley Oakmoss Lichen	NA	NA	NA	S3S4	58	16.8 ± 0.01	NS
N	<i>Heterodermia neglecta</i>	Fringe Lichen	NA	NA	NA	S3S4	244	23.2 ± 0.01	NS
N	<i>Riccardia multifida</i>	Delicate Germanderwort	NA	NA	NA	S4?	5	14.5 ± 0.2	NS
N	<i>Ephemerum stoloniferum</i>	Serrated Earth Moss	NA	NA	NA	S4?	11	10.2 ± 0.2	NS
N	<i>Orthotrichum anomalum</i>	Anomalous Bristle Moss	NA	NA	NA	S4?	11	21.6 ± 0.2	NS
N	<i>Sphagnum contortum</i>	Twisted Peat Moss	NA	NA	NA	S4?	9	10.6 ± 0.2	NS
P	<i>Rhynchospora macrostachya</i>	Tall Beakrush	Endangered	Endangered	Endangered	S1	60	65.4 ± 0.01	NS
P	<i>Trichostema dichotomum</i>	Forked Bluecurls	Threatened	NA	NA	S1	10	59.7 ± 0.2	NS
P	<i>Fraxinus nigra</i>	Black Ash	Threatened	NA	Threatened	S2	1078	7.6 ± 0.01	NS
P	<i>Clethra alnifolia</i>	Coast Pepper-Bush	Threatened	Threatened	Vulnerable	S2	178	60.0 ± 0.01	NS
P	<i>Hydrocotyle umbellata</i>	Water Pennywort	Special Concern	Special Concern	Endangered	S2	93	71.5 ± 2.9	NS
P	<i>Eleocharis tuberculosa</i>	Tuberled Spike-rush	Special Concern	Special Concern	Vulnerable	S2	1	90.6 ± 0.01	NS
P	<i>Lachnanthes caroliniana</i>	Redroot	Special Concern	Special Concern	Vulnerable	S2	1500	64.4 ± 0.01	NS
P	<i>Lophiola aurea</i>	Goldencrest	Special Concern	Special Concern	Vulnerable	S2	811	55.3 ± 0.01	NS
P	<i>Lilaeopsis chinensis</i>	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	S3	162	67.7 ± 0.01	NS
P	<i>Scirpus longii</i>	Long's Bulrush	Special Concern	Special Concern	Vulnerable	S3	510	42.8 ± 0.2	NS
P	<i>Isoetes prototypus</i>	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S3	14	35.0 ± 0.1	NS
P	<i>Floerkea proserpinacoides</i>	False Mermaidweed	Not At Risk	NA	NA	S2S3	38	15.2 ± 1.0	NS
P	<i>Salix candida</i>	Sage Willow	NA	NA	Endangered	S1	1	99.5 ± 0.2	NS
P	<i>Acer saccharinum</i>	Silver Maple	NA	NA	NA	S1	16	21.0 ± 0.01	NS
P	<i>Toxicodendron vernix</i>	Poison Sumac	NA	NA	NA	S1	42	75.9 ± 0.5	NS
P	<i>Osmorhiza depauperata</i>	Blunt Sweet Cicely	NA	NA	NA	S1	1	34.8 ± 5.0	NS
P	<i>Antennaria rosea ssp. arida</i>	Rosy Pussytoes	NA	NA	NA	S1	2	37.1 ± 0.5	NS
P	<i>Erigeron compositus</i>	Cut-leaved Fleabane	NA	NA	NA	S1	1	75.3 ± 0.01	NS
P	<i>Turritis glabra</i>	Tower Mustard	NA	NA	NA	S1	2	28.6 ± 0.5	NS
P	<i>Lobelia spicata</i>	Pale-Spiked Lobelia	NA	NA	NA	S1	7	42.7 ± 7.07	NS
P	<i>Silene antirrhina</i>	Sleepy Catchfly	NA	NA	NA	S1	5	10.8 ± 0.01	NS
P	<i>Callitriche hermaphroditica</i>	Northern Water-starwort	NA	NA	NA	S1	5	74.5 ± 0.01	NB
P	<i>Astragalus robbinsii</i>	Robbins' Milkvetch	NA	NA	NA	S1	5	37.1 ± 0.2	NS
P	<i>Astragalus robbinsii var. minor</i>	Robbins' Milkvetch	NA	NA	NA	S1	35	37.0 ± 0.6	NS
P	<i>Ribes americanum</i>	Wild Black Currant	NA	NA	NA	S1	10	49.5 ± 1.0	NS
P	<i>Fraxinus pennsylvanica</i>	Red Ash	NA	NA	NA	S1	20	27.5 ± 1.0	NS
P	<i>Polygonum achoreum</i>	Leathery Knotweed	NA	NA	NA	S1	1	47.9 ± 10.0	NS
P	<i>Persicaria careyi</i>	Carey's Smartweed	NA	NA	NA	S1	1	82.4 ± 0.01	NS
P	<i>Podostemum ceratophyllum</i>	Horn-leaved Riverweed	NA	NA	NA	S1	4	36.8 ± 0.25	NS
P	<i>Montia fontana</i>	Water Blinks	NA	NA	NA	S1	3	41.7 ± 0.5	NS
P	<i>Lysimachia minima</i>	Chaffweed	NA	NA	NA	S1	1	70.9 ± 0.01	NS
P	<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife	NA	NA	NA	S1	2	73.6 ± 0.01	NS
P	<i>Clematis occidentalis</i>	Purple Clematis	NA	NA	NA	S1	14	68.3 ± 0.2	NB
P	<i>Ranunculus pensylvanicus</i>	Pennsylvania Buttercup	NA	NA	NA	S1	3	77.0 ± 0.1	NB
P	<i>Thalictrum confine</i>	Northern Meadow-rue	NA	NA	NA	S1	2	83.6 ± 5.0	NS
P	<i>Amelanchier nantucketensis</i>	Nantucket Serviceberry	NA	NA	NA	S1	1	63.7 ± 1.0	NS
P	<i>Agalinis tenuifolia</i>	Slender Agalinis	NA	NA	NA	S1	1	17.1 ± 0.2	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Scrophularia lanceolata</i>	Lance-leaved Figwort	NA	NA	NA	S1	4	8.0 ± 1.0	NS
P	<i>Carex digitalis</i>	Slender Wood Sedge	NA	NA	NA	S1	6	47.5 ± 0.2	NS
P	<i>Carex laxiflora</i>	Loose-Flowered Sedge	NA	NA	NA	S1	6	6.8 ± 7.07	NS
P	<i>Carex normalis</i>	a Sedge	NA	NA	NA	S1	1	73.8 ± 0.2	NS
P	<i>Carex ormostachya</i>	Necklace Spike Sedge	NA	NA	NA	S1	8	7.5 ± 5.0	NS
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge	NA	NA	NA	S1	9	68.1 ± 0.04	NB
P	<i>Carex prairea</i>	Prairie Sedge	NA	NA	NA	S1	2	26.3 ± 1.0	NS
P	<i>Carex tinctoria</i>	Tinged Sedge	NA	NA	NA	S1	5	72.3 ± 0.2	NB
P	<i>Carex viridula</i> var. <i>saxillitoralis</i>	Greenish Sedge	NA	NA	NA	S1	1	37.7 ± 0.2	NS
P	<i>Eleocharis erythropoda</i>	Red-stemmed Spikerush	NA	NA	NA	S1	2	93.5 ± 0.01	NB
P	<i>Fimbristylis autumnalis</i>	Slender Fimbry	NA	NA	NA	S1	3	78.3 ± 0.01	NS
P	<i>Scirpus atrovirens</i>	Dark-green Bulrush	NA	NA	NA	S1	3	58.7 ± 0.03	NS
P	<i>Schoenoplectus torreyi</i>	Torrey's Bulrush	NA	NA	NA	S1	8	53.4 ± 0.01	NS
P	<i>Sisyrinchium fuscatum</i>	Coastal Plain Blue-eyed-grass	NA	NA	NA	S1	6	53.8 ± 1.5	NS
P	<i>Juncus secundus</i>	Secund Rush	NA	NA	NA	S1	3	16.2 ± 0.1	NS
P	<i>Juncus vaseyi</i>	Vasey Rush	NA	NA	NA	S1	6	80.0 ± 0.01	NB
P	<i>Trillium grandiflorum</i>	White Trillium	NA	NA	NA	S1	3	26.4 ± 1.0	NS
P	<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	North American White Adder's-mouth	NA	NA	NA	S1	7	37.2 ± 0.5	NS
P	<i>Spiranthes casei</i> var. <i>casei</i>	Case's Ladies'-Tresses	NA	NA	NA	S1	3	28.3 ± 0.1	NS
P	<i>Dichanthelium xanthophyllum</i>	Slender Panic Grass	NA	NA	NA	S1	10	57.7 ± 0.2	NS
P	<i>Elymus hystrix</i>	Spreading Wild Rye	NA	NA	NA	S1	9	59.8 ± 0.01	NS
P	<i>Torreyochloa pallida</i> var. <i>pallida</i>	Pale False Manna Grass	NA	NA	NA	S1	2	11.4 ± 1.5	NS
P	<i>Graphephorum melicoides</i>	Purple False Oats	NA	NA	NA	S1	4	69.7 ± 0.01	NB
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern	NA	NA	NA	S1	23	14.3 ± 100.0	NS
P	<i>Equisetum palustre</i>	Marsh Horsetail	NA	NA	NA	S1	3	24.7 ± 5.0	NS
P	<i>Selaginella rupestris</i>	Rock Spikemoss	NA	NA	NA	S1	22	57.6 ± 0.01	NS
P	<i>Carex pennsylvanica</i>	Pennsylvania Sedge	NA	NA	NA	S1?	3	53.7 ± 0.2	NS
P	<i>Carex rostrata</i>	Narrow-leaved Beaked Sedge	NA	NA	NA	S1?	1	82.8 ± 0.01	NB
P	<i>Bolboschoenus robustus</i>	Sturdy Bulrush	NA	NA	NA	S1?	1	59.0 ± 5.0	NS
P	<i>Juncus antheratus</i>	Greater Poverty Rush	NA	NA	NA	S1?	1	24.7 ± 0.01	NS
P	<i>Allium schoenoprasum</i>	Wild Chives	NA	NA	NA	S1?	13	9.7 ± 0.2	NS
P	<i>Allium schoenoprasum</i> var. <i>sibiricum</i>	Wild Chives	NA	NA	NA	S1?	3	67.2 ± 7.07	NS
P	<i>Panicum dichotomiflorum</i> ssp. <i>puritanorum</i>	Spreading Panicgrass	NA	NA	NA	S1?	5	72.0 ± 0.01	NS
P	<i>Cypripedium arietinum</i>	Ram's-Head Lady's-Slipper	NA	NA	Endangered	S1S2	422	47.5 ± 0.2	NS
P	<i>Sanicula odorata</i>	Clustered Sanicle	NA	NA	NA	S1S2	9	16.1 ± 2.0	NS
P	<i>Draba glabella</i>	Rock Whitlow-Grass	NA	NA	NA	S1S2	9	37.0 ± 0.25	NS
P	<i>Proserpinaca intermedia</i>	Intermediate Mermaidweed	NA	NA	NA	S1S2	4	13.1 ± 2.0	NS
P	<i>Carex haydenii</i>	Hayden's Sedge	NA	NA	NA	S1S2	6	32.1 ± 1.0	NS
P	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	Slim-stemmed Reed Grass	NA	NA	NA	S1S2	3	78.9 ± 7.07	NS
P	<i>Woodsia alpina</i>	Alpine Cliff Fern	NA	NA	NA	S1S2	6	72.4 ± 0.5	NB
P	<i>Selaginella selaginoides</i>	Low Spikemoss	NA	NA	NA	S1S2	8	68.2 ± 0.4	NB

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Euphrasia farlowii</i>	Farlow's Eyebright	NA	NA	NA	S1S3	2	91.1 ± 0.01	NS
P	<i>Crocianthemum canadense</i>	Long-branched Frostweed	NA	NA	Endangered	S2	157	7.7 ± 0.2	NS
P	<i>Zizia aurea</i>	Golden Alexanders	NA	NA	NA	S2	8	68.3 ± 0.01	NS
P	<i>Nabalus racemosus</i>	Glaucous Rattlesnakeroot	NA	NA	NA	S2	4	87.0 ± 0.2	NS
P	<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower	NA	NA	NA	S2	38	15.3 ± 0.2	NS
P	<i>Solidago multiradiata</i>	Multi-rayed Goldenrod	NA	NA	NA	S2	1	99.7 ± 0.5	NB
P	<i>Ageratina altissima</i>	White Snakeroot	NA	NA	NA	S2	62	38.6 ± 0.01	NS
P	<i>Arabis pycnocarpa</i>	Cream-flowered Rockcress	NA	NA	NA	S2	12	43.8 ± 0.1	NS
P	<i>Cardamine maxima</i>	Large Toothwort	NA	NA	NA	S2	29	27.3 ± 4.0	NS
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort	NA	NA	NA	S2	15	38.4 ± 1.0	NS
P	<i>Suaeda rolandii</i>	Roland's Sea-Blite	NA	NA	NA	S2	14	42.5 ± 0.25	NS
P	<i>Hudsonia ericoides</i>	Pinebarren Golden Heather	NA	NA	NA	S2	210	6.5 ± 0.01	NS
P	<i>Desmodium canadense</i>	Canada Tick-trefoil	NA	NA	NA	S2	12	25.0 ± 7.07	NS
P	<i>Hylodesmum glutinosum</i>	Large Tick-trefoil	NA	NA	NA	S2	43	15.4 ± 7.07	NS
P	<i>Oxytropis campestris</i>	Field Locoweed	NA	NA	NA	S2	1	37.7 ± 0.2	NS
P	<i>Oxytropis campestris</i> var. <i>johannensis</i>	Field Locoweed	NA	NA	NA	S2	32	37.0 ± 0.6	NS
P	<i>Hepatica americana</i>	Round-lobed Hepatica	NA	NA	NA	S2	89	26.3 ± 0.1	NS
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup	NA	NA	NA	S2	22	38.2 ± 0.2	NS
P	<i>Galium boreale</i>	Northern Bedstraw	NA	NA	NA	S2	10	42.7 ± 7.07	NS
P	<i>Dirca palustris</i>	Eastern Leatherwood	NA	NA	NA	S2	78	50.7 ± 0.2	NS
P	<i>Carex chordorrhiza</i>	Creeping Sedge	NA	NA	NA	S2	2	80.1 ± 0.01	NB
P	<i>Carex livida</i>	Livid Sedge	NA	NA	NA	S2	2	49.8 ± 10.0	NS
P	<i>Juncus greenii</i>	Greene's Rush	NA	NA	NA	S2	3	69.1 ± 0.01	NS
P	<i>Juncus alpinoarticulatus</i> ssp. <i>americanus</i>	Northern Green Rush	NA	NA	NA	S2	2	76.7 ± 0.02	NB
P	<i>Allium tricoccum</i>	Wild Leek	NA	NA	NA	S2	170	11.6 ± 0.01	NS
P	<i>Lilium canadense</i>	Canada Lily	NA	NA	NA	S2	50	15.8 ± 7.07	NS
P	<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Yellow Lady's-slipper	NA	NA	NA	S2	29	26.4 ± 5.0	NS
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper	NA	NA	NA	S2	13	7.7 ± 0.1	NS
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper	NA	NA	NA	S2	36	62.8 ± 0.1	NS
P	<i>Platanthera flava</i> var. <i>flava</i>	Southern Rein Orchid	NA	NA	NA	S2	19	37.7 ± 7.07	NS
P	<i>Platanthera flava</i> var. <i>herbiola</i>	Pale Green Orchid	NA	NA	NA	S2	28	18.8 ± 0.01	NS
P	<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid	NA	NA	NA	S2	16	43.4 ± 1.0	NS
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass	NA	NA	NA	S2	42	20.2 ± 0.01	NS
P	<i>Elymus wiegandii</i>	Wiegand's Wild Rye	NA	NA	NA	S2	1	97.4 ± 0.01	NB
P	<i>Festuca subverticillata</i>	Nodding Fescue	NA	NA	NA	S2	15	37.7 ± 7.07	NS
P	<i>Piptatheropsis pungens</i>	Slender Ricegrass	NA	NA	NA	S2	24	11.4 ± 0.0	NS
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake	NA	NA	NA	S2	6	49.8 ± 0.25	NS
P	<i>Rumex persicarioides</i>	Peach-leaved Dock	NA	NA	NA	S2?	1	61.0 ± 0.01	NS
P	<i>Crataegus submollis</i>	Quebec Hawthorn	NA	NA	NA	S2?	5	57.0 ± 1.0	NS
P	<i>Carex peckii</i>	White-Tinged Sedge	NA	NA	NA	S2?	6	57.2 ± 0.01	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Huperzia selago</i>	Northern Firmoss	NA	NA	NA	S2?	1	37.4 ± 1.0	NS
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely	NA	NA	NA	S2S3	20	15.8 ± 1.0	NS
P	<i>Eutrochium dubium</i>	Coastal Plain Joe Pye Weed	NA	NA	NA	S2S3	3	73.7 ± 0.05	NS
P	<i>Lactuca hirsuta</i>	Hairy Lettuce	NA	NA	NA	S2S3	5	34.3 ± 1.0	NS
P	<i>Draba arabisans</i>	Rock Whitlow-Grass	NA	NA	NA	S2S3	42	37.0 ± 0.5	NS
P	<i>Hypericum majus</i>	Large St John's-wort	NA	NA	NA	S2S3	6	67.7 ± 0.01	NS
P	<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort	NA	NA	NA	S2S3	8	66.5 ± 0.1	NS
P	<i>Empetrum atropurpureum</i>	Purple Crowberry	NA	NA	NA	S2S3	1	78.5 ± 7.07	NS
P	<i>Euphorbia polygonifolia</i>	Seaside Spurge	NA	NA	NA	S2S3	12	66.0 ± 3.0	NS
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil	NA	NA	NA	S2S3	10	36.6 ± 1.0	NS
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal	NA	NA	NA	S2S3	23	15.0 ± 0.5	NS
P	<i>Oenothera fruticosa ssp. tetragona</i>	Narrow-leaved Evening Primrose	NA	NA	NA	S2S3	16	35.8 ± 0.05	NS
P	<i>Polygonum aviculare ssp. buxiforme</i>	Box Knotweed	NA	NA	NA	S2S3	8	35.3 ± 1.0	NS
P	<i>Polygonum oxyspermum ssp. raii</i>	Ray's Knotweed	NA	NA	NA	S2S3	5	63.9 ± 1.0	NS
P	<i>Rumex triangulivalvis</i>	Triangular-valve Dock	NA	NA	NA	S2S3	11	25.2 ± 1.0	NS
P	<i>Anemonastrum canadense</i>	Canada Anemone	NA	NA	NA	S2S3	26	20.6 ± 0.2	NS
P	<i>Amelanchier fernaldii</i>	Fernald's Serviceberry	NA	NA	NA	S2S3	1	56.7 ± 7.07	NS
P	<i>Salix pellita</i>	Satiny Willow	NA	NA	NA	S2S3	5	24.4 ± 7.07	NS
P	<i>Gratiola neglecta</i>	Clammy Hedge-Hyssop	NA	NA	NA	S2S3	1	78.2 ± 0.2	NB
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle	NA	NA	NA	S2S3	62	14.0 ± 0.2	NS
P	<i>Carex capillaris</i>	Hairlike Sedge	NA	NA	NA	S2S3	21	37.1 ± 0.2	NS
P	<i>Carex comosa</i>	Bearded Sedge	NA	NA	NA	S2S3	13	8.2 ± 1.9	NS
P	<i>Carex hystericina</i>	Porcupine Sedge	NA	NA	NA	S2S3	9	13.0 ± 1.0	NS
P	<i>Carex longii</i>	Long's Sedge	NA	NA	NA	S2S3	1	87.1 ± 10.0	NS
P	<i>Carex scirpoidea</i>	Scirpuslike Sedge	NA	NA	NA	S2S3	6	92.1 ± 0.01	NB
P	<i>Eleocharis ovata</i>	Ovate Spikerush	NA	NA	NA	S2S3	8	24.6 ± 0.16	NS
P	<i>Vallisneria spiralis</i>	Wild Celery	NA	NA	NA	S2S3	12	53.7 ± 0.01	NS
P	<i>Najas gracillima</i>	Thread-Like Naiad	NA	NA	NA	S2S3	22	65.1 ± 0.01	NS
P	<i>Spiranthes casei var. novaescotiae</i>	Case's Ladies'-Tresses	NA	NA	NA	S2S3	7	23.9 ± 0.5	NS
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses	NA	NA	NA	S2S3	10	29.6 ± 0.75	NS
P	<i>Calamagrostis stricta</i>	Slim-stemmed Reed Grass	NA	NA	NA	S2S3	7	74.9 ± 0.01	NB
P	<i>Potamogeton friesii</i>	Fries' Pondweed	NA	NA	NA	S2S3	10	22.4 ± 2.0	NS
P	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern	NA	NA	NA	S2S3	1	90.8 ± 1.0	NB
P	<i>Woodsia glabella</i>	Smooth Cliff Fern	NA	NA	NA	S2S3	68	68.0 ± 0.1	NB
P	<i>Botrychium lanceolatum ssp. angustisegmentum</i>	Narrow Triangle Moonwort	NA	NA	NA	S2S3	13	26.0 ± 0.1	NS
P	<i>Botrychium simplex</i>	Least Moonwort	NA	NA	NA	S2S3	6	29.5 ± 1.0	NS
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue	NA	NA	NA	S2S3	8	22.3 ± 0.1	NS
P	<i>Thuja occidentalis</i>	Eastern White Cedar	NA	NA	Vulnerable	S3	428	7.1 ± 1.0	NS
P	<i>Potamogeton pulcher</i>	Spotted Pondweed	NA	NA	Vulnerable	S3	28	43.9 ± 0.2	NS
P	<i>Contoselinum chinense</i>	Chinese Hemlock-parsley	NA	NA	NA	S3	27	37.1 ± 0.5	NS
P	<i>Antennaria parlinii ssp. fallax</i>	Parlin's Pussytoes	NA	NA	NA	S3	41	37.7 ± 0.1	NS
P	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane	NA	NA	NA	S3	3	37.5 ± 0.5	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Hieracium robinsonii</i>	Robinson's Hawkweed	NA	NA	NA	S3	17	74.4 ± 0.5	NB
P	<i>Iva frutescens</i>	Big-leaved Marsh-elder	NA	NA	NA	S3	111	25.7 ± 0.2	NS
P	<i>Senecio pseudoarnica</i>	Seabeach Ragwort	NA	NA	NA	S3	2	77.8 ± 0.2	NS
P	<i>Symphyotrichum boreale</i>	Boreal Aster	NA	NA	NA	S3	6	47.5 ± 7.07	NS
P	<i>Symphyotrichum ciliolatum</i>	Fringed Blue Aster	NA	NA	NA	S3	31	31.0 ± 0.2	NS
P	<i>Symphyotrichum undulatum</i>	Wavy-leaved Aster	NA	NA	NA	S3	172	21.3 ± 0.01	NS
P	<i>Impatiens pallida</i>	Pale Jewelweed	NA	NA	NA	S3	14	21.0 ± 7.07	NS
P	<i>Caulophyllum thalictroides</i>	Blue Cohosh	NA	NA	NA	S3	75	14.9 ± 0.01	NS
P	<i>Alnus serrulata</i>	Smooth Alder	NA	NA	NA	S3	705	53.0 ± 0.01	NS
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch	NA	NA	NA	S3	64	58.9 ± 0.01	NS
P	<i>Betula pumila</i>	Bog Birch	NA	NA	NA	S3	1	84.9 ± 1.0	NS
P	<i>Cardamine parviflora</i>	Small-flowered Bittercress	NA	NA	NA	S3	17	7.6 ± 7.07	NS
P	<i>Boechera stricta</i>	Drummond's Rockcress	NA	NA	NA	S3	22	37.4 ± 1.0	NS
P	<i>Palustricodon aparinoides</i>	Marsh Bellflower	NA	NA	NA	S3	19	10.9 ± 1.0	NS
P	<i>Mononeuria groenlandica</i>	Greenland Stitchwort	NA	NA	NA	S3	257	54.8 ± 0.01	NS
P	<i>Sagina nodosa</i>	Knotted Pearlwort	NA	NA	NA	S3	45	73.7 ± 3.0	NS
P	<i>Sagina nodosa ssp. borealis</i>	Knotted Pearlwort	NA	NA	NA	S3	1	99.5 ± 5.0	NS
P	<i>Stellaria longifolia</i>	Long-leaved Starwort	NA	NA	NA	S3	2	68.8 ± 0.01	NB
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed	NA	NA	NA	S3	38	58.8 ± 0.01	NS
P	<i>Viburnum edule</i>	Squashberry	NA	NA	NA	S3	14	71.9 ± 0.01	NB
P	<i>Crassula aquatica</i>	Water Pygmyweed	NA	NA	NA	S3	1	84.9 ± 0.1	NS
P	<i>Cuscuta acadiana</i>	Acadian Dodder	NA	NA	NA	S3	2	68.6 ± 0.25	NS
P	<i>Empetrum eamesii</i>	Pink Crowberry	NA	NA	NA	S3	9	69.1 ± 0.01	NS
P	<i>Halenia deflexa</i>	Spurred Gentian	NA	NA	NA	S3	4	91.9 ± 0.01	NS
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill	NA	NA	NA	S3	30	9.6 ± 2.0	NS
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil	NA	NA	NA	S3	8	65.3 ± 3.0	NS
P	<i>Utricularia resupinata</i>	Inverted Bladderwort	NA	NA	NA	S3	14	55.5 ± 0.01	NS
P	<i>Epilobium densum</i>	Downy Willowherb	NA	NA	NA	S3	10	27.2 ± 3.0	NS
P	<i>Conopholis americana</i>	American Cancer-root	NA	NA	NA	S3	139	20.7 ± 0.2	NS
P	<i>Persicaria arifolia</i>	Halberd-leaved Tearthumb	NA	NA	NA	S3	28	20.9 ± 0.01	NS
P	<i>Plantago rugelii</i>	Rugel's Plantain	NA	NA	NA	S3	9	26.0 ± 0.01	NS
P	<i>Primula laurentiana</i>	Laurentian Primrose	NA	NA	NA	S3	79	21.3 ± 1.0	NS
P	<i>Samolus parviflorus</i>	Seaside Brookweed	NA	NA	NA	S3	56	67.8 ± 0.01	NS
P	<i>Pyrola minor</i>	Lesser Pyrola	NA	NA	NA	S3	7	21.0 ± 7.07	NS
P	<i>Anemone quinquefolia</i>	Wood Anemone	NA	NA	NA	S3	46	21.0 ± 0.01	NS
P	<i>Anemone virginiana</i>	Virginia Anemone	NA	NA	NA	S3	13	53.8 ± 0.05	NS
P	<i>Caltha palustris</i>	Yellow Marsh Marigold	NA	NA	NA	S3	44	22.4 ± 0.2	NS
P	<i>Cephalanthus occidentalis</i>	Common Buttonbush	NA	NA	NA	S3	1990	59.0 ± 0.01	NS
P	<i>Salix pedicellaris</i>	Bog Willow	NA	NA	NA	S3	99	11.4 ± 0.01	NS
P	<i>Salix sericea</i>	Silky Willow	NA	NA	NA	S3	143	21.1 ± 0.01	NS
P	<i>Saxifraga paniculata</i>	White Mountain Saxifrage	NA	NA	NA	S3	1	38.3 ± 0.2	NS
P	<i>Saxifraga paniculata ssp. laestadii</i>	Laestadius' Saxifrage	NA	NA	NA	S3	46	37.1 ± 0.5	NS
P	<i>Tiarella stolonifera</i>	Stoloniferous Foamflower	NA	NA	NA	S3	38	26.0 ± 0.01	NS
P	<i>Laportea canadensis</i>	Canada Wood Nettle	NA	NA	NA	S3	33	12.3 ± 0.39	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Pilea pumila</i>	Dwarf Clearweed	NA	NA	NA	S3	11	42.2 ± 0.2	NS
P	<i>Viola nephrophylla</i>	Northern Bog Violet	NA	NA	NA	S3	14	34.8 ± 1.0	NS
P	<i>Carex adusta</i>	Lesser Brown Sedge	NA	NA	NA	S3	9	49.3 ± 0.1	NS
P	<i>Carex bebbii</i>	Bebb's Sedge	NA	NA	NA	S3	21	52.4 ± 0.01	NS
P	<i>Carex castanea</i>	Chestnut Sedge	NA	NA	NA	S3	1	69.1 ± 0.01	NS
P	<i>Carex cryptolepis</i>	Hidden-scaled Sedge	NA	NA	NA	S3	20	53.6 ± 0.31	NS
P	<i>Carex eburnea</i>	Bristle-leaved Sedge	NA	NA	NA	S3	17	70.8 ± 0.2	NB
P	<i>Carex hirtifolia</i>	Pubescent Sedge	NA	NA	NA	S3	21	59.9 ± 0.01	NS
P	<i>Carex houghtoniana</i>	Houghton's Sedge	NA	NA	NA	S3	10	54.9 ± 0.2	NS
P	<i>Carex lupulina</i>	Hop Sedge	NA	NA	NA	S3	80	13.1 ± 0.01	NS
P	<i>Carex rosea</i>	Rosy Sedge	NA	NA	NA	S3	54	20.5 ± 0.2	NS
P	<i>Carex swanii</i>	Swan's Sedge	NA	NA	NA	S3	57	18.8 ± 5.0	NS
P	<i>Carex tenera</i>	Tender Sedge	NA	NA	NA	S3	8	23.7 ± 0.01	NS
P	<i>Carex tribuloides</i>	Blunt Broom Sedge	NA	NA	NA	S3	21	27.3 ± 0.01	NS
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge	NA	NA	NA	S3	43	55.0 ± 0.01	NS
P	<i>Carex atratiformis</i>	Scabrous Black Sedge	NA	NA	NA	S3	3	66.4 ± 0.1	NS
P	<i>Eleocharis nitida</i>	Quill Spikerush	NA	NA	NA	S3	23	26.0 ± 7.07	NS
P	<i>Eleocharis flavescens</i> var. <i>olivacea</i>	Bright-green Spikerush	NA	NA	NA	S3	16	42.0 ± 0.1	NS
P	<i>Eriophorum gracile</i>	Slender Cottongrass	NA	NA	NA	S3	10	23.6 ± 0.1	NS
P	<i>Coeloglossum viride</i>	Long-bracted Frog Orchid	NA	NA	NA	S3	20	24.1 ± 0.01	NS
P	<i>Cypripedium parviflorum</i>	Yellow Lady's-slipper	NA	NA	NA	S3	612	25.2 ± 1.0	NS
P	<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain	NA	NA	NA	S3	129	24.0 ± 0.01	NS
P	<i>Neottia bifolia</i>	Southern Twayblade	NA	NA	NA	S3	220	2.2 ± 0.2	NS
P	<i>Platanthera flava</i>	Southern Rein-Orchid	NA	NA	NA	S3	38	46.6 ± 0.01	NS
P	<i>Platanthera hookeri</i>	Hooker's Orchid	NA	NA	NA	S3	31	7.1 ± 1.0	NS
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid	NA	NA	NA	S3	12	45.5 ± 10.0	NS
P	<i>Spiranthes casei</i>	Case's Ladies'-Tresses	NA	NA	NA	S3	2	67.6 ± 0.01	NS
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass	NA	NA	NA	S3	16	10.8 ± 0.01	NS
P	<i>Piptatheropsis canadensis</i>	Canada Ricegrass	NA	NA	NA	S3	15	57.6 ± 0.01	NS
P	<i>Poa glauca</i>	Glaucous Blue Grass	NA	NA	NA	S3	25	37.4 ± 1.0	NS
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed	NA	NA	NA	S3	1	65.5 ± 7.07	NS
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed	NA	NA	NA	S3	2	25.9 ± 1.0	NS
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed	NA	NA	NA	S3	7	16.1 ± 1.0	NS
P	<i>Potamogeton zosteriformis</i>	Flat-stemmed Pondweed	NA	NA	NA	S3	4	23.2 ± 1.0	NS
P	<i>Asplenium viride</i>	Green Spleenwort	NA	NA	NA	S3	19	66.8 ± 5.0	NS
P	<i>Dryopteris fragrans</i>	Fragrant Wood Fern	NA	NA	NA	S3	82	50.0 ± 0.01	NS
P	<i>Sceptridium dissectum</i>	Dissected Moonwort	NA	NA	NA	S3	7	14.7 ± 1.0	NS
P	<i>Polypodium appalachianum</i>	Appalachian Polypody	NA	NA	NA	S3	55	9.1 ± 1.0	NS
P	<i>Persicaria amphibia</i> var. <i>emersa</i>	Long-root Smartweed	NA	NA	NA	S3?	30	43.8 ± 0.2	NS
P	<i>Diphasiastrum x sabinifolium</i>	Savin-leaved Ground-cedar	NA	NA	NA	S3?	15	23.4 ± 0.25	NS
P	<i>Bidens vulgata</i>	Tall Beggarticks	NA	NA	NA	S3S4	5	25.7 ± 0.2	NS
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane	NA	NA	NA	S3S4	83	54.7 ± 7.07	NS
P	<i>Hieracium paniculatum</i>	Panicled Hawkweed	NA	NA	NA	S3S4	53	21.1 ± 0.2	NS
P	<i>Bidens beckii</i>	Water Beggarticks	NA	NA	NA	S3S4	26	50.0 ± 0.01	NS

Table 8: Species within 100 km (continued)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Packera paupercula</i>	Balsam Groundsel	NA	NA	NA	S3S4	83	53.6 ± 0.2	NS
P	<i>Atriplex glabriuscula</i> var. <i>franktonii</i>	Frankton's Saltbush	NA	NA	NA	S3S4	18	23.6 ± 0.01	NS
P	<i>Shepherdia canadensis</i>	Soapberry	NA	NA	NA	S3S4	118	34.6 ± 0.54	NS
P	<i>Vaccinium boreale</i>	Northern Blueberry	NA	NA	NA	S3S4	3	58.6 ± 0.5	NS
P	<i>Vaccinium cespitosum</i>	Dwarf Bilberry	NA	NA	NA	S3S4	106	21.1 ± 0.01	NS
P	<i>Fagus grandifolia</i>	American Beech	NA	NA	NA	S3S4	1561	5.0 ± 0.2	NS
P	<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed	NA	NA	NA	S3S4	85	39.2 ± 3.0	NS
P	<i>Decodon verticillatus</i>	Swamp Loosestrife	NA	NA	NA	S3S4	184	47.2 ± 0.2	NS
P	<i>Nuphar microphylla</i>	Small Yellow Pond-lily	NA	NA	NA	S3S4	7	57.8 ± 0.01	NS
P	<i>Persicaria pensylvanica</i>	Pennsylvania Smartweed	NA	NA	NA	S3S4	45	11.8 ± 0.01	NS
P	<i>Fallopia scandens</i>	Climbing False Buckwheat	NA	NA	NA	S3S4	16	9.2 ± 5.0	NS
P	<i>Rumex pallidus</i>	Seabeach Dock	NA	NA	NA	S3S4	5	41.3 ± 0.6	NS
P	<i>Crataegus succulenta</i>	Fleshy Hawthorn	NA	NA	NA	S3S4	1	92.7 ± 0.01	NS
P	<i>Fragaria vesca</i> ssp. <i>americana</i>	Woodland Strawberry	NA	NA	NA	S3S4	34	37.5 ± 0.01	NS
P	<i>Fragaria vesca</i>	Woodland Strawberry	NA	NA	NA	S3S4	2	85.9 ± 0.5	NB
P	<i>Potentilla canadensis</i>	Canada Cinquefoil	NA	NA	NA	S3S4	20	57.2 ± 0.2	NS
P	<i>Galium aparine</i>	Common Bedstraw	NA	NA	NA	S3S4	34	9.3 ± 0.2	NS
P	<i>Geocaulon lividum</i>	Northern Comandra	NA	NA	NA	S3S4	7	10.4 ± 1.5	NS
P	<i>Limosella australis</i>	Southern Mudwort	NA	NA	NA	S3S4	5	70.6 ± 0.01	NS
P	<i>Ulmus americana</i>	White Elm	NA	NA	NA	S3S4	154	7.9 ± 0.01	NS
P	<i>Viola selkirkii</i>	Great-Spurred Violet	NA	NA	NA	S3S4	13	37.4 ± 1.0	NS
P	<i>Carex argyrantha</i>	Silvery-flowered Sedge	NA	NA	NA	S3S4	30	16.1 ± 2.0	NS
P	<i>Triglochin gaspensis</i>	Gaspé Arrowgrass	NA	NA	NA	S3S4	18	52.6 ± 0.6	NS
P	<i>Juncus acuminatus</i>	Sharp-Fruit Rush	NA	NA	NA	S3S4	15	9.7 ± 2.0	NS
P	<i>Juncus subcaudatus</i>	Woods-Rush	NA	NA	NA	S3S4	14	28.8 ± 0.01	NS
P	<i>Luzula parviflora</i>	Small-flowered Woodrush	NA	NA	NA	S3S4	1	55.4 ± 0.6	NS
P	<i>Luzula parviflora</i> ssp. <i>melanocarpa</i>	Black-fruited Woodrush	NA	NA	NA	S3S4	14	21.7 ± 7.07	NS
P	<i>Goodyera repens</i>	Lesser Rattlesnake-plantain	NA	NA	NA	S3S4	37	21.7 ± 7.07	NS
P	<i>Liparis loeselii</i>	Loesel's Twayblade	NA	NA	NA	S3S4	11	33.2 ± 5.0	NS
P	<i>Platanthera obtusata</i>	Blunt-leaved Orchid	NA	NA	NA	S3S4	16	25.0 ± 10.0	NS
P	<i>Platanthera orbiculata</i>	Small Round-leaved Orchid	NA	NA	NA	S3S4	55	44.1 ± 0.2	NS
P	<i>Alopecurus aequalis</i>	Short-awned Foxtail	NA	NA	NA	S3S4	10	10.8 ± 0.01	NS
P	<i>Dichanthelium clandestinum</i>	Deer-tongue Panic Grass	NA	NA	NA	S3S4	313	16.9 ± 0.01	NS
P	<i>Coleataenia longifolia</i>	Long-leaved Panicgrass	NA	NA	NA	S3S4	1626	55.4 ± 0.01	NS
P	<i>Koeleria spicata</i>	Narrow False Oats	NA	NA	NA	S3S4	26	37.1 ± 0.5	NS
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort	NA	NA	NA	S3S4	34	25.7 ± 0.01	NS
P	<i>Lorinseria areolata</i>	Netted Chain Fern	NA	NA	NA	S3S4	49	79.0 ± 7.07	NS
P	<i>Equisetum pratense</i>	Meadow Horsetail	NA	NA	NA	S3S4	9	19.9 ± 0.01	NS
P	<i>Diphasiastrum complanatum</i>	Northern Ground-cedar	NA	NA	NA	S3S4	23	3.9 ± 1.0	NS
P	<i>Diphasiastrum sitchense</i>	Sitka Ground-cedar	NA	NA	NA	S3S4	2	35.1 ± 1.0	NS
P	<i>Huperzia appressa</i>	Mountain Firmoss	NA	NA	NA	S3S4	49	36.6 ± 0.5	NS
P	<i>Sceptridium multifidum</i>	Leathery Moonwort	NA	NA	NA	S3S4	14	15.4 ± 10.0	NS

Table 8: Species within 100 km (*continued*)

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Botrychium matricariifolium</i>	Daisy-leaved Moonwort	NA	NA	NA	S3S4	10	24.9 ± 10.0	NS
P	<i>Ceratophyllum echinatum</i>	Prickly Hornwort	NA	NA	NA	S4	14	31.7 ± 3.0	NS
P	<i>Vaccinium corymbosum</i>	Highbush Blueberry	NA	NA	NA	S4	29	8.0 ± 0.2	NS
P	<i>Bartonia virginica</i>	Yellow Bartonia	NA	NA	NA	S4	28	37.4 ± 0.2	NS
P	<i>Senega sanguinea</i>	Blood Milkwort	NA	NA	NA	S4	41	8.4 ± 1.0	NS
P	<i>Pyrola asarifolia</i>	Pink Pyrola	NA	NA	NA	S4	19	37.4 ± 1.0	NS
P	<i>Endotropis alnifolia</i>	Alder-leaved Buckthorn	NA	NA	NA	S4	149	22.6 ± 0.3	NS
P	<i>Amelanchier spicata</i>	Running Serviceberry	NA	NA	NA	S4	79	7.6 ± 0.01	NS
P	<i>Agalinis purpurea</i> var. <i>parviflora</i>	Small-flowered Purple False Foxglove	NA	NA	NA	S4	2	93.3 ± 0.2	NS
P	<i>Lindernia dubia</i>	Yellow-seeded False Pimpernel	NA	NA	NA	S4	21	10.8 ± 0.2	NS
P	<i>Verbena hastata</i>	Blue Vervain	NA	NA	NA	S4	149	9.2 ± 0.2	NS
P	<i>Viola fimbriatula</i>	Ovate-leaved Violet	NA	NA	NA	S4	95	9.7 ± 0.5	NS
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage	NA	NA	NA	S4	38	58.5 ± 0.2	NS
P	<i>Sisyrinchium atlanticum</i>	Eastern Blue-Eyed-Grass	NA	NA	NA	S4	118	45.6 ± 5.0	NS
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid	NA	NA	NA	S4	51	15.2 ± 1.0	NS
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses	NA	NA	NA	S4	69	22.8 ± 1.0	NS
P	<i>Panicum tuckermanii</i>	Tuckerman's Witchgrass	NA	NA	NA	S4	32	13.9 ± 0.01	NS
P	<i>Bidens discoidea</i>	Swamp Beggarticks	NA	NA	NA	SH	1	73.6 ± 0.25	NS
P	<i>Andersonglossum boreale</i>	Northern Wild Comfrey	NA	NA	NA	SH	5	23.1 ± 0.1	NS
P	<i>Viola canadensis</i>	Canada Violet	NA	NA	NA	SH	1	55.8 ± 0.75	NS
P	<i>Iris prismatica</i>	Slender Blue Flag	NA	NA	NA	SH	1	14.3 ± 100.0	NS
P	<i>Greeneochloa coarctata</i>	Small Reedgrass	NA	NA	NA	SH	1	96.1 ± 6.0	NS
P	<i>Dichanthelium meridionale</i>	Matting Witchgrass	NA	NA	NA	SH	1	83.2 ± 10.0	NS
P	<i>Phytolacca americana</i>	Common Pokeweed	NA	NA	NA	SU	4	21.1 ± 0.2	NS
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw	NA	NA	NA	SU	8	23.9 ± 0.01	NS

5.1 Source Bibliography (100 km)

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications, or presentations in which this dataset makes a significant contribution.

Table 9: Source Bibliography (100 km)

# recs	Citation
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7624	McNeil, J.A. 2010. Blandings Turtle (<i>Emydoidea blandingii</i>) sightings, 1946-2009. Parks Canada, 12,871 recs of 597+ individuals.
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6167	iNaturalist.ca. 2023. iNaturalist Data Export December 2022. iNaturalist.org; iNaturalist.ca, Web site: 128634 recs.
3857	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
3263	Pardieck, K.L., Ziolkowski Jr., D.J., Lutmerding, M., Aponte, V.I., and Hudson, M-A.R. 2020. North American Breeding Bird Survey Dataset 1966 - 2019: U.S. Geological Survey data release, https://doi.org/10.5066/P9J6QUF6
2833	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
1800	iNaturalist.ca. 2025. iNaturalist Data Export December 2024. NatureServe Canada (ed.) iNaturalist.ca; iNaturalist.org, Web site: 254307.
1711	iNaturalist.ca. 2024. iNaturalist Data Export December 2023. iNaturalist.org; iNaturalist.ca.
1693	McNeil, J.A. 2010. Ribbonsnake (<i>Thamnophis sauritus</i>) sightings, 1900-2009. Parks Canada, 2521 recs of 716+ individuals.
1578	Paquet, Julie. 2018. Atlantic Canada Shorebird Survey (ACSS) database 2012-2018. Environment Canada, Canadian Wildlife Service.
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1009	Belliveau, A. 2012. 2012 Atlantic Coastal Plain Flora observations. Mersey Tobeatic Research Institute, 1543.
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755	McNeil, J.A. 2016. Blandings Turtle (<i>Emydoidea blandingii</i>), Eastern Ribbonsnake (<i>Thamnophis sauritus</i>), Wood Turtle (<i>Glyptemys insculpta</i>), and Snapping Turtle (<i>Chelydra serpentina</i>) sightings, 2016. Mersey Tobeatic Research Institute, 774 records.
734	Toms, Brad. 2012. Atlantic Coastal Plain Flora records, 2011. Mersey-Tobiatic Research Institute, 1109 recs.
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693	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
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583	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2018. Atlantic Canada Conservation Data Centre, 907 recs.
549	Coastal Action. 2023. 2023 Coastal Action SAR Data. Coastal Action, 552 recs.
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488	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
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429	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.

Table 9: Source Bibliography (100 km) (*continued*)

# rees	Citation
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353	Clayden, S. Digitization of Wolfgang Maass Nova Scotia forest lichen collections, 1964-2004. New Brunswick Museum. 2018.
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334	Staicer, Cindy. 2023. SAR bird occurrence data for SWNS for summer 2023.
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298	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 rees.
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Table 9: Source Bibliography (100 km) (*continued*)

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190	McNeil, J.A. 2019. Blanding's Turtle records, 2019. Mersey Tobeatic Research Institute.
190	McNeil, J.A. 2019. Eastern Painted Turtle trapping records, 2019. Mersey Tobeatic Research Institute.
185	Toms, Brad & Pepper, Chris; Neily, Tom. 2022. Nova Scotia lichen database [as of 2022-04]. Mersey Tobeatic Research Institute.
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181	Riley, J. 2020. Digby County lichen observations. Pers. comm. to J.L. Churchill.
175	Staicer, Cindy. 2023. 2022 SAR Bird field occurrences from the Landbirds at Risk Project, NS. Dalhousie University, 446 records.
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165	Birds Canada. 2025. Space To Roost project - Shorebird Surveys Minas Basin. Birds Canada.
158	Sarah Cusack. Atlantic Salmon Field Survey - Black River/Irish River NB. ACAP Saint John.
157	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
157	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
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153	McNeil, J.A. 2014. Blandings Turtle (<i>Emydoidea blandingii</i>) and Snapping Turtle (<i>Chelydra serpentina</i>) sightings, 2014. Mersey Tobeatic Research Institute.
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147	Chapman-Lam, Colin J. 2025. Field data from New Brunswick for the 2024 field season. Chapman-Lam, Colin J., 804 records.
147	McNeil, J.A. 2011. Ribbonsnake (<i>Thamophis sauritus</i>) sightings, 2010. Parks Canada, 148 recs of 70+ individuals.
147	Riley, J. 2019. Digby County lichen observations. Pers. comm. to J.L. Churchill, 50 recs.
138	Churchill, J.L. 2023. Atlantic Canada Conservation Data Centre Fieldwork 2023. Atlantic Canada Conservation Data Centre.
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Table 9: Source Bibliography (100 km) (*continued*)

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94	Richardson, Leif. 2018. Maritimes Bombus records from various sources. Richardson, Leif.
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89	Hubley, Nicole. 2022. Monarch (Danaus plexippus) records submitted to MTRI from the 2021 field season. Mersey Tobeatic Research Institute.
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62	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.
60	Canadian Wildlife Health Cooperative. 2024. Atlantic Canada Bat Hotline data from NS and PE. Atlantic Bat Conservation Project.
60	McLean, K. 2020. Species occurrence records from Clean Annapolis River Project fieldwork in 2020. Clean Annapolis River Project, 206 records.
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Table 9: Source Bibliography (100 km) (*continued*)

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48	Feltham, Carter. 2022. Monarch (<i>Danaus plexippus</i>) and Milkweed MTRI records from the 2022 Field Season. Mersey Tobeatic Research Institute.
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Table 9: Source Bibliography (100 km) (*continued*)

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Table 9: Source Bibliography (100 km) (*continued*)

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Table 9: Source Bibliography (100 km) (*continued*)

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Table 9: Source Bibliography (100 km) (*continued*)

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APPENDIX E
FRESHWATER AQUATIC ENVIRONMENT PHOTOGRAPH LOG



Photo 1: A representative photo of WC1.



Photo 2: A representative photo of WC2.



Photo 3: A representative photo of WC3.



Photo 4: A representative photo of WC4A.



Photo 5: A representative photo of WC4B.



Photo 6: A representative photo of WC5A.



Photo 7: A representative photo of WC5B.



Photo 8: A representative photo of the electrofishing reach in WC1.



Photo 9: A representative photo of the electrofishing reach in WC4A.

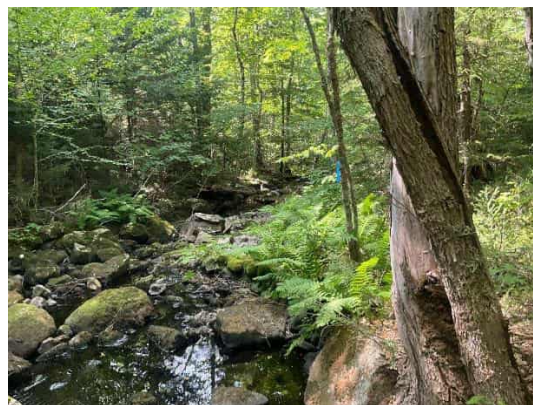


Photo 10: A representative photo of the trapping location in WC1.



Photo 11: A representative photo of the upstream trapping location in WC4A.



Photo 12: A representative photo of the downstream trapping location in WC4A.



Photo 13: A representative photo of a brook trout (*Salvelinus fontinalis*) captured within the Study Area



Photo 14: A representative photo of an American eel (*Anguilla rostrata*) captured within the Study Area

APPENDIX F
WETLAND CHARACTERISTICS AND PHOTOGRAPH LOG

Wetland ID	Date	Wetland Type	Area (m ²)	Delineation Type	Landform	Water Flow	Soil Type	Surface/ Hydrological Conditions	Dominant Vegetation			Associated Watercourse
									Herbaceous	Shrub	Trees	
WL1	2025-06-06	Treed Swamp	2208	Full	None	Isolated	Histosol (A1)	Saturation, Moss trim Line, Stunted or Stressed Plantrs	Osmunda regalis (Royal Fern), Rubus hispιδus (Bristly Dewberry), Onoclea sensibilis (Sensitive Fern)	Viburnum cassinoides (Northern Wild Raisin), Abies balsamea (Balsam Fir)	Betula papyrifera (Paper Birch)	N
WL2	2025-06-05	Treed Swamp	665	Full	Basin	Isolated	Histosol (A1)	Surface Water, Saturation, Water Marks, Geomorphic Position	Onoclea sensibilis (Sensitive Fern), Osmundastrum cinnamomeum (Cinnamon Fern), Viola cucullata (Marsh Blue Violet)	Betula papyrifera (Paper Birch), Pinus strobus (Eastern White Pine), Abies balsamea (Balsam Fir)	Acer rubrum (Red Maple), Betula papyrifera (Paper Birch), Picea rubens (Red Spruce)	N
WL3	2025-06-06	Treed Swamp	2479	Partial	Basin	Isolated	Histosol (A1)	Saturation, Water-stained Leaves, Hydrogen Sulfide odor, Drainage Patterns, Moss trimmed lines, Geomorphic Position	Osmunda regalis (Royal Fern), Osmundastrum cinnamomeum (Cinnamon Fern), Cornus canadensis (Bunchberry), Kalmia angustifolia (Sheep Laurel)	Betula alleghaniensis (Yellow Birch), Acer rubrum (Red Maple), Abies balsamea (Balsam Fir)	Acer rubrum (Red Maple)	N
WL4	2025-06-04	Treed Swamp	409	Full	Slope	Isolated	Histosol (A1)	Saturation, Water Marks, Sparsley Vegetated Concave Surface, Geomorphic Position	Osmundastrum cinnamomeum (Cinnamon Fern), Kalmia angustifolia (Sheep Laurel), Carex gynandra (Nodding Sedge), Cornus canadensis (Bunchberry)	Betula papyrifera (Paper Birch), Acer rubrum (Red Maple), Picea rubens (Red Spruce), Ilex mucronata (Mountain Holly)	Betula papyrifera (Paper Birch), Acer rubrum (Red Maple)	N
WL5	2025-06-04	Treed Bog	1497	Partial	Basin	Isolated	Histosol (A1)	Saturation, Water Marks, Geomorphic Position	Osmundastrum cinnamomeum (Cinnamon Fern), Kalmia angustifolia (Sheep Laurel), Maianthemum racemosum (Large False Solomon's Seal), Osmunda regalis (Royal Fern), Aronia melanocarpa (Black Chokeberry)	Pinus strobus (Eastern White Pine), Ilex mucronata (Mountain Holly)	Acer rubrum (Red Maple), Pinus strobus (Eastern White Pine)	N
WL6	2025-06-03	Treed Swamp	2085	Full	Fringe	Isolated	Histosol (A1)	Surface Water, Saturation, Water Marks, High Water Table, Saturation, Algal Mat or Crust, Water-stained Leaves, Drainage Patterns, Moss trimmed lines	Acer rubrum (Red Maple), Osmundastrum cinnamomeum (Cinnamon Fern)	Abies balsamea (Balsam Fir), Fraxinus americana (White Ash)	Abies balsamea (Balsam Fir), Acer rubrum (Red Maple), Fraxinus americana (White Ash)	N
WL7	2025-06-10	Treed Swamp	247	Full	floodplain	throughflow	Histosol (A1)	Surface water, Saturation, Unundation visible on ariea; imagrey, Water-stained leaves, Hygrogen sulfide odor, Moss trim lines, Saturation visible on arial imagrey	Rubus hispιδus (Bristly Dewberry), Onoclea sensibilis (Sensitive Fern)	Alnus incana (Speckled Alder), Acer rubrum (Red Maple), Spiraea tomentosa (Steeplebush)	Acer rubrum (Red Maple), Fraxinus americana (White Ash), Alnus incana (Speckled Alder)	N
WL8	2025-06-02	Treed Swamp	2264	Full	Basin	Outflow	Histosol (A1)	Surface water, Saturation, High Water Table, Water marks, Water-stained leaves, Hygrogen sulfide odor	Osmundastrum cinnamomeum (Cinnamon Fern), Carex stricta (Tussock Sedge)	Acer rubrum (Red Maple), Abies balsamea (Balsam Fir), Picea mariana (Black Spruce), Betula alleghaniensis (Yellow Birch)	Acer rubrum (Red Maple), Fraxinus americana (White Ash), Picea mariana (Black Spruce)	Y
WL9	2025-06-05	Treed Bog	2744	Full	Basin	Isolated	Histosol (A1)	High Water Table, Saturation, Water marks, Water-stained leaves	Maianthemum racemosum (Large False Solomon's Seal)	Aronia melanocarpa (Black Chokeberry), Rhododendron canadense (Rhodora), Gaylussacia baccata (Black Huckleberry), Rhododendron groenlandicum (Common Labrador Tea), Osmundastrum cinnamomeum (Cinnamon Fern)	Acer rubrum (Red Maple), Pinus strobus (Eastern White Pine), Abies balsamea (Balsam Fir)	N
WL10	2025-06-11	Treed Bog	23038	Full	Basin	Isolated	Histisol (A1)	Surface water, High Water Table, Saturation, Hydrogen Sulfide Odour, Water-stained leaves, Moss trim lines, Drainage Pattern	Osmundastrum cinnamomeum (Cinnamon Fern), Drosera rotundifolia (Round-leaved Sundew), Carex trisperma (Three-seeded Sedge)	Picea mariana (Black Spruce), Ilex mucronata (Mountain Holly), Rhododendron groenlandicum (Common Labrador Tea)	Picea mariana (Black Spruce), Acer rubrum (Red Maple), Ilex mucronata (Mountain Holly)	N
WL11	2025-06-11	Treed Bog	3095	Full	Basin	Isolated	Histisol (A1)	Saturation, Moss trim lines, Saturation visible on aerial imagry, Stnted or stressed plants	Rhododendron groenlandicum (Common Labrador Tea), Chamaedaphne calyculata (Leatherleaf)	Acer rubrum (Red Maple)	Acer rubrum (Red Maple), Picea mariana (Black Spruce)	N
WL12	2025-06-11	Treed Swamp	310	Full	Basin	Isolated	Histosol (A1)	Surface water, Saturation, Water marks, Surface soil cracks, Drainage Patterns, Moss trim lines	Osmundastrum cinnamomeum (Cinnamon Fern), Carex brunnescens (Brownish Sedge)		Picea mariana (Black Spruce), Acer rubrum (Red Maple)	N
WL13	2025-06-12	Treed Swamp	1424	Full	Slope	Isolated	Histosol (A1)	Surface Water, Saturation, Water Marks, Water-stained Leaves, Moss Trimmed Lines, Surface soil cracks, Drainage patterns	Osmundastrum cinnamomeum (Cinnamon Fern), Onoclea sensibilis (Sensitive Fern), Platanthera clavellata (Club Spur Orchid)	Abies balsamea (Balsam Fir), Picea rubens (Red Spruce)	Acer rubrum (Red Maple)	N
WL14	2025-06-10	Fen	10964	Full	Floodplain	Throughflow	Histosol (A1)	Surface Water, Saturation, High water table, Inundation visinble on aerial imagrey, Water-stained Leaves, Hydrogen sulfide odor, Moss Trimmed Lines, Drainage patterns	Rubus hispιδus (Bristly Dewberry), Onoclea sensibilis (Sensitive Fern), Carex leptalea (Bristly-stalked Sedge)	Acer rubrum (Red Maple), Betula papyrifera (Paper Birch), Salix bebbiana (Bebb's Willow)	Acer rubrum (Red Maple), Fraxinus americana (White Ash), Betula papyrifera (Paper Birch)	Y
WL15	2025-06-12	Treed Swamp	219	Full	Hillside	Isolated	Histosol (A1)	Surface water, Saturation, Drainage patterns, Moss Trimmed Lines	Onoclea sensibilis (Sensitive Fern), Viola cucullata (Marsh Blue Violet), Rubus hispιδus (Bristly Dewberry)	Acer rubrum (Red Maple)	Acer rubrum (Red Maple), Picea rubens (Red Spruce), Betula papyrifera (Paper Birch), Fraxinus americana (White Ash)	Y
WL16	2025-06-12	Treed Swamp	791	Full	Hillside	Throughflow	Histosol (A1)	Surface water, Saturation, Drainage patterns, Moss Trimmed Lines	Onoclea sensibilis (Sensitive Fern), Glyceria grandis (Common Tall Manna Grass)		Acer rubrum (Red Maple), Picea rubens (Red Spruce), Betula papyrifera (Paper Birch), Fraxinus americana (White Ash)	Y
WL17	2025-06-10	Treed Swamp	7239	Full	floodplain	Throughflow	Histosol (A1)	Surface water, Saturation, Inundation Visible on Aerial, Water-stained Leaves, Hydrogen Sulfide Odor	Rubus hispιδus (Bristly Dewberry), Onoclea sensibilis (Sensitive Fern)	Alnus incana (Speckled Alder), Acer rubrum (Red Maple), Spiraea tomentosa (Steeplebush)	Acer rubrum (Red Maple), Fraxinus americana (White Ash), Betula papyrifera (Paper birch)	Y



Photo 1: A representative photo of WL2.



Photo 2: A representative photo of WL3.



Photo 3: A representative photo of WL4.



Photo 4: A representative photo of WL5.



Photo 5: A representative photo of WL6.



Photo 6: A representative photo of WL7.



Photo 7: A representative photo of WL8.



Photo 8: A representative photo of WL9.



Photo 9: A representative photo of WL10.



Photo 10: A representative photo of WL11.



Photo 11: A representative photo of WL12.



Photo 12: A representative photo of WL13.



Photo 13: A representative photo of WL14.



Photo 14: A representative photo of WL15.



Photo 15: A representative photo of WL16.

APPENDIX G

FLORA INVENTORY

Scientific Name	Common Name	COSEWIC	SARA	ESA	S-Rank
Vascular Plants					
<i>Abies balsamea</i>	Balsam Fir	-	-	-	S5
<i>Acer rubrum</i>	Red Maple	-	-	-	S5
<i>Acer spicatum</i>	Mountain Maple	-	-	-	S5
<i>Amauropelta noveboracensis</i>	New York Fern	-	-	-	S5
<i>Anaphalis margaritacea</i>	Pearly Everlasting	-	-	-	S5
<i>Anthoxanthum odoratum</i>	Large Sweet Vernal Grass	-	-	-	SNA
<i>Aralia hispida</i>	Bristly Sarsaparilla	-	-	-	S5
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	-	-	-	S5
<i>Arisaema triphyllum</i> ssp. <i>stewardsonii</i>	Swamp Jack-In-The-Pulpit	-	-	-	S4S5
<i>Aronia arbutifolia</i>	Red Chokeberry	-	-	-	S4
<i>Athyrium filix-femina</i>	Common Lady Fern	-	-	-	S5
<i>Betula alleghaniensis</i>	Yellow Birch	-	-	-	S5
<i>Betula papyrifera</i>	Paper Birch	-	-	-	S5
<i>Cardamine pensylvanica</i>	Pennsylvania Bittercress	-	-	-	S5
<i>Carex brunnescens</i>	Brownish Sedge	-	-	-	S5
<i>Carex crinita</i>	Fringed Sedge	-	-	-	S5
<i>Carex echinata</i>	Star Sedge	-	-	-	S5
<i>Carex gracillima</i>	Graceful Sedge	-	-	-	S5
<i>Carex gynandra</i>	Nodding Sedge	-	-	-	S5
<i>Carex intumescens</i>	Bladder Sedge	-	-	-	S5
<i>Carex leptalea</i>	Bristly-Stalked Sedge	-	-	-	S5
<i>Carex lurida</i>	Sallow Sedge	-	-	-	S5
<i>Carex scabrata</i>	Rough Sedge	-	-	-	S5
<i>Carex stipata</i>	Awl-Fruited Sedge	-	-	-	S5
<i>Carex trisperma</i>	Three-Seeded Sedge	-	-	-	S5
<i>Carex utriculata</i>	Northern Beaked Sedge	-	-	-	S5
<i>Chrysosplenium americanum</i>	American Golden Saxifrage	-	-	-	S5
<i>Claytonia virginiana</i>	Interrupted Fern	-	-	-	S5
<i>Clematis virginiana</i>	Virginia Clematis	-	-	-	S5
<i>Clintonia borealis</i>	Yellow Bluebead Lily	-	-	-	S5
<i>Comarum palustre</i>	Marsh Cinquefoil	-	-	-	S5
<i>Coptis trifolia</i>	Goldthread	-	-	-	S5
<i>Cornus canadensis</i>	Bunchberry	-	-	-	S5
<i>Corylus cornuta</i>	Beaked Hazel	-	-	-	S5
<i>Cypripedium acaule</i>	Pink Lady's-Slipper	-	-	-	S5
<i>Dennstaedtia punctilobula</i>	Eastern Hay-Scented Fern	-	-	-	S5

Scientific Name	Common Name	COSEWIC	SARA	ESA	S-Rank
<i>Diervilla lonicera</i>	Northern Bush Honeysuckle	-	-	-	S5
<i>Drosera rotundifolia</i>	Round-Leaved Sundew	-	-	-	S5
<i>Dryopteris campyloptera</i>	Mountain Wood Fern	-	-	-	S5
<i>Dryopteris cristata</i>	Crested Wood Fern	-	-	-	S5
<i>Epigaea repens</i>	Trailing Arbutus	-	-	-	S5
<i>Epilobium leptophyllum</i>	Bog Willowherb	-	-	-	S5
<i>Equisetum arvense</i>	Field Horsetail	-	-	-	S5
<i>Eriophorum angustifolium</i>	Narrow-Leaved Cottongrass	-	-	-	S5
<i>Eriophorum virginicum</i>	Tawny Cottongrass	-	-	-	S5
<i>Eupatorium perfoliatum</i>	Common Boneset	-	-	-	S5
<i>Euthamia graminifolia</i>	Grass-Leaved Goldenrod	-	-	-	S5
<i>Eutrochium maculatum</i>	Spotted Joe Pye Weed	-	-	-	S5
<i>Fagus grandifolia</i>	American Beech	-	-	-	S3S4
<i>Fragaria virginiana</i>	Wild Strawberry	-	-	-	S5
<i>Fraxinus americana</i>	White Ash	-	-	-	S4
<i>Fraxinus excelsior</i>	European Ash	-	-	-	SNA
<i>Galium asprellum</i>	Rough Bedstraw	-	-	-	S5
<i>Galium mollugo</i>	Smooth Bedstraw	-	-	-	SNA
<i>Gaultheria procumbens</i>	Eastern Teaberry	-	-	-	S5
<i>Gaylussacia baccata</i>	Black Huckleberry	-	-	-	S5
<i>Geum rivale</i>	Water Avens	-	-	-	S5
<i>Glyceria striata</i>	Fowl Manna Grass	-	-	-	S5
<i>Hydrocotyle americana</i>	American Marsh Pennywort	-	-	-	S5
<i>Hypericum fraseri</i>	Fraser's St. John's-Wort	-	-	-	S5
<i>Ilex mucronata</i>	Mountain Holly	-	-	-	S5
<i>Iris versicolor</i>	Harlequin Blue Flag	-	-	-	S5
<i>Juncus canadensis</i>	Canada Rush	-	-	-	S5
<i>Kalmia angustifolia</i>	Sheep Laurel	-	-	-	S5
<i>Larix laricina</i>	Tamarack	-	-	-	S5
<i>Linnaea borealis</i>	Twinflower	-	-	-	S5
<i>Lonicera canadensis</i>	Canada Fly Honeysuckle	-	-	-	S5
<i>Lonicera x xylosteoides</i>	Bush Honeysuckle	-	-	-	SNA
<i>Lysimachia borealis</i>	Northern Starflower	-	-	-	S5
<i>Maianthemum canadense</i>	Wild Lily-Of-The-Valley	-	-	-	S5
<i>Medeola virginiana</i>	Cucumber Root	-	-	-	S5
<i>Mitchella repens</i>	Partridgeberry	-	-	-	S5

Scientific Name	Common Name	COSEWIC	SARA	ESA	S-Rank
<i>Myrica gale</i>	Sweet Gale	-	-	-	S5
<i>Nabalus trifoliolatus</i>	Three-Leaved Rattlesnakeroot	-	-	-	S5
<i>Oclemena acuminata</i>	Whorled Wood Aster	-	-	-	S5
<i>Oclemena nemoralis</i>	Bog Aster	-	-	-	S5
<i>Oenothera biennis</i>	Common Evening Primrose	-	-	-	S5
<i>Onoclea sensibilis</i>	Sensitive Fern	-	-	-	S5
<i>Osmunda regalis</i>	Royal Fern	-	-	-	S5
<i>Osmundastrum cinnamomeum</i>	Cinnamon Fern	-	-	-	S5
<i>Persicaria punctata</i>	Dotted Smartweed	-	-	-	S5
<i>Petasites frigidus</i>	Northern Sweet Coltsfoot	-	-	-	S4
<i>Picea mariana</i>	Black Spruce	-	-	-	S5
<i>Picea rubens</i>	Red Spruce	-	-	-	S5
<i>Pinus strobus</i>	Eastern White Pine	-	-	-	S5
<i>Platanthera clavellata</i>	Club Spur Orchid	-	-	-	S5
<i>Poa compressa</i>	Canada Blue Grass	-	-	-	SNA
<i>Polystichum acrostichoides</i>	Christmas Fern	-	-	-	S5
<i>Populus tremuloides</i>	Trembling Aspen	-	-	-	S5
<i>Potamogeton epihydrus</i>	Ribbon-Leaved Pondweed	-	-	-	S5
<i>Potentilla simplex</i>	Old Field Cinquefoil	-	-	-	S5
<i>Pteridium aquilinum</i>	Bracken Fern	-	-	-	S5
<i>Ranunculus repens</i>	Creeping Buttercup*	-	-	-	SNA
<i>Rhododendron groenlandicum</i>	Common Labrador Tea	-	-	-	S5
<i>Ribes glandulosum</i>	Skunk Currant	-	-	-	S5
<i>Ribes triste</i>	Swamp Red Currant	-	-	-	S4
<i>Rosa multiflora</i>	Multiflora Rose*	-	-	-	SNA
<i>Rosa palustris</i>	Swamp Rose	-	-	-	S4
<i>Rubus allegheniensis</i>	Alleghaney Blackberry	-	-	-	S5
<i>Rubus hispidus</i>	Bristly Dewberry	-	-	-	S5
<i>Rubus pubescens</i>	Dwarf Red Raspberry	-	-	-	S5
<i>Salix bebbiana</i>	Bebb's Willow	-	-	-	S5
<i>Salix lucida</i>	Shining Willow	-	-	-	S5
<i>Sarracenia purpurea</i>	Northern Pitcher Plant	-	-	-	S5
<i>Scirpus atrocinctus</i>	Black-Girdled Bulrush	-	-	-	S5
<i>Scutellaria galericulata</i>	Marsh Skullcap	-	-	-	S5
<i>Solidago canadensis</i>	Canada Goldenrod	-	-	-	S4S5
<i>Sorbus aucuparia</i>	European Mountain Ash	-	-	-	SNA
<i>Spiraea tomentosa</i>	Steeplebush	-	-	-	S5

Scientific Name	Common Name	COSEWIC	SARA	ESA	S-Rank
<i>Streptopus amplexifolius</i>	Clasping-Leaved Twisted-Stalk	-	-	-	S4S5
<i>Streptopus lanceolatus</i>	Rose Twisted-Stalk	-	-	-	S5
<i>Symphyotrichum novi-belgii</i>	New York Aster	-	-	-	S5
<i>Thalictrum pubescens</i>	Tall Meadow-Rue	-	-	-	S5
<i>Thelypteris palustris</i>	Eastern Marsh Fern	-	-	-	S5
<i>Trillidium undulatum</i>	Painted Trillium	-	-	-	S5
<i>Trillium cernuum</i>	Nodding Trillium	-	-	-	S4
<i>Trillium erectum</i>	Red Trillium	-	-	-	S4
<i>Tsuga canadensis</i>	Eastern Hemlock	-	-	-	S4
<i>Vaccinium angustifolium</i>	Late Lowbush Blueberry	-	-	-	S5
<i>Vaccinium oxycoccos</i>	Small Cranberry	-	-	-	S5
<i>Vaccinium pallidum</i>	Early Lowbush Blueberry	-	-	-	SNA
<i>Veronica officinalis</i>	Common Speedwell	-	-	-	SNA
<i>Viburnum cassinoides</i>	Northern Wild Raisin	-	-	-	S5
<i>Viburnum lantanoides</i>	Hobblebush	-	-	-	S4
<i>Viburnum opulus</i>	Highbush Cranberry	-	-	-	S4
<i>Viola cucullata</i>	Marsh Blue Violet	-	-	-	S5
Bryophytes					
<i>Bazzania trilobata</i> var. <i>trilobata</i>	Three-Lobed Bazzania	-	-	-	S5
<i>Dicranella schreberiana</i>	Schreber's Forklet Moss	-	-	-	SU
<i>Leucobryum glaucum</i>	White Pincushion Moss	-	-	-	S5
<i>Lycopodium clavatum</i>	Running Clubmoss	-	-	-	S5
<i>Neckera pennata</i>	Feathery Neckera Moss	-	-	-	S5
<i>Polytrichum piliferum</i>	Bristly Haircap Moss	-	-	-	S5
<i>Sphagnum rubellum</i>	Red Peat Moss	-	-	-	S5
<i>Spinulum annotinum</i>	Stiff Clubmoss	-	-	-	S5
<i>Ulotia crispa</i>	Crisped Pincushion Moss	-	-	-	S5

*Invasive species.

APPENDIX H

TERRESTRIAL FAUNA PHOTOGRAPH LOG



Photo 1. White-tailed deer (*Odocoileus virginianus*) photographed by trail camera located within the Study Area.



Photo 2. Red fox (*Vulpes vulpes*) photographed by trail camera located within the Study Area.



Photo 3. Raccoon (*Procyon lotor*) photographed by trail camera located within the Study Area.

APPENDIX I

AVIFAUNA

Table 1: Habitat Descriptions for Avifauna Survey Locations - Sturk Quarry Expansion Project

Project #24-10948

Survey Location	Habitat Description
PC1	Near entrance to the existing quarry, fairly disturbed mixedwood with shrubs directly along the road. Watercourse about 50 m up the road.
PC2	High level of disturbance - edge of the quarry where it intersects with a transmission line corridor. Surrounding forest is mixedwood, young to mid-aged.
PC3	Trail through young to mid-age mixedwood forest. Watercourse approximately 50m to the west. Dip in the trail is somewhat saturated.
PC4	Trail through young to mid-aged mixedwood forest, starting to become a bit more coniferous. Trail splits in two directions.
PC5	Trail through softwood dominant forest, relatively young. Disturbed, appears to have been cut in the past.
PC6	Fen with floodplain consisting of dense alders and graminoids with shallow pooled water. Watercourse itself is small permanent with clear, fast moving water.
PC7	Same wetland system as PC6 but opens up here into a nice large fen dominated by graminoids and other low veg. Surface water appears quite deep. Lots of snags including some fairly large ones. Good foraging habitat for aerial insectivores.
PC8	Dense, relatively young softwood forest, very rocky ground.
PC9	Wetland is a shrub/treed bog with many snags and scattered live trees including some decent sized red maples. Upland to the northeast heading towards PC10 is mature softwood with large pines scattered throughout, though there has been some disturbance / clearing. Good owl habitat (barred owl observed in one of the large pines).
PC10	Trail leading back out to the quarry. Young to mid-aged mixedwood forest. Evidence of disturbance and past harvesting.
PC11	Edge of the quarry near a small manmade pond. Pond could be attractive to waterfowl or aerial insectivores. Nice open view of surroundings. Dense shrubs along the road, leading into softwood dominant forest.
CONI1	Dirt road near the edge of an open, regenerating clearcut. Forest edges composed of hardwood and mixedwood. Open/disturbed habitat features in this area could provide suitable CONI nesting habitat.
CONI2	Public road with agricultural fields bordered by mixedwood and hardwood stands. Dammed lake/watercourse system directly across the road. Noise disturbance from the dam (rushing water) may be high when water levels are high.
CONI3	Road through agricultural fields, next to a small pond.
CONI4	At the top of the existing quarry, next to a small manmade pond. Good vantage point with an open view of the quarry and surrounding hills.
CONI5	Public road, near a watercourse crossing with a shrubby riparian zone. Watercourse appears to extend into a fen on both sides of the road based on satellite imagery.

Table 2: 2025 Spring Migration Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near Wetland?	Incidental ?	Flyover?	Flyover Height (m)	Flight Direction	Comments ¹
													<50 m	50 - 100 m	100 m +							
LL	11-Apr-25	Spring Migration	Round One	PC1	6:41	10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	12	8	4		8	4							
LL	11-Apr-25	Spring Migration	Round One	PC1		10	Amro	American Robin	<i>Turdus migratorius</i>	4	1	3	1	2	1							S
LL	11-Apr-25	Spring Migration	Round One	PC1		10	Sosp	Song Sparrow	<i>Melospiza melodia</i>	3		3	1	1	1							S
LL	11-Apr-25	Spring Migration	Round One	PC1		10	Amcr	American Crow	<i>Corvus brachyrhynchos</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC1		10	Cora	Common Raven	<i>Corvus corax</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC1		10	Eust	European Starling	<i>Sturnus vulgaris</i>	2		2	1	1								H
LL	11-Apr-25	Spring Migration	Round One	PC1		10	Dowo	Downy Woodpecker	<i>Picoides pubescens</i>	1		1	1									H
LL	11-Apr-25	Spring Migration	Round One	PC2	6:59	10	Amcr	American Crow	<i>Corvus brachyrhynchos</i>	2	2			2								
LL	11-Apr-25	Spring Migration	Round One	PC2		10	Cora	Common Raven	<i>Corvus corax</i>	1	1			1								
LL	11-Apr-25	Spring Migration	Round One	PC2		10	Amro	American Robin	<i>Turdus migratorius</i>	1	1			1								
LL	11-Apr-25	Spring Migration	Round One	PC2		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		1		1								
LL	11-Apr-25	Spring Migration	Round One	PC2		10	HAWO	Hairy Woodpecker	<i>Dryobates villosus</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC2		10	Baro	Barred Owl	<i>Strix varia</i>	1		1		1								S
LL	11-Apr-25	Spring Migration	Round One	PC2		10	Gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	1		1		1								
LL	11-Apr-25	Spring Migration	Round One	PC2		10	Sosp	Song Sparrow	<i>Melospiza melodia</i>	2	1	1	1	1								S
LL	11-Apr-25	Spring Migration	Round One	PC2		10	Cogr	Common Grackle	<i>Quiscalus quiscula</i>	1		1	1						1			
LL	11-Apr-25	Spring Migration	Round One	PC2		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	2		2	2									S
LL	11-Apr-25	Spring Migration	Round One	PC3	7:14	10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	2		2		2								S
LL	11-Apr-25	Spring Migration	Round One	PC3		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	2		2		2								
LL	11-Apr-25	Spring Migration	Round One	PC3		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1			1		1							S
LL	11-Apr-25	Spring Migration	Round One	PC3		10	Gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	1			1		1							S
LL	11-Apr-25	Spring Migration	Round One	PC3		10	Amro	American Robin	<i>Turdus migratorius</i>	1			1		1							
LL	11-Apr-25	Spring Migration	Round One	PC4	7:35	10	Cang	Canada Goose	<i>Branta canadensis</i>	1	1		1						1			Flying around
LL	11-Apr-25	Spring Migration	Round One	PC4		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1	1		1									
LL	11-Apr-25	Spring Migration	Round One	PC4		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1	1											
LL	11-Apr-25	Spring Migration	Round One	PC4		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	2		2	2									
LL	11-Apr-25	Spring Migration	Round One	PC5	8:08	10	Blja	Blue Jay	<i>Cyanocitta cristata</i>	5		5		3	2							
LL	11-Apr-25	Spring Migration	Round One	PC5		10	Kill	Killdeer	<i>Charadrius vociferus</i>	1		1		1						1	S	Migrant (!)
LL	11-Apr-25	Spring Migration	Round One	PC5		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2		2		2								
LL	11-Apr-25	Spring Migration	Round One	PC5		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	2		2		1	1							
LL	11-Apr-25	Spring Migration	Round One	PC5		10	Amro	American Robin	<i>Turdus migratorius</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC5		10	Ybsa	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	1		1			1							H, new arrival
LL	11-Apr-25	Spring Migration	Round One	PC5		10	CORA	Common Raven	<i>Corvus corax</i>	1		1	1									
LL	11-Apr-25	Spring Migration	Round One	PC6	8:38	10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC6		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	5	5		5									
LL	11-Apr-25	Spring Migration	Round One	PC6		10	Amro	American Robin	<i>Turdus migratorius</i>	1		1		1								
LL	11-Apr-25	Spring Migration	Round One	PC7	9:06	10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	7	5	2	7									
LL	11-Apr-25	Spring Migration	Round One	PC7		10	Blja	Blue Jay	<i>Cyanocitta cristata</i>	3	2	1	2	1								
LL	11-Apr-25	Spring Migration	Round One	PC7		10	Amro	American Robin	<i>Turdus migratorius</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC7		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		1	1									
LL	11-Apr-25	Spring Migration	Round One	PC7		10	Rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1		1	1									
LL	11-Apr-25	Spring Migration	Round One	PC7		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1	1		1									
LL	11-Apr-25	Spring Migration	Round One	PC8	9:28	10	Rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	1	1		1									
LL	11-Apr-25	Spring Migration	Round One	PC8		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		1	1									
LL	11-Apr-25	Spring Migration	Round One	PC8		10	Cogr	Common Grackle	<i>Quiscalus quiscula</i>	1		1		1					1			
LL	11-Apr-25	Spring Migration	Round One	PC9	9:51	10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC9		10	Ybsa	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	1		1			1							H
LL	11-Apr-25	Spring Migration	Round One	PC10	10:25	10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		1	1									
LL	11-Apr-25	Spring Migration	Round One	PC10		10	Rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1		1	1									
LL	11-Apr-25	Spring Migration	Round One	PC10		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		1		1								
LL	11-Apr-25	Spring Migration	Round One	PC10		10	Amcr	American Crow	<i>Corvus brachyrhynchos</i>	1		1		1								
LL	11-Apr-25	Spring Migration	Round One	PC10		10	Cora	Common Raven	<i>Corvus corax</i>	1		1		1								
LL	11-Apr-25	Spring Migration	Round One	PC10		10	Amro	American Robin	<i>Turdus migratorius</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC11	10:43	10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	3		1			3							
LL	11-Apr-25	Spring Migration	Round One	PC11		10	Blja	Blue Jay	<i>Cyanocitta cristata</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC11		10	Cora	Common Raven	<i>Corvus corax</i>	1		1			1							
LL	11-Apr-25	Spring Migration	Round One	PC11		10	Amcr	American Crow	<i>Corvus brachyrhynchos</i>	1	1		1									

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Project #24-10948

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near Wetland?	Incidental ?	Flyover?	Flyover Height (m)	Flight Direction	Comments ¹
													<50 m	50 - 100 m	100 m +							
LL	11-Apr-25	Spring Migration	Round One	PC11		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	4	3	1	3	1								
LL	11-Apr-25	Spring Migration	Round One	PC11		10	Sosp	Song Sparrow	<i>Melospiza melodia</i>	1		1	1									S
RM	6-May-25	Spring Migration	Round Two	PC1	5:46	10	RUGR	Ruffed Grouse	<i>Bonasa umbellus</i>	1		X		1		NE						Drumming
RM	6-May-25	Spring Migration	Round Two	PC1		10	AMRO	American Robin	<i>Turdus migratorius</i>	2		X		1	1	N						
RM	6-May-25	Spring Migration	Round Two	PC1		10	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1		X		1		NE						
RM	6-May-25	Spring Migration	Round Two	PC1		10	CAGO	Canada Goose	<i>Branta canadensis</i>	10		X			10	NW			10	50-100	NW	
RM	6-May-25	Spring Migration	Round Two	PC1		10	NOWA	Northern Waterthrush	<i>Parkesia noveboracensis</i>	3		X	2	1		W						
RM	6-May-25	Spring Migration	Round Two	PC1		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	5		X	4	1		NW						
RM	6-May-25	Spring Migration	Round Two	PC1		10	YBSA	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	1		X		1		SW						
RM	6-May-25	Spring Migration	Round Two	PC1		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		NW						
RM	6-May-25	Spring Migration	Round Two	PC11	6:03	10	Wiwr	Winter Wren	<i>Troglodytes hiemalis</i>	2		X		2		E						
RM	6-May-25	Spring Migration	Round Two	PC11		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X	1			N						
RM	6-May-25	Spring Migration	Round Two	PC11		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	2	X	X	1		1	NW						Calling and drumming
RM	6-May-25	Spring Migration	Round Two	PC11		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X			1	E						
RM	6-May-25	Spring Migration	Round Two	PC11		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	3		X		3		E						
RM	6-May-25	Spring Migration	Round Two	PC11		10	SOSP	Song Sparrow	<i>Melospiza melodia</i>	1		X	1			NW						
RM	6-May-25	Spring Migration	Round Two	PC11		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			SE						
RM	6-May-25	Spring Migration	Round Two	PC11		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X	1			E						
RM	6-May-25	Spring Migration	Round Two	PC11		10	RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1		X			1	SE						
RM	6-May-25	Spring Migration	Round Two	PC11		10	Rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	1		X			1	W						Drumming
RM	6-May-25	Spring Migration	Round Two	PC11		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		X	1			W						
RM	6-May-25	Spring Migration	Round Two	PC11		10	PAWA	Palm Warbler	<i>Setophaga palmarum</i>	1		X	1			E						
RM	6-May-25	Spring Migration	Round Two	PC2	6:23	10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	3	X	X	2	1		E			1	0-50	NW	2 males singing, one flyover
RM	6-May-25	Spring Migration	Round Two	PC2		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X	1			S						
RM	6-May-25	Spring Migration	Round Two	PC2		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			SE						
RM	6-May-25	Spring Migration	Round Two	PC2		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	2		X	2			SE						
RM	6-May-25	Spring Migration	Round Two	PC3	6:39	10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	5	X	X	5			S						Small flock perched in trees, singing
RM	6-May-25	Spring Migration	Round Two	PC3		10	NOWA	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X	1			W						
RM	6-May-25	Spring Migration	Round Two	PC3		10	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	2		X	2			W						
RM	6-May-25	Spring Migration	Round Two	PC3		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	2		X		2		SE			2	50-100	SW	
RM	6-May-25	Spring Migration	Round Two	PC3		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		X	1			E						
RM	6-May-25	Spring Migration	Round Two	PC3		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X		1		W						
RM	6-May-25	Spring Migration	Round Two	PC4	7:01	10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	2		X	2			S						
RM	6-May-25	Spring Migration	Round Two	PC4		10	Wiwr	Winter Wren	<i>Troglodytes hiemalis</i>	1		X			1	SE						
RM	6-May-25	Spring Migration	Round Two	PC4		10	Rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	1		X			1	SE						Drumming
RM	6-May-25	Spring Migration	Round Two	PC4		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	2		X		1	1	S						
RM	6-May-25	Spring Migration	Round Two	PC4		10	Brcr	Brown Creeper	<i>Certhia americana</i>	1		X	1			E						
RM	6-May-25	Spring Migration	Round Two	PC4		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			E						
RM	6-May-25	Spring Migration	Round Two	PC4		10	NOWA	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X		1		SW						
RM	6-May-25	Spring Migration	Round Two	PC4		10	YBSA	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	1		X			1	SW						
RM	6-May-25	Spring Migration	Round Two	PC4		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	1		X		1		E						
RM	6-May-25	Spring Migration	Round Two	PC5	7:26	10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X		1		N						
RM	6-May-25	Spring Migration	Round Two	PC5		10	YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1		X	1			N						
RM	6-May-25	Spring Migration	Round Two	PC5		10	PAWA	Palm Warbler	<i>Setophaga palmarum</i>	1		X	1			NW						
RM	6-May-25	Spring Migration	Round Two	PC5		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X	1			W						
RM	6-May-25	Spring Migration	Round Two	PC5		10	NOWA	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X	1			W						
RM	6-May-25	Spring Migration	Round Two	PC5		10	AMCR	American Crow	<i>Corvus brachyrhynchos</i>	1		X			1	N						
RM	6-May-25	Spring Migration	Round Two	PC5		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		X		1		NE						
RM	6-May-25	Spring Migration	Round Two	PC6	7:47	10	Pufi	Purple Finch	<i>Haemorhous purpureus</i>	3		X	2	1		SE						
RM	6-May-25	Spring Migration	Round Two	PC6		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	2	X	X	2			SE						
RM	6-May-25	Spring Migration	Round Two	PC6		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X	1			E						
RM	6-May-25	Spring Migration	Round Two	PC6		10	NOWA	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X			1	N						
RM	6-May-25	Spring Migration	Round Two	PC6		10	Woodpecker sp.	Woodpecker sp.	#N/A	1		X			1	E						Distant drumming
RM	6-May-25	Spring Migration	Round Two	PC6		10	Modo	Mourning Dove	<i>Zenaida macroura</i>	1		X		1		SE						
RM	6-May-25	Spring Migration	Round Two	PC6		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		X	1			SE						
RM	6-May-25	Spring Migration	Round Two	PC6		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		X	1			N						
RM	6-May-25	Spring Migration	Round Two	PC7	8:10	10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			S						

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Project #24-10948

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near Wetland?	Incidental ?	Flyover?	Flyover Height (m)	Flight Direction	Comments ¹
													<50 m	50 - 100 m	100 m +							
RM	6-May-25	Spring Migration	Round Two	PC7		10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1		X		1		N						
RM	6-May-25	Spring Migration	Round Two	PC7		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X		1		N						
RM	6-May-25	Spring Migration	Round Two	PC7		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	2		X		2		SE						
RM	6-May-25	Spring Migration	Round Two	PC7		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			S						Pair in suitable breeding habitat, flushed south
RM	6-May-25	Spring Migration	Round Two	PC7		10	Mall	Mallard	<i>Anas platyrhynchos</i>	2	X	X	2			E						
RM	6-May-25	Spring Migration	Round Two	PC7		10	NOWA	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X		1		NE						
RM	6-May-25	Spring Migration	Round Two	PC7		10	BHVI	Blue-headed Vireo	<i>Vireo solitarius</i>	1		X	1			S						
RM	6-May-25	Spring Migration	Round Two	PC7		10	Modo	Mourning Dove	<i>Zenaida macroura</i>	1		X		1		NE						
RM	6-May-25	Spring Migration	Round Two	PC7		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		NW						
RM	6-May-25	Spring Migration	Round Two	PC7		10	YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1		X	1			NE						
RM	6-May-25	Spring Migration	Round Two	PC7		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2		X	2			N						
RM	6-May-25	Spring Migration	Round Two	PC7		10	Pisi	Pine Siskin	<i>Spinus pinus</i>	1	X	X	1			SE			1	50-100	S	
RM	6-May-25	Spring Migration	Round Two	PC8	8:37	10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1		X		1		N						
RM	6-May-25	Spring Migration	Round Two	PC8		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X	1			N						
RM	6-May-25	Spring Migration	Round Two	PC8		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			NE						
RM	6-May-25	Spring Migration	Round Two	PC8		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		X			1	N						
RM	6-May-25	Spring Migration	Round Two	PC8		10	Rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	1		X		1		SE						
RM	6-May-25	Spring Migration	Round Two	PC8		10	Gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	1		X	1			SW						
RM	6-May-25	Spring Migration	Round Two	PC8		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X	1			SE						
RM	6-May-25	Spring Migration	Round Two	PC9	9:02	10	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1		X	1			N						
RM	6-May-25	Spring Migration	Round Two	PC9		10	Modo	Mourning Dove	<i>Zenaida macroura</i>	1		X			1	E						
RM	6-May-25	Spring Migration	Round Two	PC9		10	Wiwr	Winter Wren	<i>Troglodytes hiemalis</i>	1		X	1			NE						
RM	6-May-25	Spring Migration	Round Two	PC9		10	PAWA	Palm Warbler	<i>Setophaga palmarum</i>	1		X	1			N						
RM	6-May-25	Spring Migration	Round Two	PC9		10	Gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	1		X	1			E						
RM	6-May-25	Spring Migration	Round Two	PC9		10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	2		X	2			NE						
RM	6-May-25	Spring Migration	Round Two	PC9		10	YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	2	X	X	2			SE						Pair observed
RM	6-May-25	Spring Migration	Round Two	PC9		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	2	X	X	2			NE						
RM	6-May-25	Spring Migration	Round Two	PC9		10	Blja	Blue Jay	<i>Cyanocitta cristata</i>	2		X		2		S						
RM	6-May-25	Spring Migration	Round Two	PC9		10	WWCR	White-winged Crossbill	<i>Loxia leucoptera</i>	3	X	X	3			NE			3	50-100	SW	
RM	6-May-25	Spring Migration	Round Two	PC9		10	RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2		X		2		NE						
RM	6-May-25	Spring Migration	Round Two	PC9		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	2		X		2		N						
RM	6-May-25	Spring Migration	Round Two	PC10	9:32	10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		X			1	SW						
RM	6-May-25	Spring Migration	Round Two	PC10		10	DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	2	X	X	2			E						
RM	6-May-25	Spring Migration	Round Two	PC10		10	NOWA	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X		1		NW						
RM	6-May-25	Spring Migration	Round Two	PC10		10	TRES	Tree Swallow	<i>Tachycineta bicolor</i>	1		X	1			N						
RM	6-May-25	Spring Migration	Round Two	PC10		10	Gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	1		X	1			SW						
RM	6-May-25	Spring Migration	Round Two	PC10		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	1		X		1		W						
RM	6-May-25	Spring Migration	Round Two	PC10		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			NE						
RM	6-May-25	Spring Migration	Round Two	PC10		10	Nofl	Northern Flicker	<i>Colaptes auratus</i>	1		X			1	S						

Notes

¹ OBSERVED = X - Species observed in its breeding season (no breeding evidence)

POSSIBLE = H - Species observed in its breeding season in suitable nesting habitat; S - Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season

PROBABLE = P - Pair observed in suitable nesting habitat in nesting season; T - Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, on at least two days a week or more apart, during its breeding season. Use discretion when using this code.

"T" is not to be used for colonial birds, or species that might forage or loaf a long distance from their nesting site e.g. Kingfisher, Turkey Vulture, and male waterfowl; D - Courtship or display, including interaction between a male and a female or two males, including courtship feeding or copulation; V - Visiting probable nest site;

A - Agitated behaviour or anxiety calls of an adult; B - Brood Patch on adult female or cloacal protuberance on adult male; N - Nest-building or excavation of nest hole by wrens and woodpeckers

CONFIRMED = NB - Nest building or carrying nest materials, for all species except wrens and woodpeckers; DD - Distraction display or injury feigning; NU - Used nest or egg shells found (occupied or laid within the period of the survey); FY - Recently fledged young (nidicolous species) or downy young (nidifugous species), including incapable of sustained flight; AE - Adult leaving or entering nest sites in circumstances indicating occupied nest; FS - Adult carrying fecal sac; CF - Adult carrying food for young; NE - Nest containing eggs; NY - Nest with young seen or heard

Table 3: 2025 Spring Migration Survey Results Summary - Sturk Quarry Expansion Project

Project #24-10948

Common Name	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank	Count
American Crow	<i>Corvus brachyrhynchos</i>	Not Listed	Not Listed	Not Listed	S5	6
American Goldfinch	<i>Spinus tristis</i>	Not Listed	Not Listed	Not Listed	S5	10
American Robin	<i>Turdus migratorius</i>	Not Listed	Not Listed	Not Listed	S5B,S3N	15
Barred Owl	<i>Strix varia</i>	Not Listed	Not Listed	Not Listed	S5	1
Black-and-white Warbler	<i>Mniotilta varia</i>	Not Listed	Not Listed	Not Listed	S5B	5
Black-capped Chickadee	<i>Poecile atricapillus</i>	Not Listed	Not Listed	Not Listed	S5	24
Black-throated Green Warbler	<i>Setophaga virens</i>	Not Listed	Not Listed	Not Listed	S5B	2
Blue Jay	<i>Cyanocitta cristata</i>	Not Listed	Not Listed	Not Listed	S5	35
Blue-headed Vireo	<i>Vireo solitarius</i>	Not Listed	Not Listed	Not Listed	S5B	1
Brown Creeper	<i>Certhia americana</i>	Not Listed	Not Listed	Not Listed	S5	1
Canada Goose	<i>Branta canadensis</i>	Not Listed	Not Listed	Not Listed	SUB,S4N,S5M	11
Common Grackle	<i>Quiscalus quiscula</i>	Not Listed	Not Listed	Not Listed	S5B	2
Common Raven	<i>Corvus corax</i>	Not Listed	Not Listed	Not Listed	S5	5
Dark-eyed Junco	<i>Junco hyemalis</i>	Not Listed	Not Listed	Not Listed	S4S5	25
Downy Woodpecker	<i>Dryobates pubescens</i>	Not Listed	Not Listed	Not Listed	S5	1
European Starling	<i>Sturnus vulgaris</i>	Not Listed	Not Listed	Not Listed	SNA	2
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Not Listed	Not Listed	Not Listed	S5	5
Hairy Woodpecker	<i>Dryobates villosus</i>	Not Listed	Not Listed	Not Listed	S5	1
Hermit Thrush	<i>Catharus guttatus</i>	Not Listed	Not Listed	Not Listed	S5B	5
Killdeer	<i>Charadrius vociferus</i>	Not Listed	Not Listed	Not Listed	S3B	1
Mallard	<i>Anas platyrhynchos</i>	Not Listed	Not Listed	Not Listed	S5B,S5N	2
Mourning Dove	<i>Zenaidura macroura</i>	Not Listed	Not Listed	Not Listed	S5	3
Northern Flicker	<i>Colaptes auratus</i>	Not Listed	Not Listed	Not Listed	S5B	11
Northern Waterthrush	<i>Parkesia noveboracensis</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	9
Ovenbird	<i>Seiurus aurocapilla</i>	Not Listed	Not Listed	Not Listed	S5B	3
Palm Warbler	<i>Setophaga palmarum</i>	Not Listed	Not Listed	Not Listed	S5B	3
Pine Siskin	<i>Spinus pinus</i>	Not Listed	Not Listed	Not Listed	S3	1
Purple Finch	<i>Haemorhous purpureus</i>	Not Listed	Not Listed	Not Listed	S4S5B,S3S4N,S5M	17
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Not Listed	Not Listed	Not Listed	S4S5	5
Ruffed Grouse	<i>Bonasa umbellus</i>	Not Listed	Not Listed	Not Listed	S5	5
Song Sparrow	<i>Melospiza melodia</i>	Not Listed	Not Listed	Not Listed	S5B	7
Tree Swallow	<i>Tachycineta bicolor</i>	Not Listed	Not Listed	Not Listed	S4B	1
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Not Listed	Not Listed	Not Listed	S4S5B,S5M	4

Table 3: 2025 Spring Migration Survey Results Summary - Sturk Quarry Expansion Project

Project #24-10948

Common Name	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank	Count
White-winged Crossbill	<i>Loxia leucoptera</i>	Not Listed	Not Listed	Not Listed	S4S5	3
Winter Wren	<i>Troglodytes hiemalis</i>	Not Listed	Not Listed	Not Listed	S5B	4
Woodpecker sp.	N/A	N/A	N/A	N/A	N/A	1
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Not Listed	Not Listed	Not Listed	S5B	4
Yellow-rumped Warbler	<i>Setophaga coronata</i>	Not Listed	Not Listed	Not Listed	S5B	4

Table 4: 2025 Breeding Bird Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
RM	6-Jun-25	Breeding Bird PC	Round One	PC1	6:07	10	GRCA	Gray Catbird	<i>Dumetella carolinensis</i>	1		X	1			N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC1		10	Leff	Least Flycatcher	<i>Empidonax minimus</i>	1		X	1			SE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC1		10	Cswa	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	2		X	1			N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC1		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	2		X	1	1		N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC1		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	1		X	2			NE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC1		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			NE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC1		10	Nopa	Northern Parula	<i>Setophaga americana</i>	1		X	1			N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC1		10	Eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X		1		SE						Singing from direction of watercourse to the southwest
RM	6-Jun-25	Breeding Bird PC	Round One	PC11	6:25	10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2		X	2			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			SE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	2		X		1	1	N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	BEKI	Belted Kingfisher	<i>Megasceryle alcyon</i>	1	X	X	1			W						Perched over small man made pond
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	AMCR	American Crow	<i>Corvus brachyrhynchos</i>	2		X		2		E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	Chsp	Chipping Sparrow	<i>Spizella passerina</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	Eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X			1	NW						Same general direction as the EAWP from PC1 - likely the same bird
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		X		1		SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	HETH	Hermil Thrush	<i>Catharus guttatus</i>	1		X		1		SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	Nopa	Northern Parula	<i>Setophaga americana</i>	1		X				E			1	0-50	N	
RM	6-Jun-25	Breeding Bird PC	Round One	PC11		10	Cogr	Common Grackle	<i>Quiscalus quiscula</i>	1		X	1			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC2	6:40	10	Revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	2		X	2			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC2		10	SOSP	Song Sparrow	<i>Melospiza melodia</i>	1		X		1		E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC2		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC2		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			S						
RM	6-Jun-25	Breeding Bird PC	Round One	PC2		10	AMCR	American Crow	<i>Corvus brachyrhynchos</i>	1		X		1		N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC2		10	Eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X			1	NW						Likely the same bird observed earlier - same area / watercourse
RM	6-Jun-25	Breeding Bird PC	Round One	PC2		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X		1		N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC2		10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	3	X	X	3			SE			3	50-100	S	
RM	6-Jun-25	Breeding Bird PC	Round One	PC2		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X	1			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC3	6:55	10	Eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X			1	NW						Same as above
RM	6-Jun-25	Breeding Bird PC	Round One	PC3		10	Nopa	Northern Parula	<i>Setophaga americana</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC3		10	Nowa	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X	1			SE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC3		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC3		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		X		1		SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC3		10	BHVI	Blue-headed Vireo	<i>Vireo solitarius</i>	1		X	1			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC3		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		S						
RM	6-Jun-25	Breeding Bird PC	Round One	PC4	7:08	10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		SE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC4		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC4		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC4		10	Revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	1		X	1			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC4		10	Eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X		1		E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC4		10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2		X	2			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC5	7:23	10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC5		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	2		X	1	1		S						
RM	6-Jun-25	Breeding Bird PC	Round One	PC5		10	Eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X			1	SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC5		10	Nawa	Nashville Warbler	<i>Leiothlypis ruficapilla</i>	1		X	1			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC5		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			SW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC6	7:39	10	HETH	Hermil Thrush	<i>Catharus guttatus</i>	1		X		1		W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC6		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	2		X		2		S						
RM	6-Jun-25	Breeding Bird PC	Round One	PC6		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>		1	X		1		S						
RM	6-Jun-25	Breeding Bird PC	Round One	PC6		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC6		10	SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	1		X	2			NW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC6		10	Nowa	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X		1		NW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC7	7:57	10	ALFL	Alder Flycatcher	<i>Empidonax alnorum</i>	2		X	2			N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC7		10	COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	2		X	2			NW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC7		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			S						
RM	6-Jun-25	Breeding Bird PC	Round One	PC7		10	Hawo	Hairy Woodpecker	<i>Dryobates villosus</i>	1	X	X	1			SE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC7		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC7		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC7		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1	X	X		1		E						

Table 4: 2025 Breeding Bird Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
RM	6-Jun-25	Breeding Bird PC	Round One	PC7		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X		1		N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC7		10	SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC8	8:15	10	Boch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC8		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	2		X	2			NW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC8		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	2		X	1	1		N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC8		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC8		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC8		10	Nopa	Northern Parula	<i>Setophaga americana</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC8		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X		1		N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9	8:34	10	CAJA	Canada Jay	<i>Perisoreus canadensis</i>	1		X	1			SE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	NAWA	Nashville Warbler	<i>Leiothlypis ruficapilla</i>	3		X	2	1		SE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	MAWA	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X		1		W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1		X	1			S						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	1		X	1			S						
RM	6-Jun-25	Breeding Bird PC	Round One	PC9		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			E						
RM	6-Jun-25	Breeding Bird PC	Round One	PC10	9:05	10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	2		X	1			NW						
RM	6-Jun-25	Breeding Bird PC	Round One	PC10		10	Bibw	Blackburnian Warbler	<i>Setophaga fusca</i>	2		X	1			SE						
RM	6-Jun-25	Breeding Bird PC	Round One	PC10		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC10		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC10		10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2		X	2			W						
RM	6-Jun-25	Breeding Bird PC	Round One	PC10		10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1		X	1			N						
RM	6-Jun-25	Breeding Bird PC	Round One	PC10		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		X	1			S						
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1	9:16	60	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	4		X										Passed through some wetlands (treed swamp) and riparian areas although bird activity was relatively low. Some mature mixedwood areas as well with beech, sugar maple and white ash abundant.
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	HETH	Hermit Thrush	<i>Catharus guttatus</i>	2		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	3		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	Nowa	Northern Waterthrush	<i>Parkesia noveboracensis</i>	2		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	Revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	3		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	Nopa	Northern Parula	<i>Setophaga americana</i>	2		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	Cswa	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	1		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2		X										
RM	6-Jun-25	Breeding Bird Area Search	Round One	Area Search 1		60	Boch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		X										
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1	5:47	10	AMRO	American Robin	<i>Turdus migratorius</i>	2		X	1	1		E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	3		X	2	1		S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	SOSP	Song Sparrow	<i>Melospiza melodia</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	EAWP	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X		1		W						Observed here during the last round (probable breeding evidence)
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	VEER	Veery	<i>Catharus fuscescens</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	NOWA	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	Boch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2	X	X	2			N			2	50-100	SW	
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	Cswa	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	Revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	2		X	2			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	Rwbl	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	1		X	1			NE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	1		X	1			NE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC1		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11	6:05	10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	Nopa	Northern Parula	<i>Setophaga americana</i>	2		X	2			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	Revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	2		X		2		SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	PIWO	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1		X			1	S						Drumming
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	SWTH	Swainson's Thrush	<i>Catharus ustulatus</i>	1		X		1		NE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1		X		1		NW						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	1		X	1			NW						

Table 4: 2025 Breeding Bird Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
RM	3-Jul-25	Breeding Bird PC	Round Two	PC11		10	Blbw	Blackburnian Warbler	<i>Setophaga fusca</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2	6:23	10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	2		X	2			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	3	X	X	2	1		E						Confirmed breeding - recently fledged young
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Cswa	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Amro	American Robin	<i>Turdus migratorius</i>	2	X	X		2		E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2		X	2			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1		X	1			NE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X	1			SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Nowa	Northern Waterthrush	<i>Parkesia noveboracensis</i>	1		X		1		S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	1		X	1			N						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	1		X	1			NE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	2		X	2			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X			1	S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC2		10	Cora	Common Raven	<i>Corvus corax</i>	1		X		1		S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC3	6:40	10	Wivr	Winter Wren	<i>Troglodytes hiemalis</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC3		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC3		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	2		X	2			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC3		10	Boch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC3		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC3		10	YBSA	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	1		X			1	W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC3		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X	1			NE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4	6:57	10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	Hawo	Hairy Woodpecker	<i>Dryobates villosus</i>	1		X		1		N						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	2		X	2			NW						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	Eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X			1	W						Watercourse to the west. I think one was in this location last round too (probable breeding evidence)
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1		X			1	S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC4		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5	7:12	10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	RTHU	Ruby-throated Hummingbird	<i>Archilochus colubris</i>	1	X	X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	2		X		2		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X			1	W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	PAWA	Palm Warbler	<i>Setophaga palmarum</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X		1		N						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X			1	E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	Boch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	Nawa	Nashville Warbler	<i>Leiothlypis ruficapilla</i>	1		X		1		S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC5		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6	7:30	10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X			1	E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X		1		E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	Nowa	Northern Waterthrush	<i>Parkesia noveboracensis</i>	2	X	X	2			S						Probable breeding evidence - pair in suitable nesting habitat / agitated behaviour
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	1		X		1		SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC6		10	Boch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2		X	2			SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7	7:47	10	Nopa	Northern Parula	<i>Setophaga americana</i>	2		X	2			N						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	2		X	2			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	1		X	1			NW						Probable breeding evidence - agitated behaviour

Table 4: 2025 Breeding Bird Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	3	X	X	2			NW						Probable breeding evidence - pair in suitable habitat / agitated behaviour
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2		X	2			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X		1		E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		X		1		E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC7		10	ALFL	Alder Flycatcher	<i>Empidonax alnorum</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC8	8:08	10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC8		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	3		X	3			SW						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC8		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	2		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC8		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X		1		N						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC8		10	RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC8		10	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	2	X	X	2			E						Probable breeding - pair in suitable habitat
RM	3-Jul-25	Breeding Bird PC	Round Two	PC8		10	Amro	American Robin	<i>Turdus migratorius</i>	1		X		1		W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC8		10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			SW						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9	8:33	10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		X		1		SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	PIWO	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1	X	X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2		X	2			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	Nawa	Nashville Warbler	<i>Leiothlypis ruficapilla</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	ALFL	Alder Flycatcher	<i>Empidonax alnorum</i>	1		X	1			W						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	1		X	1			S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	Gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	1		X	1			N						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1		X		1		N						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		X		1		S						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC9		10	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC10	8:57	10	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X	1			N						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC10		10	Wiwr	Winter Wren	<i>Troglodytes hiemalis</i>	1		X	1			SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC10		10	Eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		X			1	S						Singing from watercourse to the south. Pretty sure it was recorded here during the last round too (probable breeding evidence)
RM	3-Jul-25	Breeding Bird PC	Round Two	PC10		10	Btbw	Black-throated Blue Warbler	<i>Setophaga caeruleascens</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC10		10	PIWO	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1		X		1		S						Drumming
RM	3-Jul-25	Breeding Bird PC	Round Two	PC10		10	Nopa	Northern Parula	<i>Setophaga americana</i>	1		X	1			SE						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC10		10	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	1		X		1		E						
RM	3-Jul-25	Breeding Bird PC	Round Two	PC10		10	Bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		X	1			E						
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2	9:07	60	Oven	Ovenbird	<i>Seiurus aurocapilla</i>	6		X										Area Search: explored the area where the OSFL observations have been made in attempt to pinpoint it's location. Did not observe it today. Habitats covered included mature softwood dominant mixedwood forest, young mixedwood, and treed swamp.
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	Mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	4		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	Btbw	Black-throated Blue Warbler	<i>Setophaga caeruleascens</i>	2	X	X										Confirmed breeding evidence - female carrying food. (Also observed agitated behaviour of a pair in suitable habitat). Nest likely very close
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	HETH	Hermit Thrush	<i>Catharus guttatus</i>	4		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	Baww	Black-and-white Warbler	<i>Mniotilta varia</i>	3		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	PIWO	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1		X										Same one heard earlier
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	Btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	2		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	4		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	Bibw	Blackburnian Warbler	<i>Setophaga fusca</i>	1		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	Gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	2		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	Deju	Dark-eyed Junco	<i>Junco hyemalis</i>	2		X										
RM	3-Jul-25	Breeding Bird Area Search	Round Two	Area Search 2		60	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1		X										

Table 5: 2025 Breeding Bird Results Summary - Sturk Quarry Expansion Project

Project #24-10948

Common Name	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank	Count
Alder Flycatcher	<i>Empidonax alnorum</i>	Not Listed	Not Listed	Not Listed	S5B	4
American Crow	<i>Corvus brachyrhynchos</i>	Not Listed	Not Listed	Not Listed	S5	3
American Goldfinch	<i>Spinus tristis</i>	Not Listed	Not Listed	Not Listed	S5	2
American Robin	<i>Turdus migratorius</i>	Not Listed	Not Listed	Not Listed	S5B,S3N	10
Belted Kingfisher	<i>Megasceryle alcyon</i>	Not Listed	Not Listed	Not Listed	S4S5B	1
Black-and-white Warbler	<i>Mniotilta varia</i>	Not Listed	Not Listed	Not Listed	S5B	16
Blackburnian Warbler	<i>Setophaga fusca</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	4
Black-capped Chickadee	<i>Poecile atricapillus</i>	Not Listed	Not Listed	Not Listed	S5	10
Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	Not Listed	Not Listed	Not Listed	S5B	3
Black-throated Green Warbler	<i>Setophaga virens</i>	Not Listed	Not Listed	Not Listed	S5B	27
Blue Jay	<i>Cyanocitta cristata</i>	Not Listed	Not Listed	Not Listed	S5	19
Blue-headed Vireo	<i>Vireo solitarius</i>	Not Listed	Not Listed	Not Listed	S5B	1
Canada Jay	<i>Perisoreus canadensis</i>	Not Listed	Not Listed	Not Listed	S3	1
Cedar Waxwing	<i>Bombicilla cedrorum</i>	Not Listed	Not Listed	Not Listed	S5B	18
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	Not Listed	Not Listed	Not Listed	S5B	5
Chipping Sparrow	<i>Spizella passerina</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	1
Common Grackle	<i>Quiscalus quiscula</i>	Not Listed	Not Listed	Not Listed	S5B	1
Common Raven	<i>Corvus corax</i>	Not Listed	Not Listed	Not Listed	S5	1
Common Yellowthroat	<i>Geothlypis trichas</i>	Not Listed	Not Listed	Not Listed	S5B	8
Dark-eyed Junco	<i>Junco hyemalis</i>	Not Listed	Not Listed	Not Listed	S4S5	10
Eastern Wood-Pewee	<i>Contopus virens</i>	Special Concern	Special Concern	Vulnerable	S3S4B	9
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Not Listed	Not Listed	Not Listed	S5	3
Grey Catbird	<i>Dumetella carolinensis</i>	Not Listed	Not Listed	Not Listed	S4B	1
Hairy Woodpecker	<i>Dryobates villosus</i>	Not Listed	Not Listed	Not Listed	S5	2
Hermit Thrush	<i>Catharus guttatus</i>	Not Listed	Not Listed	Not Listed	S5B	17
Least Flycatcher	<i>Empidonax minimus</i>	Not Listed	Not Listed	Not Listed	S4S5B,S5M	1
Magnolia Warbler	<i>Setophaga magnolia</i>	Not Listed	Not Listed	Not Listed	S5B	21
Nashville Warbler	<i>Leiothlypis ruficapilla</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	6
Northern Flicker	<i>Colaptes auratus</i>	Not Listed	Not Listed	Not Listed	S5B	6
Northern Parula	<i>Setophaga americana</i>	Not Listed	Not Listed	Not Listed	S5B	11
Northern Waterthrush	<i>Parkesia noveboracensis</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	8
Ovenbird	<i>Seiurus aurocapilla</i>	Not Listed	Not Listed	Not Listed	S5B	41
Palm Warbler	<i>Setophaga palmarum</i>	Not Listed	Not Listed	Not Listed	S5B	1

Table 5: 2025 Breeding Bird Results Summary - Sturk Quarry Expansion Project

Project #24-10948

Common Name	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank	Count
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Not Listed	Not Listed	Not Listed	S5	4
Purple Finch	<i>Haemorhous purpureus</i>	Not Listed	Not Listed	Not Listed	S4S5B,S3S4N,S5M	6
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Not Listed	Not Listed	Not Listed	S4S5	4
Red-eyed Vireo	<i>Vireo olivaceus</i>	Not Listed	Not Listed	Not Listed	S5B	10
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Not Listed	Not Listed	Not Listed	S4B	1
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Not Listed	Not Listed	Not Listed	S5B	1
Song Sparrow	<i>Melospiza melodia</i>	Not Listed	Not Listed	Not Listed	S5B	2
Swainson's Thrush	<i>Catharus ustulatus</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	1
Swamp Sparrow	<i>Melospiza georgiana</i>	Not Listed	Not Listed	Not Listed	S5B	5
Veery	<i>Catharus fuscescens</i>	Not Listed	Not Listed	Not Listed	S4B	1
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Not Listed	Not Listed	Not Listed	S4S5B,S5M	2
Winter Wren	<i>Troglodytes hiemalis</i>	Not Listed	Not Listed	Not Listed	S5B	2
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Not Listed	Not Listed	Not Listed	S5B	1
Yellow-rumped Warbler	<i>Setophaga coronata</i>	Not Listed	Not Listed	Not Listed	S5B	2

Table 6: 2025 Nightjar Survey Results - Sturk Quarry Expansion Project

Observer	Date	Start Time	Survey Type	Survey Round	Temperature (°C)	Wind (Beaufort Scale)	Cloud Cover (%)	Noise	Survey Location	Total Survey Time (mins)	Species code	Common name	Scientific Name	#	Comments
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	TRES	Tree Swallow	<i>Tachycineta bicolor</i>	4	No nightjars
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	AMRO	American Robin	<i>Turdus migratorius</i>	3	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	2	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	2	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	MODO	Mourning Dove	<i>Zenaida macroura</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	2	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	AGOL	American Goldfinch	<i>Spinus tristis</i>	3	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	BTNW	Black-throated Green Warbler	<i>Setophaga virens</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	CORA	Common Raven	<i>Corvus corax</i>	2	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	AMCR	American Crow	<i>Corvus brachyrhynchos</i>	3	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>	2	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	2	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	CAGO	Canada Goose	<i>Branta canadensis</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	BAWW	Black-and-white Warbler	<i>Mniotilta varia</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	SWTH	Swainson's Thrush	<i>Catharus ustulatus</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	ALFL	Alder Flycatcher	<i>Empidonax alnorum</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	RUGR	Ruffed Grouse	<i>Bonasa umbellus</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	YEWA	Yellow Warbler	<i>Setophaga petechia</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	NOPA	Northern Parula	<i>Setophaga americana</i>	1	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	AMRE	American Redstart	<i>Setophaga ruticilla</i>	2	
JL	06-Jun-25	20:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI4	6	CSWA	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	2	
JL	06-Jun-25	20:40	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI3	6	RWBL	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	3	No nightjars
JL	06-Jun-25	20:40	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI3	6	SOSP	Song Sparrow	<i>Melospiza melodia</i>	2	
JL	06-Jun-25	20:40	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI3	6	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1	
JL	06-Jun-25	20:40	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI3	6	AMRO	American Robin	<i>Turdus migratorius</i>	4	
JL	06-Jun-25	20:40	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI3	6	OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	1	
JL	06-Jun-25	20:40	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI3	6	AMCR	American Crow	<i>Corvus brachyrhynchos</i>	1	
JL	06-Jun-25	20:40	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI3	6	COGR	Common Grackle	<i>Quiscalus quiscula</i>	2	
JL	06-Jun-25	20:40	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI3	6	AMRE	American Redstart	<i>Setophaga ruticilla</i>	1	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	HETH	Hermit Thrush	<i>Catharus guttatus</i>	2	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	3	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	AMRO	American Robin	<i>Turdus migratorius</i>	1	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	MAWA	Magnolia Warbler	<i>Setophaga magnolia</i>	1	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	1	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	BAWW	Black-and-white Warbler	<i>Mniotilta varia</i>	1	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	1	
JL	06-Jun-25	20:53	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI5	6	CONI	Common Nighthawk (SAR)	<i>Chordeiles minor</i>	3	Calling and wingboom display. All within 50 m
JL	06-Jun-25	21:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI1	6	AMWO	American Woodcock	<i>Scolopax minor</i>	2	
JL	06-Jun-25	21:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI1	6	HETH	Hermit Thrush	<i>Catharus guttatus</i>	2	
JL	06-Jun-25	21:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI1	6	AMRO	American Robin	<i>Turdus migratorius</i>	5	
JL	06-Jun-25	21:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI1	6	VEER	Veery	<i>Catharus fuscescens</i>	3	
JL	06-Jun-25	21:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI1	6	AMCR	American Crow	<i>Corvus brachyrhynchos</i>	1	
JL	06-Jun-25	21:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI1	6	WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1	
JL	06-Jun-25	21:25	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI1	6	CONI	Common Nighthawk (SAR)	<i>Chordeiles minor</i>	4	Closest individual within 20 m, all within 100 m. Over clearcut to the east.
JL	06-Jun-25	21:50	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI2	6	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	2	No nightjars
JL	06-Jun-25	21:50	Nightjar	Round One	20	0-1	95	Slight (distant traffic)	CONI2	6	AMRO	American Robin	<i>Turdus migratorius</i>	2	

Table 6: 2025 Nightjar Survey Results - Sturk Quarry Expansion Project

Observer	Date	Start Time	Survey Type	Survey Round	Temperature (°C)	Wind (Beaufort Scale)	Cloud Cover (%)	Noise	Survey Location	Total Survey Time (mins)	Species code	Common name	Scientific Name	#	Comments
RM	02-Jul-25	20:09	Nightjar	Round Two	26	1	50-90	None	CONI1	6	CONI	Common Nighthawk (SAR)	<i>Chordeiles minor</i>	1	Moon not visible. One CONI Calling from more than 100 m southeast
RM	02-Jul-25	20:43	Nightjar	Round Two	26	1	50-90	None	CONI4	6	No Nightjars	N/A	N/A		No nightjars
RM	02-Jul-25	21:05	Nightjar	Round Two	26	1	50-90	None	CONI5	6	CONI	Common Nighthawk (SAR)	<i>Chordeiles minor</i>	2	Both calling and wingbooming withiin 100 m. Southeast.
RM	02-Jul-25	21:25	Nightjar	Round Two	26	2	50-90	None	CONI3	6	No Nightjars	N/A	N/A		No nightjars
RM	02-Jul-25	21:40	Nightjar	Round Two	26	1	50-90	Excessive	CONI2	6	No Nightjars	N/A	N/A		No nightjars. Lots of noise from the hydro dam and passing traffic

Table 7: 2025 Nightjar Survey Results Summary - Sturk Quarry Expansion Project

Project #24-10948

Common Name	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank	Count
Alder Flycatcher	<i>Empidonax alnorum</i>	Not Listed	Not Listed	Not Listed	S5B	1
American Crow	<i>Corvus brachyrhynchos</i>	Not Listed	Not Listed	Not Listed	S5	5
American Goldfinch	<i>Spinus tristis</i>	Not Listed	Not Listed	Not Listed	S5	3
American Redstart	<i>Setophaga ruticilla</i>	Not Listed	Not Listed	Not Listed	S5B	3
American Robin	<i>Turdus migratorius</i>	Not Listed	Not Listed	Not Listed	S5B,S3N	15
American Woodcock	<i>Scolopax minor</i>	Not Listed	Not Listed	Not Listed	S5B	2
Black-and-white Warbler	<i>Mniotilta varia</i>	Not Listed	Not Listed	Not Listed	S5B	2
Black-capped Chickadee	<i>Poecile atricapillus</i>	Not Listed	Not Listed	Not Listed	S5	2
Black-throated Green Warbler	<i>Setophaga virens</i>	Not Listed	Not Listed	Not Listed	S5B	1
Blue Jay	<i>Cyanocitta cristata</i>	Not Listed	Not Listed	Not Listed	S5	4
Canada Goose	<i>Branta canadensis</i>	Not Listed	Not Listed	Not Listed	SUB,S4N,S5M	1
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Not Listed	Not Listed	Not Listed	S5B	2
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	Not Listed	Not Listed	Not Listed	S5B	2
Common Grackle	<i>Quiscalus quiscula</i>	Not Listed	Not Listed	Not Listed	S5B	2
Common Nighthawk	<i>Chordeiles minor</i>	Special Concern	Special Concern	Threatened	S3B	10
Common Raven	<i>Corvus corax</i>	Not Listed	Not Listed	Not Listed	S5	2
Common Yellowthroat	<i>Geothlypis trichas</i>	Not Listed	Not Listed	Not Listed	S5B	3
Dark-eyed Junco	<i>Junco hyemalis</i>	Not Listed	Not Listed	Not Listed	S4S5	3
Hermit Thrush	<i>Catharus guttatus</i>	Not Listed	Not Listed	Not Listed	S5B	5
Magnolia Warbler	<i>Setophaga magnolia</i>	Not Listed	Not Listed	Not Listed	S5B	1
Mourning Dove	<i>Zenaida macroura</i>	Not Listed	Not Listed	Not Listed	S5	1
Northern Flicker	<i>Colaptes auratus</i>	Not Listed	Not Listed	Not Listed	S5B	1
Northern Parula	<i>Setophaga americana</i>	Not Listed	Not Listed	Not Listed	S5B	1
Ovenbird	<i>Seiurus aurocapilla</i>	Not Listed	Not Listed	Not Listed	S5B	4
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Not Listed	Not Listed	Not Listed	S4B	3
Ruffed Grouse	<i>Bonasa umbellus</i>	Not Listed	Not Listed	Not Listed	S5	1
Song Sparrow	<i>Melospiza melodia</i>	Not Listed	Not Listed	Not Listed	S5B	2
Swainson's Thrush	<i>Catharus ustulatus</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	1
Tree Swallow	<i>Tachycineta bicolor</i>	Not Listed	Not Listed	Not Listed	S4B	4
Veery	<i>Catharus fuscescens</i>	Not Listed	Not Listed	Not Listed	S4B	3
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Not Listed	Not Listed	Not Listed	S4S5B,S5M	5
Yellow Warbler	<i>Setophaga petechia</i>	Not Listed	Not Listed	Not Listed	S5B	1
Yellow-rumped Warbler	<i>Setophaga coronata</i>	Not Listed	Not Listed	Not Listed	S5B	1

Table 8: 2025 Fall Migration Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near Wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
LL	22-Aug-25	Fall Migration	Round One	PC1	7:46	10	cawa	Canada Warbler (SAR)	<i>Cardellina canadensis</i>	1	x		1				N					
LL	22-Aug-25	Fall Migration	Round One	PC1		10	yewa	Yellow Warbler	<i>Setophaga petechia</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC1		10	yrwa	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC1		10	amre	American Redstart	<i>Setophaga ruticilla</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC1		10	eust	European Starling	<i>Sturnus vulgaris</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC1		10	agol	American Goldfinch	<i>Spinus tristis</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC1		10	amro	American Robin	<i>Turdus migratorius</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC1		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC1		10	sosp	Song Sparrow	<i>Melospiza melodia</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC1		10	revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	2		x	2									
LL	22-Aug-25	Fall Migration	Round One	PC1		10	oven	Ovenbird	<i>Seiurus aurocapilla</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC2	8:05	10	RTHU	Ruby-throated Hummingbird	<i>Archilochus colubris</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC2		10	eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		x	1				N					
LL	22-Aug-25	Fall Migration	Round One	PC2		10	DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	2	x		2									
LL	22-Aug-25	Fall Migration	Round One	PC2		10	SOSP	Song Sparrow	<i>Melospiza melodia</i>	3	x		3									
LL	22-Aug-25	Fall Migration	Round One	PC2		10	AMRO	American Robin	<i>Turdus migratorius</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC2		10	BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC2		10	BLJA	Blue Jay	<i>Cyanocitta cristata</i>	10		x	7	3								
LL	22-Aug-25	Fall Migration	Round One	PC2		10	CAJA	Canada Jay	<i>Perisoreus canadensis</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC2		10	MAWA	Magnolia Warbler	<i>Setophaga magnolia</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC3	8:31	10	DOWO	Downy Woodpecker	<i>Picoides pubescens</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC3		10	GCKI	Golden-crowned Kinglet	<i>Regulus satrapa</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC3		10	BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC3		10	AGOL	American Goldfinch	<i>Spinus tristis</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC3		10	PUFI	Purple Finch	<i>Haemorhous purpureus</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC3		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC3		10	BAWW	Black-and-white Warbler	<i>Mniotilta varia</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC4	8:57	10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	4		x	4									
LL	22-Aug-25	Fall Migration	Round One	PC4		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC4		10	AMRO	American Robin	<i>Turdus migratorius</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC4		10	BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC4		10	BTNW	Black-throated Green Warbler	<i>Setophaga virens</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC4		10	BAWW	Black-and-white Warbler	<i>Mniotilta varia</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC4		10	NOFL	Northern Flicker	<i>Colaptes auratus</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC4		10	AMRE	American Redstart	<i>Setophaga ruticilla</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC4		10	WIWR	Winter Wren	<i>Troglodytes hiemalis</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC5	9:16	10	BTNW	Black-throated Green Warbler	<i>Setophaga virens</i>	6	x		6									
LL	22-Aug-25	Fall Migration	Round One	PC5		10	CAJA	Canada Jay	<i>Perisoreus canadensis</i>	2	x		2									
LL	22-Aug-25	Fall Migration	Round One	PC5		10	CAWA	Canada Warbler (SAR)	<i>Cardellina canadensis</i>	1	x		1				N					
LL	22-Aug-25	Fall Migration	Round One	PC5		10	MAWA	Magnolia Warbler	<i>Setophaga magnolia</i>	3	x		3									
LL	22-Aug-25	Fall Migration	Round One	PC5		10	BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>	7	x		7									
LL	22-Aug-25	Fall Migration	Round One	PC5		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC6	9:40	10	BTBW	Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	2	x		2									
LL	22-Aug-25	Fall Migration	Round One	PC6		10	DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC6		10	CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC6		10	BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>	12	8	4	12									
LL	22-Aug-25	Fall Migration	Round One	PC6		10	BTNW	Black-throated Green Warbler	<i>Setophaga virens</i>	4		1		1								
LL	22-Aug-25	Fall Migration	Round One	PC6		10	MAWA	Magnolia Warbler	<i>Setophaga magnolia</i>	5		1	1									
LL	22-Aug-25	Fall Migration	Round One	PC6		10	LEFL	Least Flycatcher	<i>Empidonax minimus</i>	1		1		1								
LL	22-Aug-25	Fall Migration	Round One	PC6		10	BHVI	Blue-headed Vireo	<i>Vireo solitarius</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC6		10	PAWA	Palm Warbler	<i>Setophaga palmarum</i>	2		x		2								
LL	22-Aug-25	Fall Migration	Round One	PC6		10	RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2		x	2									
LL	22-Aug-25	Fall Migration	Round One	PC6		10	YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC6		10	GCKI	Golden-crowned Kinglet	<i>Regulus satrapa</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC7	10:12	10	RUGR	Ruffed Grouse	<i>Bonasa umbellus</i>	2		x	2									
LL	22-Aug-25	Fall Migration	Round One	PC7		10	BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC7		10	AMCR	American Crow	<i>Corvus brachyrhynchos</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC7		10	OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	1		x	1									
LL	22-Aug-25	Fall Migration	Round One	PC8	10:37	10	BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>	2		x	2									

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													<50 m	50 - 100 m	100 m +							
LL	22-Aug-25	Fall Migration	Round One	PC8		10	GCKI	Golden-crowned Kinglet	<i>Regulus satrapa</i>	3		x	3									
LL	22-Aug-25	Fall Migration	Round One	PC8		10	BTNW	Black-throated Green Warbler	<i>Setophaga virens</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC8		10	HETH	Hermit Thrush	<i>Catharus guttatus</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC8		10	AMRO	American Robin	<i>Turdus migratorius</i>	1	x		1									
LL	22-Aug-25	Fall Migration	Round One	PC8		10	AMCR	American Crow	<i>Corvus brachyrhynchos</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC8		10	RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC8		10	OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	1		x		1								
LL	22-Aug-25	Fall Migration	Round One	PC8		10	PAWA	Palm Warbler	<i>Setophaga palmarum</i>	1		x		1								
JL	9-Sep-25	Fall Migration	Round Two	PC1	6:45	10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	deju	Dark-eyed Junco	<i>Junco hyemalis</i>	8												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	modo	Mourning Dove	<i>Zenaida macroura</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	eust	European Starling	<i>Sturnus vulgaris</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	cogr	Common Grackle	<i>Quiscalus quiscula</i>	1	x	x	x						x			
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	amro	American Robin	<i>Turdus migratorius</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	agol	American Goldfinch	<i>Spinus tristis</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	bhvi	Blue-headed Vireo	<i>Vireo solitarius</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	cora	Common Raven	<i>Corvus corax</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	cedw	Cedar Waxwing	<i>Bombycilla cedrorum</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	dowo	Downy Woodpecker	<i>Picoides pubescens</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC1		10	amre	American Redstart	<i>Setophaga ruticilla</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	cedw	Cedar Waxwing	<i>Bombycilla cedrorum</i>	9												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	coye	Common Yellowthroat	<i>Geothlypis trichas</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	amro	American Robin	<i>Turdus migratorius</i>	7												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	sosp	Song Sparrow	<i>Melospiza melodia</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	deju	Dark-eyed Junco	<i>Junco hyemalis</i>	6												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	8												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	cogr	Common Grackle	<i>Quiscalus quiscula</i>	2	x								x			
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	agol	American Goldfinch	<i>Spinus tristis</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	pawa	Palm Warbler	<i>Setophaga palmarum</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	Waterfowl sp.	Waterfowl sp.	#N/A	1	x			x					x			
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	hawo	Hairy Woodpecker	<i>Dryobates villosus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	yrwa	Yellow-rumped Warbler	<i>Setophaga coronata</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	cora	Common Raven	<i>Corvus corax</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	beki	Belted Kingfisher	<i>Megaceryle alcyon</i>	1	x			x					x			
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	rcki	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	pufi	Purple Finch	<i>Haemorhous purpureus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	bhvi	Blue-headed Vireo	<i>Vireo solitarius</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	wisn	Wilson's Snipe	<i>Gallinago delicata</i>	1		x		x								
JL	9-Sep-25	Fall Migration	Round Two	PC2		10	cago	Canada Goose	<i>Branta canadensis</i>	20	x	x	x						x			Group flying in v-shape, likely migratory group.
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	piwo	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1	x	x							x			
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	brcr	Brown Creeper	<i>Certhia americana</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1												

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													<50 m	50 - 100 m	100 m +							
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	cora	Common Raven	<i>Corvus corax</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	cago	Canada Goose	<i>Branta canadensis</i>	4	x	x							x			
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	dowo	Downy Woodpecker	<i>Picoides pubescens</i>	1	x		x									Male.
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC3		10	amro	American Robin	<i>Turdus migratorius</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	hawo	Hairy Woodpecker	<i>Dryobates villosus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	6												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	blbw	Blackburnian Warbler	<i>Setophaga fusca</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	yrwa	Yellow-rumped Warbler	<i>Setophaga coronata</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	oven	Ovenbird	<i>Seiurus aurocapilla</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	wbnu	White-breasted Nuthatch	<i>Sitta carolinensis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	coye	Common Yellowthroat	<i>Geothlypis trichas</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	cedw	Cedar Waxwing	<i>Bombycilla cedrorum</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	amro	American Robin	<i>Turdus migratorius</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	lefl	Least Flycatcher	<i>Empidonax minimus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC4		10	rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	yrwa	Yellow-rumped Warbler	<i>Setophaga coronata</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	6												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	pawa	Palm Warbler	<i>Setophaga palmarum</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	brcr	Brown Creeper	<i>Certhia americana</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	btnw	Black-throated Green Warbler	<i>Setophaga virens</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	pufi	Purple Finch	<i>Haemorhous purpureus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC5		10	amro	American Robin	<i>Turdus migratorius</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	amro	American Robin	<i>Turdus migratorius</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	coye	Common Yellowthroat	<i>Geothlypis trichas</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	swsp	Swamp Sparrow	<i>Melospiza georgiana</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	swth	Swainson's Thrush	<i>Catharus ustulatus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	cago	Canada Goose	<i>Branta canadensis</i>	5	x	x							x			
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	agol	American Goldfinch	<i>Spinus tristis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	yrwa	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	bbwa	Bay-breasted Warbler	<i>Setophaga castanea</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC6		10	nawa	Nashville Warbler	<i>Leiothlypis ruficapilla</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	cago	Canada Goose	<i>Branta canadensis</i>	20	x	x							x			
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	amro	American Robin	<i>Turdus migratorius</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	pawa	Palm Warbler	<i>Setophaga palmarum</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	coye	Common Yellowthroat	<i>Geothlypis trichas</i>	5												

Table 8: 2025 Fall Migration Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near Wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	14												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	bhvi	Blue-headed Vireo	<i>Vireo solitarius</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	yrwa	Yellow-rumped Warbler	<i>Setophaga coronata</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	rwbl	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	swsp	Swamp Sparrow	<i>Melospiza georgiana</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	mawa	Magnolia Warbler	<i>Setophaga magnolia</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	noca	Northern Cardinal	<i>Cardinalis cardinalis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	agol	American Goldfinch	<i>Spinus tristis</i>	6												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	cedw	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	cogr	Common Grackle	<i>Quiscalus quiscula</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	eawp	Eastern Wood-Pewee (SAR)	<i>Contopus virens</i>	1		x	x				x					Approx. 50 m on other side of wetland, on wetland edge.
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	eaph	Eastern Phoebe	<i>Sayornis phoebe</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	pufi	Purple Finch	<i>Haemorhous purpureus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	sosp	Song Sparrow	<i>Melospiza melodia</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC7		10	rcki	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	spgr	Spruce Grouse	<i>Canachites canadensis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	agol	American Goldfinch	<i>Spinus tristis</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	brcr	Brown Creeper	<i>Certhia americana</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	lefl	Least Flycatcher	<i>Empidonax minimus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC8		10	blpw	Blackpoll Warbler	<i>Setophaga striata</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	coye	Common Yellowthroat	<i>Geothlypis trichas</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	pawa	Palm Warbler	<i>Setophaga palmarum</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	cedw	Cedar Waxwing	<i>Bombycilla cedrorum</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	swsp	Swamp Sparrow	<i>Melospiza georgiana</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	agol	American Goldfinch	<i>Spinus tristis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC9		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	cora	Common Raven	<i>Corvus corax</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	wiwr	Winter Wren	<i>Troglodytes hiemalis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	8												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	8												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	nopa	Northern Parula	<i>Setophaga americana</i>	2												

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Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near Wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	bhvi	Blue-headed Vireo	<i>Vireo solitarius</i>	7												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	agol	American Goldfinch	<i>Spinus tristis</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	yrwa	Yellow-rumped Warbler	<i>Setophaga coronata</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	lefl	Least Flycatcher	<i>Empidonax minimus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	bbwa	Bay-breasted Warbler	<i>Setophaga castanea</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	amre	American Redstart	<i>Setophaga ruticilla</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	brcr	Brown Creeper	<i>Certhia americana</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	amro	American Robin	<i>Turdus migratorius</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC10		10	phvi	Philadelphia Vireo	<i>Vireo philadelphicus</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC11	10:20	10	pawa	Palm Warbler	<i>Setophaga palmarum</i>	5												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	agol	American Goldfinch	<i>Spinus tristis</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	6												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	revi	Red-eyed Vireo	<i>Vireo olivaceus</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	deju	Dark-eyed Junco	<i>Junco hyemalis</i>	8												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	sosp	Song Sparrow	<i>Melospiza melodia</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	7												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	amro	American Robin	<i>Turdus migratorius</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	bhvi	Blue-headed Vireo	<i>Vireo solitarius</i>	6												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	blpw	Blackpoll Warbler	<i>Setophaga striata</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	yewa	Yellow Warbler	<i>Setophaga petechia</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	coye	Common Yellowthroat	<i>Geothlypis trichas</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	cora	Common Raven	<i>Corvus corax</i>	4												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	swsp	Swamp Sparrow	<i>Melospiza georgiana</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	piwo	Pileated Woodpecker	<i>Dryocopus pileatus</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	wtsp	White-throated Sparrow	<i>Zonotrichia albicollis</i>	3												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	ybsa	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	cedw	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	baww	Black-and-white Warbler	<i>Mniotilta varia</i>	1												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	agol	American Goldfinch	<i>Spinus tristis</i>	6												
JL	9-Sep-25	Fall Migration	Round Two	PC11		10	rbgr	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC1	7:38	10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	6												
JL	24-Oct-25	Fall Migration	Round Three	PC1		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC1		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC1		10	cedw	Cedar Waxwing	<i>Bombycilla cedrorum</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC1		10	amro	American Robin	<i>Turdus migratorius</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC1		10	cora	Common Raven	<i>Corvus corax</i>	2		x	x		x							
JL	24-Oct-25	Fall Migration	Round Three	PC1		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC1		10	eust	European Starling	<i>Sturnus vulgaris</i>	6	x	x			x							
JL	24-Oct-25	Fall Migration	Round Three	PC1		10	deju	Dark-eyed Junco	<i>Junco hyemalis</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC2	7:52	10	agol	American Goldfinch	<i>Spinus tristis</i>	8												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	amro	American Robin	<i>Turdus migratorius</i>	10												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	10												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	cedw	Cedar Waxwing	<i>Bombycilla cedrorum</i>	6												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	amro	American Robin	<i>Turdus migratorius</i>	18	x	x							x	20 to 30 m	North	Few small groups, all flying northwards.
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	rwbl	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	5		x	x						x			
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	5												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	sosp	Song Sparrow	<i>Melospiza melodia</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	piwo	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	noca	Northern Cardinal	<i>Cardinalis cardinalis</i>	1		x			x							
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	yrwa	Yellow-rumped Warbler	<i>Setophaga coronata</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC2		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC3	8:12	10	brcr	Brown Creeper	<i>Certhia americana</i>	1												

Table 8: 2025 Fall Migration Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near Wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
JL	24-Oct-25	Fall Migration	Round Three	PC3		10	amro	American Robin	<i>Turdus migratorius</i>	4												
JL	24-Oct-25	Fall Migration	Round Three	PC3		10	deju	Dark-eyed Junco	<i>Junco hyemalis</i>	4												
JL	24-Oct-25	Fall Migration	Round Three	PC3		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC3		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC3		10	riph	Ring-necked Pheasant	<i>Phasianus colchicus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC3		10	cora	Common Raven	<i>Corvus corax</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC3		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC3		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC4	8:28	10	rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC4		10	agol	American Goldfinch	<i>Spinus tristis</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC4		10	amro	American Robin	<i>Turdus migratorius</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC4		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC4		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	5												
JL	24-Oct-25	Fall Migration	Round Three	PC4		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC4		10	ghow	Great Horned Owl	<i>Bubo virginianus</i>	1		x		x								
JL	24-Oct-25	Fall Migration	Round Three	PC4		10	cago	Canada Goose	<i>Branta canadensis</i>	15	x	x	x						x	30 to 40 m	North	Flying in v formation. Appears to be migratory flock.
JL	24-Oct-25	Fall Migration	Round Three	PC5	8:44	10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	5												
JL	24-Oct-25	Fall Migration	Round Three	PC5		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC5		10	amro	American Robin	<i>Turdus migratorius</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC5		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC5		10	cago	Canada Goose	<i>Branta canadensis</i>	8		x			x				x		Southeast	
JL	24-Oct-25	Fall Migration	Round Three	PC5		10	agol	American Goldfinch	<i>Spinus tristis</i>	4												
JL	24-Oct-25	Fall Migration	Round Three	PC5		10	brcr	Brown Creeper	<i>Certhia americana</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC5		10	rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC5		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC6	8:58	10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	4												
JL	24-Oct-25	Fall Migration	Round Three	PC6		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC6		10	amro	American Robin	<i>Turdus migratorius</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC6		10	agol	American Goldfinch	<i>Spinus tristis</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC7	9:19	10	amro	American Robin	<i>Turdus migratorius</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC7		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	5												
JL	24-Oct-25	Fall Migration	Round Three	PC7		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC7		10	agol	American Goldfinch	<i>Spinus tristis</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC7		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC7		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC7		10	cora	Common Raven	<i>Corvus corax</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC8	9:38	10	amro	American Robin	<i>Turdus migratorius</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC8		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC8		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	6												
JL	24-Oct-25	Fall Migration	Round Three	PC8		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	8												
JL	24-Oct-25	Fall Migration	Round Three	PC8		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC8		10	agol	American Goldfinch	<i>Spinus tristis</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC8		10	rugr	Ruffed Grouse	<i>Bonasa umbellus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC8		10	cora	Common Raven	<i>Corvus corax</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC9	9:57	10	amro	American Robin	<i>Turdus migratorius</i>	6												
JL	24-Oct-25	Fall Migration	Round Three	PC9		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC9		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC9		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC9		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC9		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC9		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC10	10:21	10	blja	Blue Jay	<i>Cyanocitta cristata</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC10		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC10		10	wbnu	White-breasted Nuthatch	<i>Sitta carolinensis</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC10		10	agol	American Goldfinch	<i>Spinus tristis</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC10		10	amro	American Robin	<i>Turdus migratorius</i>	5												
JL	24-Oct-25	Fall Migration	Round Three	PC10		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	6												
JL	24-Oct-25	Fall Migration	Round Three	PC10		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	3												

Table 8: 2025 Fall Migration Survey Results - Sturk Quarry Expansion Project

Observer	Date	Survey Type	Survey Round	Survey Location	Survey Start Time	Total Survey Time (mins)	Species Code	Common Name	Scientific Name	#	Seen	Heard	Distance			Bearing	Observed in or near Wetland?	Incidental?	Flyover?	Flyover Height (m)	Flight Direction	Comments
													<50 m	50 - 100 m	100 m +							
JL	24-Oct-25	Fall Migration	Round Three	PC10		10	amcr	American Crow	<i>Corvus brachyrhynchos</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC10		10	deju	Dark-eyed Junco	<i>Junco hyemalis</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC11	10:40	10	deju	Dark-eyed Junco	<i>Junco hyemalis</i>	12												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	agol	American Goldfinch	<i>Spinus tristis</i>	3												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	5												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	amro	American Robin	<i>Turdus migratorius</i>	4												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	sosp	Song Sparrow	<i>Melospiza melodia</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	bcch	Black-capped Chickadee	<i>Poecile atricapillus</i>	6												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	rbnu	Red-breasted Nuthatch	<i>Sitta canadensis</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	nofl	Northern Flicker	<i>Colaptes auratus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	Woodpecker sp.	Woodpecker sp.	#N/A	1												hawo or dowo
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	heth	Hermit Thrush	<i>Catharus guttatus</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	gcki	Golden-crowned Kinglet	<i>Regulus satrapa</i>	5												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	piwo	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	cora	Common Raven	<i>Corvus corax</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	amro	American Robin	<i>Turdus migratorius</i>	2												
JL	24-Oct-25	Fall Migration	Round Three	PC11		10	blja	Blue Jay	<i>Cyanocitta cristata</i>	4												

Table 9: 2025 Fall Migration Survey Results Summary - Sturk Quarry Expansion Project

Project #24-10948

Common Name	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank	Count
American Crow	<i>Corvus brachyrhynchos</i>	Not Listed	Not Listed	Not Listed	S5	23
American Goldfinch	<i>Spinus tristis</i>	Not Listed	Not Listed	Not Listed	S5	55
American Redstart	<i>Setophaga ruticilla</i>	Not Listed	Not Listed	Not Listed	S5B	5
American Robin	<i>Turdus migratorius</i>	Not Listed	Not Listed	Not Listed	S5B,S3N	91
Bay-breasted Warbler	<i>Setophaga castanea</i>	Not Listed	Not Listed	Not Listed	S3S4B,S4S5M	4
Belted Kingfisher	<i>Megasceryle alcyon</i>	Not Listed	Not Listed	Not Listed	S4S5B	1
Black-and-white Warbler	<i>Mniotilta varia</i>	Not Listed	Not Listed	Not Listed	S5B	18
Blackburnian Warbler	<i>Setophaga fusca</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	1
Black-capped Chickadee	<i>Poecile atricapillus</i>	Not Listed	Not Listed	Not Listed	S5	101
Blackpoll Warbler	<i>Setophaga striata</i>	Not Listed	Not Listed	Not Listed	S3B,S5M	2
Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	Not Listed	Not Listed	Not Listed	S5B	2
Black-throated Green Warbler	<i>Setophaga virens</i>	Not Listed	Not Listed	Not Listed	S5B	15
Blue Jay	<i>Cyanocitta cristata</i>	Not Listed	Not Listed	Not Listed	S5	96
Blue-headed Vireo	<i>Vireo solitarius</i>	Not Listed	Not Listed	Not Listed	S5B	18
Brown Creeper	<i>Certhia americana</i>	Not Listed	Not Listed	Not Listed	S5	7
Canada Goose	<i>Branta canadensis</i>	Not Listed	Not Listed	Not Listed	SUB,S4N,S5M	72
Canada Jay	<i>Perisoreus canadensis</i>	Not Listed	Not Listed	Not Listed	S3	3
Canada Warbler	<i>Cardellina canadensis</i>	Special Concern	Threatened	Endangered	S3B	2
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Not Listed	Not Listed	Not Listed	S5B	37
Common Grackle	<i>Quiscalus quiscula</i>	Not Listed	Not Listed	Not Listed	S5B	5
Common Raven	<i>Corvus corax</i>	Not Listed	Not Listed	Not Listed	S5	18
Common Yellowthroat	<i>Geothlypis trichas</i>	Not Listed	Not Listed	Not Listed	S5B	17
Dark-eyed Junco	<i>Junco hyemalis</i>	Not Listed	Not Listed	Not Listed	S4S5	45
Downy Woodpecker	<i>Dryobates pubescens</i>	Not Listed	Not Listed	Not Listed	S5	3
Eastern Phoebe	<i>Sayornis phoebe</i>	Not Listed	Not Listed	Not Listed	S4S5B,S4M	2
Eastern Wood-Pewee	<i>Contopus virens</i>	Special Concern	Special Concern	Vulnerable	S3S4B	2
European Starling	<i>Sturnus vulgaris</i>	Not Listed	Not Listed	Not Listed	SNA	12
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Not Listed	Not Listed	Not Listed	S5	89
Great Horned Owl	<i>Bubo virginianus</i>	Not Listed	Not Listed	Not Listed	S4	1
Hairy Woodpecker	<i>Dryobates villosus</i>	Not Listed	Not Listed	Not Listed	S5	2
Hermit Thrush	<i>Catharus guttatus</i>	Not Listed	Not Listed	Not Listed	S5B	27
Least Flycatcher	<i>Empidonax minimus</i>	Not Listed	Not Listed	Not Listed	S4S5B,S5M	4
Magnolia Warbler	<i>Setophaga magnolia</i>	Not Listed	Not Listed	Not Listed	S5B	14

Table 9: 2025 Fall Migration Survey Results Summary - Sturk Quarry Expansion Project

Project #24-10948

Common Name	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank	Count
Mourning Dove	<i>Zenaida macroura</i>	Not Listed	Not Listed	Not Listed	S5	2
Nashville Warbler	<i>Leiothlypis ruficapilla</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	2
Northern Cardinal	<i>Cardinalis cardinalis</i>	Not Listed	Not Listed	Not Listed	S4	3
Northern Flicker	<i>Colaptes auratus</i>	Not Listed	Not Listed	Not Listed	S5B	16
Northern Parula	<i>Setophaga americana</i>	Not Listed	Not Listed	Not Listed	S5B	2
Ovenbird	<i>Seiurus aurocapilla</i>	Not Listed	Not Listed	Not Listed	S5B	5
Palm Warbler	<i>Setophaga palmarum</i>	Not Listed	Not Listed	Not Listed	S5B	22
Philadelphia Vireo	<i>Vireo philadelphicus</i>	Not Listed	Not Listed	Not Listed	S2?B,SUM	1
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Not Listed	Not Listed	Not Listed	S5	5
Purple Finch	<i>Haemorhous purpureus</i>	Not Listed	Not Listed	Not Listed	S4S5B,S3S4N,S5M	4
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Not Listed	Not Listed	Not Listed	S4S5	32
Red-eyed Vireo	<i>Vireo olivaceus</i>	Not Listed	Not Listed	Not Listed	S5B	16
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Not Listed	Not Listed	Not Listed	S4B	8
Ring-necked Pheasant	<i>Phasianus colchicus</i>	Not Listed	Not Listed	Not Listed	SNA	1
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Not Listed	Not Listed	Not Listed	S3B	1
Ruby-crowned Kinglet	<i>Corthylio calendula</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	2
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Not Listed	Not Listed	Not Listed	S5B	1
Ruffed Grouse	<i>Bonasa umbellus</i>	Not Listed	Not Listed	Not Listed	S5	10
Song Sparrow	<i>Melospiza melodia</i>	Not Listed	Not Listed	Not Listed	S5B	15
Spruce Grouse	<i>Canachites canadensis</i>	Not Listed	Not Listed	Not Listed	S4	1
Swainson's Thrush	<i>Catharus ustulatus</i>	Not Listed	Not Listed	Not Listed	S4B,S5M	1
Swamp Sparrow	<i>Melospiza georgiana</i>	Not Listed	Not Listed	Not Listed	S5B	10
Waterfowl sp.	N/A	N/A	N/A	N/A	N/A	1
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Not Listed	Not Listed	Not Listed	S4	2
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Not Listed	Not Listed	Not Listed	S4S5B,S5M	19
Wilson's Snipe	<i>Gallinago delicata</i>	Not Listed	Not Listed	Not Listed	S3B,S5M	1
Winter Wren	<i>Troglodytes hiemalis</i>	Not Listed	Not Listed	Not Listed	S5B	2
Woodpecker sp.	N/A	N/A	N/A	N/A	N/A	1
Yellow Warbler	<i>Setophaga petechia</i>	Not Listed	Not Listed	Not Listed	S5B	3
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Not Listed	Not Listed	Not Listed	S5B	1
Yellow-rumped Warbler	<i>Setophaga coronata</i>	Not Listed	Not Listed	Not Listed	S5B	16

Table 10: 2025 Incidental Observations - Sturk Quarry Expansion Project

Project #24-10948

Observer	Date	Survey Type	Common Name	Scientific Name	#	Seen	Heard	Observed in or near Wetland?	Comments
RM	2025-05-06	Avifauna	Brown Creeper	<i>Certhia americana</i>	1		X		Singing
RM	2025-05-06	Avifauna	Magnolia Warbler	<i>Setophaga magnolia</i>	1		X		Singing
RM	2025-05-06	Avifauna	Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	1		X		Singing
RM	2025-05-06	Avifauna	Barred Owl	<i>Strix varia</i>	1	X			Flew from a large pine. Forest is open and mature enough here to support owls.
RC/SS	2025-05-27	Herpetofauna	Olive-sided Flycatcher	<i>Contopus cooperi</i>	1		X	Yes	Heard in area potentially a disturbed wetland, cinnamon fern red maple. Young to mature mixed wood, trail side. Calling.
CD/JW	2025-06-04	Wetland/Watercourse	Olive-sided Flycatcher	<i>Contopus cooperi</i>	1	X	X	Yes	Isolated Cut over tree swamp, OSFC seen and heard in wetland. Edge habitat present with Mixedwood forest cover in upland.
RM	2025-06-06	Avifauna	Olive-sided Flycatcher	<i>Contopus cooperi</i>	1		X	Yes	Calling from roughly 100m southwest. Bird was observed in the same location by other field crews incidentally on May 27th and 5th, suggesting probable breeding activity.
SC	2025-08-07	Fish	Olive-sided Flycatcher	<i>Contopus cooperi</i>	1		X	Yes	One individual pipping (calling) non-stop.
SC	2025-08-07	Fish	Eastern Wood-pewee	<i>Contopus virens</i>	1		X	Yes	Singing and moving around site.
JL	2025-09-09	Avifauna	Eastern Wood-pewee	<i>Contopus virens</i>	1		X	Yes	Edge of transmission line.
SC/EM	2025-08-08	Fish	Barn Swallow	<i>Hirundo rustica</i>	5	X	X	Yes	Five adult swallows flying over old open pit of quarry that is now full of deep (>2 m) water. Calling while flying down low over water and than returning to fly slightly above canopy height (roughly 25 m in air above observer).

Table 11: 2025 Incidental Observations Summary - Sturk Quarry Expansion Project

Project #24-10948

Common Name	Scientific Name	COSEWIC	SARA	ESA	ACCDC S-Rank	Count
Barn Swallow	<i>Hirundo rustica</i>	Special Concern	Threatened	Endangered	S3B	5
Barred Owl	<i>Strix varia</i>	Not Listed	Not Listed	Not Listed	S5	1
Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	Not Listed	Not Listed	Not Listed	S5B	1
Brown Creeper	<i>Certhia americana</i>	Not Listed	Not Listed	Not Listed	S5	1
Eastern Wood-pewee	<i>Contopus virens</i>	Special Concern	Special Concern	Vulnerable	S3S4B	2
Magnolia Warbler	<i>Setophaga magnolia</i>	Not Listed	Not Listed	Not Listed	S5B	1
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Special Concern	Special Concern	Threatened	S3B	4

APPENDIX J

PROJECT TEAM CVs

AREAS OF SPECIALIZATION

- Environmental Assessment Practitioner
- Regulatory Engagement
- Indigenous Engagement
- Project Management
- Species At Risk
- Environmental Screening
- Environmental Approvals
- Wetland and Watercourse Assessments and Permitting

RELEVANT EXPERIENCE

Ms. Johnston oversees, manages, and executes regulatory and environmental projects. She is a member of NS Wetland Delineation, Maritime College of Forest Technology and holds a NS Advanced Wetlands Delineator and Evaluator certification. She provides project management for federal and provincial environmental assessment (EA) processes and is an experienced EA practitioner. Ms. Johnston manages and completes environmental baseline surveys including habitat surveys, species at risk and wildlife surveys, botany and bird surveys, wetland and watercourse delineations, characterizations, and functional assessment, fish habitat evaluation, harmful alteration, disruption, and destruction (HADD) authorizations, and bat hibernacula identification. Ms. Johnston also completes watershed evaluations, and guides clients through the environmental and permitting stages of mining, industrial, alternative energy, and development projects.

Ms. Johnston supports clients through provincial and federal environmental assessment requirements and supports project teams to identify and evaluate project environmental risk. She has completed multiple provincial environmental assessment registration documents in the past five years in NS and NL, two Initial Project Description (IPD) documents for the Impact Assessment Agency of Canada (IAAC) in 2025 in NS and was the project manager for the submission of a CEAA 2012 Environmental Impact Statement (EIS) for a mining project in NS in 2021 to IAAC. Ms. Johnston consults regularly with federal and provincial regulatory agencies, First Nation communities, and local landowners and stakeholder groups.

Ms. Johnston regularly completes applications for wetland and watercourse alteration and HADD authorizations across Atlantic Canada, and has developed and implemented wetland compensation programs, fish habitat offsetting projects, and wetland and fish habitat restoration projects. Ms. Johnston is a trained wetland evaluator, biologist, and restoration professional. Ms. Johnston regularly implements species at risk, habitat and biodiversity mitigation planning, permitting, monitoring plans, and offsetting programs.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Assessment, Goldboro Gold Project, Goldboro, NS, 2017-Present – Project Director: As part of the Environmental Assessment Registration Document (EARD), Ms. Johnston, acting as project director, has overseen the completion of baseline wetland and watercourse delineation, fish habitat identification, rare plant, rare lichen, habitat and wildlife, avian, and species at risk surveys within a 1200 hectare Study Area in Goldboro NS. Strum was also responsible for the baseline and effects assessment reporting for all biophysical components of the EARD for this gold mining project. Following EA approval in 2022, Strum completed biophysical permitting requirements including the federal *Fisheries Act* Authorization Application, associated offsetting, wetland and watercourse permitting including

EDUCATION

- Masters in Environmental Studies, York University, Toronto, ON (1999)
- Bachelor of Science (Biology), Dalhousie University, Halifax, NS (1997)
- Bachelor of Arts (Political Science), Honours, Dalhousie University, Halifax, NS (1997)

TRAINING

- Standard First Aid, AED, CPR (C) (2023)
- Wetland Construction: Principles, Planning, and Design, Rutgers (2016)
- Wetland Functional Assessment Training Workshop, NSE (2013)
- Urban Wetland Restoration: A Watershed Approach (2012)
- Nova Scotia Advanced Wetlands Delineation and Evaluation Course (2009)
- Water Management and Wetland Restoration Training Course (2009)
- Identifying and Delineating Wetlands for Nova Scotia (2008)

wetland compensation, development of monitoring plans, the Metal and Diamond Mine Effluent Regulation (MDMER) Schedule 2 process for deposition of deleterious substance into a fisheries resource, and biodiversity offsetting.

Environmental Assessment, Antrim Gypsum Project, Antrim, NS, 2021-Present – Project Director: As part of the EARD, Ms. Johnston, acting as project director, has overseen the completion of baseline wetland and watercourse delineation, fish habitat identification, rare plant, rare lichen, habitat and wildlife, avian, and species at risk surveys within a 600 hectare Study Area in Antrim, NS. Strum was also responsible for the baseline and effects assessment reporting for all biophysical components of the EARD for this gypsum project. Following EA approval in 2024, Strum has commenced biophysical permitting requirements including the federal *Fisheries Act* offsetting plan, wetland permitting including wetland compensation and development of monitoring plans.

Environmental Assessment, Botwood Green Hydrogen Project, Botwood, NL, 2024-Present – Project Director: Ms. Johnston is the project director for the EA Registration for this 3.5 GW wind to green hydrogen and ammonia project (30,000 ha) in Central Newfoundland. The project includes over 500 wind turbines, a 150 MW solar farm, 900 km transmission and collection lines, 400 km access roads, industrial water withdrawal, and hydrogen and ammonia production plants with capacity of 1,000,000 tonnes of ammonia per year. Strum developed the relevant biophysical studies (avifauna, flora, terrestrial, aquatic, fish habitat, hydrology) that were required for the EA Registration, and implemented multiple years of the field monitoring programs. This included noise monitoring of several locations, the deployment of over 50 wildlife cameras, 80 fish habitat assessments, over 120 bird point count surveys, and water sampling at several locations. Strum submitted the EA Registration and is currently conducting the analysis of the data and compiling the EIS report in support of an EA approval.

Environmental Assessment, Gold Mining Projects (4), Eastern Shore, NS, 2014-Present – Senior Project Manager: Ms. Johnston has, and continues to support, the 15 Mile Minerals and Renewables Ltd. project team with their four mine locations in Nova Scotia since 2014. Strum has completed regulatory work and environmental permitting through all mining stages: local and regional exploration (planning and permitting support); pre-permitting baseline studies (wildlife, fish, species at risk, birds, wetlands, surface water) at Fifteen Mile and Cochrane Hill proposed mine locations; permitting (CEAA EIS Submission: Team and Regulatory Lead) for the Beaver Dam and Fifteen Mile projects; and permitting (provincial and federal), monitoring and offsetting (fish and wetlands) to support construction, operations, and decommissioning at the Touquoy Mine.

Wetland Compensation and Construction Support, Highway 104 Twinning, Dexter Nova Alliance, Antigonish County, NS, 2020-Present – Project Director: Ms. Johnston, acting as the project director, is responsible for the wetland compensation requirements, fisheries monitoring, and fish rescues for the twinning of NSPW Highway 104 in Antigonish County, NS. Ms. Johnston oversaw the site identification, design and construction of four wetland restoration projects over a three year period, with long term monitoring of these sites ongoing. Strum also completed pre-construction surveys for wood turtles, bats and nesting birds. Strum completed numerous fish rescues to support culvert and bridge installation and is also responsible for the design and implementation of the Fisheries Effectiveness Monitoring Program (FEMP) which is on-going.

Environmental Permitting, Black Point Quarry and Marine Terminal, Guysborough County, NS, 2023-Present – Senior Project Manager: Ms. Johnston is responsible for the *Fisheries Act* authorization permit submission (freshwater and marine) and associated offsetting plan and industrial approval, and wetland and watercourse permitting and associated wetland compensation for the Black Point Quarry and Marine Terminal, located in Guysborough County, NS.

Environmental Permitting, Route 332 NSPW, Fisheries Act Authorization and Wetland Permitting, Lunenburg County, NS, 2020-2022 – Project Director: Ms. Johnston was the project director for NSPW in 2020 to identify and assess impacts of the Route 332 Widening Project in Lunenburg County on freshwater and marine habitats. Strum submitted wetland alteration applications for impacts to both tidal and non-tidal wetlands, including implementation of associated wetland compensation. Freshwater and tidal fish habitat assessments resulted in the submission of a Request for Review (RfR) and eventual *Fisheries Act* Authorization application to Fisheries and Oceans Canada (DFO), and implementation of associated fish habitat offsetting.

AREAS OF SPECIALIZATION

- Project Management
- Fish and Fish Habitat Assessments
- Watercourse Alterations, Assessments and Permitting
- Water Quality Assessments and Monitoring
- Environmental Assessment

RELEVANT EXPERIENCE

Ms. O'Neill is an Environmental Scientist and Project Manager with Strum working in our Environmental Science Group. She has 14 years of experience working as an Aquatic Scientist in Calgary, Alberta, where she worked as a project manager and technical lead on various environmental projects.

Ms. O'Neill is an experienced project manager and discipline lead, having taken on multi-component projects with successful outcomes. The projects ranged from small to large-scale and involved environmental permitting and discussions with regulators and stakeholders. Her organization and attention to detail have contributed to the success of these projects.

Ms. O'Neill is also a seasoned field biologist, her range of experience includes scientific data collection for fish habitat assessments, environmental impact assessments (EIAs), surface water monitoring, fish salvages, construction monitoring, benthic invertebrate sampling, spill response, bathymetry surveys, and stream restoration projects. She has marine experience as an at-sea fisheries observer for JaviTech Atlantic LTD. Her responsibilities included collecting detailed information on catch records for Cod, Pollock, Haddock, and Snow Crabs, as well as conducting biological surveys, by-catch identification and marine mammal observations.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Assessment, Wind Farm Project, NS, (2023 – ongoing) – Senior Environmental Specialist and Project Manager: Conducted senior review and management of the post Environmental Assessment approval for the wind farm.

Environmental Assessment, Phase 2 Wind Farm, NS, (2023 – ongoing) – Senior Environmental Specialist: Provided regulatory guidance and expertise during the post Environmental Assessment approval process for wind farm development.

Watercourse Assessment and Alteration Permitting, NS, (2023 – ongoing) – Senior Environmental Specialist and Project Manager: Completed watercourse assessments, electrofishing, and permitting submission at various sites around Nova Scotia. Projects include pre and post construction assessments, construction monitoring, compensation planning, and erosion and sediment control plans.

EDUCATION

- Bachelor of Arts – St. Francis Xavier University, Antigonish, NS (2009)
- River Habitat and Hydraulics, Dr. Bob Newbury, University of New Brunswick (2013)
- Environmental Monitoring for Construction Sites, Vancouver Island University (2013)

TRAINING

- Backpack Electrofishing – Vancouver Island University (2013)
- Jet Boat/Rescue Boat Handling – Raven Rescue (2022)
- First Aid and CPR/AED Level C – Canadian Red Cross (2022)
- Swift Water and Awareness (Rescue 1) – Rocky Mountain Adventures Medicine (2022)
- Pleasure Craft Operator Card – BOATsmart (2011)
- Defensive Driving – Fleet Safety International (2022)
- Back Country Safety Program – Rocky Mountain Adventures Medicine (2013)
- Bear Awareness – Enform (2015)
- Common Safety Orientation – Energy Safety Canada (2019)

Wetland and Waterbody Monitoring Program, AB, (2018-2023) – Aquatic Scientist and Project Manager: Project Manager and Coordinator of the wetland and waterbody monitoring program as per the Environmental Protection and Enhancement Act (EPEA) approval. Coordinated technical information between three disciplines (Hydrology, Water Quality and Vegetation), corresponded with the Alberta Energy Regulator and provided financial management of the overall project.

Environmental Work, Transmission Lines, Wabamun Lake, AB, (2018-2020) – Aquatic Scientist and Project Manager: Managed their replacement and repair work on the transmission lines within Wabamun Lake. The multidisciplinary project includes collaborative work between aquatics, wildlife, vegetation, and wetlands teams. Regulatory components included a Fisheries and Oceans Canada request for review and Water Act Approval.

Various Environmental Projects, AB, (2015 - 2022) – Aquatic Scientist and Project Manager: Project Manager for several multidisciplinary projects involving engineering and fish and fish habitat assessments for pipeline installation and remediation projects across Alberta. The projects involved gaining Fisheries Authorizations, developing offsetting measures to meet Fisheries and Oceans Canada requirements and working with Alberta Environment and Parks and Alberta Energy Regulator to gain Water Act Approvals.

Costal Gas Link, AB and BC, (2021 - 2022) – Project Manager: Project Manager for the fish and fish habitat field assessments. The work involved adhering to strict budgets, invoicing, and managing staff.

Emergency Response, AB, (2018 - 2022) – Aquatic Scientist and Project Manager: Managed an emergency culvert and road washout. The project involved engineering and aquatics support to remediate the site. The work included a Fisheries and Oceans Canada request for review and a Water Act approval.

Qualified Aquatic Environmental Specialist Assessment and Bathymetry Survey, AB, (2016) – Aquatic Scientist and Project Manager: Completed a Qualified Aquatic Environmental Specialist Assessment and Bathymetry Survey on two lakes north of Fox Creek, Alberta. Project included stakeholder consultations with the Alberta Energy Regulator and Alberta Environment and Parks, collection of baseline data, and reporting.

Jackfish Steam-Assisted Gravity Drainage Project, AB (2014- 2019) – Discipline Lead on the Jackfish West EIA, Field Lead on Jackfish East EIA, Field Lead on the Wetland Monitoring Program and the Qualified Aquatic Environmental Specialist Assessments for Pipeline Crossings: The work included Aboriginal consultation and conducting field work with a representative from the Heart Lake First Nations (Treaty 6, Heart Lake) or Chipewyan Prairie First Nations (Treaty 8, Janvier) who are a member of the Athabasca Tribal Council.

Pipeline Projects, AB, (2015) – Aquatics Discipline Lead/Field Lead: Coordinated and conducted Qualified Aquatic Environmental Specialist Assessments. Authored the Qualified Aquatic Environmental Specialist Assessment report to support a review by Fisheries and Oceans Canada. Authored fisheries section of the Conservation and Reclamation Plan and provided input for the Environmental Protection Plan and alignment sheets.

APPL Pipeline Replacement Project, AB, (2018) – Aquatic Scientist: Conducted Qualified Aquatic Environmental Specialist Assessments, authored Qualified Aquatic Environmental Specialist Assessment reports, and assisted with regulatory applications. On-site Construction Monitor for horizontal directional drilling and isolation open cut of watercourses.

Qualified Aquatic Environmental Scientist, Various Locations, AB, (2012-2019) – Aquatic Scientist: Lead QAES and monitored turbidity at post-flood remediation construction worksites along various locations in central and southern Alberta. Project components included works on class A and B watercourses, bank armoring, channel engineering, installing fish habitat, and setting up temporary and permanent measures to protect exposed or almost exposed pipelines. Completed fish salvages using seine nets, block nets, minnow traps, and electrofishing equipment when necessary.

PROFESSIONAL ASSOCIATIONS

- Association of Professional Geoscientists of Nova Scotia (member-in-training)
- Eco Canada (Environmental Professional in-training)

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment and Delineations
- Wildlife Surveys
- Surface and Groundwater
- Climate Change and GHG Assessments
- Industrial Approvals
- Environmental Approvals

RELEVANT EXPERIENCE

Mr. Scott joined the Strum team in 2022 and is working as a Junior Environmental Scientist with the Environmental Assessment and Approvals Group. Mr. Scott is experienced in many components of Environmental Assessments, including field surveys, delineations, avian radar analysis, wildlife acoustic analysis, and GHG quantification. In an industrial setting, Mr. Scott has experience managing projects and ensuring regulatory compliance and successful approvals. Mr. Scott is experienced in groundwater monitoring, groundwater development, sampling, and conducting aquifer testing and interpreting results.

Mr. Scott has completed fieldwork and report writing to support wetland permitting, Environmental Management Plans and Environmental Assessments for numerous projects across Nova Scotia. Additionally, Mr. Scott has been involved in fieldwork, report writing, and analysis concerning projects throughout the province relating to Level I/II Groundwater Assessments for Subdivisions, groundwater withdrawal approvals, and groundwater monitoring plan programs.

REPRESENTATIVE PROJECTS AND ROLES

Municipal Groundwater Supply Assessment, NS, 2023 – Junior Environmental Scientist: Worked with a team of groundwater experts to analyze well logs, available pump tests and well chemistry data to inform municipal planning around groundwater supply development. This assessment involved determining the depth and stratification of sediments, yields and water quality to understand the yield and safety of a potential groundwater supply.

Groundwater Monitoring Program, Canso, NS, 2023 – Junior Environmental Scientist: Ongoing groundwater monitoring work (following approval of the groundwater monitoring plan), including developing groundwater wells, groundwater sampling, aquifer testing and analysis. The purpose of the monitoring plan is to avoid/mitigate potential impacts to nearby environmental receptors throughout the lifespan of the Project.

Greenhouse Gas Inventories, NS, 2023 – Present – Junior Environmental Scientist: Experienced in conducting direct and indirect GHG emission inventories to quantify large-scale industrial impacts and identify areas for mitigation.

Post-Approval Work, Point Tupper Green Hydrogen/Ammonia Project, NS – Phase 1, NS, 2023 – Junior Environmental Scientist: Development of the groundwater monitoring plan for the hydrogen/ammonia industrial facility as required following the EA approval. Completed fieldwork to support surface water monitoring.

EDUCATION

- Bachelor of Science (Environmental Science), Saint Mary's University, Halifax, NS (2022)

TRAINING

- Wetland Delineation and Classification Training (2023) – Fern Hill Institution of Plant Classification
- Wetland Ecosystem Services Protocol Atlantic Canada (WESP-AC) Training (2023) – Maritime College of Forestry Technology
- Backpack Electrofishing Training (2023) – Maritime College of Forestry Technology
- Standard First Aid Level C CPR & AED (2022) – St John's Ambulance
- ATV Training Course (2022) – Canadian Safety Council
- Pilot Certificate – Small Remotely Piloted Aircraft System (RPAS), Visual line-of-sight (VLOS) (2022) – Transports Canada

Wetland Carbon Sequestration, NS, 2023 – Present – Junior Environmental Scientist: Designing methods and procedures for fieldwork and subsequent analysis to quantify carbon stored in wetland soils.

Wetland Delineation and Permitting, NS, 2023 – Present – Junior Environmental Scientist: Completed wetland delineations, functional assessments, and permitting applications for pre-construction wetland alterations.

Groundwater Geothermal Heating and Cooling Systems Review and Permitting, NS, 2023 – Present – Junior Environmental Scientist: Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.

Nesting Bird Searches, NS, 2023 – Junior Environmental Scientist: Surveyed areas pre-construction for the presence of nesting bird activity. Collected field data related to observations and flagged off buffer areas surrounding nesting bird species.

Wind Power Environmental Assessments, NS, 2022 – Present – Junior Environmental Scientist: Conducted watercourse, wetland, fish/fish habitat, wildlife and avian assessments, and environmental assessment reporting. Quantified greenhouse gas and climate change impacts of the projects on the environment.

Level I/II Groundwater Assessments, NS, 2022—Present—Junior Environmental Scientist: Completed desktop assessments to determine the viability of sustainable groundwater withdrawals. Conducted drilling and pump test supervision. Sampled water to compare with drinking water guidelines and analyzed aquifer test data to determine adequate safe yields for groundwater users.

Radar and Avian Acoustic Assessments NS, 2022 – Present – Junior Environmental Scientist: Built and ran remote radar and acoustic monitor assemblies to record the passage of avian migrant species. The radar and acoustic data were processed and analyzed to determine the patterns of avian migration. The acoustics were analyzed with machine-learning software and manually verified for accuracy.

Various Management and Leadership Roles, NS, 2018- 2022 – Self-Employed: Competed internationally for Canada in Sprint Kayaking. This required creating sponsorship proposals, developing relationships with sponsors and stakeholders, and managing travel and shipping logistics. Part of this role required public speaking engagements, client receptions, and providing mentorship.

AREAS OF SPECIALIZATION

- Fish community & habitat assessments
- Fish rescues
- Fisheries offsetting and restoration
- Wetland and watercourse assessments, research and permitting
- Fisheries permitting
- Environmental assessments

RELEVANT EXPERIENCE

Ms. Stoffer has worked in environmental consulting and research since 2014. She has worked on both project and research-related field assessments in Nova Scotia, Alberta, and Quebec. Specializing in fish and fish habitat sciences, Ms. Stoffer has a range of experience in the planning and implementation of aquatic field programs and restoration projects. She is experienced with provincial and federal environmental impact assessments, regulatory permitting, technical reporting, and fish habitat restoration to support federal offsetting requirements. She has worked as a field biologist responsible for conducting a variety of biophysical assessments including wetland delineation and functional assessments, flora surveys, avian surveys, and species at risk evaluations. She has also performed environmental monitoring for a variety of large and small-scale development and exploration initiatives across Nova Scotia.

EDUCATION

- Master of Resource and Environmental Management, Dalhousie University (2015)
- Bachelor of Science (Honours, Biology), University of Ottawa (2013)

TRAINING

- Fish Habitat Restoration – Instream Techniques (2025)
- Fish Habitat Restoration – Prescription Development (2023)
- Standard First Aid (2023)
- Technical Writing for Professionals (2019)
- Fish and Fish Habitat Characterization (2019)
- Backpack Electrofishing (2018)
- Wetland Delineation and WESP-AC (2017)
- Watercourse Installers Certification for Aquatic Restoration (2017)
- Pleasure Craft Operator's License (2016)
- Marine Emergency Duties – A1 (2014)
- WHMIS (2013)

REPRESENTATIVE PROJECTS AND ROLES

Fisheries Offsetting, NS, 2022-Present – Technical Specialist: Led the scoping and implementation of freshwater and marine fisheries offsetting programs, including identification, design, baseline data collection, data processing and reporting. Projects involve engagement with local restoration specialists, regulators (e.g. Fisheries and Oceans Canada), stakeholders (e.g. watershed groups) and landowners. Prepared offsetting plans to support *Fisheries Act* Authorization permitting process.

Fish Rescues, NS, 2020-Present – Technical Specialist and Field Crew: Assisted more than 75 fish rescues in the past four years in support of various transportation projects throughout Nova Scotia. Acted as both field crew and Project Manager, depending on the specific Project.

Fisheries Act Authorization, Fishermans Harbour, NS, 2024 – Project Coordinator: Field coordination, preparation of the application, senior review, client and regulatory liaison.

Fish & Fish Habitat Assessments and Fisheries Act Authorization, NS, 2022-2023 – Technical Specialist: Completed detailed evaluation of effects to fish and fish habitat to support the *Fisheries Act* Authorization application for one provincially approved gold project. This involved detailed fish habitat assessment, fish community structure evaluation, effects assessment based for direct and indirect impacts, and offsetting for residual effects. Lead author of application.

Fisheries Act Request for Review, Purcells Cove, NS, 2022 – Project Coordinator: Field scoping and coordination, preparation of the RFR, and client and regulator liaison for a shoreline alteration project.

Fisheries Act Request for Review, Route 332 Widening Project, Lunenburg, NS, 2021 – Technical Specialist: Field scoping and coordination, preparation of the RFR.

Environmental Monitoring, NS, 2019-2021 – Environmental Monitor: Acted as an environmental monitor for exploratory and geotechnical drilling along the eastern shore. Completed regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring, and regulatory reporting.

Environmental Baseline Surveys, Mining, NS, 2017-2023 – Environmental Scientist & Technical Specialist: Completion and coordination of biophysical baseline data collection, reporting, and effects assessments for multiple gold mine environmental assessment projects (provincial and federal), including terrestrial habitats (flora and fauna), avifauna, wetlands, and fish and fish habitats. Provide technical review, specifically relating to qualifying direct and indirect impacts of open pit mining developments on fish and fish habitat.

Environmental Baseline Surveys, Wind and Quarries, NS, 2018-2023 – Environmental Scientist & Technical Specialist: Completion of environmental baseline surveys for multiple provincial environmental assessments for various wind power projects and quarries. Field lead for aquatic surveys, including scoping, implementation of field programs, and interpretation and reporting of results.

Fish Passage Restoration and Habitat Enhancement, Annapolis River, NS, 2016-2017 – Fisheries Lead: Coordination of field teams and scoping of field surveys, preparation of watershed plans, fish passage and fish habitat assessments, regulatory permitting and community outreach, implementation of fish passage restoration and habitat enhancement projects.

Marine Mammal Monitoring, QC, 2014 - Field Crew: Completed land and boat-based surveillance and enumeration of beluga whales in the St. Lawrence River.

PROFESSIONAL ASSOCIATIONS

- Canadian Institute of Forestry - Forestry Technician

AREAS OF SPECIALIZATION

- Rare plant surveys
- Wetland and Watercourse Assessment and Delineations
- Wildlife Surveys
- Fish Habitat Assessments
- Environmental Approvals

RELEVANT EXPERIENCE

Ms. Daffre has been an environmental professional since 2022. She has a background working in environmental sustainability and natural resource management in both local and international settings. She has experience conducting fieldwork such as vegetation surveys, species at risk and invasive species monitoring. Ms. Daffre has strong forest mensuration skills such as timber cruises, biodiversity, biomass and carbon biomass inventories as well as, forest and vegetation classification. Ms. Daffre has authored baseline technical reports for provincial environmental assessments and regulatory applications and has completed watercourse and wetland assessments, including field delineation, habitat assessment, species at risk identification and data management, and mapping and spatial analyses (ArcGIS and QGIS).

REPRESENTATIVE PROJECTS AND ROLES

Wind Power Environmental Assessments, 2023- Present- Biologist: Conducted field work and data compilation and analysis to support environmental assessments for a number of 100MW+ wind farms across Atlantic Canada, including but not limited to wetland and watercourse assessments, old growth scoring, rare plant and lichen surveys, fish and fish habitat surveys. Prepare, interpreted, and organized field data. Prepared various environmental assessments and compliance documents, including baseline reporting, effects assessments and long-term monitoring plans

Biophysical Assessments, Clydesdale Ridge Wind Farm, NS, 2023-Present- Field Technician/ Biologist: Completed baseline biophysical assessments including fish habitat and collection surveys, botany surveys wetland and watercourse delineation, and watercourse habitat assessments. Contributed to writing the Environmental Assessment Registration Document (EARD) for this project.

Biophysical Assessments, Antrim Gypsum Mine, NS, 2023-Present- Field Technician/ Biologist: Completed baseline biophysical assessments including fish habitat surveys, wetland and watercourse delineation, and watercourse habitat assessments. Contributed to writing the Environmental Assessment Registration Document (EARD) for this project.

Wetland Monitoring Program, Highway Twinning Project, NS, 2023-Present – Field Technician: Completed wetland monitoring and baseline monitoring for Highway 103 and 104 twinning projects near Barney's River, and Hubbard's Nova Scotia on behalf of Dexter Nova Alliance. Conducted visual observations of wetlands along the study site, soil conditions, vegetation surveys, and collected data from monitoring wells.

EDUCATION

- Natural Resource Environmental Technology, Nova Scotia Community College (2022)
- Bachelor of Social Science (International Development and Environmental Studies), University of Ottawa (2017)

TRAINING

- St. John's Ambulance First Aid & CPR/AED Level C (2023)
- Winter Identification of Trees and Woody Plants, Eagle Hill Institute (2023)
- Electrofishing Certification (2023)
- Wetland Ecosystem Services Protocols Training (2023) – Nova Scotia
- Wilderness First Aid + CPR Level C (2021) – Canadian Red Cross
- Chainsaw Safety Certification (2021) – Safety First Nova Scotia
- ATV/OHV Operator Certification (2021)
- WHIMIS (2021)

Wood Turtle Habitat suitability study, Department of Defense, NS 2024- Field Technician/Biologist: Completed desktop suitability exercise using aerial photography and available GIS databases to identify suitable wood turtle habitat at 14 Wing Greenwood in Kings County, Nova Scotia. Conducted field surveys to identify suitable habitat and visual encounter surveys for wood turtles to inform habitat management and future development. Contributed to report writing for this project.

Biophysical Assessments, Six Mile Brook Pit Expansion, NS, 2023-2024- Field Technician/ Biologist: Completed baseline biophysical assessments including botany surveys, wetland and watercourse delineation, and watercourse habitat assessments. Contributed to writing the Environmental Assessment Registration Document for this project.

AREAS OF SPECIALIZATION

- Forest management and characterization
- Environmental and carbon modelling
- Urban forest assessment
- Stakeholder engagement
- Hydrologic assessment and modelling

RELEVANT EXPERIENCE

Dr. Foster is an environmental scientist with a special interest in forests, their management, and how people relate to them. More broadly, he is interested in natural resource management and how resources can be utilized sustainably. He has experience in a variety of fieldwork and teaches field work planning, methods, and reporting to undergraduate students at Saint Mary's University.

Dr. Foster completed his PhD in 2024, researching the relationship between forest management and water treatability for potable water supplies. Specifically, his research examined how timber harvesting can be used to reduce watershed dissolved organic carbon (DOC) production to reduce the chemical and financial cost of water treatment in the face of continual and concerning increases in DOC. This study resulted in academic publications on its findings, and forest management recommendations to the region's water utility.

Before this research, David worked for two years as a research associate at Dalhousie University, studying various urban forest and non-urban forest matters. In addition to a contracted characterization of Halifax Regional Municipality's (HRM), urban forest, during this time, he also served as research associate for Prof. William Lahey during the Nova Scotia Independent Review of Forest Practices. He contributed research services, assisted with logistics, and provided writing input, including a report on the history of forest practices review. During this process, he had the opportunity to hear a diverse range of perspectives from stakeholders with contrasting perspectives on natural resource usage, helping to develop an understanding of what is at stake in the management of the natural environment.

REPRESENTATIVE PROJECTS AND ROLES

Wind Power and Infrastructure Environmental Assessments, NS (2024-Ongoing) – Environmental Scientist:

Supporting writing and editing several sections of a variety of environmental assessment for proposed wind farms and associated infrastructure. Contributions in several biophysical and socioeconomic sections, demonstrating a breadth in competencies related to communicating the findings of environmental assessment. Includes writing the terrestrial flora, fauna, and habitat sections of the recently approved Rhodena Wind Project in Cape Breton, NS, and the same sections plus human health effects and effects of the environment on the undertaking for the recently approved Melvin Lake Wind Project in Halifax Regional Municipality and East Hants, NS.

Navigating the Social Acceptability of Forest Biomass Utilization, NS (2024-ongoing) – Environmental Scientist:

Working with a client in the forest biomass utilization industry to help understand the aspects that contribute to the social acceptability of forest biomass usage in an evolving economy and modern society. Collaborating to help establish a roadmap for future entrants into the market to better understand the landscape and plan for successful development of projects that contribute an economy that makes sustainable use of Nova Scotia's natural resources.

EDUCATION

- Doctor of Philosophy, Interdisciplinary PhD Program, Dalhousie University, Halifax, NS (2024). Thesis: Mitigating forested water supply carbon loading through timber harvesting.
- Master of Resource and Environmental Management, Dalhousie University, Halifax, NS (2016). Report: Location matters: the importance of tree placement to urban forest values.
- Bachelor of Science, Combined Honours in Biology and Sustainability, Dalhousie University, Halifax, NS (2014). Thesis: Strategic environmental assessment of changes in Bill C-45 to the Navigable Waters Protection Act and potential effects of environmental protection in Canada.

TRAINING

- Forest Ecosystem Classification qualified (NS, 2024)
- St. John's Ambulance First Aid & CPR/AED Level C (2024)
- Environmental Impact Assessment certificate (2014)

Crown Land Forest Stakeholder Engagement, NS (2023-Ongoing) – Chair/Facilitator: Work with the NS Natural Resources and Renewables as Chair of the Nova Scotia Western Region Crown Land Stakeholder Interaction Committee (WRSIC). This committee is comprised of diverse stakeholders that come together to learn about and contribute to the management of public forests in Nova Scotia. Stakeholders include representatives from industry (mills and silvicultural contractors), Indigenous groups with a specific environmental mandate, NGOs including recreationalist and research groups, elected members of local government, private forest landowners, and more. The group meets at least twice a year to receive updates and provide input on public forest management policy and practice, and to review harvest proposals.

Pockwock Watershed Carbon Loading Study, NS (2018-2024) – PhD Candidate/Lead Researcher: Completed extensive study of the Pockwock watershed, source of water for more than 1/5th of Nova Scotians. Led three summers of fieldwork with research assistants to characterize forest composition, determine hydrologic carbon export, and model watershed hydrology. Wrote custom forest management model and novel implementation of Natural Resources Canada's Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3) for use in a programming environment (R). Research was conducted in partnership through a pan-Canadian research network (the forWater network) including other researchers, forest regulators, the regional water utility, forest managers, forestry contractors, ENGOs, and more. He coordinated with diverse stakeholders to ensure that forest management within the watershed during the study period met research objectives and was properly implemented and characterized and met the research goals of the network.

Community Greening Program, NS (2013-2017) – Coordinator: Developed and implemented a program of urban green space appreciation, education, and improvement. Creating a program of the Sierra Club Canada Foundation Atlantic Canada Chapter focused on urban green spaces, worked with a diverse range of stakeholders to plan, fund, and carry out urban greening initiatives in HRM, including numerous tree plantings. This required working with local government to obtain permission and support for initiatives, members of the public to gain support and to solicit for participation in local events, and business and organizations to find and otherwise support initiatives. These efforts led to planting over 2,700 trees in HRM and establishing the municipality's first publicly hosted community urban orchard.

AREAS OF SPECIALIZATION

- Statistical and spatial analysis
- Biophysical survey design
- Impacts of climate change on natural systems
- Species conservation
- Effects of disturbance on plant communities

RELEVANT EXPERIENCE

Dr. Emma Davis is a landscape ecologist with an interest in the effects of human disturbance and climate change on plant community dynamics. Emma has significant experience leading field-based research programs and has completed several major projects aimed at understanding how interactions between human activities and natural processes influence forest systems, particularly as it relates to rare and sensitive plant species and communities.

Emma completed her PhD at the University of Guelph in 2018 studying the long-term impacts of climate change on the distribution of alpine treelines in Canada's Rocky Mountain region. Her research involved combining data from a series of field experiments and greenhouse studies with dendrochronology (tree-ring analysis) to understand how soil characteristics, herbivory, and climate determine the ability of trees to establish at the edges of their distributional range.

Following the completion of her PhD, Emma held Postdoctoral Fellowships at the University of Guelph Arboretum and the University of Waterloo, where she worked with a multidisciplinary team of researchers and conservation practitioners to develop skills in conservation planning, remote sensing and spatial modelling. Emma also has led the preparation of provincial species recovery documents (Newfoundland and Labrador) through the coordination of species at risk recovery teams. Throughout her academic and professional career, Emma has developed strong data analysis, visualization, and writing skills, and has enjoyed opportunities to collaborate with individuals from diverse backgrounds and areas of expertise.

REPRESENTATIVE PROJECTS AND ROLES

Renewable Energy and Infrastructure Environmental Assessments, NS (2025-Ongoing) – Project Coordinator and Terrestrial Specialist: Provided writing and editorial support during the preparation of several environmental assessment documents for proposed renewable energy projects and associated infrastructure.

Quality Control/Quality Assurance for Biophysical Field Data Collection, NS (2025-Ongoing) – Project Coordinator and Terrestrial Specialist: Coordinated timely reviews of incoming data from wetland and watercourse field programs to ensure the collection of complete and accurate data.

Species at Risk Recovery Planning, NL (2022-2023) – Ecosystem Management Ecologist: Responsible for drafting species recovery documents for provincially-listed plant species and coordinating species at risk recovery teams. Completed fieldwork and monitoring for plant species at risk, including the implementation of a soil temperature logger monitoring program across sensitive ecosystems in Newfoundland.

Northern Vegetation Change Study, NL (2019-2022) – Postdoctoral Fellow: Collaborated with researchers and conservation practitioners on a major research project northern Labrador, Nunatsiavut. The multidisciplinary study combined the use of observational field data and remote sensing to document and understand the drivers of shrub expansion in Torngat Mountains National Park.

EDUCATION

- Doctor of Philosophy, Department of Geography, Environment & Geomatics, University of Guelph, Guelph, ON (2018). Thesis: An evaluation of constraints to treeline advance across multiple scales in the Canadian Rocky Mountains.
- Master of Science, Department of Geography, Carleton University, Ottawa, ON (2014) Thesis: The influence of vegetation and climate on wildfires in Jasper, Alberta, over the last ~3,500 years.
- Bachelor of Science, Environmental Science (Honours), Mount Allison University, Sackville, NB (2012). Thesis: Dendrochronology in the Canadian Prairies: Evaluating the Usefulness of Shelterbelt Species Now and in the Future.

TRAINING

- St. John's Ambulance First Aid & CPR/AED Level C (2025)

Plant Species at Risk Conservation Projects, ON (2016-2022) – Conservation Intern and Postdoctoral Fellow:

Assisted with seed collection and propagation programs for provincially rare plant species and led the analysis and writing of a provincial tree atlas.

Northern Shorebird Nest Fate Study, NU (2014) – Field Assistant:

Completed nest searches and habitat assessments as part of a long-term shorebird nest fate monitoring study at the remote Canadian Wildlife Service research station on Southampton Island, NU.

Forest Ecology Research Studies, AB, NB, NS, ON, and SK (2010-2018) – Lead Researcher and Field Assistant:

Led and assisted with several field-based research studies focused on interactions between tree growth dynamics, human disturbance, and climate change. Responsibilities included field preparation, supervision and mentorship of junior researchers, data QA/QC and statistical analysis, reporting (peer-reviewed journals and public outlets), and extensive fieldwork in remote locations across Canada.

AREAS OF SPECIALIZATION

- Environmental Approvals
- Wetland and Watercourse Assessment and Delineations
- Wildlife Surveys
- Geospatial Data Analysis
- Wetland Permitting

RELEVANT EXPERIENCE

Emma Posluns is a Project Manager with the Environmental Assessment & Approvals Group, bringing nine years of experience in the field of environmental science. Her expertise spans proposal development, client engagement, field program coordination and execution. She has led and conducted a variety of wildlife surveys including wetland and watercourse surveys, winter transect surveys, avifauna assessments, botanical surveys, and species at risk surveys. Emma also has strong proficiency in geospatial data management and analysis.

In her career, Ms. Posluns has overseen the writing and submission of wetland permitting documentation, Environmental Management Plans, and provincial Environmental Assessments. She plays a key role in leading both terrestrial and aquatic biophysical component studies. She has planned and coordinated multi-team fieldwork across large projects and is knowledgeable in municipal, provincial and federal permitting and approvals processes.

REPRESENTATIVE PROJECTS AND ROLES

Wind Power Environmental Assessments, Multiple Locations, NS, 2025-Present – Project Manager: Providing project management, coordination of field work on several 100 MW+ wind farms. Coordinating the completion of field work, communicating with clients, reviewing and organizing field data. Ensuring the smooth transition from environmental assessment to project completion.

Antrim Gypsum Mine, Antrim, NS, 2022-Present – Project Coordinator: Coordinated multiple teams of field crew to conduct terrestrial and aquatic programs, including wetlands, watercourses, fishing, avifauna, lichenology, botany and habitat studies. Communicated with the client about timelines, project tasks, team safety, budgets, and field results. Answered questions and provided information to the public at a project open house. Organized the compilation and writing of four Environmental Assessment Registration Document (EARD) chapters by staff members. Supported the successful completion of an EARD. Continual support for the management of Species at Risk on the site, regulator communication, and evolving project activities.

Greenwood Wood Turtle Assessment, Greenwood, NS, 2024 – Project Manager: Facilitated a wood turtle assessment at the army base in Greenwood, requiring coordinating safety and background checks for all staff. Ensured safety and efficiency during a multi-week field assessment project. Communicated field results and updates to all stakeholders.

Six Mile Brook Pit Expansion EA Project, Pictou County, NS, 2023 – Project Manager: Coordinated multi-crew field work for various biophysical studies including wetlands, watercourses, fish and fish habitat, lichens, botany, and terrestrial habitat. Lead the compilation and writing of five reports to support the successful submission of an EARD. Successfully communicated with the client and provincial government to ensure environmental regulations followed.

EDUCATION

- Master of Science (Environmental Science), Memorial University of Newfoundland and Labrador (2013)
- Bachelor of Science (Geography), University of Victoria, Victoria, BC (2009)

TRAINING

- Watercourse Identification (2019)
- Technical Writing (2019)
- Backpack Electrofishing Certification (2018)
- At-Risk Landbird Identification Workshop (2018)
- Standard First Aid Level C CPR & AED – St John's Ambulance (2023)
- Wildlife Awareness Training (2015)
- WHMIS (2015)
- Geographic Information System (GIS) Training ESRI (2013)
- Facilitation Skills for Technical Professionals, Dalhousie University (2017)

Environmental Assessment, Shaw Sandpit, Middleton, NS, 2023 – Project Manager: Coordinated multi-crew field work for various biophysical studies including wetlands, watercourses, fish and fish habitat, lichens, botany, and terrestrial habitat. Lead the compilation and writing of five chapters to support the successful submission of an EARD. Successfully communicated with the client and provincial government to ensure environmental regulations followed.

Geomatics Data Analysis, Mining Projects, NS, 2023-2024 – Data Coordinator: Coordinated data organization, dissemination, and interpretation for client. Completed data analysis and map making for a mining project, sharing data and ensuring accuracy and precision of geospatial information.

Wetland Alteration Approvals, Various Locations, NS, 2023 – Project Manager: Managed the field data collection, data compilation, and reporting for over 30 wetland alteration permit submissions. Coordinated with Nova Scotia Environment and Climate Change on behalf of clients, communicated with the clients to ensure they were in compliance with government regulations. In-depth understanding of municipal and provincial environmental regulations and able to communicate that understanding to clients to help them meet their goals. Facilitated wetland compensation with clients to ensure no net loss of wetland habitat in the province.

Goldboro Gold Mine Environmental Assessments, Goldboro, NS 2020 - 2021 – Environmental Scientist: Coordinated and completed terrestrial field surveys, including wetland, watercourse, fish and fish habitat, avifauna, and habitat surveys. Arranged field crew logistics and communicated with client and project manager. Completed data QA/QC and compilation.

Environmental Baseline Surveys, Quarries and Mining, NS, 2018 - 2023 – Environmental Scientist: Completion and coordination of biophysical baseline data collection, reporting, and effects assessments for multiple gold mine environmental assessment projects (provincial and federal), including surveys of flora, fauna, habitat, avifauna, winter tracking, wetlands, fish and fish habitat.

PROFESSIONAL ASSOCIATIONS

- Association of Professional Engineers of Nova Scotia

AREAS OF SPECIALIZATION

- Industrial Approvals
- Environmental Approvals
- Hydrology/Hydrogeology
- Water Treatment
- Climate Change and GHG Assessments
- Dangerous Goods Assessments

RELEVANT EXPERIENCE

Mr. Gascon joined the Strum team in 2021 and leads a team with the Environmental Assessment and Approvals Group. Mr. Gascon is experienced in project management, engineering design, environmental monitoring, groundwater assessments, hazard assessments, environmental assessments, project reporting, and regulatory compliance.

Mr. Gascon has worked in various roles, from field technician to project manager, on numerous projects throughout Atlantic Canada, including various Industrial Approval applications, renewals, and amendments, dangerous goods permitting, and environmental monitoring. Additionally, he has valuable experience developing potable groundwater supplies, evaluating and treating water quality issues, and reviewing factors contributing to groundwater resource degradation at residential sites. His responsibilities lie in managing and coordinating these projects, completing various field programs, collecting, compiling, and analyzing data, developing mitigative measures/plans, and preparing reports and related regulatory paperwork.

More recently, Mr. Gascon has been developing and implementing Environmental Management Plans for a variety of small- and large-scale projects, including environmental monitoring and compliance components for groundwater, surface water, air quality, soil quality, erosion and sedimentation controls, vegetation/wildlife management, hazardous and non-hazardous waste management, spill response, remediation, and decommissioning works.

Mr. Gascon previously worked as a Research Assistant with the Centre for Water Resources Studies. His role involved researching the management and disposal options for municipal drinking water treatment plant waste residuals in the Northwest Territories.

Prior to completing his bachelor's degree, Mr. Gascon was a Mechanical Designer, developing and designing 3D renderings for heavy-duty industrial enclosures. Tasks included designing structures with computer-aided design software, formatting designs compatible with the water jet cutter, configuring assembly plans, and inspecting units for fabrication and assembly deficiencies.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Assessment, Simply Blue Group's Green Hydrogen to SAF Project, NS, 2024-Present –

Environmental Engineer: On-going environmental assessment work (development of the EA Registration Document), including the development of technical and environmental component studies. Involved in coordinating the environmental considerations for the Pre-FEED.

Post-Approval Work, EverWind Point Tupper Green Hydrogen/Ammonia Project Phase 1, NS, 2023-Present –

Environmental Engineer: On-going post-approval work (following approval of the EA Registration Document), including the development of environmental management and monitoring plans. These plans are developed to avoid/mitigate potential impacts to nearby environmental and residential receptors throughout the project lifespan.

EDUCATION

- Bachelor of Engineering (Environmental), Dalhousie University, Halifax, NS (2020)
- Civil/Mining Technician, Collège Boréal, Sudbury, ON (2010)

TRAINING

- Wilderness First Aid (2022)
- Standard First Aid & CPR (2021)
- WHMIS (2021)
- Confined Spaces (2021)
- Excavation and Trenching (2020)
- Pleasure Craft Operator License (2002)

Greenhouse Gas Assessments, NS and NL, 2022-Present – Environmental Engineer – Complete a greenhouse gas inventory for various projects across the Atlantic provinces. Quantifying the GHG generation/sinking potential of a project is becoming a requirement for regulatory, financial, and incentivized institutions. Understanding the GHG contributions from projects increases the requirements to offset and adapt to meet federal and provincial net-zero goals.

Waste Transfer Station Permitting, NS, 2022-Present – Intermediate Engineer: Complete regulatory outreach for the permitting of new waste transfer stations. The permitting process requires detailed engineering plans and specifications, contingency planning, air quality, noise, surface water, and groundwater management and monitoring.

Pyrolysis and Biochar Facilities, NS, 2021-Present – Intermediate Engineer: Complete field studies and key reporting requirements for Environmental Assessment and Industrial Approvals. The permitting process requires detailed engineering plans and specifications, contingency planning, air quality and dispersion modelling, and surface water and groundwater management and monitoring.

Compost Facility Environmental Monitoring Program, NS, 2021-Present – Intermediate Engineer: Monitoring groundwater and surface water sampling, data compilation, data analysis, and regulatory reporting. Prepared various approval amendment applications for submission to NSECC, direct correspondence with NSECC, and streamlined the monitoring and reporting program.

Wind Power Environmental Assessments, NS, 2021-Present – Intermediate Engineer: Conducted watercourse, wetland, fish/fish habitat, wildlife and avian assessments required, and environmental assessment reporting. Developed greenhouse gas and climate change assessment criteria for quantifying the effects or impacts of the Projects on the environment and climate change on the Projects.

Groundwater Geothermal Heating and Cooling System Review and Permitting, NS, 2021-Present – Intermediate Engineer: Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.

Municipal Compost Facility Leachate Handling System, NS, 2021-Present – Intermediate Engineer: Design, specification, and industrial approval amendment.

Level I and II Groundwater Assessments, NS, 2021-Present – Intermediate Engineer: Supervise well installation, pump testing (i.e., step and constant), sampling, analysis of aquifer characteristics, groundwater modelling, and regulatory reporting.

Groundwater Geothermal Cooling Systems, NS, 2021-Present – Intermediate Engineer: Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.

Environmental Assessment, EverWind Point Tupper Green Hydrogen/Ammonia Project, NS – Phase 1, NS, 2022 – Environmental Engineer: Completed field studies and key reporting requirements for the submission of an EA Registration Document for a green ammonia/hydrogen facility. This was the first green ammonia/hydrogen facility to be approved in both Nova Scotia and Canada.

Production Field Centre Hazardous Materials Assessment, NS, 2021 – Junior Engineer: Hazardous Materials inventory, coordinate sampling, data analysis, and reporting.

Greenhouse Gas Inventory Audit, NS, 2021 – Junior Engineer: Greenhouse Gas auditing for Fisheries and Oceans Canada (DFO) application.

Air Quality Improvement Design, Labrador, NL, 2021 – Junior Engineer: Design, specification, stack testing, data analysis, and construction of ventilation improvements.

Drinking and Wastewater Treatment Plant System Assessments, NS, 2021 – Junior Engineer: Assess water and wastewater infrastructure, establish an asset inventory, and reporting.

Municipal Groundwater Withdrawal Compliance, NS, 2021 – Junior Engineer: Review pumping rates and withdrawal volumes, spatial interferences, sustainability concerns, data analysis, and regulatory compliance.

Registered Potable Groundwater Supply Assessment, NS, 2021 – Junior Engineer: Review design specifications, well logs, water quality, data compilation, data analysis, and regulatory compliance.

AREAS OF SPECIALIZATION

- Environmental Assessments
- Flora and Fauna Surveys
- Species at Risk Assessments
- Field Implementation
- Technical Review
- Project Management
- Project Design
- Staff Training

RELEVANT EXPERIENCE

Mr. MacDonald a Senior Project Manager and Terrestrial Lead. He has a strong terrestrial survey design and oversight background and extensive experience in avian and botanical studies. Mark provides survey design and oversees the drafting of terrestrial baseline reports and effects assessments for many projects. He has consulted regularly with provincial regulatory agencies, local landowners, and other stakeholder groups.

Mark is a versatile, conservation-focused ecologist with over 18 years in adaptive project management in challenging environments. He is a dedicated learner with a proven record of quickly developing new skills and an excellent writer for both a technical and general audience. He is diplomatic and capable when navigating differing values of multiple stakeholders.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Baseline Surveys, NS, 2022-Present – Project Manager: Completion of environmental baseline surveys for multiple provincial environmental assessments for various wind power projects and quarries. This involves detailed desktop and constraints analyses to determine required field assessments, implementation of all field programs, interpretation and reporting of results, across multiple taxa and habitat types.

Environmental Assessment, Various Projects, 2022-Present – Project Manager: Lead terrestrial baseline reporting and environmental effects chapters for various mine, quarry, and wind projects, as well as other development projects across the maritime provinces (e.g., Walden Quarry Expansion, Six Mile Brook Quarry Expansion, Rhodena Wind Project, Wedgeport Wind Project, Caribou and Wood Islands Ferry Terminal Expansion Projects).

Botanical Surveys, NS, 2022-2024 – Project Manager: Planned and developed botanical survey programs, including species at risk and habitat assessments, for various mine, quarry, solar, and wind projects, as well as other development projects across the maritime provinces (e.g., Walden Quarry Expansion, Six Mile Brook Quarry Expansion, Shaw Sand Pit, Wedgeport Wind Project, Clydesdale Wind Project, Rhodena Wind Project, Wejipek Wind Project, Apitamkiejit Wind Project, Upper Afton Wind Project, New Prospect Wind Project, White Cedar Wind Project, Port Malcolm Solar Project, Caribou and Wood Islands Ferry Terminal Expansion Projects, Sungro Horticuture Peat Harvesting Projects, etc.).

Avian Survey Design and Completion, 2022-2024 – Project Manager: Planned and developed avian survey programs, including species at risk, coastal, migration, nocturnal owl surveys, breeding, and raptor/diurnal watch count surveys, for various mine, quarry, solar, and wind projects, as well as other development projects across the maritime provinces (e.g., Walden Quarry Expansion, Six Mile Brook Quarry Expansion, Shaw Sand Pit, Wedgeport Wind Project, Clydesdale Wind Project, Rhodena Wind Project, Wejipek Wind Project, Apitamkiejit Wind Project, Upper Afton Wind Project, New Prospect Wind Project, White Cedar Wind Project, Port Malcolm Solar Project, Caribou and Wood Islands Ferry Terminal Expansion Projects, Sungro Horticuture Peat Harvesting Projects, etc.).

EDUCATION

- Masters of Science in Forestry, University of New Brunswick, Fredericton, NB (2012)
- Bachelor of Science in Forestry (Major in Forest Management, Minor in Wildlife Ecology), University of New Brunswick, Fredericton, NB (2004)

TRAINING

- Emergency First Response & CPR (2022)
- Wilderness First Responder (2014)

AREAS OF SPECIALIZATION

- Fish and Fish Habitat
- Fish Rescue
- Wetland Delineation
- Environmental Monitoring
- Freshwater Mussels

RELEVANT EXPERIENCE

Ms. Cameron entered the environmental consulting profession in 2022. She is diligently working to broaden her professional field skills and familiarizing herself with various aspects of professional field biology and environmental sciences. Ms. Cameron has worked on projects related to field surveys, and education and outreach in Nova Scotia and Prince Edward Island.

Ms. Cameron has been involved in watercourse and wetland delineation, fish and fish habitat assessments, fish rescues and electrofishing, water quality monitoring, wildlife surveys, construction monitoring, and various types of environmental report writing. Before joining Strum, Reilly completed her co-op with Mi'kmaq Conservation Group (MCG) where she conducted extensive surveys assessing the distribution and population of freshwater mussels (focusing on brook floater) throughout the St. Mary's watershed.

REPRESENTATIVE PROJECTS AND ROLES

Shoreline Assessment, Fishermans Harbour, NS, 2024 – Field Lead: Acted as a field lead for a shoreline assessment to prevent erosion during large storm events. Scope of work supported the Fisheries Act authorization (FAA).

Environmental Assessment, Trafalgar, NS, 2024 – Field Technician: Acted as a field technician for a provincial gold mine Environmental Assessment in Trafalgar, NS. The scope of work included fish collection, water quality sampling, moose surveys, flow monitoring, and detailed fish habitat assessment. Submission of a baseline report was completed in 2024.

Environmental Assessment, Cook Brook, NS, 2023 – Technician: Acted as a technician for a biophysical and provincial gypsum mine Environmental Assessment. The scope of work included habitat assessment, wetland delineation, fish collection and supplementary eDNA sampling. Ms. Cameron supported the submission of the biophysical in 2023.

Environmental Assessment, Pictou, NS, 2023 – Field Technician: Acted as field technician for a provincial wind farm EA. The scope of work included wetland delineation and moose surveys.

Highway Twinning Project, Glasgow to Antigonish, NS, 2022 – Field Technician: Acted as a field technician for a highway twinning project along Highway 104 from New Glasgow to Antigonish. The scope of work included completing various sized fish rescues, detailed fish habitat assessment, and turtle surveys.

Environmental Assessment, Goldboro, NS, 2023 – Field Technician: Completed field work for a provincial gold mine Environmental Assessment, in Goldboro, NS. The scope of work included detailed habitat assessment and installation of long-term monitoring wells.

Environmental Monitoring, Pickle Lake, ON, 2023 – Environmental Monitor: Acted as an environmental monitor for a 1300 km transmission line project. Completed regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring and reporting on construction activity.

EDUCATION

- Bachelor of Science (Environmental Sciences), Saint Mary's University, Halifax, NS (2020)

TRAINING

- Intermediate Workplace First Aid Level C CPR & AED (2023)
- WHMIS Certificate (2023)
- Wetland Ecosystem Services Training (2022)
- Backpack Electrofishing Certificate (2020)
- Pleasure Craft Operator (2020)

AREAS OF SPECIALIZATION

- Environmental Assessment
- Flora and Fauna Surveys
- Species at Risk Assessment and Monitoring
- Field Program Planning and Survey Design
- Data Management & Analysis
- Report Writing

RELEVANT EXPERIENCE

Renee MacQuarrie joined the Strum team in 2023 as a Junior Environmental Scientist upon graduating from Dalhousie University's Bachelor of Environmental Science program.

Between her studies at Dalhousie, Renee worked for a number of environmental Non-Profit Organizations throughout Nova Scotia, focusing on Species at Risk Conservation. She has a strong skill set in many areas of environment field work, data analysis, and report writing.

During her undergraduate studies, Renee worked on the Species-at-Risk team at the Unama'ki Institute of Natural Resources, where she monitored Wood Turtle populations, conducted bumble bee research, and assisted with surveying efforts for birds and bats. She later worked as a Field Technician for Birds Canada, conducting surveying and nest monitoring for Chimney Swifts and Bank Swallows. She has also worked as a Research Assistant for Cape Breton Environmental Association, where she focused on marine debris and derelict fishing gear, and for Dalhousie University, where she used GIS software to assess access to green space on school grounds across Canada. Renee is an avid birder and naturalist with strong identification skills across a wide range of taxa and has experience conducting field work in remote and difficult to access areas.

Since joining Strum, Renee has focused primarily on avian field surveys, avian acoustic analysis, and botany surveys. She also holds strong skills in lichen surveys, old growth forest assessment, wetland and watercourse assessment, winter tracking, and various other biophysical survey methods. She has worked on a wide range of different projects throughout Atlantic Canada, including wind energy, transmission lines, green hydrogen/ammonia, solar energy, mines, quarries, and housing development.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Assessments, Various Projects, 2023-Present – Environmental Scientist: Conducts field work, data analysis, and reporting for various projects in Nova Scotia, New Brunswick, and Prince Edward Island. Field work includes avian surveys, botany and lichen surveys, old-growth assessment, wetland and watercourse assessment, winter tracking, pellet group inventory (PGI), and field equipment deployment and maintenance. Completion of desktop review, survey planning, data analysis, budgeting, and writing for Environmental Assessments and other technical reports. Projects include the Goose Harbour Lake Wind Farm Project, Weavers Mountain Wind Energy Project, Ellershouse Wind Farm Project, Melvin Lake Wind Project, Windy Ridge Wind Power Project, Kmtnuk Wind Power Project, Bear Lake Wind Power Project, Mersey River Wind Farm, Higgins Mountain Wind Farm Project, Rhodena Wind Project, Setapuktuk Wind Project, NS-NB Reliability Intertie Project, EverWind Point Tupper Green Hydrogen/Ammonia Project, EverWind Strait Crossing Transmission Line Project, Nova Sustainable Fuels Renewable Energy Park Project, Goldboro Gold Project, and Black Point Quarry Project.

Avian Field Surveys, Various Projects, 2023-Present – Environmental Scientist: Conducts avian field surveys (i.e. point count surveys, area searches, diurnal watch count surveys, nightjar surveys, owl surveys, nest sweeps) for various projects in Nova Scotia, New Brunswick, and Prince Edward Island. Projects include the Goose Harbour Lake Wind Farm Project, Weavers Mountain Wind Energy Project, Ellershouse Wind Farm Project, EverWind Point Tupper Green

EDUCATION

- Bachelor of Science, Major in Environmental Science – Dalhousie University (2022)

TRAINING

- Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC) Training (2024)
- Wetland Delineation Training (2024)
- UTV Certification – Canada Safety Council (2023)
- Standard First Aid & CPR/AED – (2025)
- WHMIS (2023)
- Bear Aware Training (2023)

Hydrogen/Ammonia Project, EverWind Strait Crossing Transmission Line Project, Nova Sustainable Fuels Renewable Energy Park Project, and Black Point Quarry Project. Conducts desktop review, scoping, and survey design for avian field programs.

Avian Acoustic Monitoring, Various Projects, 2023-Present – Environmental Scientist: Conducts avian acoustic analysis using a variety of specialized software programs to assess avifauna presence on project sites. Analyses avian nocturnal flight calls to assess nocturnal migratory activity over project sites. Deploys and maintains acoustic monitoring devices. Prepares related technical reports and Environmental Assessment report sections.

Botany and Lichen Surveys, Various Projects, 2023-Present – Environmental Scientist: Conducts botany surveys focused on the identification of Species at Risk and/or Species of Conservation Interest flora. Keeps a full inventory of all plant species encountered during surveys. Optimizes survey transect locations based on habitat characteristics likely to support rare or unique flora. Conducts targeted surveys for Species at Risk lichens. Conducts monitoring and health assessments for Blue Felt Lichen and has experience conducting Blue Felt Lichen translocation.

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment
- Wetland Delineation & Functional Assessment
- Wildlife Surveys & Assessment
- Electrofishing & Fish Habitat Assessment
- Environmental Reporting
- Environmental Monitoring

RELEVANT EXPERIENCE

Ms. Chilibeck joined Strum Consulting full-time in April 2025 after completing her Bachelor of Science in Environmental Science and Biology at Dalhousie University. She has previously worked in consulting during a co-op work term with McCallum Environmental Ltd. (now Strum Consulting) in 2022 and worked on-contract for Strum from July to October in 2024.

Ms. Chilibeck has a varied background in professional and academic work. She has worked for the non-profits Net Zero Atlantic (co-op term in 2023) and Birds Canada (contract in 2024); in natural resource management for Premier Tech Horticulture (co-op term in 2024); and as a teaching assistant at Dalhousie University (part-time, 2023-2025). She also completed her Honour's thesis researching the breeding biology of Leach's storm-petrel, a globally vulnerable seabird found in Atlantic Canada. These experiences have made Ms. Chilibeck well-rounded in understanding conservation management and research, community engagement, and industry practices.

Ms. Chilibeck is a member of the Environmental Assessment and Approvals group at Strum and work primarily with the avifauna team, spending much of her time contributing to the fieldwork and reporting aspects of the avifauna chapters for environmental assessments; however, her experience makes her well-suited to assisting on a variety of remote field projects across Atlantic Canada. Other work she has completed includes assisting with electrofishing, wetland delineation and assessments, and wildlife surveys. She is also experienced with driving 4x4, ATVs, and hauling heavy equipment.

REPRESENTATIVE PROJECTS AND ROLES

Wetland Delineation Fieldwork, NS, 2022-Present – Environmental Scientist: Completed wetland delineation and functional assessments at variety of project sites, including mines and wind farms.

Wetland Monitoring, NS, 2025-Present – Environmental Scientist: Responsible for conducting field assessments for several wetland monitoring programs. Field assessments included wetland delineation & functional assessment, monitoring well installment, vegetation plot monitoring, and in-situ water chemistry sampling.

Surface Water Sampling and Surface Flow Measurements, NS, 2022-Present – Environmental Scientist: Assisted with completing baseline surface water quality sampling and surface flow measurements across several projects in Nova Scotia, including three potential gold mines and one gypsum mine.

Nesting Bird Searches, NS, 2025-Present – Environmental Scientist: Surveyed prospective project areas for the presence of nesting birds to mitigate potential impacts of construction activities. Collected field data related to any observed species and reported on the findings. Flagged buffer areas for any identified species.

Avifauna Surveys, NS, 2024-Present – Environmental Scientist: Surveyed diversity of proposed projects (e.g., quarries, powerplants, wind farms, mine site) for birds throughout the spring migration, breeding bird, and fall migration seasons. Field surveys include diurnal watch counts to identify migratory corridors; breeding bird area searches to locate breeding bird activity in areas of sites that are not targeted by standardized surveys; and nightjar surveys to identify project usage by crepuscular bird species. Also contributed to analyzing and reporting findings from surveys into reports for clients.

EDUCATION

- B.Sc. Combined Honours in Environmental Science and Biology from Dalhousie University (2025)
- Certificate in Environmental Impact Assessment from Dalhousie University (2025)

TRAINING

- Remote/Wilderness First Aid – Canadian Red Cross (2025)
- Care and Use of Wildlife Certificate – Canadian Council on Animal Care (2022)
- WHMIS (GHS) Training (2022)

AREAS OF SPECIALIZATION

- Geographic Information Systems (GIS)
- Location, Spatial, and Data Analytics
- Database Management
- Geoprocessing, Model Building
- Civic Addressing

COMPUTER EXPERIENCE

- GIS Software: ArcGIS Suite, QGIS
- Other Software: CorelDRAW X7
- Scripting: SQL, Python 2 & 3

RELEVANT EXPERIENCE

Ms. Wallace is a GIS Technician working in the Environmental Assessments and Approvals group. She joined the team in early 2023 and has been helping the GIS team with data analysis and creating mapping products for environmental assessments and other projects.

Ms. Wallace received her Bachelor of Science with Honours in Geology at Saint Mary's University in 2019. While studying at Saint Mary's, Ms. Wallace was a research assistant, and was able to use a variety of tools to aid in the analysis of minerals and in their identification process. Ms. Wallace then went on to receive an Advanced Diploma in Geographic Information Systems at the Centre of Geographic Sciences in 2020.

Before joining Strum, Ms. Wallace worked for the Province of Nova Scotia as part of the Civic Addressing team, where she was able to continue to use GIS and was involved in the emergency management operations during Hurricane Fiona where she analysed data and created a dashboard to help the team with their planning going forward.

REPRESENTATIVE PROJECTS AND ROLES

Wind Farm Projects, NS, 2023 - Present - Geomatics Technician: Compiled and checked collected field data, performed geospatial data analysis, and completed numerous drawings as a visual aid in environmental assessments and other reports.

Detrital Mineral Provenance Analyses from the Cretaceous McMurray Formation, Alberta and the Holocene Portneuf River Delta, North Shore of Quebec (2021) – Research Assistant: Used a scanning electron microscope to determine mineral composition and to identify mineral assemblages in different offshore wells in the Scotian Basin. Supplementary graphs were created to aid in demonstrating mineral assemblages and chemical composition.

Sedimentary Petrology of the Upper Cree Member in the Cohasset A-52 Well, Scotian Basin, Offshore Nova Scotia (2020) – Research Assistant: Used a scanning electron microscope to determine mineral composition and to identify mineral assemblages in different offshore wells in the Scotian Basin. Supplementary graphs were created to aid in demonstrating mineral assemblages and chemical composition.

Electron Microprobe and Scanning Electron Microscope Mineral Analyses of Diagenetic Minerals from Lower Cretaceous Reservoir Sandstone, Scotian Basin, Offshore Nova Scotia (2019) – Research Assistant: Computer software was used to combine all backscattered electron images captured from a scanning electron microscope.

EDUCATION

- Advanced Diploma in Geographic Information Systems (GIS), Centre of Geographic Sciences (COGS), Lawrencetown, NS (2020) ‘
- Bachelor of Science with Honours, Major in Geology, Saint Mary's University, Halifax, NS (2019

TRAINING

- Emergency First Aid CPR Level "C" & AED (2021)
- WHMIS (2023)
- Over 100 hours ESRI Academy Training (2019 – Present)

Detrital Petrology and Provenance of the Logan Canyon Formation Sandstones, Scotian Basin (2019) –

Research Assistant: Analyzed petrographic information from samples using a scanning electron microscope, where mineral composition was determined using Energy dispersive spectroscopy and identification was helped with backscattered electron images using texture and brightness as a guide. Heavy mineral separation and identification was used to determine mineral assemblages and understand origins.

PROFESSIONAL ASSOCIATIONS

- Association of Professional Geoscientists of Nova Scotia

AREAS OF SPECIALIZATION

- Remote Sensing
- Geographic Information Systems (GIS)
- Artificial Intelligence (AI) (e.g., Machine Learning and Deep Learning)
- LiDAR
- Photogrammetry
- Location, spatial, and data analytics
- Geoprocessing, Model Building, and automation
- Database management
- Geomorphology
- Hydrologic Modelling

COMPUTER EXPERIENCE

- Operating Systems: Windows, macOS
- GPS Software: Garmin BaseCamp, Trimble Geospatial
- GIS Software: ArcGIS Suite, QGIS, Global Mapper
- Remote Sensing Data Processing: DJI Terra, ArcGIS Pro, Trimble Inpho, POSpac MMS, LAsTools
- Other Software: CorelDRAW X7
- Scripting: Python 2 & 3, SQL

RELEVANT EXPERIENCE

Mr. Opra is a Remote Sensing Scientist working in our Environmental Assessments & Approvals group. Mr. Opra specializes in Geomatics analysis and automation. He has extensive experience in implementing workflows for data analysis and processing. This experience includes integration of Machine Learning and Deep Learning in the environmental modelling, processing LiDAR data, photogrammetry, and automation of geospatial data analysis with both vector and raster data. Further experience involves applying environmental geoscience principals to protect and manage natural environments. In addition, Mr. Opra is experienced in operating a RPAS for data collection.

During his graduate studies, Mr. Opra focused on the application of remote sensing technologies in exploration geology. He investigated LiDAR as an effective means to visualize topography and in further detail, geomorphological features such as folds and glacial structures. He explored the advantages of both RPAS and airplane-acquired LiDAR while reviewing various software for processing and analysis. Mr. Opra helped support the project's RPAS surveys in Trafalgar, Nova Scotia and processed the data to produce high resolution terrain models.

Prior to and following his research contribution, Mr. Opra worked in academia as an advisor, then in the industry as a Geospatial Data Analyst and as a Remote Sensing Analyst. In academia, he assisted with an Honours thesis in developing a geospatial model to automatically detect sinkholes based on LiDAR data. He also assisted in a Master's thesis by mapping legacy gold mine tailings and developing a survey grid for sampling. As a geospatial data analyst, he helped create new data products using multispectral imagery for precision agriculture. Through working on various LiDAR and Photogrammetry projects based throughout the Caribbean, USA, and Canada, Mr. Opra was able to apply automation to photogrammetry procedures and LiDAR processing. His commitment to data quality assurance and control allowed him to develop a deeper understanding of how data is affected by environmental and human factors.

EDUCATION

- Master of Science in Applied Geomatics, Acadia University, Wolfville, NS (2021)
- Advanced Diploma in Geographic Information Systems (GIS), Centre of Geographic Sciences (COGS), Lawrencetown, NS (2020)
- Bachelor of Science, Major in Geology Saint Mary's University, Halifax, NS (2019)

TRAINING

- Standard First Aid and WHMIS (2022)
- RPAS Pilot Certification (2021)
- Over 200 hours ESRI Academy Training (2019 – Present)

His experience in both geology and environmental science allows him to have a strategic approach for geospatial analysis in environmental consulting.

Due to the multidisciplinary nature of Geomatics, Mr. Opra developed the ability to anticipate, identify, and solve diverse geospatial problems. Mr. Opra continues to research advancements in technology to build on and develop efficient procedures for data analysis and collection.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Constraint Analysis, NB, NS, NL, 2023-Present – Remote Sensing Scientist: Land cover, landform, and hydro analysis for projects throughout the Maritimes. Using remotely sensed baseline data to create geospatial data products.

Hydrologic Modelling, NB, NS, NL, 2023-Present – Remote Sensing Scientist: Identifying stream networks and creating geospatial data products to guide project designs. Geospatial products that are created, but are not limited to, depth to water, potential wetlands, potential watercourses, and catchment areas for various scale projects. High resolution remotely sensed data (e.g., LiDAR and Multispectral Imagery) is used to gain insights about complex hydrology.

EverWind Fuels Green Hydrogen Project, NS, 2022-Present – Geomatics Specialist: Spearheaded geospatial analysis, supported external inquiries, and integrated environmental and socioeconomic factors in the assessments.

Wind Farm Projects, NS, 2022-Present – Geomatics Specialist: Streamlining field data collection, developed in house habitat modelling, tracking applications, and performing geospatial data analysis.

Sinkhole Delineation Automation, NS, 2021-2022 – Advisor: Assisted in the development of a model within ArcGIS Pro for automating detection and delineation of sinkholes in the Karst prone areas.

LiDAR and Orthoimagery Data Production, Caribbean, USA, and Canada, 2021-2022 – Remote Sensing Analyst: Trajectory processing, LiDAR processing, automation, and creation of data products from inception to delivery.

Multispectral Vineyard Imagery Data Production, California, USA, 2020 – Geospatial Data Analyst: Assisted with the development of new proprietary geospatial products for precision agriculture.

Epiphytic Lichens as Spatial Biomonitors of Airbourne Mercury and Arsenic, 2019 – Research Intern: Used GPS to map historical mining sites, and designed survey grids for Lichen collection.

Provenance and Diagenesis of Sandstones in the Deep Wells Annapolis G-24, Balvenie B-79, Crimson F-81, Weymouth A-45, and Newburn H-23, Scotian Basin, offshore NS, 2017-2018 – Research Assistant: Creation of graphic models and diagrams using data captured by a scanning electron microscope (SEM) to further research efforts in understanding the geology of the Scotian Basin.

Petrography of Bedrock and Ice-rafted Granules, Flemish Cap, offshore Newfoundland and Labrador, 2017 – Research Assistant: Determining petrographic information of the samples using a scanning electron microscope (SEM). Energy dispersive spectroscopy (EDS) was used to determine mineral composition and backscattered electron images (BSE) where used to identify textures. Graphic design software was used to aggregate the images captured from the SEM.