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**Environmental Assessment
Goffs Quarry
Expansion Phases 3 and 4
Scotian Materials Limited**

Goffs, Nova Scotia

GEMTEC Project: 103269.002

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Prepared for:

Scotian Materials Limited
171 Resource Road
Goffs, Nova Scotia
B2T 0L2

Environmental Assessment Goffs Quarry Expansion Phases 3 and 4 Scotian Materials Limited

Goffs, Nova Scotia

October 20, 2026
GEMTEC Project: 103269.002

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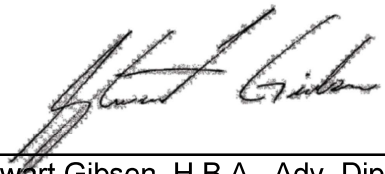
Attention: Jeremy Higgins, Environmental Assessment Officer

**Re: Environmental Assessment: Scotian Materials Limited., Goffs Quarry Expansion
Phases 3 and 4; Goffs, Nova Scotia.**

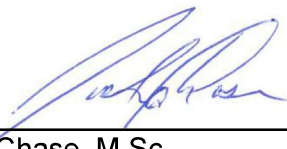
GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) is pleased to submit this Environmental Assessment (EA) Registration document for Phases 3 and 4 of proposed expansion of the Goffs Quarry, on behalf of Scotian Materials Limited. The proposed project is located at 171 Resource Road, Goffs, Nova Scotia.

Please do not hesitate to contact the undersigned if you have any questions or concerns about the registration document or the information presented herein.

Sincerely,



Stewart Gibson, H.B.A., Adv. Dipl.
Ecological and Permitting Services
Lead



Justin Chase, M.Sc.
Senior Environmental Scientist

JWC/sag

Enclosures

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EXECUTIVE SUMMARY

This Environmental Assessment (EA) Registration document has been prepared for the proposed Goffs Quarry Expansion Phases 3 and 4, located in Goffs, Halifax County, Nova Scotia (the Project). The EA Registration document was prepared by GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) on behalf of the Proponent, Scotian Materials Limited (Scotian Materials).

The existing quarry consists of an 18.4-hectare construction aggregate facility, including the original quarry and the Phase 1 and 2 expansions, under the Industrial Approval No. 2016-095664-03. The proposed expansion is intended to support the long-term supply of aggregate materials for regional infrastructure and construction projects, including roads, asphalt production, airport infrastructure, and residential and commercial development. There has been quarry activity on the property since the early 1960s, and the present facility continues to provide essential construction materials, support local employment, and contribute to the provincial construction and transportation sectors while operating in compliance with provincial environmental standards.

The proposed expansion involves a total area of 23.2 hectares and consists of two additional phases: Phase 3 and Phase 4. The Project scope includes the construction, operation, decommissioning, and restoration of the expanded quarry.

Including the original quarry (3.99 ha), the Phase 1 and 2 expansions (14.35 ha), and the proposed Phase 3 and 4 expansions (23.2 ha), the total quarry footprint will increase to approximately 41.5 ha within the 100 ha property (PID 00505941). The average production rate of the quarry will remain at approximately 300,000 tonnes per year, with the possibility of limited periods of increased production should significant aggregate contracts require. Based on current estimates, there are over 14 million tonnes of rock reserves within the Project footprint. Depending on market demand, operation of the proposed Goffs Quarry Expansion will take place over a period of 25 to 30 years.

As the expansion area will exceed 4 hectares, the Project requires registration as a Class I Undertaking under Nova Scotia's Environmental Assessment Regulations. GEMTEC has prepared this EA Registration document on behalf of Scotian Materials, based on the *proponent's guide to Environmental Assessment* (Nova Scotia Department of Environment and Climate Change, 2025), and the sector-specific guideline "Environmental Assessment Supplemental Checklist: Pits and Quarries" (Nova Scotia Department of Environment and Climate Change, 2025). As well as the *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (Government of Nova Scotia, 2009). Furthermore, the proposed expansion project adheres to the *Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999).

This document presents an assessment of the potential impacts of the Project on existing Valued Components (VC) that comprise the physical, ecological, and socio-economic environment of the project site and surrounding area. A combination of desktop review, field assessments, and consultation with regulatory databases informed the analysis. The proponent has undertaken community and Mi'kmaq engagement and remains committed to ongoing engagement throughout the life of the Project.

The observed overburden thickness aligns with the typical till veneer thickness of 0.5–5 m reported for the area (Utting, 2011). Bedrock encountered during drilling consisted of metasandstone and slate of the Goldenville Group (Horne, 2009), locally exposed at the surface or overlain by a thin till veneer.

An Archaeological Resource Impact Assessment (ARIA) was completed by Davis MacIntyre and Associates Limited (DMA) in 2012. The assessment included a review of historical sources and the MARI database, followed by a field reconnaissance survey. No pre-contact sites or archaeological features were identified within the quarry property, and the study area (including Phases 3 and 4) was assessed as having low archaeological potential. The main riparian corridor that bisects the PDA will be avoided during Phase 3 and 4 developments.

Ecological effects are anticipated to be minimal, with limited impacts on habitat availability and carbon sequestration. Potential residual effects are primarily associated with fugitive dust, and loss of forest and wetland habitat and their associated function as carbon sinks; however, these effects are anticipated to be low magnitude. The proposed expansion is expected to have minimal cumulative effects on most VCs, as the project represents a continuation of existing quarry operations with a similar level of production, within an already developed industrial area.

Environmental monitoring will be conducted as required under applicable approvals and permits, including post-construction wetland monitoring where applicable. Slope stability within active quarry areas will also be monitored regularly. Dust, noise, and blast monitoring will be carried out as required, in accordance with the NS *Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999).

The following report includes an assessment of environmental effects of the project for all Valued Components of the existing environment identified. Generally, none of the off-site effects of the Project are anticipated to generate a significant measurable increase beyond those of the current operation. Ultimately, all off-site impacts of this expansion project should be negligible relative to the existing operation.

TABLE OF CONCORDANCE

Table 1.1 Concordance table of minimum registration requirements under Section 9(1A)(b) of the Nova Scotia Environmental Assessment Regulations.

Legislated Minimum Requirements for an EA Registration Document, NS Environment Act	Section Addressing Requirements
(i) Name of the proposed undertaking	Section 1.2 – Name of the Undertaking
(ii) Location of the proposed undertaking	Section 1.3 – Project Location
(iii) Name, address and identification of the proponent	Section 1.1 – Project Proponent
(iv) List of contact persons for the proposed undertaking and their contact information	Section 1.1 – Project Proponent
(v) Name and signature of the Chief Executive Officer or a person with signing authority, if the proponent is a corporation	Section 9.1 – Proponent Signature
(vi) Details of the nature and sensitivity of the area surrounding the proposed undertaking	Section 4.0 – Existing Environment and Effects Assessment Appendix A – ACCDC Report
(vii) Purpose and need for the proposed undertaking	Section 2.3 – Purpose of the Undertaking
(viii) Proposed construction and operation schedules for the undertaking	Section 2.6 – Site Preparation and Construction Section 2.7 – Operation and Maintenance Details
(ix) Description of the proposed undertaking	Section 2.0 – Project Description
(x) Environmental baseline information	Section 4.0 – Existing Environment and Effects Assessment Appendix B – Geology Appendix C – Hydrogeology Appendix D – Surface Water Hydrology Appendix E – Vegetation Inventory Appendix F – Lichen Survey Report Appendix G – Wetland Data Sheets, Photo Log, and WESP-AC Score Sheets Appendix H – Fish & Fish Habitat Data

	Appendix I – Avifauna Baseline Report
(xi) List of the licences, certificates, permits, approvals, and other forms of authorization that will be required for the proposed undertaking	Section 8.1 – Approval of the Project
(xii) All sources of any public funding for the proposed undertaking	Section 8.2 – Funding
(xiii) All steps taken by the proponent to identify the concerns of the public and the Mi'kmaq of Nova Scotia about the adverse effects or the environmental effects of the proposed undertaking	Section 7.0 – Indigenous and Public Involvement
(xiv) List of all concerns expressed by the public and the Mi'kmaq of Nova Scotia about the adverse effects or the environmental effects of the proposed undertaking	Section 7.0 – Indigenous and Public Involvement
(xv) All steps taken or proposed to be taken by the proponent to address concerns of the public and the Mi'kmaq of Nova Scotia identified under subclause (xiv)	Section 7.0 – Indigenous and Public Involvement
(xvi) Assessment of climate-change-related environmental effects, including positive and adverse effects	Section 4.1.2 – Climate Change Section 4.5 – Effects of the Environment on the Project
(xvii) Plain-language summary of the undertaking, its environmental effects, including both positive and adverse effects, and any efforts to mitigate its environmental effects, to be posted on the government's website	Section 5.0 – Summary of Mitigation and Residual Effects
(xviii) Environmental effects of the undertaking, including both positive and adverse effects	Section 4.0 – Existing Environment and Effects Assessment Section 5.0 – Summary of Mitigation and Residual Effects

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LIST OF ABBREVIATIONS AND TERMINOLOGY

ACCDC – Atlantic Canada Conservation Data Centre

AO – Aesthetic Objectives

AQHI – Air Quality Health Index

AQMS – Air Quality Management System

ARD – Acid Rock Drainage

ARIA – Archaeological Resource Impact Assessment

ATV – All-terrain vehicle

BBS – Breeding Bird Survey

BUI – Buildup Index

CAAQS – Canadian Ambient Air Quality Standards

CCME – Canadian Council of Ministers of the Environment

CMA – Halifax Census Metropolitan Area

CO_{2e} – Carbon Dioxide Equivalent

COSEWIC – Committee on the Status of Endangered Wildlife in Canada

CPCAD – Canadian Protected and Conserved Areas Database

CWS – Canadian Wildlife Service

dBA – Decibels A-weighted

DEM – Digital elevation model

DFO – Fisheries and Oceans Canada
Dfb – Humid Continental Climate
EA – Environmental Assessment
EARD – Environmental Assessment Registration Document
ECCC – Environment and Climate Change Canada
EHS – Emergency Health Services
ELC – Ecological Land Classification
ESA – Ecologically Significant Areas
FBP – Function-Benefit Products
FCSI – Federal Contaminated Sites Inventory
FWI – Fire Weather Index
GCDWQ – Guidelines for Canadian Drinking Water Quality
GHG – Greenhouse gas
GPS – Global Positioning System
HAB – Habitat Attributes
HFCs – Hydrofluorocarbons
HRM – Halifax Regional Municipality
HU – Habitat Units
Hz – Hertz
IAAC – Impact Assessment Agency of Canada
IBA – Important Bird Areas
IDW – Inverse Distance Weighting
IPCA – Indigenous Protected and Conserved Areas
ISI – Initial Spread Index
LAA – Local Assessment Area
L_{eq} – Equivalent continuous sound level, from Pit and Quarry Guidelines.
LOU – Letter of Understanding
MA – Managed Area
MAC – Maximum Acceptable Concentrations
MARI – Maritime Archaeological Resource Inventory
MAT – Mean annual temperature
MBBA – Maritimes Breeding Bird Atlas
MBCA – Migratory Birds Convention Act
mbgs – Metres Below Ground Surface
McCallum – McCallum Environmental Ltd.
ML – Metal Leaching
Mt – Megatonnes
NSCCTH – Nova Scotia Department of Communities, Culture, Tourism, and Heritage
NSDNR – Nova Scotia Department of Natural Resources
NSE – Nova Scotia Environment
NSECC – Nova Scotia Department of Environment and Climate Change

NSHN – Nova Scotia Hydrographic Network
NSTIR – Nova Scotia Department of Transportation and Infrastructure Renewal
OECD – Other Effective area-based Conservation Measures
PCSWMM – Personal Computer Storm Water Management Model
PDA – Project Development Area
PNA – Protected Natural Areas
QA/QC – Quality Assurance / Quality Control
RAA – Regional Assessment Area
RCMP – Royal Canadian Mounted Police
SAR – Species at Risk
SARA – Species at Risk Act
SOCC – Species of Conservation Concern
SUP – Support Attributes
TSS – Total Suspended Solids
VC – Valued Component of the Existing Environment (e.g., wetlands)
VOC – Volatile organic compounds
VT – Vegetation Type
WAA – Wetland Alteration Approval
WESP-AC – Wetland Ecosystem Services Protocol for Atlantic Canada
WSS – Wetland of Special Significance
FEC – Forest ecosystem classification

1.0 INTRODUCTION

Scotian Materials Limited (Scotian Materials) currently operates an 18.4-hectare (ha) construction aggregate quarry in Goffs, Nova Scotia, under an existing Industrial Approval (Approval No. 2016-095664-03) and has proposed an expansion of the quarry to extend the life of the project.

GEMTEC has prepared this EA Registration document on behalf of Scotian Materials, based on the *proponent's guide to Environmental Assessment* (Nova Scotia Department of Environment and Climate Change, 2025), and the sector-specific guideline “Environmental Assessment Supplemental Checklist: Pits and Quarries” (Nova Scotia Department of Environment and Climate Change, 2025). As well as the *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (Government of Nova Scotia, 2009). Furthermore, the proposed expansion project adheres to the *Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999).

The following sections describe the existing conditions at the Project site, and provide an overview of the construction, operation, and decommissioning and restoration phases of the Project. Environmental impact pathways are identified, mitigation is proposed, and potential residual effects are evaluated.

1.1 Project Proponent

The proponent for the proposed Goffs Quarry expansion is Scotian Materials Ltd. (Scotian Materials), a Nova Scotia-registered company. Scotian Materials is a privately owned Canadian company based in Nova Scotia specializing in the production and supply of construction aggregates and related materials. The company operates several quarry sites and is involved in the extraction, processing, and distribution of high-quality stone products used in road building, infrastructure development, and other construction projects across the province.

1.1.1 Proponent Contact

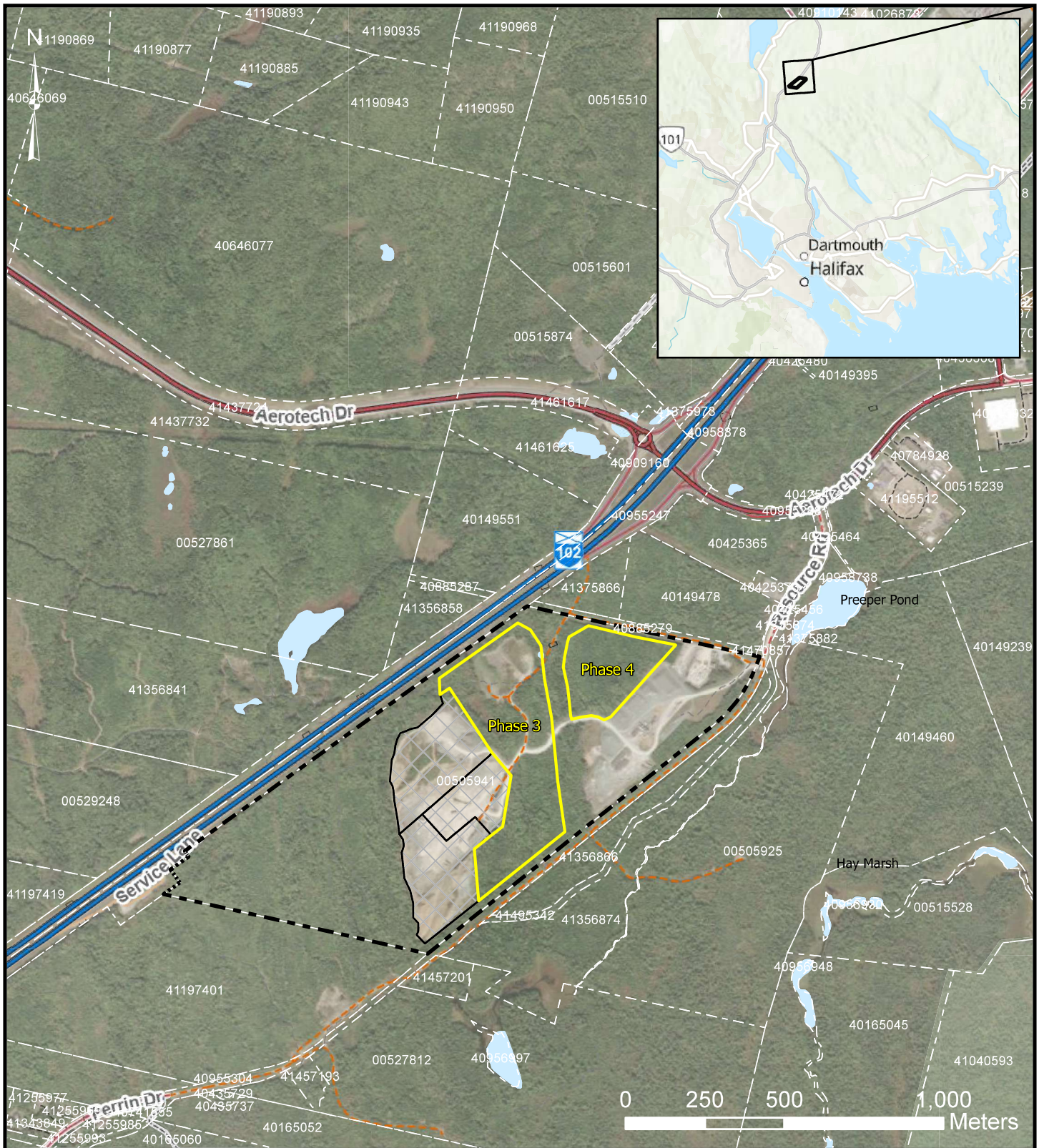
Name of Proponent	Scotian Materials Ltd. http://www.scotianmaterials.ca/
Business Registration Number	3274340
Address of Proponent	171 Resource Rd Goffs, Nova Scotia B2T 0L2 Tel. 902-481-9800 Fax. 902-481-9530
Principal Proponent Contact	Nolan Chase, PTech Quarry Operations Manager Telephone: 506-473-1822 Email: nolan.chase@euroviamaritimes.ca
Principal Contact Person for EA	Stewart Gibson, PMP Ecological and Permitting Services Lead (Atlantic) Telephone: (506) 453-1025 Email: Stewart.Gibson@gemtec.ca

1.2 Name of the Undertaking

The proposed undertaking, referred to as the Goffs Quarry Expansion Phases 3 and 4 (The Project), involves the expansion of the existing quarry beyond its current footprint. As the expansion area will exceed 4 hectares, the Project requires registration as a Class I Undertaking under Nova Scotia's *Environmental Assessment Regulations*.

1.3 Project Location

The Project is located within Halifax Regional Municipality (HRM) and is approximately 2.86 km southwest of the Halifax Stanfield International Airport (measured from the northeastern boundary of the Project to closest runway to the southwest) and immediately adjacent to the Aerotech Industrial Park, located northeast of the Project (Figure 1.1). The Project is on land owned by Scotian Materials, located in Goffs, Halifax County, Nova Scotia (NS) (PID 00505941). The approximate centre of the Project is located at 455465 Easting, 4965835 Northing, UTM Zone 20.



Legend:

- Existing Phases
- Quarry Property

- Project Development Area (PDA)
- NS Properties

Note:

1. Coordinate system: NAD83 CRS UTM Zone 20.
2. Aerial Imagery Retrieved from: ESRI World Imagery

Project:

Goffs Quarry
Phase 3 & 4 Expansion
Goffs, Nova Scotia

Drawing:

Project Location

Client:

Scotian Materials Ltd.

Drawn by: Checked by:

JC SG

Date:

October 2026

Project Number:

103269.002

Drawing Number:

Figure 1.1

Revision No.

3



GEMTEC
CONSULTING ENGINEERS
AND SCIENTISTS

2.0 PROJECT DESCRIPTION

2.1 Project Overview

2.1.1 Previous EA Registration

On August 7, 2018, Scotian Materials Ltd. registered the original Goffs Quarry Expansion Project (Phases 1 - 4) for Environmental Assessment, in accordance with Section 18(a) of the *Environmental Assessment Regulations*, pursuant to Part IV of the *Environment Act*.

On September 25, 2018, the Minister of Environment concluded that the Registration information submitted for the Project was insufficient to support a decision and requested additional details. The Proponent was directed to provide an Addendum addressing surface water and groundwater, site design and restoration, fish, wetlands, and potential effects on the Waverley–Salmon River–Long Lake Wilderness Area. In addition, the Proponent was required to undertake a Mi'kmaq Ecological Knowledge Study.

Following the submission of additional information on September 5, 2019, the Minister of Environment issued a decision on October 25, 2019, approving a 14.35-hectare expansion (*Phases 1 and 2 only) of the undertaking described in the Registration document. This approval brought the total permitted quarry footprint to 18.4 hectares. While Phases 3 and 4 were not included in the approval, it was noted that results of operational monitoring of the approved Phases 1 and 2 would inform assessments of Phases 3 and 4.

2.1.2 Phases 3 and 4

The current Project proposed by Scotian Materials consists of the expansion of an existing 18.4 ha construction aggregate quarry in Goffs, Nova Scotia (the 'existing quarry'). Phases 1 and 2 involved the westward and northward expansion of the original 3.99 ha quarry footprint, with aggregate extraction to a depth of 88 (masl). Those phases are now operational under an Industrial Approval (Approval No. 2016-095664-03), which was issued in June 2020 following EA Approval.

The expansion Project covers a total area of 23.2 hectares and consists of two additional phases: Phase 3 and Phase 4 (Figure 3.1). The Project scope includes the construction, operation, decommissioning, and restoration of the expanded quarry. Phases 3 and 4 will extend the quarry eastward from its current footprint, with planned extraction depths reaching 88 masl in Phase 3 and 99 masl in Phase 4. Including the original quarry (3.99 ha), the Phase 1 and 2 expansions (14.35 ha), and the proposed Phase 3 and 4 expansions (23.2 ha), the total quarry area will be approximately 41.5 ha within the 100 ha property (PID 00505941).

The current grade elevation of the land for Phases 1-3 ranges from 125 to 96 masl and 125 to 109 masl for the proposed Phase 4 of the quarry.

Phases 1 and 2 of the quarry development involved the westward and northward expansion of the original 3.99 ha quarry, with aggregate extraction occurring to a depth of 88 masl. The proposed Phases 3 and 4 will continue this development, expanding the extraction area from 18.4 ha to 41.5 ha.

The anticipated average production rate for the Project is 300,000 tonnes per year, with the possibility of limited periods of increased production should significant aggregate contracts require. Based on current estimates, there are over 14 million tonnes of rock reserves within the Project footprint. Depending on market demand, operation of the proposed Goffs Quarry Expansion will take place over a period of 25 to 30 years.

The operating schedule for the development will be five days a week, ten to twelve hours a day for eight to ten months a year. This schedule may be modified in the event a significant aggregate supply contract is awarded.

The anticipated timeline of Project activities is outlined in Table 2.1, below.

Table 2.1 Anticipated Timeline of Project Activities.

Project Activity	Anticipated Completion Date
Environmental Assessment (EA) Registration	Q3 2026
EA Decision	Q4 2026
Downstream Permitting	Q4 2026 – Q1 2027
Clearing and Construction	Beginning 2027
Operation	2027-2057
Decommissioning and Restoration	Between 2057 and 2082

2.2 Siting Considerations

The expansion Project encompasses 23.2 ha within the 100.2 ha property (PID 00505941) owned by Scotian Materials. The proposed footprint of the Project within the land parcel was determined based on topography, the depth of overburden and proximity (i.e., required setback) to existing features (e.g., watercourses, natural gas pipeline). The property boundary is bounded to the north by lands of the Nova Scotia Department of Natural Resources (NSDNR) (PID 40885279); to the west by Highway 102; to the east by lands owned by Scotian Materials Ltd. (PIDs 41197401, 41356874, and 41356866) and B2 Investments Ltd. (41457201); and to

the south by lands owned by Scotian Materials Ltd. (PID 41197401) and NSDNR (PID 00527812).

The Property Boundary includes a former rock quarry that was operated periodically over the past few decades to support provincial transportation and infrastructure projects and previously had a clay pit (Industrial Approval #2014-089057-T01). Scotian Materials has an approved permit to operate an asphalt plant within the eastern portion of the Property Boundary (located southeast of Phase 4), on the same property but outside of the proposed quarry expansion boundaries. Other land uses in the vicinity of the Project include a variety of business and industrial operations north and east of the Project in the Aerotech Industrial Park such as Maritime Fence, Clean Earth Technologies Inc., and L3 Electronics Systems as well as the Halifax Stanfield International Airport. Located west of the proposed quarry is the north bound Highway 102 weigh station, operated by the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR).

2.3 Purpose of the Undertaking

The proposed expansion represents upwards of 30 years of essential aggregate supply for asphalt, roadbed, and other construction materials. The quarry supports construction and maintenance of public transportation infrastructure, residential and commercial development, and is a key source of aggregate for the airport.

The property has been used for aggregate production since the early 1960's to support highway development and upgrading projects as well as other road and local construction projects.

Construction aggregates are comprised primarily of crushed stone, natural and manufactured sands, and gravel. These resources are a necessity for the development and maintenance of modern infrastructure. For example, aggregate content in concrete is about 80% and about 94% in asphalt. The aggregates that will be produced at the quarry are a critical requirement in many construction projects in the region.

This Project as well as other quarries in NS are an important component of the natural resource sector of the economy and provide essential raw materials to the province's construction industry. The Project will also provide direct and indirect employment for its workers and suppliers, as well as for the transportation and construction industries.

2.4 Consideration of Alternatives

In the context of Environmental Assessment, 'alternatives' may include alternative locations for the development, alternative processing scenarios and transportation routes, alternative means of extraction, and alternatives to the development and operation schedule.

In Nova Scotia, there appears to be no shortage of rock. However, the location of suitable aggregate quality bedrock (or gravel deposits for that matter) is fixed. Access to these quality

resources is a critical consideration to quarry developers, and in some instances, to major development projects.

Because aggregates are a high bulk and low-cost commodity, the cost of transportation to market / end user can easily exceed the price of the aggregate thereby making the process uneconomical. Locating quarries adjacent to existing transportation infrastructure and within relatively close proximity to markets is critical to the success of any pit or quarry operation. Proximity and access to Highway 102 was one of the main reasons for selection of this Project. In addition, the proximity to Scotian Materials' existing asphalt and concrete plant, ensures a supply of aggregate for the long term.

The alternative methods for aggregate extraction are highly dependent on the raw material; that is: consolidated or unconsolidated material. Unconsolidated material is most often extracted using common construction equipment such as loaders and excavators. For consolidated material, the rock can be ripped or hammered (i.e., mechanical extraction) or it can be drilled and blasted. Ripping and hammering are only feasible for softer, more friable rock types which are not common aggregate resources. Drilling and blasting are required for hard rock resources. With respect to Project, mechanical extraction methods are not practical or feasible due to the nature and characteristics of the host rock (e.g., hard and dense). Therefore, there are no feasible alternatives to drilling and blasting as a means of extracting this material.

With respect to the processing of the blasted rock, there are no known alternatives to crushing. The configuration of screens and conveyors within the crushing spread can vary depending on the aggregate being produced. Scotian Materials will use crushers, screens, and conveyors to optimize and automate the operation to the extent practical.

Consideration of alternative Project access and transportation routes was given a cursory review. There are only two routes available—to the north of the Project from Aerotech Drive then Highway 102 via Exit 5A, and to the south of the Project down Perrin Drive, through Miller Lake West subdivision and on to Highway 118. There are several disadvantages to the latter option. Trucking through a residential area should be avoided whenever possible, and there would be considerable cost associated with upgrading approximately 2 km of Perrin Drive that would be required to accommodate truck traffic. As such, Scotian Materials has committed to ensuring all quarry related traffic access the Project from the north.

2.5 Physical Components of the Project

The proposed quarry will expand the existing 14.35 ha operation and include a quarry floor and working face, a laydown area for crushing equipment, overburden and aggregate stockpiles, a wash plant, weight scales, and one or more sedimentation ponds. Development will occur in four phases. The area designated for each phase includes the quarry footprint and associated work areas such as stockpile and laydown zones.

Surface runoff and quarry drainage will be managed using the existing water management infrastructure. For Phase 3, water collected on the quarry floor will be directed to existing sedimentation ponds, which can be expanded as needed. Phase 4 will be designed to provide sufficient area for water management infrastructure to be constructed, including a dedicated sedimentation pond.

During each phase, topsoil, grubbing material, and overburden will be stripped prior to drilling and blasting. These materials will be stored on-site for future use in progressive site restoration and stabilized with straw mulch where feasible to minimize erosion and sedimentation.

Portable crushing equipment will be used at the quarry and may be set up as a stationary installation on the quarry floor, positioned for long-term efficiency. Aggregate stockpiles will be placed within the available footprint, as space allows.

The crushing spread will consist of crushers, screens, conveyors, hoppers, and surge piles, all configured to efficiently process material into smaller size fractions suitable for construction-grade aggregates. The layout of the crushing and screening circuit will be determined by rock type and the required product mix and may be adjusted as needed.

All truck traffic associated with the quarry will enter and exit from the north via Aerotech Drive and Highway 102 (Exit 5A). No through traffic will be permitted south to Perrin Drive or through the Miller Lake West subdivision.

To the west, across Highway 102, lie several residential subdivisions in Fall River. Roughly 1.1 km southwest of the Project is a residential area known as the Miller Lake West subdivision. Directly south of the quarry property is Perrin Drive, which runs in a northeast–southwest direction. Most of Perrin Drive, between the quarry entrance and Miller Lake West, is not passable by automobile. Running parallel to the southern side of Perrin Drive is the Maritimes and Northeast Pipeline Halifax Lateral.

The Waverley Game Sanctuary and the Waverley Salmon River Long Lake Wilderness Area are located approximately 300 m and 1.2 km to the south and east of the Project, respectively.

Table 2.2 provides a summary of the number of residences within 1 km, 1.5 km, and 2 km of the Project. According to aerial imagery and the “Buildings” polygon shapefile layer downloaded from the Halifax Data, Mapping & Analytics Hub (Halifax Regional Municipality, 2026), the closest residential structure is located about 1.3 km to the southwest of the Project. A planar area threshold of 120 m² was used to roughly distinguish between residences and outbuildings (garages, etc.).

Table 2.2 Number of Residences in Proximity to the Project.

Distance from Quarry Boundary	Number of Residences
1 km	0
1.5 km	4
2 km	30 (approximate)

2.6 Site Preparation and Construction

Preparation and construction will involve clearing trees, grubbing (i.e., removal of stumps), stripping of topsoil, and removal of overburden. Topsoil and overburden will be stored on-site in designated areas located outside of active work zones. These storage areas will be stabilized with straw mulch, where practical, to minimize erosion and sedimentation and to preserve material for future restoration efforts.

Quarry drainage and surface runoff collection and controls are currently in place for the existing 18 ha quarry. Surface runoff and quarry drainage related to Project activities will be collected on the quarry floor and will initially drain to the current sedimentation pond. When required, an additional sedimentation pond will be constructed in Phase 4. The sedimentation ponds are designed for the water to be held until the concentration of Total Suspended Solids (TSS) complies with the NS Pit and Quarry Guidelines for effluent discharge (Nova Scotia Environment and Labour, 1999). The water will be gravity fed and will flow through a ditch where it will re-enter the natural environment.

Drilling and blasting activities will be carried out using industry-standard methods. All blasting operations will maintain appropriate separation distances from public highways, property boundaries, and watercourses, in accordance with provincial blasting regulations and the Pit and Quarry Guidelines (Nova Scotia Environment and Labour, 1999).

The fueling and vehicle maintenance area associated with the 3.99 ha quarry will be used also for this Project. Refueling will take place outside of all 30 m buffers from wetlands and watercourses. Fueling areas including mobile fueling will have spill response equipment available (appropriately sized spill kits, shovels, etc.) and maintained in conjunction with a spill response plan. Equipment operators will always remain with the equipment during refueling in accordance with the Petroleum Management Regulations of the Nova Scotia Environment Act.

There is no storage of dangerous goods, pipelines, port facility, or railway associated with the existing quarry, and none are proposed for this extension project.

Solid waste generated by the Project will be collected by an approved, licensed contractor and transported to a provincially approved waste disposal facility for appropriate reuse or disposal. On-site sewage is limited to portable washrooms/toilets at suitable locations on site, such as near the asphalt plant and near the office trailer. These units will be maintained and serviced regularly by licensed subcontractors in compliance with provincial regulations. All waste management activities will adhere to Nova Scotia Environment guidelines to minimize environmental impacts. There is an on-site septic system at the Maritime Fence site, which only services that building and will have no connections to the quarry expansion.

No new permanent buildings or warehouses are currently planned.

Power for on-site operations will continue to be supplied by diesel generators. These provide electricity for equipment, lighting, and the site office, as needed. Scotian Materials is in the permitting process to eventually transition from diesel power generation to a more sustainable grid-tied power supply.

Water use on-site will be minimal and sourced primarily from collected surface runoff and sedimentation ponds. This water may be used for dust suppression and washing aggregate. Temporary lighting will be used as necessary during low-light conditions and will be directed to minimize light pollution beyond the Project area.

2.7 Operation and Maintenance Details

The Project activities will be consistent with industry standard practices and will adhere to the *NS Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999). These guidelines apply to all pit and quarry operations in the province of Nova Scotia and include separation distances for operations, including blasting; liquid effluent discharge level limits; suspended particulate matter limits; sound level limits; and requirements for a restoration plan and security bond.

The Project is an expansion of the Scotian Materials existing 18 ha quarry. Aggregate production will begin with drilling and blasting. Drilling and blasting will be conducted by an independent licensed contractor who will be responsible for blast designs and methods in accordance with the *General Blasting Regulations* pursuant to the *Nova Scotia Occupational Health and Safety Act* (1996). Further, all blasting activity will be conducted in accordance with the *NS Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999), and blasts will be designed to meet the requirements for air concussion and vibrations as well as minimize the risk associated with flyrock. Blasting and noise level guidelines respecting the time of day and day of the week will be followed, and blast monitoring will be conducted for every blast event. It

is anticipated that blasting could occur four to six times a year however the frequency of blasting may change based on production requirements.

The topography within the proposed quarry area varies from approximately 125 masl in the northern section of Phase 4 to approximately 88 masl in the southern end of Phase 3. It is anticipated that Phase 3 will be extracted to a depth of 88 masl, and that Phase 4 will be extracted to 99 masl.

Blasted rock will be transferred from the working face to the crushing spread. The blasted rock will be loaded into the jaw crusher (primary crusher). From there, the material will be conveyed into another feeder bin and screened. From the screen, material will be conveyed to two separate cone crushers, depending on size. Beyond the primary crushing and screening phase, additional crushing and screening will depend on the size of the aggregate required to supply specifications of the contracts. All crushers will be equipped with dust suppression systems.

The material is re-circulated to the screen and will be crushed again until the required aggregate size is attained at which time the aggregate will be conveyed into various stockpiles. The various aggregate products will be stockpiled within the Project footprint until they are transported to local markets via tandem trucks or tractor trailer trucks.

The proposed quarry will operate five days a week, ten to twelve hours a day and eight to ten months a year, weather permitting. Based on the production rate and proposed operating schedule, the average number of loaded trucks hauling material from the quarry each day is expected to be 75. All quarry-related truck traffic will access the Project from the north via Aerotech Drive and Highway 102 exit 5A. There will be no through traffic from quarry related vehicles on Perrin Drive and vehicles will not travel south along Perrin Drive to the Miller Lake West subdivision.

The existing workforce at the Goffs Quarry will be used. The facility employs at least 10 to 12 direct employees throughout the year, with five to six additional secondary workers being employed by the blasting contractor for at least one week, four times a year. Additional secondary employment through trucking contractors is estimated to result in the employment of another 20 to 30 workers.

The production rates, hours of operation, traffic etc., will be consistent with the current operations. The existing controls will be implemented for this Project. The implementation and use of standard environmental controls and compliance with regulations will minimize any potential environmental damage to the area. Environmental controls such as diversion ditches, check dams, settling ponds, straw mulch and hydroseed will be used to control erosion and minimize sedimentation, as required. All operations will be carried out in a responsible manner to ensure regulatory thresholds and guidelines for noise, vibration, dust, and sediment are not exceeded.

2.7.1 Water Management

Surface water will be diverted around the Project to minimize the volume of water that may require treatment for suspended sediments. Erosion controls will be in place to ensure that Project runoff generated during operations is managed appropriately. Surface runoff will collect on the quarry floor and drainage ditches and will be conveyed to a sedimentation pond in the existing quarry. Water from the sedimentation ponds is used for washing aggregates as required.

Overflow, if any, will be monitored and sampled as per the terms and conditions of the Environmental Assessment Approval (once obtained) and the *Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999) to ensure TSS levels do not exceed effluent discharge limits prior to discharge into a watercourse or beyond the property boundaries:

- maximum suspended solids concentration in any grab sample – 50 mg/l; and,
- maximum monthly average suspended solids concentration – 25 mg/l.

The water collected within the quarry will be discharged back into the environment resulting in no consumptive water use at the site, with the exception of a minimal amount of water that may be absorbed on the aggregate.

During extraction, some amount of groundwater is expected to drain into the quarry, referred to herein as quarry seepage. As a part of the quarry water management system, water captured in the excavation and discharged from the sediment pond will be returned to the local environment, resulting in negligible changes to the annual water balance at the regional or watershed scale.

2.7.2 Air Emissions

Equipment exhaust and dust will represent the majority of air emissions from the Project. Emissions produced will include carbon monoxide, carbon dioxide, oxides of nitrogen, sulphur dioxide, and dust.

Combustion emissions will be generated from the operation of vehicles and equipment during Project activities. Given the scope of the planned operations, these emissions will be minimal, localized and similar in quantities to the operation of a small construction project using one or two pieces of heavy equipment. Emissions will be reduced with proper exhaust systems and through proper equipment maintenance and inspection practices. Consideration will be given to methods to reduce idling, as feasible.

Dust emissions will be generated throughout the Project during activities such as road use, overburden removal, blasting, crushing, and screening, material handling, truck loading and unloading, and wind erosion from storage piles. Mitigation of these emissions will involve several control measures including the application of water—sourced from pooled water on the

quarry floor or the sedimentation pond—on active work areas and haul roads. Additionally, laydown and work areas will be covered with blasted rock to minimize dust generation.

Dust generated by truck movement within the property boundary will be managed through a combination of speed control, proper truck loading, the use of dust suppressants, appropriate road construction, and other measures. Trucks transporting aggregate will be covered to reduce dust emissions during transport.

Monitoring of airborne particulate emissions (dust) will be conducted at the request of Nova Scotia Environment (NSE), in accordance with the Pit and Quarry Guidelines (Nova Scotia Environment and Labour, 1999) and the Nova Scotia *Air Quality Regulations*. Dust levels at the property boundaries will not exceed the following regulatory limits:

- Annual Geometric Mean: 70 µg/m³
- Daily Average (24-hour): 120 µg/m³

2.7.3 Noise Management

As per the *Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999), noise levels from quarry operations will be maintained at a level not to exceed the following sound levels (L_{eq}) at the property boundaries:

- 65 A-Weighted Decibels (dBA), 07:00-19:00 hours (Days);
- 60 dBA 19:00-23:00 hours (Evenings); and,
- 55 dBA 23:00-07:00 hours (Nights).

It is anticipated that blasting could occur four to six times a year; however, the frequency of blasting may change based on production requirements. Factors that influence air concussion and peak ground vibrations include the distance between the blast and the receptor, and the explosive weight per delay period during the blast. As per the Pit and Quarry Guidelines (Nova Scotia Environment and Labour, 1999), blasting is monitored for both air concussion and ground vibration. Blasting activities may not exceed the following:

- Concussion of 128 dBA within 7 m of the nearest structure located outside of the Property Boundary; and
- Ground vibration of 0.5 in/sec (12.5 mm/s) peak particle velocity measured at the nearest structure located outside of the Property Boundary.

2.7.4 Waste Management

Where the Project is an extension existing operation, there will be minimal additional solid waste generated from this Project. All solid waste will be properly collected and stored until such time that it can be transported to a provincially approved waste disposal facility.

The only Project-related hazardous materials anticipated will be those associated with the normal operation and maintenance of construction equipment. These substances include gasoline, diesel fuel, lubricants, and antifreeze liquid. No storage of such materials is anticipated, since all refueling and maintenance will be carried out on an as-needed basis in a designated area within the quarry by licenced contractors.

2.7.5 Accidents and Malfunctions

As discussed above, a designated fueling and vehicle maintenance area will be utilized for the Project. As a result, the on-site storage of gasoline, diesel fuel, lubricants, and antifreeze is not anticipated. In compliance with the *Petroleum Management Regulations* of the Nova Scotia Environment Act (NS 1994-95e), equipment operators will remain with their equipment at all times during refueling.

The following mitigation strategies will be implemented to avoid or minimize potential environmental effects from hazardous materials:

- Repairs and refuelling of equipment will not occur within 30 m of a watercourse or wetland.
- Used oil and filters will be removed from the Project for proper disposal and recycling. All refuelling activities will comply with the NS Petroleum Management Regulations (NS Reg. 44/202).
- Unforeseen events such as leaks, or spills will be responded to immediately and adequate spill response material will be available on-site.
- Spills will be reported to Nova Scotia Department of Environment and Climate Change (NSECC) in accordance with the *Emergency Spill Regulations* (NS Reg. 59/95) (NS 1995-95d).
- Contaminated materials resulting from a spill (i.e., absorbent material, soil) will be stored in an appropriate manner in a designated location until such time as it can be transported off-site for treatment or disposal at an approved facility.

2.8 Decommissioning and Restoration

Scotian Materials will implement a progressive rehabilitation program at the Goffs Quarry. Restoration activities will be guided by the intended end use of the land, which is designated as commercial/industrial, in accordance with a Master Plan developed by Scotian Materials for their properties in the area. All restoration efforts will align with the *Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999), ensuring they are consistent with regulatory standards and long-term land use planning.

As part of quarry development, extraction will continue to advance north to northwest toward the property boundary. The quarry floor will be sloped at a minimum of 0.5% to direct surface water runoff into sedimentation ponds. This pond is engineered to retain runoff until TSS reach

acceptable levels and will be scaled appropriately to accommodate changing site conditions throughout the life of the quarry.

Restoration will prioritize environmental protection and the restoration of natural habitat through the application of appropriate vegetation techniques that support ecological succession. Quarry faces in reclaimed areas will be backfilled at a 3:1 slope using overburden stockpiled during initial site stripping. Exposed bedrock will be capped with topsoil, and steep outcrops will be regraded to safe and stable slopes.

All disturbed areas will be treated with hydroseed and mulch, and native tree and shrub species will be planted where feasible. Re-vegetation and site stabilization will be carried out during suitable growing seasons to ensure success. Where stabilization is required before seasonal conditions permit, site-specific interim measures such as siltation fences, check dams, straw, and mulch will be used.

The maximum area exposed at any one time will vary depending on operational requirements and surface water management needs. As the quarry expands, overburden from newly developed areas will be repurposed for the restoration of previously quarried sections.

The reclamation will also include creation of an artificial lake at the location of the quarry pit. The main lake slopes will be formed by blasting, while the northern shoreline will be graded at 5:1 from the existing ground surface to 2 m below the waterline before dropping to full quarry depth. This slope will also extend 10 m above the planned water level to provide wildlife egress. Other quarry walls will remain as they are at closure, and the 9:1 pit access road will serve as a secondary egress route. Once flooded, the pit will provide aquatic habitat, with shoreline access for wildlife and added lake-bottom habitat created using unprocessed rock from shoreline construction.

3.0 ENVIRONMENTAL ASSESSMENT METHODOLOGY

The methodology for this EA follows a structured approach to identify and describe Valued Components (VC) of the existing environment and assess potential impacts of the proposed Project on the existing environment. A summary of the EA methodology is provided below.

3.1 Environmental Assessment in Nova Scotia

This EA Registration document has been prepared to meet the requirements of the Nova Scotia *Environmental Assessment Regulations*, made under Section 49 of the *Environment Act*.

The purpose of the EA Registration document is to:

- Describe the existing conditions of the Project site
- Provide a detailed description of the proposed undertaking (the Project).
- Assess potential effects of the Project on the existing environment.
- Outline proposed mitigation to avoid potential interactions or to reduce anticipated interactions to acceptable levels.

This EA methodology adheres to the following provincial guidance documents and additional information sources:

- *A proponent's guide to Environmental Assessment* (Nova Scotia Department of Environment and Climate Change, 2025)
- *Environmental Assessment Supplemental Checklist: Pits and Quarries*: (Nova Scotia Department of Environment and Climate Change, 2025)
- *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (Nova Scotia Environment and Labour, 2002).
- *Pit and quarry guidelines in Nova Scotia* (Nova Scotia Environment and Labour, 1999)
- *General Blasting Regulations made pursuant to the Nova Scotia Occupational Health and Safety Act* (Governor in Council of Nova Scotia, 1996)

3.2 Spatial and Temporal Boundaries

3.2.1 Temporal Boundaries

Temporal boundaries establish the timeframes within which the biophysical, social, and economic impacts of the Project are assessed. Temporal boundaries of assessment may reflect seasonal variations or life cycle requirements of biological VCs or forecasted trends for socioeconomic VCs.

The temporal boundaries of assessment for this EA include the construction, operation, and eventual decommissioning phases of the Project (Table 3.1).

Table 3.1 Temporal boundaries of assessment for the Project.

Project Phase	Timeframe
Construction	2026-2027
Operation	Beginning 2027, ending between 2052 and 2057
Decommissioning & Restoration	Between 2057 and 2082

3.2.2 Project Phases

The Project will be carried out over three main phases: Construction, Operations, and Decommissioning and Restoration. Table 3.2 summarizes the specific activities within each phase.

Table 3.2 Project phases and activities.

Project Phase	Activity
Construction	Vegetation clearing and grubbing
	Excavation & Grading
	Placement of staging areas
Operation	Aggregate extraction and processing (e.g., drilling, blasting, crushing, screening, and stockpiling)
	Operation of heavy equipment
	On-site transportation and hauling aggregate to stockpiles
	Dust suppression measures
	Equipment Maintenance
Decommissioning and Restoration	Environmental Monitoring
	Infrastructure decommissioning and removal
	Land recontouring (grading/shaping surfaces to create gentle slopes)
	Spreading topsoil, and revegetating
	Erosion control and other site restoration activities

3.2.3 Spatial Boundaries

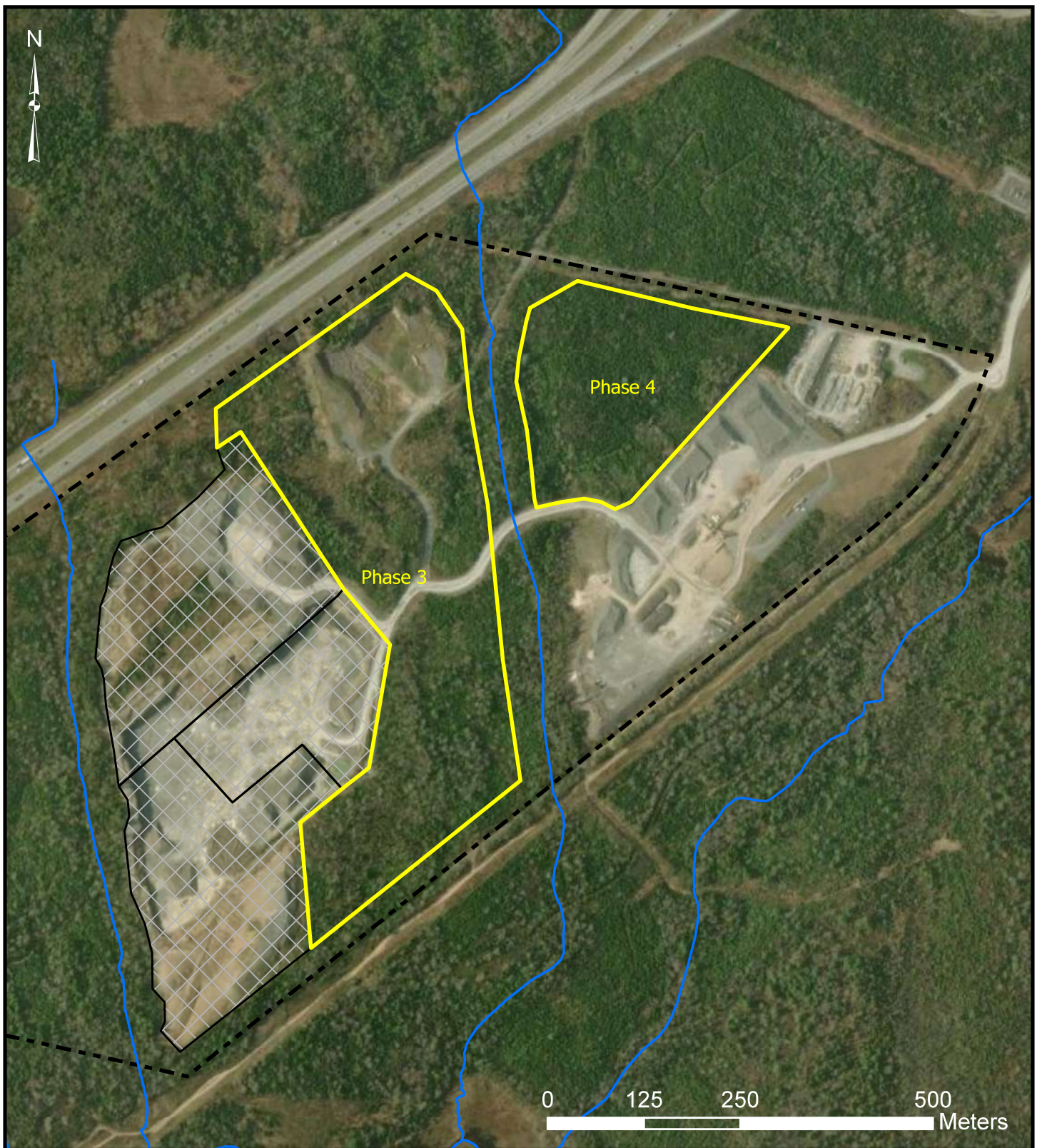
Spatial boundaries are defined to establish a study area for direct, indirect, and cumulative effects of a project on each Valued Component of the existing environment. These boundaries reflect the probable geographic extent of environmental effects, also referred to as the zone of influence for each VC.

The selection of spatial boundaries considers where Project activities will or are likely to interact with the existing environment. As such, boundaries are VC-specific and may differ depending on the nature and distribution of each VC, and potential impact pathways identified. In some cases, a spatial boundary can be applied to multiple VCs, when the impact pathways are similar.

Potential impacts of this Project on the existing environment are considered at three spatial scales, referred to here as the Project Development Area (PDA), the Local Assessment Area (LAA), and a Regional Assessment Area (RAA). These are described below.

3.2.3.1 Project Development Area (PDA)

The PDA is defined as the immediate Project Area where the proposed development activities will occur. It serves as the primary focus for assessing direct impact pathways associated with the Project. For this project, the PDA includes only the proposed 23.2 ha Phase 3 and 4 expansions (Figure 3.1). The original quarry area (3.99 ha) and the previous Phase 1 and 2 expansions (14.35 ha), are not considered part of the PDA for this registration.



Legend:

 Existing Phases

 Property Boundary (PID 00505941)

 Project Development Area (PDA)

 Watercourses (NSHN)

Note:

1. Coordinate system: NAD83 CRS UTM Zone 20.
2. Aerial Imagery Retrieved from: ESRI World Imagery

Project: Goffs Quarry
Phase 3 & 4 Expansion
Goffs, Nova Scotia

Drawing: Project Development Area (PDA)

Client: Scotian Materials Ltd.

Drawn by: JC
Checked by: SG
Date: November 2025

Project Number: 103269.002

Drawing Number: Figure 3.1

Revision No. 2



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3.2.3.2 Local Assessment Areas (LAA)

The LAA is generally defined as the maximum spatial extent of measurable or predictable project-related impacts on the existing environment and used to assess both direct and indirect effects within the PDA and surrounding areas.

The LAA varies between individual VCs depending on local conditions and specific impact pathways. However, for ecological components—Valued Components associated with habitats and organisms—a generalized LAA was developed as a consistent study area across ecological disciplines.

This generalized ecological LAA was based on drainage basins surrounding the PDA. The drainage area from a point downstream of the PDA at the inlet to Soldier Lake was generated based on a LiDAR-derived digital elevation model (DEM) using the modelling software *Personal Computer Storm Water Management Model* (PCSWMM). Rather than defining an LAA arbitrarily based on a radius or buffer, this LAA represents natural topographical boundaries within which off-site effects might be anticipated, such as those associated with runoff and erosion. It is acknowledged that individual ecological VCs (e.g., birds, wildlife, vegetation) may experience indirect effects at different spatial scales; however, in the interest of a simplified effects assessment, drainage basins were considered a reasonable spatial limit for off-site effects on ecosystems. The extent of the Ecological LAA for this project is an area of approximately 604 ha surrounding and including the PDA (Figure 3.2).

Table 3.3 summarizes the spatial boundaries for all Valued Components identified.



Legend:

- Local Assessment Area (LAA)
 Existing Phases

- Property Boundary (PID 00505941)
 Project Development Area (PDA)

Note:
 1. Coordinate system: NAD83 CRS UTM Zone 20.
 2. Aerial Imagery Retrieved from: ESRI World Imagery

Project:
 Goffs Quarry
 Phase 3 & 4 Expansion
 Goffs, Nova Scotia

Drawing:
 Local Assessment Area (LAA)
 for Ecological Valued Components

Client:
 Scotian Materials Ltd.

Drawn by: JC
 Checked by: SG
 Date: November 2025

Project Number:
 103269.002

Drawing Number:
 Figure 3.2

Revision No.
 1



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3.2.3.3 Regional Assessment Area (RAA)

The RAA is established to describe broader regional context for the Project. This area represents the zone where Project impacts may overlap or interact with the environmental effects of past, present, or reasonably foreseeable projects and activities, creating the potential for cumulative environmental effects.

The RAA will be defined below for each VC. However, for terrestrial ecological components and wetlands it was decided that the EcoSections overlapping the PDA would provide the most meaningful RAA for consideration of implications of the Project on the broader ecological landscape (Figure 4.8). These EcoSections are all within the Eastern Interior EcoDistrict (EcoDistrict 440), of the Eastern EcoRegion (EcoRegion 400).

For Surface Water Resources and Fish and Fish Habitat, the Nova Scotia Tertiary Watershed 1DG-1-GG, a subwatershed of the Shubenacadie River basin, was used as an RAA.

For abiotic (e.g., Air Quality, Groundwater) and socioeconomic VCs (including Transportation, etc.), RAAs for the Goffs Quarry Expansion Project were defined using existing regional administrative boundaries—such as Halifax Regional Municipality—or through VC-specific buffers around the Project site, reflecting potential impact pathways (e.g., fugitive dust dispersion, traffic flow changes).

Table 3.3 Spatial Boundaries for each Valued Component (VC).

Valued Component	Local Assessment Area (LAA)	Regional Assessment Area (RAA)
Atmospheric Environment	5 km radius around site	Nova Scotia Central Air Zone
Climate Change	5 km radius	Nova Scotia Central Air Zone
Acoustic Environment	1 km radius	5 km radius
Geology	Estimated Radius of Influence for Groundwater	Halifax Quartzite Barrens (region #413a)
Hydrogeology (groundwater)	Estimated Radius of Influence	NS Tertiary Watershed 1DG-1-GG
Surface Water Hydrology	Drainage upstream of Soldier Lake (Same as Ecological LAA)	NS Tertiary Watershed 1DG-1-GG
Ecological Land Classification	Ecological LAA (Figure)	Ecological RAA (EcoSection-based, Figure 4.8)
Vegetation and Rare Plants	Ecological LAA	Ecological RAA
Wetlands	Ecological LAA	Ecological RAA
Fish and Fish Habitat	Ecological LAA	NS Tertiary Watershed 1DG-1-GG (Figure 4.4)
Avifauna	Ecological LAA	Ecological RAA
Wildlife (non-avian)	Ecological LAA	Ecological RAA
Species at Risk	Ecological LAA	Ecological RAA
Managed and Significant Areas	Ecological LAA	Ecological RAA
Cultural and Heritage Resources	Entire Quarry Property	Halifax Quartzite Barrens (region #413a)
Community and Local Economy	5 km radius	Halifax Regional Municipality
Public Health and Safety	5 km radius	Halifax Regional Municipality
Transportation and Infrastructure	5 km radius	Halifax Regional Municipality
Land and Resource Use	5 km radius	Halifax Regional Municipality
Recreation and Tourism	5 km radius	Halifax Regional Municipality

3.3 Identification of Valued Components

Valued Components (VC) of the existing environment include physical and ecological features (biophysical), and socioeconomic conditions that could be affected by the Project. The methodology outlined below describes the systematic approach used to determine VCs.

A VC list was initially compiled as a desktop exercise using available information on biophysical conditions (e.g., wetlands and watercourse mapping), as well as standard components typically required for EA in Nova Scotia (e.g., heritage and archaeological resources). VC lists are often refined during the EA process, as existing conditions are verified in the field; however, the VC list for this project remained unchanged. Selection of a given VC considers not only the presence of a biophysical or socioeconomic component within the assessment areas, but also whether a potential Impact Pathway exists.

For Goffs Quarry Expansion Project, the following VCs were considered in this Environmental Assessment:

- | | |
|---|---|
| • Atmospheric Environment (Air Quality) | • Avifauna |
| • Climate Change | • Wildlife (non-avian) |
| • Acoustic Environment (noise) | • Species at Risk |
| • Geology | • Managed and Significant Areas |
| • Hydrogeology (groundwater) | • Cultural and Heritage Resources (archaeology) |
| • Surface Water Hydrology | • Community and Local Economy |
| • Ecological Land Classification | • Public Health and Safety |
| • Vegetation and Rare Plants | • Transportation and Infrastructure |
| • Wetlands | • Land and Resource Use |
| • Fish and Fish Habitat | • Recreation and Tourism |

A summary of physical, ecological, and socioeconomic VCs and their potential interaction with Project activities is presented in Table 3.4. A checkmark in the table indicates that a potential interaction (impact pathway) between the Project activity and a particular VC was identified, however unlikely.

Table 3.4 Project interactions and VC screening table.

	Physical VCs						Ecological VCs						Socioeconomic VCs						
	Local Atmospheric Environment	Climate Change	Acoustic Environment	Geology	Groundwater	Surface Water Resources	Vegetation and Rare Plants	Wetlands	Fish and Fish Habitat	Avifauna	Wildlife (non-avian)	Species at Risk	Managed and Significant Areas	Cultural and Heritage Resources	Community and Local Economy	Public Health and Safety	Transportation and Infrastructure	Land and Resource Use	Recreation and Tourism
Site Preparation and Construction	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓				✓	
	✓		✓	✓		✓		✓	✓	✓	✓	✓		✓				✓	
	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓				✓	
	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓				✓	
Operation																			
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Decommissioning	✓	✓	✓							✓	✓	✓							
	✓	✓	✓			✓				✓	✓	✓							
	✓	✓	✓			✓				✓	✓	✓						✓	✓
	✓	✓	✓			✓				✓	✓	✓							
Malfunctions and Unplanned Events						✓	✓	✓	✓										
	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
						✓													
	✓				✓	✓	✓	✓	✓	✓	✓	✓							

3.4 Characterizing Existing Conditions

A suite of field and desktop studies were completed to characterize the existing environment, while delineating environmental features within the PDA.

Desktop assessments of existing information included a variety of public mapping resources (e.g., [GeoNOVA](#) geographic datasets), satellite imagery, historic records, and previous studies. A data report was acquired from the Atlantic Canada Conservation Data Centre (ACCDC) for a 5 km radius around the Project site. The ACCDC report provides the location of recorded flora and fauna Species at Risk (SAR) or Species of Conservation Concern (SOCC), the presence or absence of any location sensitive species, and the location and information on managed and significant areas. The ACCDC report (No. 8690) is provided in Appendix A.

Field surveys were conducted for VCs that could be adequately described based solely on existing information and to ground-truth desktop information (e.g., habitat boundaries).

Table 3.5 below lists the desktop and field studies completed for this EA

Table 3.5 Summary of Desktop and Field Studies completed for this EA.

Valued Component (VC)	Dates	Details
Local Atmospheric Environment; Climate Change	Fall 2025	<ul style="list-style-type: none"> • Desktop Review (qualitative) • Desktop Review of GHG sources and sinks
Acoustic Environment	Fall 2025	<ul style="list-style-type: none"> • Desktop Review (qualitative)
Geology & Hydrogeology	Summer-Fall 2025	<ul style="list-style-type: none"> • Desktop Review of geological conditions • Drilling and well Installations for Phase 3 and 4 • Hydraulic Testing of new wells and analysis of collected data • Estimate of quarry dewatering and radius of influence for impacted groundwater table. • Assessment of potential project impacts based on previous groundwater monitoring of existing quarry.
Surface Water Hydrology	Spring-Fall 2025	<ul style="list-style-type: none"> • Preliminary Lidar-based predictive drainage mapping. • Field verification of watercourse locations • Stream water flow and water quality monitoring
Managed and Significant Areas	Fall 2025	<ul style="list-style-type: none"> • Desktop review of available spatial datasets on protected areas, etc. • ACCDC report also included managed and significant areas
Ecological Land Classification & Vegetation Communities	Spring & Summer 2025	<ul style="list-style-type: none"> • Preliminary desktop habitat mapping (stands, mapped wetlands, watercourses, etc.) • Field verification of vegetation communities, habitat structure, wetlands & watercourses.
Vegetation & Lichens	Spring & Summer 2025	<ul style="list-style-type: none"> • Basic field characterization of plant communities and incidental plant observations by GEMTEC (2025) • *note: vascular plant inventory survey for entire project area included in previous EA (2017) • Lichen survey (spring 2025)

Fish & Fish Habitat	Summer 2025	<ul style="list-style-type: none"> • Fish Habitat Assessment • <i>In situ</i> water quality (YSI multimeter) • Qualitative backpack electrofishing
Wetlands	September 2025	<ul style="list-style-type: none"> • Delineation and Functional Assessments (WESP) of directly impacted wetlands; desktop review of previous delineation and assessment for Wetland 8.
Birds	June-October 2025	<ul style="list-style-type: none"> • Breeding Bird Point Counts (8-10 points). • Nightjar Survey (2-3 locations) • Bird species presence; habitat characterization. • Passage (spring/fall) & stopover (fall) migration • Incidental visual observations.
Other Wildlife (non-avian)	Summer-Fall 2025	<ul style="list-style-type: none"> • Incidental Observations of Wildlife Species and Signs • Desktop review of available information.
Species at Risk	Spring-Fall 2025	<ul style="list-style-type: none"> • ACCDC data report for area. • Field surveys for lichens and birds, incidental observations of vascular plants in addition to general plant community characterization • Desktop review of habitats and rare species in the area.
Heritage & Archaeological Resources	2013*	<ul style="list-style-type: none"> • Archaeological Resource Impact Assessment (ARIA) by Davis MacIntyre and Associates Ltd. (DMA) within entire property boundary and some surrounding areas. Included Preliminary Desktop Review and Pedestrian Survey (walkover).
Socioeconomic Environment	Fall 2025	<ul style="list-style-type: none"> • Desktop Review and Field Observations: <ul style="list-style-type: none"> ○ Community & Local Economy ○ Cultural and Heritage Resources ○ Public Health and Safety ○ Transportation and Infrastructure ○ Land and Resource Use ○ Recreation and Tourism

3.5 Effects Assessment Methodology

Potential effects of the Project on the existing environment have been identified and are discussed herein. Where potential effects are anticipated, proposed mitigation is presented, and potential residual effects are identified. The potential for cumulative effects – that is, mechanisms by which the Project could contribute to (or even offset) the impacts of existing stressors on the environment – are then considered. This methodology is described in the following sections.

3.5.1 Identification of Impact Pathways

The potential impact pathways for each VC identified by overlaying the detailed project description (physical components, spatial arrangement, and project development schedule) with baseline information gathered on the existing environment to establish pathways of potential direct and indirect effects that could lead to environmental, social, or economic impacts.

Direct impacts refer to the immediate and measurable effects of project activities on the environment, occurring as a direct result of the Project activities. These impacts are typically predictable and occur at the same time and place as the activity. For example, installation of cofferdams can directly alter water flow patterns, potentially impacting aquatic organisms and sediment transport within the immediate construction area. Generally, direct impacts are confined to the PDA but may extend into the LAA in cases of accidental events such as fires, spills, or erosion.

Indirect impacts are the secondary effects that result from direct impacts and may develop over time or across a broader area. These impacts are not always immediately apparent. For example, a potential change in hydrology from the diversion channel construction could alter natural groundwater recharge patterns, potentially affecting nearby wetlands or water sources over time. Indirect impacts can occur at various scales but are typically associated with the LAA and RAA.

3.5.2 Effects Assessment Criteria

For each impact pathway identified, the potential effect was assessed based on a standard set of criteria: magnitude, duration, frequency, extent, reversibility, and likelihood. This EA Registration does not use any sort of rating system to assign a 'significance' value to the effects identified. Rather, the aim was to describe the predicted effects as clearly as possible, outline a proposed mitigation strategy, and identify any residual effects anticipated following mitigation.

As an additional nuance, because this project represents an expansion of an existing quarry with no planned increase in total production, the evaluation of potential effects considered the likelihood of net changes from current conditions. For example, while the expansion will reduce the overall area of terrestrial habitat on site, the net impact on local traffic is expected to be negligible.

Table 3.6 Effects assessment criteria, definition, and rating system.

Criteria	Definition	Rating
Magnitude	The intensity or degree of change caused by the impact pathway relative to the baseline condition, ranging from negligible to high severity.	<p>This will vary across VCs.</p> <p>Negligible - no detectable effect that would result in changes from current conditions (i.e., no net change from present).</p> <p>Low – minor but detectable effects on the environment, often reversible and easily managed with standard mitigation measures.</p> <p>Medium – Moderate impacts that are more noticeable and extend over a larger area or time, requiring specific mitigation strategies but typically manageable.</p> <p>High- Significant, widespread, and often irreversible impacts causing long-term environmental damage, potentially requiring extensive or complex mitigation efforts.</p>
Duration	The length of time over which the impact is expected to occur, categorized as short-term, medium-term, or long-term.	<p>Short Term – residual effect restricted to no more than the duration of the construction phase</p> <p>Medium Term – residual effect extends through the operation and maintenance phase</p> <p>Long Term - residual effect extends beyond the decommissioning phase</p>
Frequency	How often an environmental effect will likely occur.	<p>Once – Occurs once during The Project</p> <p>Sporadic – Occurs sporadically during The Project</p> <p>Regular – Occurs on a regular basis throughout The Project</p> <p>Continuous – Occurs repeatedly throughout The Project</p>
Extent	The geographical area affected by the impact, ranging from direct (PDA) to localized (LAA) or regional (RAA).	<p>PDA – residual effects are restricted to the PDA</p> <p>LAA – residual effects extend into the local assessment area</p>

		RAA – residual effects interact with those of projects in the regional assessment area
Reversibility	The potential for the affected environment to return to its pre-impact condition after the impact has occurred, classified as reversible or irreversible.	<p>Reversible – the impact from project activities is likely to be reversed after the activity is completed</p> <p>Irreversible – impact from project activities is unlikely to be reversed</p>
Likelihood	The degree of probability that a predicted effect will materialize, given the current understanding of The Project, conditions, and influencing factors	<p>Unlikely – Impact is improbable</p> <p>Possible – moderate chance of occurrence</p> <p>Likely – Strong probability of occurrence</p> <p>Almost Certain - Impact is expected to occur</p>

3.5.3 Mitigation and Monitoring

Mitigation is proposed to minimize or eliminate potential environmental effects for each identified impact pathway.

Where there is a heightened potential for residual effects, concern regarding the severity of impacts, or uncertainty around the effectiveness of mitigation, monitoring may also be recommended. Monitoring helps validate EA predictions, verify the effectiveness of mitigation strategies, and determine whether additional measures are needed. Monitoring is also often a regulatory requirement or standard practice for valued components, when a potential or actual pathway exists (e.g., wetland impacts).

3.5.4 Identification of Residual Effects

For each valued component (VC), potential impact pathways were identified, and an effects assessment was conducted to evaluate potential residual effects after mitigation. Residual effects are defined as changes from existing conditions that may persist even with mitigation in place.

3.5.5 Cumulative Effects Assessment

The Impact Assessment Agency of Canada (IAAC) defines *cumulative effects* as “the combined effects from past, present, and reasonably foreseeable future activities and natural processes” (Impact Assessment Agency of Canada, 2025). For this project, the potential for cumulative effects was assessed for each identified VC at the RAA scale. The RAA for each VC was defined based on the spatial scale at which cumulative effects could be reasonably anticipated.

The provincial approach emphasizes the identification of other similar or related projects and activities within the surrounding area that could contribute to overlapping effects on VCs.

The relative importance of cumulative effects was determined using similar criteria to those used for individual project impacts. These criteria often reflect socially perceived thresholds, such as the acceptable geographic extent of an effect in relation to the amount of available land or habitat within a particular area. This helps gauge whether the combined impact of the Project and other activities may exceed what is considered acceptable or sustainable for the region.

The goal of the cumulative effects assessment for this project is to identify past (i.e., residual effects of historical stressors), present, and future environmental stressors and evaluate whether the Project could exacerbate their effects.

The interaction of multiple stressors can produce a cumulative effect that is additive (incremental) or synergistic, where the combined impact of multiple stressors is more severe than the sum of the individual effects (Impact Assessment Agency of Canada, 2025). Conversely, depending on factors like magnitude of the additional stressor and specific mechanisms of impact, the combined impact of multiple stressors may be no greater than the existing effects of other stressors.

Although some EA practitioners reserve the term “cumulative effects” for synergistic interactions or “emergent” effects, the inclusion of additive project contributions to broader environmental change is consistent with established Canadian EA practice and federal cumulative effects guidance. Moreover, consideration of simple additive contributions to local and regional patterns is typically a precursor to the assessment of potential mechanistic interactions, nonlinear responses, or environmental threshold exceedances.

In some cases, masking can occur, where the effects of other activities (e.g., land uses) are so substantial that the additional effects of the Project become negligible or undetectable. However, it should be noted that a masked effect may become significant if the original stressor is removed. In other situations, the interaction of multiple physical activities can produce a compensatory effect, where individual impacts offset each other, resulting in no measurable change, or even a net positive environmental outcome.

Naturally occurring factors that influence VCs (e.g., predation, wildfire, weather) were generally not considered in the cumulative effects assessment.

4.0 EXISTING ENVIRONMENT AND EFFECTS ASSESSMENT

A concise structure was used for this EA Registration document, wherein the effects assessment for each VC is provided immediately after the description of existing conditions. In this way, reviewers can efficiently review the existing conditions and effects assessment for their VCs of interest within a single section. Section 4.5 synthesizes mitigation and any residual effects for all VCs. This is followed by Section 6.0, which considers potential cumulative effects across the landscape. Cumulative effects are only considered if a potential residual effect (post mitigation) was identified.

4.1 Physical Environment

4.1.1 Atmospheric Environment

The Atmospheric Environment VC pertains to local air quality, and considers how particulate (i.e., dust) and other air emissions from the Project could affect existing air quality within the spatial boundaries of assessment. Greenhouse gas emissions and climate change considerations are discussed in the following section (Section 4.1.2). Note, vibration and blasting impacts are considered within the Land and Resource Use VC (Section 4.3.5), in accordance with the Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia (Government of Nova Scotia, 2009).

4.1.1.1 Methodology

4.1.1.1.1 Spatial Boundaries

The PDA described in Section 3.2.3 is applicable for the local Atmospheric Environment VC. A 5 km radius around the Project site was established as a Local Assessment Area (LAA), which was thought to be an appropriate maximum extent of potential off-site effects of the Project, in terms of dust, and vehicle and equipment emissions that could impact local air quality.

The RAA for this VC is defined as the NS Central Air zone, described in Section 4.1.1.2.

4.1.1.2 Existing Conditions

4.1.1.2.1 Local Climate

The climate around the Goffs Quarry exhibits characteristics typical of northeastern Nova Scotia's maritime-influenced continental climate. Winters are cold and summers are warm, though coastal influences from the nearby Atlantic Ocean and St. Margaret's Bay help moderate temperature extremes resulting in somewhat milder winters and cooler spells during summer.

According to the Köppen-Geiger climate classification, the Goffs region has a humid continental climate (Dfb) – characterized by cold winters, warm summers, and no distinct dry season (Beck, et al., 2023).

Environment and Climate Change Canada (ECCC) has meteorological stations located at Halifax Stanfield International Airport that provide thirty-year climate normals (1991-2020) for the region and is presented in Figure 4.1. The meteorological station information is summarized in Table 4.1 below. The meteorological stations are located approximately 3 km northwest of the PDA.

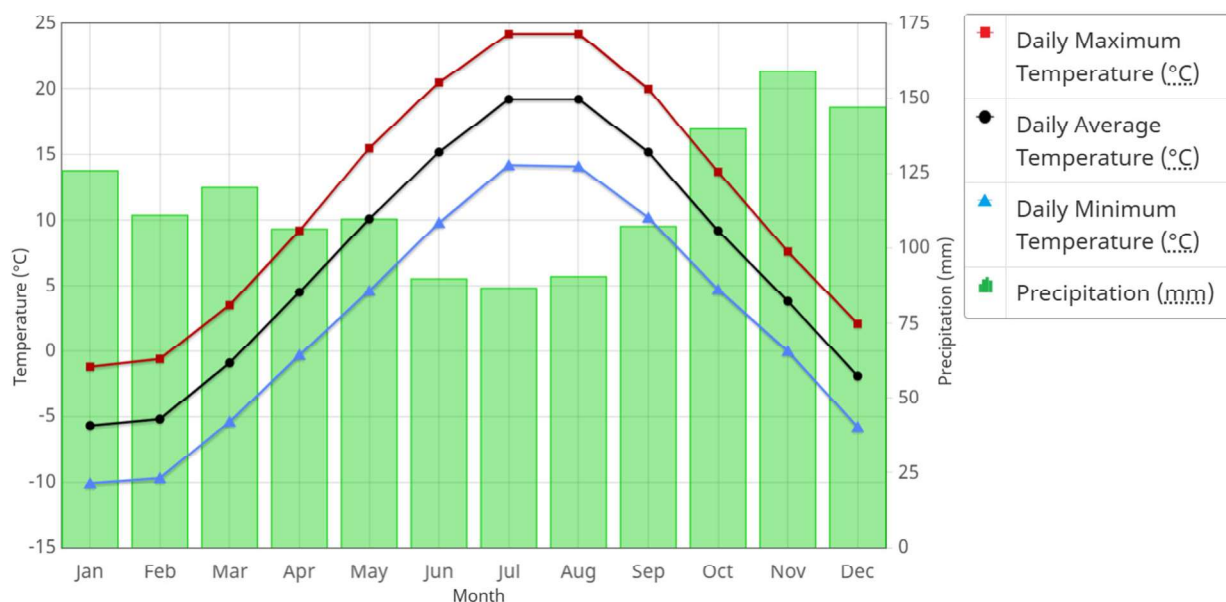


Figure 4.1 Temperature and precipitation normals for Halifax, based on ECCC data from 1991-2020.

Table 4.1 Composite meteorological station information.

Station Name	Climate ID	WMO ID	TC ID	Latitude	Longitude	Elevation (m)
HALIFAX STANFIELD INT'L A	8202251	71395	YHZ	44°52'52.00" N	63°30'31.00" W	145.4
HALIFAX STANFIELD INT'L A	8202250	71395	YHZ	44°52'48.06" N	63°30'00.05" W	145.4

The Canadian Climate Normals for the Halifax Stanfield International Airport Region are summarized in Table 4.2. July and August are the warmest months and January and February are the coldest months. The mean annual temperature is approximately 6.9°C and ranges from -5.7°C (January) to 19.2°C (July, August). The mean annual precipitation for the area is 1,393.3

mm with the greatest amount of rainfall typically in November with 159.1 mm and the least amount of rainfall in February with 70.7 mm. The greatest amount of snowfall is typically in January with 53.9 mm.

Table 4.2 Climate Normals (1991-2020) at Halifax Stanfield International Airport station.

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (°C)	-5.7	-5.2	-0.9	4.5	10.1	15.2	19.2	19.2	15.2	9.2	3.8	-1.9	6.9
Rainfall (mm)	78.6	70.7	89.0	90.4	108.2	89.8	86.7	90.5	107.3	139.2	145.4	106.8	1,202.4
Snowfall (mm)	53.9	44.3	34.4	16.6	2.1	0.0	0.0	0.0	0.0	0.6	19.4	44.1	215.2
Precipitation (mm)	125.9	111.0	120.2	106.4	109.7	89.8	86.7	90.5	107.3	139.8	159.1	146.9	1,393.3

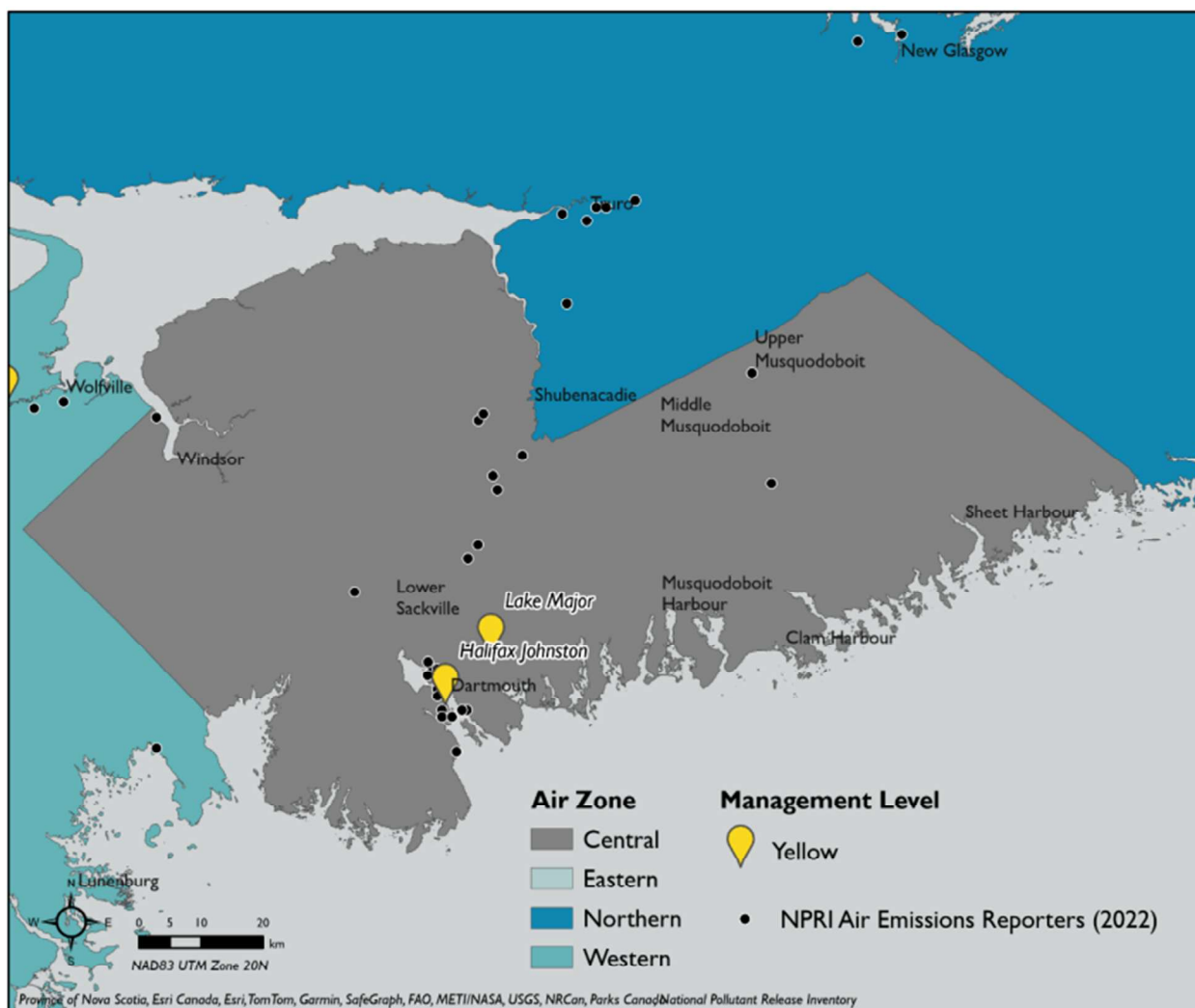
Table Note: Data are sourced from Environment and Climate Change Canada's 1991 to 2020 *Canadian Climate Normals*. The 'Annual' column represents the annual average for temperature and annual totals for rainfall, snowfall, and total precipitation.

4.1.1.2.2 Air Quality

Nova Scotia is divided into four "air zones". The Study Area lies within the Central Air Zone, which encompasses Halifax and Goffs. This zone includes both urban centers like Halifax and suburban or rural areas, resulting in a wide range of air emission sources. Key contributors in this zone include transportation-related emissions from vehicles and ships, residential heating, and industrial activity.

Ambient air quality is monitored in Nova Scotia with a network of stations operated by NSECC and ECCC (i.e., National Air Pollution Surveillance [NAPS] network). The Canadian Council of Ministers of the Environment (CCME) developed the Canadian Ambient Air Quality Standards (CAAQS) as part of the Air Quality Management System (AQMS). These standards apply to key pollutants, including nitrogen dioxide (NO₂), sulfur dioxide (SO₂), fine particulate matter (PM_{2.5}), and ozone (O₃) (Canadian Council of Ministers of the Environment, 2023).

To help the public understand air quality and its health impacts, the Air Quality Health Index (AQHI) was developed by public and environmental health specialists. This scale ranges from 1 to 10+, indicating risk levels as follows: Low (1–3), Moderate (4–6), High (7–10), and Very High (10+). The AQHI is calculated based on the combined risks of common air pollutants, including ozone (O₃), particulate matter (PM_{2.5}/PM₁₀), and nitrogen dioxide (NO₂) (Environment and Climate Change Canada, 2024).



Note: Sourced from (Department of Environment and Climate Change, 2024)

Figure 4.2 Locations of ambient air monitoring stations in the central air zone.

The closest air quality monitoring station to the Project is the Lake Major station located north of Cherry Brook Road in Cherry Brook, NS which is operated by NSECC. The Lake Major station is located roughly 15 km southeast of the Project in a rural setting, with another active quarry situated about 3.5 km to the west of the station. As such, this station is considered representative of the area surrounding the Project. In 2022, the monitored data at the Lake Major station ranged as follows:

A summary of the air quality results, the Nova Scotia objectives and the CAAQS are listed in Table 4.3 below.

Table 4.3 Nova Scotia Air Quality Objectives and Standards and CCME CAAQS.

Pollutant	Type of Objective	Calculated Statistic	Objective	2022 Results for Lake Major
Carbon Monoxide	Provincial	1-hour average	30 ppm	N/A
		8-hour average	11 ppm	
Fine Particulate Matter (PM_{2.5})	CAAQS	3-year average of daily maximum 24-hour average	27 µg/m ³	10 µg/m ³
		3-year annual average	8.8 µg/m ³	4.6 µg/m ³
Ground Level Ozone	CAAQS (2020) CAAQS (2025)	3-year average of 4th worst daily 8-hour maximum	62 ppb	54 ppb
		3-year average of 4th worst daily 8-hour maximum	60 ppb	
Hydrogen Sulphide	Provincial	1 hour average	3 ppb	N/A
		24-hour average	0.6 ppb	
Nitrogen Dioxide	Provincial	1 hour average	21 ppb	18 ppb
		24-hour average	5 ppb	N/A
		Annual average	23 ppb	1 ppb
	CAAQS (2020)	3-year average of 98th percentile daily 1 hour maximum	60 ppb	N/A
		Annual Average	17 ppb	
	CAAQS (2025)	3-year average of 98th percentile daily 1 hour maximum	42 ppb	N/A
Sulphur Dioxide	Provincial	Annual Average	12 ppb	
		1 hour average	34 ppb	5 ppb
		24-hour average	11 ppb	N/A
	CAAQS (2020)	Annual Average	2 ppb	0.2 ppb
		3-year average of 99th percentile daily 1 hour maximum	70 ppb	N/A
	CAAQS (2025)	Annual Average	5 ppb	
		3-year average of 99th percentile daily 1 hour maximum	65 ppb	N/A
		Annual Average	4 ppb	

Total Suspended Particulate	Provincial	24-hour average Annual Average	120 µg/m ³ 70 µg/m ³	N/A
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Table Note: Table sourced from (Department of Environment and Climate Change, 2003). CAAQS refers to the Canadian Ambient Air Quality Standards. Units are defined as ppm (parts per million), µg/m³ (micrograms per cubic metre), and ppb (parts per billion).

4.1.1.3 Effects Assessment

The potential for project impacts on local air quality is considered for each project phase. Impact pathways are identified below, along with proposed mitigation, followed by an assessment of the possible residual effects after proposed mitigation is applied.

4.1.1.3.1 Impact Pathways

There is a potential interaction with air quality during all Project phases. Dust and particulate can be emitted from quarrying activities such as blasting, rock drilling, crushing, stockpiling material, truck travel on unpaved roads, and other on-site routine operations.

For the purposes of this assessment, potential impacts to air quality are evaluated against the *Air Quality Regulations* under Sections 25 and 112 of the Nova Scotia *Environment Act*, which establish limits for ground-level concentrations of total suspended particulates. In accordance with the Pit and Quarry Guidelines (Nova Scotia Environment and Labour, 1999), the Proponent will ensure that particulate concentrations at identified receptors remain within these regulatory limits. Air quality conditions associated with the Project are expected to be consistent with current emissions at the existing site.

There is potential to generate fugitive dust from any soil moving or disturbing activities, and from general operation of vehicles and equipment around unpaved areas of the site. There will also be emissions generated from heavy equipment, vehicles and generators including combustion gasses such as CO₂, CO, NO_x, volatile organic compounds (VOCs), and particulate.

Unmitigated, these emissions could affect nearby human receptors by disrupting daily activities, posing potential health risks, and contributing to the degradation of local water quality and vegetation and aquatic habitat through particulate deposition.

It is important to note that there is not expected to be an increase in quarrying activities from current operations since the intention of the expansion is to extend the life of the project, not to increase material output. As such, air quality related impacts are not anticipated to change from current levels.

4.1.1.3.2 Mitigation

The Project has been designed with mitigation measures aimed at reducing or eliminating potential effects on local air quality and atmospheric conditions. These measures are aligned with applicable regulatory requirements and environmental guidelines.

Industry standards and best practices will be implemented throughout all phases of the Project to minimize impacts on air quality. These include, but are not limited to, the *Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999), as well as the project-specific blasting procedures, *Safe Operating Procedures for Drilling, Loading & Blasting* plan (Scotian Materials Ltd. and Dyno Nobel Canada Inc., 2018). Although the objectives of these guidance documents are broad, adherence to them will certainly contribute to minimizing local atmospheric effects.

All project works associated with site preparation and construction will be in accordance with the provincial *Air Quality Regulation* under the *Clean Air Act* as well as the CCME CAAQS (Canadian Council of Ministers of the Environment, 2023).

A minimum separation distance of 800 m is required between quarry operations and the foundation or base of any off-site structure (Nova Scotia Environment and Labour, 1999). Other setbacks are stipulated in the *Pit and Quarry Guidelines*, but the 800 m setback for structures is most applicable to minimising off-site impacts of particulate and other air emissions. Structures include, but are not limited to, private homes, cottages, apartment buildings, schools, churches, commercial buildings, hospitals, nursing homes, industrial buildings or structures, and treatment facilities associated with municipal sewage, industrial processes, or landfill effluent.

A summary of the proposed mitigation strategies, organized by impact pathway, is provided in Table 4.4 below.

Table 4.4 Potential impact pathways and proposed mitigation for the local Atmospheric Environment.

Impact Pathway	Project Phase	Mitigation
Fugitive dust from vehicle movement and soil disturbance can decrease local air quality.	Construction Operation Decommissioning & Restoration	<ul style="list-style-type: none"> • Apply water or approved dust suppressant during dry, windy, or high-activity periods. • Source water from on-site collection or bring in by water truck. • Maintain vegetated buffer zones between the quarry and property boundaries. • Follow appropriate truck loading, unloading, and hauling practices. • Adhere to site speed limits to reduce dust from truck traffic. • Regularly inspect and maintain vehicles to ensure effective dust control

Degradation of local air quality due to machinery operations and activities that release air contaminants.	Construction Operation Decommissioning & Restoration	<ul style="list-style-type: none"> • Ensure equipment complies with provincial air quality regulations and emission standards. • Minimize equipment idling where possible. • Regularly inspect equipment to meet emission standards. • Use low-sulfur diesel to reduce SOx emissions. • Maintain engines and exhaust systems as per manufacturer specifications.
Dust impacts from blasting, crushing, and stockpiling activities.	Operation	<ul style="list-style-type: none"> • The quarry will operate ten to twelve hours per day, during daytime hours, mostly Monday to Friday. • Blasting will be infrequent, occur from Monday to Friday, only between 8:00 – 18:00, and will adhere to the project-specific blasting procedures. • Dust levels generated around equipment and roadways will be visually monitored. • Implement additional dust suppression measures as needed near stockpiles, crushing areas, and roadways. • Conduct operations in accordance with all applicable guidelines, including required setback distances from the Pit and Quarry Guidelines.

4.1.1.3.3 Residual Effects

The residual effects of Project activities on the local atmospheric environment were assessed based on the criteria outlined in 3.5.2. These effects were evaluated assuming that the mitigation measures described earlier will be properly implemented throughout all Project phases. The local atmospheric environment is always a primary concern with quarry projects, so Scotian Materials is cognizant not to downplay the significance of any potential fugitive dust that could leave the site. Dust and particulate management will remain central to the daily operations at the quarry throughout the life of the proposed expansion. Airborne particulate is also a key concern for workplace health and safety within the quarry, and as such, visual monitoring and mitigation for dust will remain central to the health and safety program at Goffs.

Condition 6.1 of the October 2019 EA Approval for Phases 1 & 2 states “*At the request of the Department, the Approval Holder shall develop and implement an air quality and/or dust monitoring plan. This plan shall include, but not be limited to, sampling locations, parameters, monitoring methods, protocols and frequency.*” To date, the Department has not requested an air quality monitoring plan. No additional monitoring is planned by Scotian Materials in association with Phase 3 & 4, beyond just managing operational dust based on visual observations. Nonetheless, Scotian Materials acknowledges that NSECC may request additional monitoring as described in the condition cited above.

A summary of the residual effects assessment is provided in Table 4.5.

The magnitude of most air quality-related effects is assessed as low to medium, reflecting the potential for moderate but manageable impacts within the LAA.

The duration of effects is considered medium-term, typically persisting throughout active phases of the Project from construction through to decommissioning. Some effects, such as dust generated by blasting or stockpiling, may be shorter in duration but will still occur intermittently throughout of operation.

The frequency of these effects is expected to be sporadic, occurring primarily during periods of active site work.

All identified air quality effects are considered reversible, assuming adherence to mitigation measures. Air quality is expected to return to baseline conditions following the cessation of active operations.

Table 4.5 Assessment of potential residual effects identified for local atmospheric environment.

Effect	Magnitude	Duration	Frequency	Extent	Reversibility	Likelihood
Fugitive dust from vehicle movement and soil disturbance can decrease local air quality.	Medium	Medium Term	Sporadic	LAA	Reversible	Possible
Addition of combustion gasses and other airborne pollutants to local atmosphere from quarry machinery.	Low	Medium Term	Sporadic	LAA	Reversible	Unlikely
Dust impacts from blasting, crushing, and stockpiling activities.	Low	Medium Term	Sporadic	LAA	Reversible	Possible

4.1.2 Climate Change

4.1.2.1 Methodology

4.1.2.1.1 Spatial Boundaries

For the purposes of the Local Atmospheric Environment, the PDA and LAA described in Section 3.2.3 are applicable.

The RAA for this VC is defined as the Central Air zone, discussed in Section 4.1.1.2.

4.1.2.1.2 Information Sources

To characterize existing greenhouse gas emissions and carbon sinks in and around the Project area, data were reviewed from sources such as the Nova Scotia Department of Environment and Climate Change (NS Department of Environment and Climate Change, 2022) and Canada's National Inventory Report: *Greenhouse Gas Sources and Sinks in Canada* (Environment and Climate Change Canada, 2025). To characterize carbon sinks, and potential loss of carbon sequestration, rough carbon sequestration rates were obtained from various literature sources.

4.1.2.2 Existing Conditions

4.1.2.2.1 Greenhouse Gas Emissions

Regional Context

Greenhouse gas (GHG) emissions are commonly reported in megatonnes of carbon dioxide equivalent (CO₂e), a standardized measure that reflects the relative heat-trapping effects of different gases. Emissions inventories are dominated by CO₂, methane (CH₄), and nitrous oxide (N₂O), while synthetic gases including hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF₆) contribute smaller but still significant amounts.

Between 2005 and 2023, Nova Scotia's GHG emissions declined steadily, falling from 22 megatonnes (Mt) CO₂e in 2005 to 14 Mt CO₂e in 2023. This represents an overall reduction of 8.4 Mt CO₂e, or a 38% decrease over the period. Emissions dropped notably between 2005 and 2015, remained relatively stable after 2018, and stayed at 14 Mt CO₂e from 2020 through 2023, indicating a sustained lower emissions level compared to earlier years (Environment and Climate Change Canada, 2025).

Nova Scotia's population continued to increase while overall emissions declined, leading to a 7.9% reduction in per-capita greenhouse gas emissions in 2023. In 2023, the province recorded 12.86 tonnes of GHG emissions per person, well below the national average of 17.33 tonnes per capita (Canada Energy Regulator, 2024).

Current Project Emissions

A detailed accounting of current emissions generated at the Goffs Quarry was not completed for this EA Registration. The main sources of emissions are on-site quarry machinery; diesel generators used to power various equipment, lighting, office trailer, etc.; stationary equipment like crushers; emissions associated with hauling quarry products off site; and passenger vehicles used by staff. There is currently no grid connection to the quarry.

4.1.2.2.2 Carbon Sinks

In general, the PDA contains two types of carbon sinks, wetlands and forest stands. The wetland impacts are discussed in detail in Section 4.2.3, and the impact to terrestrial habitats is considered as part of Ecological Land Classification, Section 4.2.1. Based on some generalized (net) sequestration rates for these habitat types, it is estimated that the wetland area could sequester approximately 4.99 tonnes/ha/year of CO₂ equivalent (Gallant, Withey, Risk, van Kooten, & Spafford, 2020). Multiplying this sequestration rate by the approximate area of wetland (~1.8 ha within PDA boundaries), it is estimated that the total annual sequestration of within the Project area could be roughly 8.98 tonnes/year CO₂e.

As with wetlands, forest carbon sequestration rates vary widely by climate, forest type, and management practices. While highly productive tropical forests may sequester more than 11 tonnes of carbon per hectare per year, temperate forests similar to those found in Nova Scotia often compared to New England forest systems generally sequester much lower amounts, on the order of approximately 0.5 tonnes per hectare per year (Brent Sohngen, Robert Mendelsohn, & Roger Sedjo, 2012). Multiplying this sequestration rate by the approximate area of forest (~17.68 ha), it is estimated that the total annual sequestration of within the Project area could be roughly 8.84 tonnes/year CO₂e. Total carbon capture currently provided by habitats in the PDA may be upwards of 17,82 tonnes/year CO₂e.

Beyond the PDA, existing carbon sinks within the LAA and RAA, including forested lands and wetlands surrounding the Project and within the broader Goffs Quarry area, continue to provide carbon storage and carbon sinks. While these broader landscape-level sinks are not expected to be directly affected by Project activities, they contribute to the overall regional carbon balance and ecological context within which the Project is situated.

4.1.2.3 Effects Assessment

The potential for project impacts on GHG emissions and carbon sinks is considered for each project phase. Impact pathways are identified below, along with proposed mitigation, followed by an assessment of the possible residual impacts after proposed mitigation is applied. For the climate change VC, a residual effect is defined as a net change from existing levels of emissions or carbon sequestration.

4.1.2.3.1 Impact Pathways

There is potential for interaction with climate change during the construction and operational phases of the Project through the loss of existing carbon sinks and the generation of greenhouse gas emissions.

Direct impact pathways by which the Project could impact greenhouse gas emissions, in terms of sources and sinks, are primarily related to the removal wetland and forest currently providing greenhouse gas sequestration. During construction, vegetation clearing and wetland alteration will result in the loss of forested and wetland carbon sinks, reducing the capacity of the quarry property to sequester and store carbon. These effects are expected to be localized and limited to the approved Project footprint.

Greenhouse gas emissions will also be generated during construction and operation from the combustion of fuels in machinery, vehicles, and other equipment. These emissions may include carbon dioxide and other combustion-related gases associated with routine Project activities. While emissions are expected to be low during construction and operation, there will be a short-term increase in GHG emissions during the construction phase, associated with machinery used for vegetation clearing, grubbing, grading, etc. Operational emissions are not expected increase above present levels, so there is no residual or 'net' effect anticipated.

4.1.2.3.2 Mitigation

A range of mitigation measures will be incorporated into the construction and operation of the Project to minimize contributions to climate change and reduce GHG emissions. These measures are intended to limit the loss of existing carbon sinks, reduce combustion-related emissions, and support long-term carbon sequestration where practicable.

During construction, clearing will be restricted to the approved Project footprint, and unnecessary disturbance of forested and wetland areas will be avoided wherever possible. Permanent wetland impacts will be offset through the implementation of approved wetland compensation plans. At the end of quarry operations, most of the project footprint will be restored to a natural vegetated landscape, which will begin to capture and store carbon again.

Greenhouse gas emissions associated with the use of construction equipment and vehicles will be managed through efficient equipment operation and maintenance practices. Construction machinery and vehicles will be kept in good working order to reduce fuel inefficiencies, and idling will be minimized where feasible. Construction planning and logistics will aim to reduce unnecessary vehicle movements and travel distances, thereby lowering overall fuel consumption and emissions.

A summary of the proposed mitigation strategies, organized by impact pathway, is provided in Table 4.6 below.

Table 4.6 Potential impact pathways and proposed mitigation for the climate change.

Impact Pathway	Project Phase	Mitigation
Loss of carbon sink (forest and wetland)	Construction	<ul style="list-style-type: none">• Minimize vegetation clearing and wetland disturbance where possible.• Avoid unnecessary clearing outside the approved Project footprint.• Implement wetland compensation plan to offset permanent losses of carbon sequestration capacity.• Restore temporarily disturbed areas using native vegetation to re-establish carbon sinks following construction; and at the end of quarry operation.
GHG emissions from machinery, generators, and vehicles	Construction Operation	<ul style="list-style-type: none">• Minimize idling of vehicles where possible.• Construction equipment and vehicles will be kept in good working order to reduce inefficiencies.• All vehicles and machinery will comply with current emission standards and will be used efficiently, minimizing distances travelled whenever possible.

4.1.2.3.3 Residual Effects

The potential residual climate change effects of the Project were assessed using predefined criteria (Table 4.7). This assessment assumes that all proposed mitigation measures will be fully implemented during the construction and operational phases.

The magnitude of residual effects on GHG emissions and carbon storage and capture is considered relatively low, reflecting the localized nature and relatively small scale of the Project. The net loss of carbon sinks associated with forest and wetland removal is relatively small, especially considering the required wetland compensation and planned reclamation of the

quarry area at the end of project life. Likewise, combustion-related greenhouse gas emissions from machinery, generators, and vehicles are assessed as low in magnitude, because the net increase in emissions from current levels is mainly associated with the short-term increase in machinery use during clearing and construction.

The duration of residual effects varies by impact pathway. The loss of carbon sinks is considered long term, as recovery of carbon storage and sequestration functions occurs over extended timeframes, even with compensation and restoration. In contrast, the net increase in combustion gas emissions is expected to be short term, occurring primarily during active construction.

In terms of frequency, the loss of carbon sinks is expected to occur once, associated with construction-related clearing. Other effects, such as combustion gas emissions, are expected to be sporadic, occurring intermittently during periods of equipment and vehicle use.

Residual effects are spatially limited to the PDA for the loss of forest and wetland carbon sinks, while greenhouse gas emissions may extend to the LAA. Residual effects of lost carbon sequestration are considered mostly reversible, as carbon sequestration capacity can be re-established over time through restoration and compensation measures. The net increase in combustion-related emissions, although temporary, is considered irreversible.

The likelihood of these residual effects occurring is considered almost certain.

Table 4.7 Assessment of potential residual effects on GHG emissions and carbon sequestration.

Effect	Magnitude	Duration	Frequency	Extent	Reversibility	Likelihood
Loss of carbon sink (forest and wetland)	Low	Long Term	Once	PDA	Reversible	Almost Certain
GHG emissions from machinery and vehicles during construction	Low to Medium	Short Term	Sporadic	LAA	Irreversible	Almost Certain

4.1.3 Acoustic Environment

The Acoustic Environment VC pertains to ambient and predicted noise levels within the PDA and LAA. Note, blasting and vibration are discussed within Land and Resource Use (Section 4.3.5).

Noise is regulated in Nova Scotia through consideration of the Guidelines for Environmental Noise Measurement and Assessment published by Nova Scotia Environment and Climate

Change (Noise Guidelines) (Nova Scotia Environment and Climate Change, 2023). Noise level is measured in dBA, weighted to accommodate for frequencies detected by the human ear (Ministry of Health and Social Services, 2022). People can be affected physiologically and psychologically when detrimental levels of noise interfere with basic activities such as rest, sleep, study, and communication. The human ear can generally detect sounds ranging from 1 dB to 130 dBA. At high dBA, or when sustained for long periods of time, sound can also cause long term health effects, such as permanent hearing loss or impairment.

4.1.3.1 Methodology

4.1.3.1.1 Spatial Boundaries

A desktop review of existing information on noise levels was completed for the Project. A radius of 5 km from the centre of the PDA was considered a suitable LAA for consideration of noise impacts on off-site receptors. Often a much smaller radius (e.g., 1 km) is used as the LAA for acoustic impacts for projects of a similar scale. Except for off-site truck traffic, it is assumed that any operational noise would be largely contained within the PDA and immediate surroundings, with some potential for noise into the LAA. Therefore, an RAA was not specifically defined for the Acoustic Environment. The noise associated with off-site truck traffic is also considered with transportation impacts, as part of the Socioeconomic VC (Section 4.3).

4.1.3.1.2 Receptor Identification

Human dwellings were used as the receptor of concern in the analysis of acoustic impacts of the Project. The *Building Polygons* GIS Layer was downloaded on September 8, 2025, from the Halifax Data, Mapping & Analytics Hub, here:

<https://data-hrm.hub.arcgis.com/datasets/HRM::buildings/explore?layer=0>. Buildings within the layer that occurred within the 5 km LAA was considered as potential noise receptors.

Additionally, buildings with a planar area less than 120 m² were excluded, as these were mostly sheds, garages, and other out-buildings.

4.1.3.1.3 Previous Modelling

Predictive noise modelling was completed for the previous EA (Golder Associates Ltd., 2018). The analysis included two noise generation scenarios (normal operations and drilling), and predicted noise levels for two fenceline locations on the property boundary, and two nearby residential receptors, roughly 700 m southwest of the quarry (~1,500 m from Phase 3). The model considered all four phases of the project. Results of the model indicated that noise levels at the two nearby residential receptors would be between 33 and 36 dBA during normal operations, and between 34 and 36 dBA during drilling work. Fenceline (property boundary) noise levels were also predicted to remain at or below noise limits specified in the *Pit and Quarry Guidelines* (Nova Scotia Environment and Labour, 1999).

4.1.3.2 Existing Conditions

The existing Goffs quarry is within an industrial and commercial area, roughly 2 km south of the Halifax Stanfield International Airport, surrounded by a mix of forest, and other industrial land uses. The site borders a 4-lane provincial highway (Route 102) to the northwest. The nearest residential areas are the suburban communities of Miller Lake West (approximately 1.5 km southwest) and Fletchers Lake (approximately 2 km west).

Figure 4.2 shows surrounding land use and buildings within the 5 km LAA around the Goffs Quarry expansion area. Section 4.1.3.3.1 below provides a summary of the noise receptors within the LAA.

There were 2,173 buildings identified within the 5 km LAA applied for the Acoustic VC (Figure 4.2). Of these, approximately 1,782 buildings are estimated to be dwellings, where approximately 391 are outbuildings (garages, sheds, and other accessory buildings). This distinction between dwellings and outbuildings is based on a 120 m² size threshold applied. Most of these buildings are concentrated around the outer half of the western side of the 5 km radius, and almost all residences are more than 2 km or more from the PDA. There are 3 or 4 houses along Perrin Drive, approximately 1-2 km southwest of the PDA. The nearest buildings are mostly commercial and industrial buildings located northeast of the quarry along Aerotech Drive.

The acoustic environment within and immediately surrounding the quarry property is primarily shaped by noise from the existing quarry operations, other nearby industry, the airport, and the highway. On weekends and evenings, natural sounds including wind moving through trees, wildlife calls, etc. would become more prevalent, although the noise from the highway and airport still dominate the soundscape of the area immediately surrounding the quarry.

Additional sources of noise in the broader LAA include additional vehicle on minor roads, seasonal snowmobile and all-terrain vehicle (ATV) use, forestry activity, and residential construction activity.

Legend

- Quarry Property Boundary
- Phase 3 and 4 Boundaries
- Noise LAA (5 km)
- Buildings Within LAA

Notes

1. Coordinate system: NAD UTM Zone 20N, NAD83 (CSRS) Datum.
2. Geographic dataset source: GeoNova Data Catalogue.
3. Contains information licensed under the Open Government Licence - Nova Scotia.
4. Service Layer Credits: Earthstar Geographics

Date

SEPTEMBER 2026

Draw by

JC

Checked by

SG

Client

Scotian Materials

Project

Goffs Quarry Expansion
Environmental Assessment
Resource Road, Goffs, Nova Scotia

Drawing

Noise Receptors:
Buildings within 5 km (LAA)

Scale

0 215 430 860 1,290 1,720 Meters

Project No.

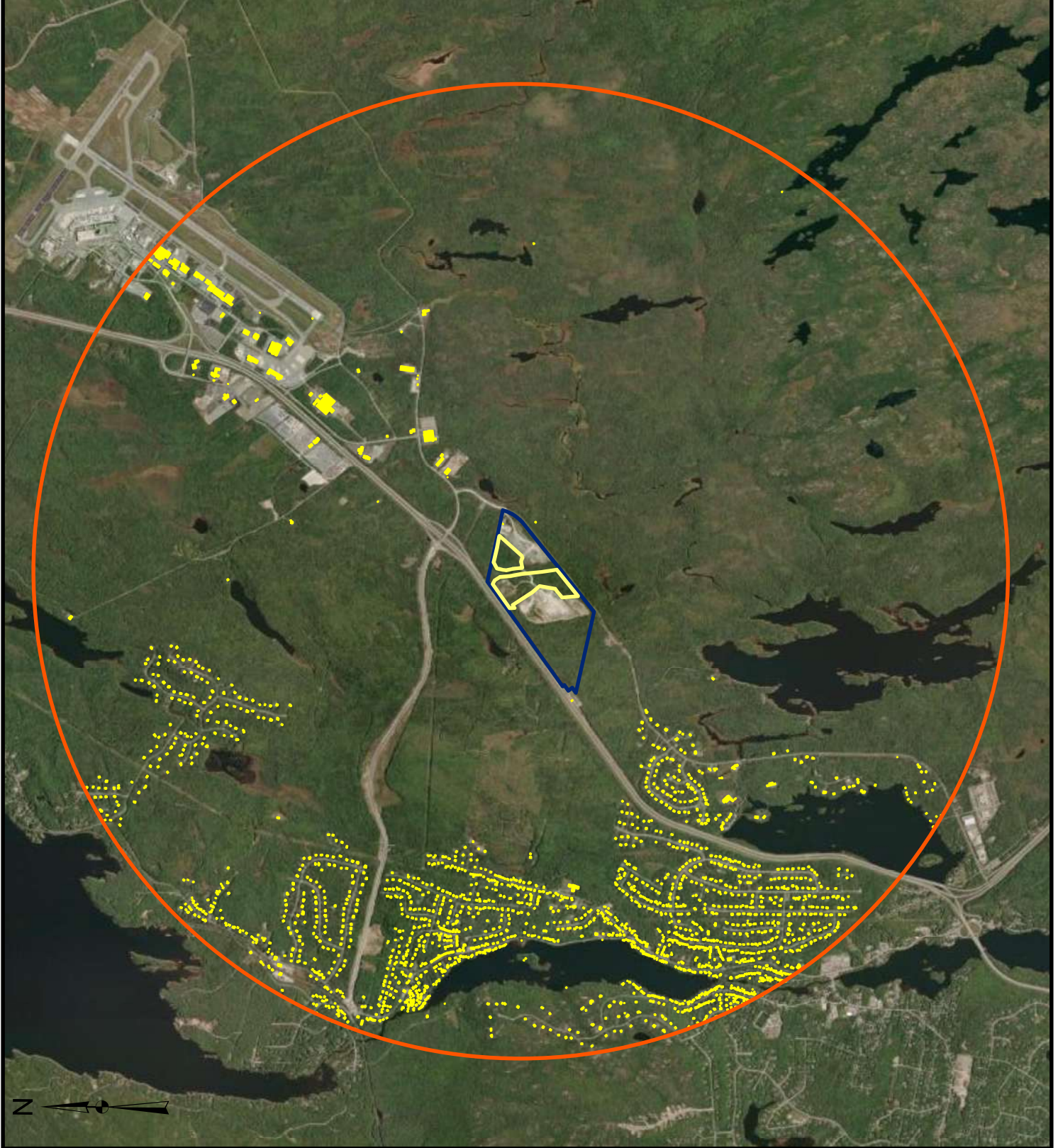
103269.002

Drawing No.

FIGURE 4.3

Rev.No.

2



4.1.3.3 Effects Assessment

The effects assessment for the acoustic environment is focused on identifying sources of Project-related noise, identifying nearby receptors, identifying mitigation options, and the potential residual effects based on the criteria outlined in Section 3.5.2. For noise, a residual effect is defined as a net increase above existing ambient noise levels generated by the quarry.

4.1.3.3.1 Impact Pathways

The NSECC *Guidelines for Environmental Noise Measurement and Assessment* (Nova Scotia Environment and Climate Change, 2023) provides standard protocols to predict and measure environmental noise and address noise complaints affecting off-site receptors outside the property line of approved facilities.

Table 4.8 presents the NSECC noise guidelines for the maximum allowable equivalent continuous sound levels at the residential property line of industrial and approved facilities.

Table 4.8 NSECC Noise Screening Levels (Equivalent Continuous Sound Level (L_{eq})) used in Nova Scotia, adjusted by time of day.

Level	Hours of the Day
$L_{eq} \leq 65\text{dBA}$	07:00-19:00 hours (Days)
$L_{eq} \leq 60\text{dBA}$	19:00-23:00 hours (Evenings)
$L_{eq} \leq 55\text{dBA}$	23:00-07:00 hours (Nights), all day Sunday and Statutory holidays

Table Note: Sourced from <https://novascotia.ca/nse/air/docs/guidelines-environmental-noise-measurement-and-assessment.pdf> (Nova Scotia Environment and Climate Change, 2023).

Health Canada recommends mitigation for sound pressure levels of 75 dBA or higher over baseline (Health Canada, 2017). Using the noise levels anticipated from a typical excavator as a proxy for the noise that would typically be generated during construction, it is estimated that noise in the immediate vicinity of an operating machine would be 83-110 dBA (Government of Ontario, 2022). It is not anticipated that the noise levels from construction and operations at the nearest sensitive receptor would exceed recommended thresholds. Nonetheless, it is acknowledged that residents and users of recreational properties may find any detectable noise above background conditions disruptive. Therefore, although the off-site noise levels are expected to be very low, any residual noise was considered a potential concern.

Table 4.9 Noise Sources and Exposures in Mines and Mining Plants.

Noise Source	Range (dB)	Midpoint
Cutting machines	83 – 93	88
Locomotives (electrical)	85 – 95	90
Haulage truck	90 – 100	95
Loaders	95 – 100	98
Long-wall shearers	96 – 101	99
Chain conveyors	97 – 100	99
Continuous miners	97 – 103	100
Loader-dumper	97 – 102	100
Fans	90 – 110	100
Pneumatic percussion tools	114 – 120	117

Sourced from (Government of Ontario, 2022)

Noise and vibration effects are expected during all phases of the Project due to equipment operation, material transport, and blasting activities within the PDA. Construction activities, including earth moving and vehicle traffic, will temporarily increase noise levels in the surrounding area. During operations, rock crushing, drilling, blasting, and the use of on-site generators will generate intermittent noise that may be perceptible beyond the PDA.

Although these effects are anticipated, they are not expected to result in elevated levels of impact beyond existing operational noise and vibration conditions in the area. Furthermore, noise levels should continue to meet guidelines at both the property line, and at nearby residential receptors.

4.1.3.3.2 Mitigation

The NSECC noise guidelines also establish mitigation expectations for facilities including quarries. These include limiting work to daytime hours, ensuring equipment is equipped with mufflers or enclosures, incorporating berms and other noise barriers into site design, and monitoring if needed.

To minimize the construction and operational sounds and the potential disturbance to nearby receptors, the mitigation listed in Table 4.10 below will be implemented. Project activities during the Decommissioning and Restoration phase will follow regulations and guidelines in place at

the time of the Project's closure and may not necessarily follow the same protocol that was required during project planning.

As stated previously, the Pit and Quarry Guidelines stipulate an 800 m minimum separation distance between blasting activity and the foundation or base of any off-site structure (Nova Scotia Environment and Labour, 1999). Structures include, but are not limited to, private homes, cottages, apartment buildings, schools, churches, commercial buildings, hospitals, nursing homes, industrial buildings or structures, and treatment facilities associated with municipal sewage, industrial processes, or landfill effluent. This setback is fundamental to the prevention of acoustic impacts on surrounding communities.

Natural vegetated buffers will be retained around the quarry margins, which will help to dampen operational noise. There are large areas of forested land between the quarry property and the nearest receptors, which also contribute significantly to noise reduction.

Refer to Section 4.3.5 for assessment of potential blasting vibration impacts on nearby structures.

Table 4.10 Potential effects across Project phases and the proposed mitigative measures for acoustic environment.

Effect	Phase	Mitigation
Noise emissions from equipment transporting materials to and from the PDA.	Construction Operation Decommissioning & Restoration	<ul style="list-style-type: none"> • Restrict construction to daytime hours, when practical. • Minimize engine braking in residential areas. • Maintain equipment with proper mufflers. • Minimize idling of machinery. • Dampen tailgates to prevent banging.
Noise emissions from earth moving using heavy equipment.	Construction Operation Decommissioning & Restoration	<ul style="list-style-type: none"> • Restricting construction activities to daytime hours. • Restrict the idling of equipment where feasible. • Equipment and machinery should be maintained in accordance with manufacturers specifications (e.g., appropriate mufflers).
Noise from blasting and rock crushing activities	Operation	<ul style="list-style-type: none"> • Blasting will be performed by a qualified contractor in accordance with provincial

Pit and Quarry Guidelines, including prescribed setback distances.

- Blasting and crushing will occur intermittently and only during daytime hours.

Noise emissions from on-site generator

Operation

- Restrict run-time to daytime hours.
- Use generator equipped with sound dampening muffler and internal or external baffles.
- Install vibration dampeners to absorb sound vibrations.
- Contain generator within shed, sea container, or other housing.

4.1.3.3.3 Residual Effects

Large tracts of forest land provide somewhat of a natural acoustic buffer between the quarry and residential areas. The loudest noises from the quarry operation are related to heavy machinery and tandem truck operation, crushing, and occasional blasting.

Large areas of forested land between the quarry and nearby receptors continue to provide an effective acoustic buffer. The primary noise sources associated with the existing quarry operation include heavy equipment use, haul trucking, crushing, and occasional blasting. The proposed expansion is not expected to increase overall operational noise levels beyond current conditions, as activity type and intensity are anticipated to remain comparable to existing operations.

Residual noise effects are therefore largely limited to temporary, short-term increases during site clearing and construction activities, which will be localized within the PDA or immediately adjacent areas (Table 4.11). These effects are expected to be intermittent and of limited spatial extent, with most receptors in the LAA remaining unaffected due to distance and existing buffering.

Where noise is perceptible beyond the PDA, it is expected to be primarily associated with short-duration construction events and occasional operational variability rather than sustained increases in baseline quarry noise. No meaningful increase in long-term operational noise exposure at off-site receptors is anticipated.

Residual noise effects are considered reversible, with conditions returning to baseline once construction activities are complete or following eventual cessation of quarry operations.

Table 4.11 Assessment of potential residual effects identified for the acoustic environment.

Effect	Magnitude	Duration	Frequency	Extent	Reversibility	Likelihood
Increase in noise levels during clearing and construction.	Low	Short-Term	Regular	LAA	Reversible	Likely

4.1.4 Geology

The Geology VC includes local geological conditions such as bedrock, surficial, and structural geology.

4.1.4.1 Methodology

4.1.4.1.1 Spatial Boundaries

For the purposes of the Geology subchapter, the PDA, LAA, and RAA described in Section 3.2.3 are applicable.

4.1.4.1.2 Information Sources

A desktop study was carried out to identify important geological features of the PDA, using public mapping resources (e.g., GeoNOVA geographic datasets), and available regional geological data from the Surficial Mapping Project of the Halifax Metropolitan Area (Nova Scotia Department of Natural Resources, 2011). Additionally, relevant information from the previous 2018 EIA, including the Hydrogeological Assessment report (Golder Associates Ltd., 2018), was also reviewed.

4.1.4.2 Existing Conditions

4.1.4.2.1 Surficial Geology

Surficial geology in the PDA is mapped predominantly as Pleistocene-aged sandy tills, drumlins formed during the last glaciation and to a lesser extend post glacial Lacustrine and Alluvial deposits, reflecting the complex regional ice-flow history of Nova Scotia (Stea, 1992).

Within the PDA, surficial deposits are shown in Figure B1-1 in Appendix B1-Figures, and occur in the following sequence:

- Lacustrine deposits, present mainly in Phase 3, are composed of sand, silt, clay, and organic material, with estimated thicknesses of 1–5 m.

- Till veneer, widespread across most of the PDA and particularly in the active quarry areas and northwest areas of Phases 3 and 4. It is composed of sandy diamicton with locally derived clasts. This unit is the most heavily removed at the quarry due to its relatively thin overburden (approximately 0.5–5 m) and the presence of locally exposed bedrock, which facilitates efficient bedrock extraction.
- Till blanket, occurring primarily in Phases 3 and 4, composed of similar diamicton but thicker (5–10 m) and sufficient to mask bedrock irregularities; and
- Drumlins, located mainly in the southwestern area of Phases 3 and 4, consist of the same till materials, with thicknesses locally exceeding 30 m depending on landform relief.

4.1.4.2.2 Bedrock Geology

The PDA is underlain by folded and metamorphosed rocks of the Goldenville Group, part of the Cambro-Ordovician Meguma Supergroup (Figure B1-2, Appendix B1-Figures). Specifically, the Goffs area is situated within the Taylors Head Formation, which consists of metasandstone (originally feldspathic wacke) and represents the most extensive unit along the Eastern Shore of Nova Scotia, typically occurring in the cores of northeast-trending anticlines (White & Nickerson, 2021). The bedrock is composed of greenish-grey metasandstone with minor interbedded green, laminated metasiltstone, and dark grey-black slate (Horne, 2009). This sequence originated as a thick-bedded turbiditic deposit and sandstone that underwent regional metamorphism (greenschist to amphibolite facies) and was deformed into northeast-trending folds during the Devonian Neoacadian Orogeny (White C. E., 2010).

The subsequent intrusion of the South Mountain Batholith produced a well-developed contact metamorphic aureole (located 1.3 km to the southeast of the PDA) superimposed on the regional greenschist assemblages. This thermal overprint is characterized by a darkening of the rock and the development of biotite and cordierite porphyroblasts (White, et al., 2008). Metasandstone beds range from less than 0.5 m to several meters in thickness (~150 m), while metasiltstone beds are typically less than 0.5 m (White, et al., 2008). These rocks locally contain calc-silicate nodules and pyrite cubes (up to 2 cm), which are characteristic of the formation.

4.1.4.2.3 Structural Geology

The bedrock architecture of the Goffs Quarry area is defined by the Wyse Corner Syncline and the Oldham Anticline (Halifax Group), the latter of which terminates near Lively Brook (Horne, 2009) and is located 350 m north of the PDA (Figure B1-2, Appendix B1-Figures). The Goffs Quarry is located on the southern limb of the northeast-trending Wyse Corner Syncline. Bedrock exposures along Highway 102 north of the PDA reveal that the strata are steeply dipping to locally overturned, with dips of approximately 85° toward the northwest and a strike parallel to the highway. Regional geological mapping (Horne, 2009) indicates the presence of the Soldier Lake Fault approximately 1.8 km to the southwest; however, no faults are currently mapped within the PDA.

4.1.4.2.4 Acid Rock Drainage

The PDA is predominantly underlain by the Goldenville Group, which is generally characterized by a low risk of Acid Rock Drainage (ARD) due to a sulfide content typically below 1%. In contrast, the Halifax Group, located just 350 m north of the quarry, contains reactive sulfides like pyrrhotite that pose a severe environmental hazard (Prime & White, 2007). The nearby Halifax Stanfield International Airport, a site listed on the Federal Contaminated Sites Inventory (FCSI), serves as a significant regional example of this risk; historical construction there exposed Halifax Group slates, leading to chronic acidification and requiring multi-million-dollar long-term mitigation to manage federal environmental liabilities (Hicks, 2003).

Rock samples collected from the existing quarry in 2017 (Golder Associates Ltd., 2018) were analyzed to assess ARD and metal leaching (ML) potential. Results indicate that the lithologies have low sulphur content and sufficient neutralization capacity, classifying them as non-acid generating. Although laboratory testing showed that aluminum, arsenic, and selenium may be mobilized under leaching conditions, the limited exposure area, dilution with non-contact water, and background concentrations suggest no meaningful impact on effluent quality. As a result, ARD and ML were not carried forward for further impact assessment (Golder Associates Ltd., 2018).

4.1.4.2.5 Project Geology Description

Existing geological conditions were confirmed during GEMTEC's 2025 drilling program, which included the advancement of six boreholes completed as monitoring wells (Figure C1-1, Appendix C1-Figures). Based on the field investigation (Appendix B2– Borehole Logs), the confirmed geology within the PDA generally consists of the following:

- 2025-MW01S and 2025-MW01D are located northeast of Phase 3 and northwest of Phase 4. Overburden at this location consists of approximately 0.1 m of organic and peat material overlying sandy silt, underlain by approximately 5.4 m of till composed of sandy silt, clay, and gravel. Metasandstone bedrock was encountered from approximately 5.5 m to 30.5 m below ground surface (mbgs).
- 2025-MW02S and 2025-MW02D are located in the central area of the PDA, between Phases 3 and 4. Overburden was absent at 2025-MW02S, while 2025-MW02D encountered approximately 0.46 m of gravel with cobbles and boulders at the surface. Slate bedrock was encountered from surface to approximately 9.0 mbgs, underlain by metasandstone and metasilstone from approximately 7.3–9.0 mbgs to 26.2 mbgs.
- 2025-MW03S and 2025-MW03D are located along the western boundary of Phase 4. Overburden consists of approximately 0.36–0.43 m of gravel and cobbles overlying slate bedrock, which extends from the base of overburden to approximately 12.2 mbgs. Metasandstone was observed between approximately 12.2 and 18.3 mbgs, underlain by slate from approximately 18.3 to 30.3 mbgs.

Additionally, existing, and decommissioned monitoring well records from the previous EA report (Golder Associates Ltd., 2018) were used to complete the geology of the western boundary of the proposed Phase 3 expansion. These previous well logs are available online (https://novascotia.ca/nse/ea/Goffs.Quarry.Expansion.Project/Appendix_A_-_2.pdf), and are incorporated in the cross-section profiles presented in Figure C1-5 and C1-6 Appendix C. A summary of the descriptions is provided below:

- BH16-1 well nest (on-site) is located on the northwest side of the proposed Phase 3 quarry expansion. The well nest was constructed with wells named MW16-1A, MW16-1B, MW16-1C, MW16-1D and MW16-1E, installed at near-surface, intermediate, shallow, deep, and deeper bedrock intervals, respectively. The overburden consists, from top to bottom, of approximately 0.15 to 0.23 m of silty sand. Bedrock was identified as greywacke with argillite, siltstone, and shale beds of the Goldenville Formation, encountered in all five boreholes at depths ranging from 0.15 to 33.39 mbgs.
- BH17-6 well nest (on-site) is located on the southwest side of the property boundary, 200 m to the west of the existing quarry pit. The well nest was constructed with wells named MW17-6A, MW17-6B and MW17-6C, installed at depth of intermediate and

shallow bedrock, and near-surface intervals, respectively. The overburden consists, from top to bottom, of approximately 1.42 m of gravelly silty sand, 0.71 m of sand, and 0.92 m of silty sand. Bedrock was identified as greywacke with argillite, siltstone and shale beds of the Goldenville Formation, encountered at depths ranging from 3.05 to 13.11 mbgs.

- BH17-7 well nest (on-site) is located on the southern property boundary. The well nest was constructed with wells named MW17-7A, and MW17-7B, installed at depth of near-surface and shallow bedrock intervals, respectively. The overburden consists, from top to bottom, of approximately 0.48 m of silty sand, 2.11 m of gravelly clayey silt and sand, and 0.2 m of clayey gravel. Bedrock was identified as greywacke with argillite, siltstone and shale beds of the Goldenville Formation, encountered at depths ranging from 2.79 to 8.89 mbgs.
- BH16-2 well nest (decommissioned) was located towards the southwest side of the proposed Phase 3 quarry expansion. The well nest was constructed with wells installed at shallow, intermediate, and deeper bedrock intervals. The overburden consists, from top to bottom, of approximately 0.05 to 0.10 m of silty sand. Bedrock was identified as greywacke with argillite, siltstone, and shale beds of the Goldenville Formation, encountered in all five boreholes at depths ranging from 0.05 to 17.10 mbgs.
- BH16-4 well nest (decommissioned) was located in the western central part of the proposed Phase 3 quarry expansion. The well nest was constructed with wells installed at shallow, intermediate, and deeper bedrock intervals. The overburden consists, from top to bottom, of approximately 0.3 m of rootmat and peat and 0.66 m of silty sand. Bedrock was identified as greywacke with argillite, siltstone, and shale beds of the Goldenville Formation, encountered in all five boreholes at depths ranging from 0.96 to 21.23 mbgs.

Overall, the observed overburden thickness aligns with the typical till veneer thickness of 0.5–5 m reported for the area. Bedrock encountered during drilling consisted of metasandstone and slate of the Goldenville Group (White, 2008 and Horne, 2009), locally exposed at the surface or overlain by a thin till veneer. Bedrock was observed to be slightly weathered to fresh, with localized iron oxidation staining along fractures. Rock was moderately strong and became more competent with depth, fractures were observed to be variable and decreasing with depth. This is consistent with previous investigations, which reported less than 5% weathered rock mass and more competent bedrock encountered at depths of approximately 3 to 11 m below ground surface across the property.

It is important to note that, for the purposes of this assessment and to maintain consistency with the reference bedrock descriptions presented by White (2008) and Horne (2009), the bedrock units described in Golder (2018) as greywacke interbedded with siltstone were interpreted as metasandstone interbedded with metasilstone. Similarly, shale units described in Golder (2018)

were interpreted as slate. The results of this interpretation are presented in Tables C2-1, C2-2, and C2-3, and are illustrated in the cross-sectional profiles shown in Figure C1-5 and C1-6 in Appendix C.

4.1.4.3 Effects Assessment

The effects assessment for the geology is focused on identifying potential impacts of quarry activities on the underlying geological features, evaluating the sensitivity of geological receptors, identifying feasible mitigation measures, and assessing the significance of any potential residual effects in accordance with the criteria outlined in Section 3.5.2.

4.1.4.3.1 Impact Pathways

Alterations to surficial geology, bedrock geology, and topography are anticipated throughout all phases of the Project, including construction, operation, decommissioning, and restoration. During construction, site preparation activities such as vegetation clearing, grading, and overburden removal will result in the disturbance and potential loss of topsoil and organic material. These activities can lead to soil compaction and destabilization, increasing the risk of erosion and sediment transport, particularly during rainfall events or periods of high surface runoff.

The removal of surface materials and exposure of subsoils and rock during construction and operation phases may result in the permanent loss or alteration of geological features or natural exposures. As the quarry footprint expands, progressive excavation will permanently modify the site's topography and landforms, altering slope gradients and local elevation profiles. These changes can influence drainage patterns and may create conditions for localized slope instability or soil movement, especially in areas with unconsolidated material.

During the operational phase, blasting and excavation will expose fresh bedrock surfaces to atmospheric oxygen and moisture. This exposure may result in the oxidation of sulfide-bearing minerals, potentially leading to the leaching of soluble metals into surrounding surface and groundwater systems. Continued excavation activities may further contribute to changes in slope stability, increasing the potential for soil instability or localized failure.

Throughout the life of the Project, including the decommissioning and restoration phase, ongoing ground disturbance may lead to temporary increases in sedimentation within nearby watercourses and wetlands. These inputs can degrade water quality and impact local hydrological function. If site restoration is poorly executed or delayed, there is potential for ineffective long-term stabilization of soils and landforms, increasing the risk of erosion, reduced revegetation success, and residual landscape instability.

4.1.4.3.2 Mitigation

A range of mitigation measures will be incorporated into the design and implementation of the Project to minimize disturbances to surficial and bedrock geology, preserve soil quality, and maintain landscape stability throughout all phases of development. These measures are intended to reduce potential impacts on geological features and topography, and to prevent indirect effects on surface water systems and wetlands.

Erosion and sediment control will be a key component of site management during construction and operation. Measures such as sediment fencing, mulching, and timely revegetation will be implemented to limit soil erosion and reduce sediment mobilization into adjacent areas. A Surface Water Management Plan will be developed to guide site-specific practices that manage surface water flow, minimize erosion, and protect downstream aquatic environments.

Topsoil and organic material removed during initial land clearing will be salvaged and stockpiled for use in future restoration. Preserving this material helps maintain the native seed bank, thereby enhancing the success of revegetation and restoring local ecological function. The reapplication of salvaged soils will be timed to coincide with favourable weather conditions, reducing the risk of erosion and minimizing compaction during handling.

In areas where soil compaction occurs due to equipment movement or material storage, mechanical aeration will be applied to improve soil structure and promote healthy root development. Progressive restoration will be undertaken wherever feasible, with stabilization and revegetation of disturbed areas occurring incrementally as the quarry expands. This approach supports early establishment of vegetation, reduces erosion potential, and facilitates smoother final site rehabilitation.

All excavation and blasting activities will be confined to approved areas. Slope stability will be actively monitored through site-specific geotechnical assessments, and any areas of concern will be managed appropriately. Where necessary, slopes will be designed to meet established safety and stability criteria.

During the decommissioning and restoration phase, previously stockpiled topsoil and organic materials will be reapplied to disturbed areas to support natural regeneration and landscape recovery. Restoration activities will be scheduled to align with optimal weather conditions to maximize effectiveness and minimize erosion risk.

A summary of the proposed mitigation strategies, organized by impact pathway, is provided in Table 4.12.

Table 4.12 Potential effects across the Project phases and the proposed mitigative measures for geology.

Effect	Phase	Mitigation
Soil erosion and sedimentation	Construction Operation	<ul style="list-style-type: none"> • Install sediment control measures (e.g., sediment fencing) and erosion control (e.g., mulching, revegetation). • Develop and implement a Surface Water Management Plan.
Loss of topsoil and organic material	Construction	<ul style="list-style-type: none"> • Salvage topsoil and organic soil for future restoration. • Use local seed material to support revegetation.
Soil compaction	Construction Operation Decommissioning & Restoration	<ul style="list-style-type: none"> • Aerate compacted soil during restoration to improve soil structure and productivity.
Alteration of landform and topography	Operation	<ul style="list-style-type: none"> • Implement progressive restoration during quarry expansion to stabilize and revegetate disturbed areas.
Impacts to bedrock geology (e.g., excavation)	Operation	<ul style="list-style-type: none"> • Limit excavation to approved areas. • Monitor and manage slope stability.
Soil instability or slope failure	Operation Decommissioning & Restoration	<ul style="list-style-type: none"> • Conduct geotechnical assessments. • Design stable slopes and monitor for signs of instability.
Ineffective site restoration	Decommissioning & Restoration	<ul style="list-style-type: none"> • Use stockpiled native soil and seed mixes for revegetation. • Time restoration during optimal weather (e.g., minimal precipitation).

4.1.4.3.3 Residual Effects

The potential residual geology effects of the Project were assessed using predefined criteria (Table 4.13). This assessment assumes the correct implementation of the proposed mitigation measures across all phases of the Project. With mitigation in place, most geology-related effects are expected to be minimized and contained to the immediate quarry footprint; however, some

residual effects, particularly those related to landform alteration and bedrock removal, are anticipated to persist within the PDA.

The magnitude of residual effects is generally assessed as Medium for geological impacts. The magnitude of effects related to topographic alteration and bedrock excavation is rated as High, given the permanent removal of geological material and reshaping of the land surface.

The duration of soil-related residual effects (e.g., erosion) is considered Medium Term, as these impacts may extend through the construction and operational phases but are expected to diminish over time following restoration. In contrast, changes to landform and bedrock geology are considered Long Term and will remain evident post-closure.

In terms of frequency, residual effects such as soil compaction and erosion are expected to occur on a regular basis due to ongoing equipment use and surface disturbances throughout the life of the Project. Other effects, such as slope instability or the disturbance of isolated geological features, are expected to be sporadic.

The extent of residual effects will generally be limited to the PDA. While erosion and sedimentation have the potential to extend to LAA.

The reversibility of residual effects varies by component. Soil compaction and erosion are considered reversible through proper restoration, including soil aeration, stabilization, and revegetation. However, alteration of landforms and the removal of bedrock are considered irreversible.

The likelihood of residual effects occurring ranges from Possible to Almost Certain, depending on the nature of the activity.

Table 4.13 Effects assessment of the impact pathways identified for the geology.

Effect	Magnitude	Duration	Frequency	Extent	Reversibility	Likelihood
Soil erosion and sedimentation	Medium	Medium Term	Regular	LAA	Reversible	Possible
Loss of topsoil and organic material	Medium	Medium Term	Regular	PDA	Reversible	Likely
Loss of geological features or exposures	Low	Medium Term	Sporadic	PDA	Irreversible	Unlikely
Soil compaction	Medium	Medium Term	Regular	PDA	Reversible	Likely
Alteration of landform and topography	High	Long Term	Continuous	PDA	Irreversible	Almost Certain
Impacts to bedrock geology (e.g., excavation)	High	Long Term	Continuous	PDA	Irreversible	Almost Certain
Soil instability or slope failure	Low	Medium Term	Sporadic	PDA	Reversible	Possible

4.1.5 Hydrogeology (Groundwater)

GEMTEC was retained by Scotian Materials to carry out a hydrogeological investigation to accompany Scotian Materials Environmental Assessment for the proposed Project, prepared in general compliance with provincial regulations and NSECC guidance for pit and quarry EA registration documents (Nova Scotia Department of Environment and Climate Change, 2025), and the sector-specific guideline “Environmental Assessment Supplemental Checklist: Pits and Quarries.” (Nova Scotia Department of Environment and Climate Change, 2025).

4.1.5.1 Methodology

GEMTEC developed a drilling and monitoring well installation program, hydrogeological assessment, and groundwater monitoring plan to support the collection of both short- and long-term groundwater quality and quantity data. The hydrogeological investigation and monitoring program were designed to complement and facilitate future integration with the existing wetland monitoring program, allowing for a coordinated assessment of groundwater and surface water interactions within the study area.

4.1.5.1.1 Drilling and Monitoring Well Installation (2025)

A total of 6 boreholes were drilled between July 9 and 14, 2025, at three locations (2025-MW01, 02, and 03) shown in Figure C1-1 and C1-2 (Appendix C1 - Figures), completed with monitoring wells to provide an understanding of existing groundwater levels and to allow monitoring of groundwater levels as the quarry expands. The boreholes were core-drilled using a track-mounted rig. Fieldwork was supervised by GEMTEC staff, who observed drilling operations, logged boreholes, and conducted testing. Monitoring well nests were installed in clusters of two monitoring intervals at 2025-MW01S and 01D, 2025-MW02S and 02D, and 2025-MW03S and 03D.

The new 3 wells nest locations were intended to assess the proposed extension, located on the border of the proposed Phase 4 and on the eastern border of Phase 3, including shallow and deep wells. Deep rock wells were completed in a range of 26.21 to 30.46 mbgs, which is approximately 1.47 to 3.29 m below the proposed Phase 3 quarry floor (88 masl) and 12.47 to 14.29 below the proposed Phase 4 quarry floor (99 masl). The screened intervals were installed at elevations generally consistent with those of the existing monitoring wells to ensure that groundwater monitoring across the quarry targeted comparable hydrostratigraphic intervals. After installation, GEMTEC conducted a survey to collect data on elevations, coordinates, and recorded groundwater levels following well development. Monitoring well construction details and water levels are included in Tables C2-1 and C2-2, respectively, in Appendix C2-Tables, and borehole logs in Appendix B2.

4.1.5.1.2 Hydraulic Conductivity Testing

Following the well installation, single-well response tests (slug test) were conducted in the six monitoring wells to estimate bedrock hydraulic conductivity. Testing was performed between August 13 and 14, 2025, for most wells, except for 2025-MW02D, which was tested on November 22, 2025, as a result of high fire index during the late summer 2026.

Hydraulic conductivity values were calculated for the metasandstone and slate bedrock using AQTESOLV® software, using the Bower and Rice method (Bouwer & Rice, 1976), for unconfined aquifers and wells that partially penetrate the aquifer. Results for hydraulic conductivity calculations are presented in Tables C2-3 in Appendix C2-Tables, and AQTESOLV® graphs in Appendix C3-K -Testing Results.

4.1.5.1.3 Groundwater Quality Sampling

Samples were collected using a dedicated Waterra® polyethylene tubing and a peristaltic pump using low flow methodology. Groundwater samples were collected in laboratory-supplied containers; samples submitted for metals analysis were field-filtered. Quality assurance/quality control (QA/QC) protocols included the collection of one field duplicate sample during each sampling event. The results of the QA/QC sampling were used to evaluate the reliability of the

sampling and analysis methods. One field duplicate was collected during each of the June and December 2025 monitoring events

After sampling, each sample container was tightly capped, labelled, and maintained in temperature-controlled storage until delivered to AGAT Laboratories in Dartmouth, NS, for general chemistry and dissolved metals analysis. The laboratory certificates of analysis are provided in Appendix C6.

Additionally, these samples serve as baseline data for assessing potential future impacts of quarry dewatering on groundwater quality, consistent with the analyses completed for previous expansion phases in 2018. Of the original seven well clusters, three remain within the quarry area and were included in this assessment to allow comparison with the previously established baseline conditions for the site.

4.1.5.2 Hydrogeological Assessment

4.1.5.2.1 Subsurface Conditions

Overall, the observed overburden thickness is consistent with the typical 0.5–5.5 m till veneer for the area, comprising organic matter and silty sand, reported for the quarry area. However, overburden was absent at 2025-MW02S. Where present, it occurred as a thin, discontinuous veneer which is consistent with mapping and previous investigations. Well logs are presented in Appendix B2.

Bedrock encountered during drilling consisted of metasandstone and slate of the Goldenville Group, locally exposed at the surface or overlain by a thin till veneer. The bedrock ranged from slightly weathered to fresh, with localized iron oxidation staining along fractures, and became moderately strong and more competent with depth. Groundwater flow is expected to occur primarily through bedrock fractures.

4.1.5.2.2 Local Groundwater Use

A review of the available Groundwater Database of the Nova Scotia Groundwater Atlas (Department of Energy and Mines, 2026) was carried out for the area within approximately 2 kilometers of the Goffs Quarry property. The database indicated 185 records within the Goffs Quarry search area (Figure C1-3 in Appendix C1).

Of the 185 records identified in the surrounding 2 km of the Goffs quarry area, 175 are documented as domestic supply wells, two are industrial wells, one is used as a heat transfer, and seven have an unknown use. The dates of construction for supply wells ranged from 1972 to 2020. Most of these wells are in the Miller Lake West subdivision, located 1.1 km to the southwest of the Project. A summary of these records is provided in Table 4.14 below, and all the well records are provided in Appendix C4 - Water Well Records within 1 and 2 km.

Table 4.14 Goffs Quarry Well Records Review Within a 2 km Radius.

Well Type	Depth (m)			Source			Well Use			
	min	max	avg	Overburden	Bedrock	NA	DO	IN	HT	NA
Drilled	22.8	170.5	95.5	1	182	2	175	2	1	7

Notes:

- min = minimum; max = maximum; avg = arithmetic mean
- DO = Domestic; IN = Industrial; HT = Heat Transfer; NA = Not Available

There are no well records mapped within the Goffs quarry property boundary. However, 16 well records (12 domestic wells, 2 industrial wells, and 2 decommissioned wells) are mapped within a 1 km radius of the property boundary. These wells are described in greater detail in Appendix C4 – Water Well Records Within 1 km and 2 km Radii of the Site Boundary and are shown in Figure C1-3 – Water Well Location Plan, both included in Appendix C. Key information related to these wells is summarized below:

- Well Log Record # 752209 - Located 130 m southwest of the southwestern boundary of the Goffs quarry property. According to Golder (2018), this well is located on land owned by Scotian; however, the landowner was not aware of any well in that location. The current status of the well remains unknown.
- Well Log Records # 150185 and # 150186 – Both wells were located in 203 Aerotech Drive, approximately 710 m northeast of the northeastern boundary of the Goffs quarry property. Both wells were completed in 2015 and are currently decommissioned.
- Well Log Record # 831335 – Located in Holand Rd, at approximately 888 m northwest of the northwestern boundary of the Goffs quarry property. Based on aerial photos of Google Earth®, there are no residential structures in the area.
- Ten out of the 12 domestic wells, associated with the Miller Lake West subdivision, are clustered within 1 km of the Goffs quarry property boundary, located approximately 670 to 1,000 m southwest of the site. All wells are for domestic use and were completed between 2008 and 2011. Reported total depths range from 62.4 to 103.5 mbgs, with static water levels between 3.7 and 7.6 mbgs. Bedrock was encountered at depths ranging from 2.4 to 103.5 mbgs. The domestic wells in the Miller Lake West Subdivision are completed within quartzites, shales, and slates inferred to belong to the Goldenville Formation

4.1.5.2.3 Groundwater Levels and Flow Direction

Monitoring wells for the proposed Phase 3 and 4 expansions were installed in July 2025; therefore, a full year of seasonal groundwater data is not yet available. A groundwater baseline was previously established by Golder (2018) using 10 monitoring wells within the Existing <4 ha Quarry and Phases 1 and 2 (Existing Quarry Pit), which extend to the boundary of the proposed

Phase 3 expansion. Given their proximity, this dataset is considered representative for interim comparison in support of the expansion assessment. While the baseline results are discussed in detail in the 2025 Annual Monitoring Assessment for Goffs Quarry (GEMTEC, 2026), Table 4.15 below provides a comparison of historical groundwater elevations with current 2025 measurements.

Table 4.15 Groundwater Levels Results Summary.

Monitoring Well Nest ID	Monitoring Well ID	Baseline Minimum Groundwater Elevation ¹ (masl)	Date	2025 Minimum Groundwater Elevation (masl)	Date	Difference (m)
BH16-1	MW16-1A	112.125	27-Oct-17	111.16	14-Aug-25	0.965
	MW16-1B	111.626	27-Oct-17	110.06	22-Oct-25	1.57
	MW16-1C	111.136	27-Oct-17	109.19	22-Oct-25	1.95
	MW16-1D	111.21	26-Sep-17	108.79	22-Oct-25	2.42
	MW16-1E	111.192	26-Sep-17	108.83	22-Oct-25	2.36
BH17-6	MW17-6A	90.039	26-Sep-17	88.15	22-Oct-25	1.89
	MW17-6B	90.029	26-Sep-17	88.16	22-Oct-25	1.87
	MW17-6C	90.078	26-Sep-17	88.05	22-Oct-25	2.03
BH17-7	MW17-7A	81.514	26-Sep-17	79.89	22-Aug-25	1.62
	MW17-7B	81.779	15-Sep-17	80.12	22-Aug-25	1.66
2025-MW01	2025-MW01S	-	-	114.49	14-Aug-25	-
	2025-MW01D	-	-	115.80	13-Aug-25	-
2025-MW02	2025-MW02S	-	-	106.99	13-Aug-25	-
	2025-MW02D	-	-	107.25	23-Oct-25	-
2025-MW03	2025-MW03S	-	-	112.57	14-Aug-25	-
	2025-MW03D	-	-	112.89	14-Aug-25	-

Notes:

- (1) = Baseline elevations based on 2016-2017 sampling events (Golder Associates Ltd., 2018).
- (-) = Not Available

Historically (2016–2024), groundwater elevations ranged from 80.82 masl to 113.78 masl (GEMTEC, 2026). In 2025, levels ranged from 79.89 masl to 112.89 masl, representing the lowest values recorded since monitoring began. Groundwater levels typically peak in spring and decline through late summer and fall; however, in 2025, they remained below typical seasonal levels, coincident with below-normal precipitation and drought conditions reported throughout most of the year. Significant decreases (>1 m below baseline, as defined in the Industrial Approval #2016-095664-04) were observed in all monitoring wells except MW16-1A (0.965 m) and are interpreted to reflect climatic influences rather than quarry operations (GEMTEC, 2026).

Current groundwater levels across Goff Quarry, including the proposed Phase 3 and 4 expansion areas, ranged from 0.1 to 6.36 mbgs, corresponding to elevations of 115.94 to 108.79 masl, respectively (Table C2-2, Appendix C2). Groundwater was assessed in both shallow monitoring wells, screened between 3.96 and 9.27 mbgs, and deeper monitoring wells, screened between 24.0 and 33.39 mbgs. Both the shallow and deeper groundwater systems show similar hydraulic behaviour, with groundwater flow generally following the local topographic gradient from northeast to southwest across the site. Shallow and deep groundwater contours are shown in Figures C1-1 and C1-2, respectively, in Appendix C1.

Within the existing quarry pit, shallow groundwater flow conditions are locally influenced by the excavated pit floor, which occurs at an approximate elevation between 89.01 and 87.10 masl (based on GEMTEC 2026 Survey, performed on March 25, 2026). As groundwater moving through the fractured bedrock system approaches the quarry, the pit acts as a local hydraulic sink or groundwater discharge area. Groundwater is interpreted to seep through fractures and exposed bedrock faces along the quarry walls and then flow downslope along the pit floor toward the sedimentation pond located at the lower portion of the pit. This results in a locally steeper hydraulic gradient toward the quarry excavation compared to the surrounding groundwater flow system.

Therefore, although the overall groundwater flow direction across the site is interpreted to be northeast to southwest, the existing quarry excavation locally modifies the flow pattern by creating an inward hydraulic gradient toward the pit. This effect is expected to influence both shallow and deeper fractured bedrock groundwater, with groundwater discharging into the quarry and being collected in the sedimentation pond.

4.1.5.2.4 Hydraulic Conductivity Test Results

To estimate dewatering requirements for the Phase 3 and 4 quarry expansions, it is necessary to determine the hydraulic conductivity (K) of the different screened geological units. The hydraulic conductivity results are presented in Table C2-3 (Appendix C2), and the corresponding AQTESOLV® analysis charts are included in Appendix C3.

A total of 12 rising- and falling-head tests were analyzed for the six new monitoring wells installed for the Goffs quarry Phase 3 and 4 expansions. During the AQTESOLV® analysis, the Bouwer and Rice method was applied (Bouwer & Rice, 1976). The fractured bedrock was assumed to be an unconfined and anisotropic aquifer. Anisotropy ratios are reported to be $K_v/K_h < 0.1$ in sedimentary clayey rocks, such as shales (Freeze & Cherry, 1979) and they can range from 0.1 to 0.01 in layered soils or rock (Fitts, 2012). Based on this, anisotropic values of 0.01 and 0.1 were assigned to slate and metasandstone, respectively, considering slate as the most anisotropic rock in the area and metasandstone as a standard value.

In addition, hydraulic conductivity results from wells drilled in 2016 and 2017 by Golder (Golder Associates Ltd., 2018) were incorporated into the assessment. These 2016–2017 records

(including both existing and decommissioned wells) helped address data gaps along the western boundary of the Phase 3 expansion area. The existing wells are located on the northwestern side of Phase 3 (MW16-1A to MW16-1E). In contrast, the decommissioned wells were situated in the west-central area (MW16-2A and MW16-2B) and along the southern side (MW16-4A to MW16-4C) of the Phase 3 expansion (Figure C1-3, Appendix C1).

For effects of dewatering calculations, the Marinelli and Niccoli method (Marinelli & Niccoli, 2000) was used to estimate groundwater inflow to the quarry pit. The hydraulic conductivities were grouped according to the horizontal (K_{h1}) and vertical (K_{h2}) distribution, which represent flow to the pit walls and pit bottom, respectively (Marinelli & Niccoli, 2000). These hydraulic conductivities were selected based on well-screen depths related to the proposed quarry pit bottom elevation for Phases 3 (88 masl) and 4 (99 masl). The hydraulic conductivity values obtained from the analyses for new and existing wells ranged from 2.3×10^{-7} to 7.2×10^{-7} m/s for K_{h1} , and from 2.2×10^{-7} to 3.3×10^{-7} m/s for K_{h2} (Table C2-3, Appendix C1).

According to representative values of hydraulic conductivity for sedimentary rocks and crystalline rocks (Domenico & Schwartz, 1990) the hydraulic conductivity values measured at Goffs Quarry are consistent with sandstone ranges of 3×10^{-10} to 6×10^{-6} m/s and fractured igneous and metamorphic rock ranges of 8×10^{-9} to 3×10^{-4} m/s, which is consistent with the metasandstone description.

4.1.5.2.5 Groundwater Quality

Groundwater samples were taken from five of the six new 2025 wells in August 2025. 2025-MW02D was not sampled due to field constraints. Groundwater analytical quality results were tested for general chemistry and dissolved metals and are presented in Tables C5-1 and C5-2, respectively, in Appendix C5. The tables also include the 2025 water quality results for the existing wells (GEMTEC, 2026) and the baseline ranges obtained from the 2016-2017 sampling events completed by Golder (Golder Associates Ltd., 2018).

Tested parameters were compared against the Guidelines for Canadian Drinking Water Quality (GCDWQ) in accordance with the Industrial Approval and baseline values from the initial 2016-2017 monitoring program (Base). Groundwater results exceeding GCDWQ Maximum Acceptable Concentrations (MAC), the Aesthetic Objectives (AO), and/or the baseline ranges (Base) for general chemistry and dissolved metals parameters are summarized in Table 4.16 and Table 4.17, respectively, below:

Table 4.16 Summary of Exceedances in General Chemistry Groundwater Results (2025).

Monitoring Well ID	Parameter	Turbidity (NTU)		True Colour (TCU)		Nitrate as N (mg/L)		pH	
	Guideline	Base ¹	AO	Base ¹	AO	Base ¹	MAC	Base ¹	AO
	2025 Event	35 - 6810	0.3	<5.0 - 16	15	<0.05 - 1.71	10	5.84 - 8.11	7.0 - 10.5
MW16-1A	June	-	20.9	-	-	-	-	5.71	5.71
MW16-1A	December	-	1.9	-	-	-	-	-	6.05
MW16-1B	June	-	17.8	-	-	-	-	-	6.2
MW16-1B	December	-	27.9	19	19	-	-	-	6.21
MW16-1C	June	-	23.2	-	-	-	-	-	6.93
MW16-1C	December	-	9.2	-	-	-	-	-	-
MW16-1D	June	-	2.2	-	-	3.5	-	-	-
MW16-1D	December	-	2.2	-	-	2.38	-	-	-
MW16-1E	June	-	323.0	-	-	4.19	-	-	-
MW16-1E	December	-	3.0	-	-	2.46	-	-	-
MW17-6A	June	-	1.0	-	-	-	-	-	-
MW17-6A	December	-	1.0	-	-	-	-	-	-
MW17-6B	June	-	7.8	-	-	-	-	-	6.66
MW17-6B	December	-	19.0	-	-	-	-	-	6.98
MW17-6C	June	-	1.9	-	-	-	-	-	6.03
MW17-6C	December	-	4.0	-	-	-	-	-	6.24
MW17-7A	June	-	5.7	-	-	-	-	-	6.03
MW17-7A	December	-	2.5	-	-	-	-	-	6.5
MW17-7B	June	-	5.7	-	-	-	-	-	6.7
MW17-7B	December	-	10.6	-	-	-	-	-	6.99
2025-MW01S	August	-	18.4	-	-	-	-	-	-
2025-MW01D	August	-	51.1	-	-	-	-	-	6.76

Monitoring Well ID	Parameter	Turbidity (NTU)		True Colour (TCU)		Nitrate as N (mg/L)		pH	
	Guideline	Base ¹	AO	Base ¹	AO	Base ¹	MAC	Base ¹	AO
	2025 Event	35 - 6810	0.3	<5.0 - 16	15	<0.05 - 1.71	10	5.84 - 8.11	7.0 - 10.5
2025-MW02S	August	-	259.0	-	-	-	-	-	6.58
2025-MW02S-DUP1	August	-	42.7	-	-	-	-	-	6.83
2025-MW02D	August	NA	NA	NA	NA	NA	NA	NA	NA
2025-MW03S	August	-	115.0	-	-	-	-	-	6.41
2025-MW03D	August	-	31.4	-	-	-	-	-	6.65

Table Notes:

(1) = Baseline ranges based on 2016-2017 sampling events (Golder Associates Ltd., 2018).

(-) = no exceedance of the guideline.

(NA) = Not Available

In general, the 2025 groundwater quality results indicate that the existing wells (2016-2017) exhibited exceedances of turbidity, true colour, nitrate as N, and pH, which are discussed in detail in the Annual Monitoring Report (GEMTEC, 2026). All the new wells drilled in 2025 exceeded the aesthetic objective value for turbidity, and most of them were below the aesthetic objective values for pH, except for 2025-MW01S. Like the groundwater level monitoring results, there is insufficient data at this time to establish a baseline for the new wells. However, comparison with baseline ranges from the existing wells, which are expected to be representative based on similar local geology, indicates that no baseline ranges were exceeded in the area.

Table 4.17 Summary of Exceedances in Dissolved Metals Results (2025) (µg/L).

Monitoring Well ID	Parameter	Al		Sb	As		Cr	Fe	Mn	
	Guideline	Base ¹	AO	MAC	Base ¹	MAC	MAC	AO	MAC	AO
	2025 Event	<5.0 - 190	100 (OG)	6	<1.0 - 15	10	50	100	120	20
MW16-1A	June	-	190	-	-	-	-	-	-	21.7
MW16-1A	December	231	231	-	-	-	-	-	-	37
MW16-1B	June	-	-	-	-	-	-	-	-	35.5
MW16-1B	December	-	144	-	-	-	-	-	-	-
MW16-1C	June	-	-	-	-	14.7	-	-	827	827
MW16-1C	December	-	-	-	-	-	-	-	359	359
MW16-1D	June	-	-	-	-	-	-	-	119	119
MW16-1D	December	-	-	-	-	-	-	-	169	169
MW16-1E	June	-	-	-	-	-	-	-	131	131
MW16-1E	December	-	-	-	-	-	-	-	-	29
MW17-7B	June	-	-	-	-	-	-	-	-	80.9
MW17-7B	December	-	-	-	-	-	-	-	-	47
2025-MW01S	August	-	-	-	-	-	-	-	297	297
2025-MW01D	August	-	-	-	-	15	283	1140	-	98
2025-MW02S	August	-	-	-	25	25	-	-	-	-
2025-MW02S-DUP1	August	-	-	-	-	16	-	-	-	85
2025-MW02D	August	NA	NA	NA	NA	NA	NA	NA	NA	NA
2025-MW03S	August	-	-	-	-	-	-	-	-	25
2025-MW03D	August	-	-	17	45	45	-	-	-	25

Table Notes:

- (1) = Baseline values based on 2016-2017 sampling events (Golder Associates Ltd., 2018).
- (-) = no exceedance of the guideline.
- (NA) = Not Available

The 2025 dissolved metals results for the existing wells (installed in 2016–2017) showed exceedances of aluminum (Al), arsenic (As), and manganese (Mn). These exceedances are discussed in the Annual Monitoring Report (GEMTEC, 2026); however, it is important to note

that most of the Al, As, and Mn exceedances were observed within the MW16-1A to MW16-1E cluster, located along the northwestern boundary of Phase 3:

- Concentrations of dissolved Al exceed the GCDWQ AO/OG at MW16-1A (June and December CDWQG AO) and MW16-1B (December CDWQG AO). The Al Baseline range was exceeded in MW16-1A in December.
- Concentrations of dissolved As exceeded the GCDWQ MAC in monitoring well MW16-1C during the June 2025 monitoring event.
- Concentrations of dissolved Mn exceeded the GCDWQ MACs and AO at MW16-1C (June and December), MW16-1D (June and December), and MW16-1E (June). GCDWQ AO was exceeded also at MW16-1A (June and December), MW16-1B (June), and MW16-1E (December).

In contrast, the new monitoring wells installed in 2025 showed exceedances of the following parameters:

- Concentrations of dissolved antimony (Sb) exceed the GCDWQ MACs in monitoring well 2025-MW03D.
- Concentrations of dissolved As exceeded the GCDWQ MACs in monitoring well 2025-MW01D, 2025-MW02S, 2025-MW02S-DUP, and 2025-MW03D. Also, baseline ranges were exceeded in 2025-MW02S and 2025-MW03D.
- Concentrations of dissolved chromium (Cr) exceeded the GCDWQ MAC in monitoring well 2025-MW01D.
- Concentrations of dissolved iron (Fe) exceeded the GCDWQ AO in monitoring well 2025-MW01D.
- Concentrations of dissolved Mn exceeded the GCDWQ AO in monitoring wells 2025-MW01S, 2025-MW01D, 2025-MW02S-DUP1, 2025-MW03S, and 2025-MW03D; it is important to note that the 2025-MW02S and 2025-MW02S-DUP1 values were 8 µg/L and 85 µg/L, respectively. The GCDWQ MAC was exceeded in monitoring wells 2025-MW01S and 2025-MW01D.

In general, while the pH values were generally lower than the GCDWQ AO range, they were within the range reported during baseline monitoring at all locations except MW16-1A.

According to the Annual Monitoring Report (GEMTEC, 2026), variability in groundwater pH has been observed historically at the Site and is expected to be consistent with natural groundwater conditions. As such, the pH values measured in groundwater in 2025 are not considered indicative of quarry-related effects.

Nitrate (as N) concentrations exceeded baseline ranges at MW16-1D and MW16-1E during both the June and December 2025 monitoring events. However, nitrate concentrations did not exceed the CDWQG MAC of 10 mg/L during the 2025 monitoring period. Nitrate was detected

in the three shallower wells within monitoring well nest BH16-1 during 2025; however, concentrations in these wells were an order of magnitude lower than those observed in MW16-1D and MW16-1E. Similarly, nitrate concentrations measured at monitoring well nests BH17-6 and BH17-7, located downgradient of the quarry and BH16-1, were either below laboratory detection limits or approximately an order of magnitude lower than concentrations observed in MW16-1D and MW16-1E.

Dissolved arsenic, antimony, chromium, and manganese were the only metals to exceed the GCDWQ MACs during the 2025 monitoring events. Aluminum and iron exceeded the GCDWQ AO. Groundwater quality in Nova Scotia is known to exhibit naturally occurring water quality concerns, including arsenic, chloride, fluoride, hardness, iron, manganese, sulphate, and uranium (Nova Scotia Department of Natural Resources, 2026). Arsenic occurs naturally in the rocks of the Goldenville Group, which contain arsenopyrite (FeAsS), a mineral commonly associated with gold-bearing deposits (NSDNR, 2016). Within the metamorphic rocks of the Goldenville Group, reported arsenic concentrations range from 2 to 710 µg/L, with a mean concentration of 48 µg/L in the Wellington area, located upgradient of Goffs Quarry (Nova Scotia Department of Natural Resources, 2016). Studies have generally demonstrated that total arsenic concentration increases with well depth, since deeper wells are associated with longer flow paths and older, more alkaline groundwater (Nova Scotia Department of Natural Resources, 2016).

The 2025 concentrations for aluminum, arsenic, and manganese were generally consistent with established baseline ranges. However, baseline ranges were not available for antimony, chromium, and iron for direct comparison. Arsenic concentrations in new monitoring wells 2025-MW02S and 2025-MW03D exceeded the historical baseline range; however, these values remain consistent with documented regional groundwater conditions in the Goldenville Group. No other dissolved metals exceeded the GCDWQ MACs during the 2025 monitoring period.

Overall, the 2025 groundwater monitoring results indicate that the observed exceedances are generally consistent with historical baseline conditions and documented regional groundwater variability associated with the Goldenville Group. At this time, the available data do not indicate a discernible trend or pattern suggestive of quarry-related effects to groundwater quality; however, continued monitoring will further support this assessment.

4.1.5.3 Dewatering Assessment

The following sections present the dewatering assessment completed for the proposed Goffs quarry Phase 3 and Phase 4 expansions, including the site hydrogeological conceptual model, proposed excavation and dewatering approach, and the analytical assessment completed to estimate groundwater inflows, dewatering requirements, and the potential extent of groundwater drawdown associated with quarry operations.

4.1.5.3.1 Generalized Hydrogeological Conceptual Model

The generalized hydrogeological conceptual model for the Goffs quarry Phase 3 and Phase 4 expansions was developed to characterize the subsurface conditions controlling groundwater flow within the quarry area and provide a relevant and applicable inputs into the dewatering assessment.

The conceptual model consists of a thin surficial overburden layer underlain by fractured metasedimentary bedrock that forms the principal groundwater-bearing unit. The overburden is composed of silty sand and gravelly silty sand, generally ranging from 0 to 5.5 m thick, with groundwater levels generally observed near the overburden/bedrock interface. No testing of the overburden unit was tested during the 2025 well installations but a value of 4.0×10^{-7} m/s was utilized for this unit based on works completed by Golder (Golder Associates Ltd., 2018).

The groundwater flow occurs primarily within fractured metasandstone, slate, and greywacke bedrock units exhibiting low to moderate hydraulic conductivity. For the purposes of the dewatering assessment, the bedrock was conceptually divided into shallow and deep groundwater flow zones relative to the proposed quarry floor elevations, with hydraulic conductivity values for the shallow and deep flow zones ranging from approximately 2.3×10^{-7} to 2.2×10^{-7} m/s, respectively for Phase 3 and 7.2×10^{-7} to 3.3×10^{-7} m/s, respectively for Phase 4 (Table C2-3 in Appendix C).

Based on the above the layers of the generalized hydrogeological conceptual models for Phase 3 and Phase 4 are expressed as follows in Table 4.18 and 4.19:

Table 4.18 Goffs Quarry Phase 3 Generalized Hydrogeological Conceptual Model.

Unit	Hydraulic Conductivity (K) (m/s)	Notes
Gravelly Silty Sand	4.0×10^{-7}	Overburden thickness between 0 and 5.5 m, Unit was untested in 2025, but value was provided for MW16-4A in the Golder (2018) report (0.6 - 0.76 m sample depth).
Shallow Groundwater Flow Unit Metasandstone, metasiltstone, slate	2.3×10^{-7}	Geometric mean for all K values for quarry pit walls for well screens between 3.96 - 9.27 mbgs (shallow groundwater conditions)
Deep Groundwater Flow Unit Metasandstone, metasiltstone, slate	2.2×10^{-7}	Geometric mean for all K values for quarry pit bottom for well screens between 24 – 33.39 mbgs (deep groundwater conditions)

Table 4.19 Goffs Quarry Phase 4 Generalized Hydrogeological Conceptual Model.

Unit	Hydraulic Conductivity (K) (m/s)	Notes
Gravelly Silty Sand	4.0×10^{-7}	Overburden thickness between 0 and 5.5 m. Unit was untested in 2025, but value was provided for MW16-4A in the Golder (2018) report (0.6 - 0.76 m sample depth).
Shallow Groundwater Flow Unit Metasandstone, slate	7.2×10^{-7}	Geometric mean for all K values for quarry pit walls (K_{h1}) for well screens between 7.93 - 9.03 mbgs (shallow groundwater conditions)
Deep Groundwater Flow Unit Metasandstone, slate	3.3×10^{-7}	Geometric mean for all K values for quarry pit bottom (K_{h2}) for well screens between 26.21 – 30.46 mbgs (deep groundwater conditions)

4.1.5.3.2 Description of Quarry Excavation Stages

The proposed excavation for Goffs Quarry Phase 3 and 4 expansions will be advanced in stages, with variable lengths and depths to each extraction stage. The successive stages will lead to an open quarry pit with a maximum elevation of 88 masl for Phase 3, and 99 masl for Phase 4. Ground surface elevations in Phases 3 and 4 range from approximately 128 to 91 masl, and 132 to 112 masl, respectively, with a gentle slope to the southwest, with the northeast side most elevated (Figures C1-4 and C1-5, Appendix C1).

4.1.5.3.3 Dewatering Approach and Discharge

Dewatering in the existing pit is currently managed by pumping water from the quarry floor into a filtration bag with the filtered discharging draining into the surrounding vegetated area. An approved sedimentation pond designed for gravity drainage, which will form part of the quarry dewatering system, is under construction and is expected to be operational in 2026. The sedimentation pond is located along the southeastern boundary of the Existing Quarry Pit, north of Wetland 4 in the proposed Phase 3 area (Figure C1-4, Appendix C1). The quarry dewatering system is expected to receive water from two main sources:

- Groundwater seepage into the excavation walls and pit floor, and
- Surficial water entering the quarry during precipitation events, seasonal snowmelt, and runoff.

The analytical calculation estimating dewatering volumes completed for this report considers groundwater seepage and direct precipitation within the pit area only and does not include

inflow from snowmelt or surface runoff into the quarry pit. Water from seepage and direct precipitation is expected to accumulate in the approved sedimentation pond at the lowest elevation of the quarry floor, although the low point of the active quarry floor location may shift with quarry phasing and operations.

Following periods of heavy precipitation and/or snowmelt, dewatering requirements in excess of the estimated groundwater seepage rates will be necessary to manage accumulated water within the quarry. It is anticipated that several weeks of intensive dewatering may be required following the spring snowmelt, with additional short-term increases in pumping demand following major precipitation events throughout the year.

4.1.5.3.4 Steady State Dewatering Calculation

A steady-state analytical solution (Marinelli & Niccoli, 2000) was applied to estimate long-term groundwater inflow to the proposed quarry expansion. The method assumes the effect of decreased saturated thickness near the pit walls, distributed recharge to the water table, and upward flow through the pit bottom. This method provides a conservative estimate of sustained pumping requirements.

4.1.5.3.4.1 Dewatering Calculation Approach

For the dewatering assessment, three different calculations were considered:

- Existing Quarry Pit (including the Original Quarry, and Phase 1 and 2 extensions), with a pit floor elevation of 88 masl (surveyed in March 2026) and a footprint area of 18.84 ha.
- Phase 3 extension, with a pit floor elevation of 88 masl and a footprint area of 16.7 ha.
- Phase 4 extension, with a pit floor elevation of 99 masl and a footprint area of 6.52 ha.

4.1.5.3.4.2 Dewatering Calculation Assumptions

For these three dewatering assessments, the steady-state drawdown cone induced (radius of influence) by the simulated pit dewatering is presented in Figure C1-4, Appendix C1. Some assumptions were considered in the application of the analytical calculations, such as:

- The hydrogeologic unit in the Goffs Quarry area was assumed unconfined, uniform, and homogeneous, with horizontal radial flow.
- Full extraction of the proposed Phase 3 and Phase 4 areas was assumed, reaching pit floor elevations of 88 masl and 99 masl, respectively. Pit walls were conservatively approximated as a right-angle circular cylinder.
- For Phases 3 and 4, the pre-quarrying water table was assumed to be approximately horizontal at 115.94 masl (based on recorded water level in 2025-MW01D) which

represented the highest groundwater level measured among the six new monitoring wells. This well is located between the two proposed phases.

- The Existing Quarry Pit was also included to assess current dewatering effects in the Goffs Quarry Pit area. Groundwater levels in BH16-1A averaged 112.88 masl in 2017 and 112.35 masl in 2025 (GEMTEC, 2026). In 2017, groundwater levels ranged from 112.13 to 113.57 masl, while in 2025 they ranged from 111.16 to 113.39 masl. The 2017 maximum level of 113.57 masl was used in the Existing Quarry Pit analytical calculations.
- Recharge was estimated as 20% (Davis & Browne, 1996) of the annual precipitation in the Goffs Quarry area (1,393.3 mm/year) (Government of Canada, 2026), resulting in a recharge rate of 278.7 mm/year. All recharge occurring within the radius of influence (cone of depression) of the pit was assumed to be captured by the pit.
- Streams and wetlands within the quarry area were not included as boundary conditions, as their effects are not represented in the analytical calculation. To partially account for surface water-groundwater interaction, the highest observed groundwater levels were used in the calculations.
- No circular sink disk was assigned to the pit floor, as the pit was assumed to be fully dewatered and the sink head was taken as equal to the pit bottom elevation.

4.1.5.3.4.3 Dewatering Calculation Hydraulic Conductivity and Input Parameters

The hydraulic conductivity (K) used in the analytical model was divided (based on the conceptual model) into Zone 1 K_{h1} (Shallow groundwater flow zone -from ground surface to pit floor) and Zone 2 K_{h2} (Deep groundwater flow zone from pit floor to the depth of the deepest well). Materials within Zone 2 are considered anisotropic; however, because limited data were available on vertical hydraulic conductivity in the area, isotropic conditions were assumed.

The hydrogeological conceptual model, analytical assumptions, and input parameters used in the steady-state dewatering assessment are summarized in the following table. The table presents the generalized hydrostratigraphic units, interpreted groundwater conditions, hydraulic conductivity values, and key elevations used to support the analytical calculation of groundwater inflow and the potential extent of drawdown associated with the proposed quarry expansions.

Table 4.20 Goffs Quarry Phase 3 Generalized Hydrogeological Conceptual Model.

Elevation (masl)	Unit	Hydraulic Conductivity (K) (m/s)	Notes
116.04 to 96.38	Ground surface elevations range from a high at 2025-MW01D to a low at MW16-2C.		
116.04–115.94	Silty Sand	Untested	Overburden thickness between 0 and 5.5 m.
115.94	Highest groundwater level (0.1 mbgs at 2025-MW01D)		
115.94–110.51	Gravelly Silty Sand	4.0×10^{-7}	Unit was untested in 2025, but value was provided for MW16-4A in the Golder (2018) report (0.6 - 0.76 m sample depth).
110.09 – 94.15	Metasandstone, Metasiltstone, slate	2.3×10^{-7}	Geometric mean for all K values for quarry pit walls (K_{h1}) for well screens between 3.96 - 9.27 mbgs (shallow groundwater conditions)
94.15 – 88.0	Metasandstone, Metasiltstone, slate	2.3×10^{-7}	Geometric mean for all K values for quarry pit walls (K_{h1}) for well screens between 24 – 33.39 mbgs (deep groundwater conditions)
88.0	Expected Phase 3 quarry pit floor elevation		
88.0 – 79.28	Metasandstone, Metasiltstone, slate	2.2×10^{-7}	Geometric mean for all K values for quarry pit bottom (K_{h2}) for well screens between 24 – 33.39 mbgs (deep groundwater conditions)

Table 4.21 Goffs Quarry Phase 4 Generalized Hydrogeological Conceptual Model.

Elevation (masl)	Unit	Hydraulic Conductivity (K) (m/s)	Notes
116.88 to 110.92	Ground surface at 2025-MW03S (highest) and 2025-MW02D (lowest). However, the highest groundwater level was observed at 2025-MW01D (116.04 masl).		
116.04–115.94	Silty Sand	Untested	Overburden thickness between 0 and 5.5 m.
115.94	Highest groundwater level (0.1 mbgs at 2025-MW01D)		
115.94–110.51	Gravelly Silty Sand	4.0×10^{-7}	Unit was untested in 2025, but value was provided for MW16-4A in the Golder (2018) report (0.6 - 0.76 m sample depth).
110.51 – 102.03	Metasandstone, slate	7.2×10^{-7}	Geometric mean for all K values for quarry pit walls (K_{h1}) for well screens between 7.93 - 9.03 mbgs (shallow groundwater conditions)
102.03 – 99.0	Metasandstone, slate	7.2×10^{-7}	Geometric mean for all K values for quarry pit walls (K_{h1}) for well screens between 26.21 – 30.46 mbgs (deep groundwater conditions)
99.0	Expected Phase 4 quarry pit floor elevation		
99.0 – 84.71	Metasandstone, slate	3.3×10^{-7}	Geometric mean for all K values for quarry pit bottom (K_{h2}) for well screens between 26.21 – 30.46 mbgs (deep groundwater conditions)

4.1.5.3.4.4 Dewatering Calculation Results

Based on the above assumptions and considering field measurements inputs, the Marinelli and Niccoli (Marinelli & Niccoli, 2000) analytical model was used to calculate the quarry inflows and zone of influence. Those calculations also included direct precipitation to the pit. Results are summarized below:

- Existing Quarry Pit has been fully extracted to 88 masl (with an estimate of total pit inflow of 1,515 m³/day. The calculated groundwater zone of influence is a circular area with a radius of 427 m.
- Phase 3 extension with full extraction to 88 masl with an estimate of total pit inflow of 1,688 m³/day. The calculated groundwater zone of influence is a circular area with a radius of 503.5 m (Figure C1-4, Appendix C1).

- Phase 4 extension with full extraction to 99 masl with an estimate of total pit inflow of 732 m³/day. The calculated groundwater zone of influence is a circular area with a radius of 306.5 m (Figure C1-4, Appendix C1).

The estimated total groundwater inflow (including groundwater inflow and direct precipitation to the pit) to the full Goffs Quarry pit is 3,935 m³/day, of which 2,420 m³/day is attributed to the proposed Phase 3 and Phase 4 expansions.

These analytical results likely reflect a worst-case scenario for the real system. When comparing the conservative conceptual model to what is anticipated in practice, there are several factors that may reduce the areal extent of drawdown. For example, the model is steady-state, and it will likely take many years for the system to actually stabilize; and this time will be further extended by virtue of the bedrock boundary that is anticipated to exist between the surrounding wetland and streams and the quarry pit. Furthermore, the surficial aquifer is likely thinner and more discontinuous than calculated. Also, although the hydraulic conductivity values selected are within acceptable literature ranges (Freeze & Cherry, 1979), and reflect our field data, it is possible that they are lower, which would proportionally decrease the area of influence. Finally, discharge from the quarry settling ponds will likely reduce the drawdown to the west of the quarry pit by inputting more water than is extracted from this area.

4.1.5.4 Effects Assessment

The effects assessment for hydrogeology focuses on identifying potential impacts of quarry development and dewatering on groundwater quantity, groundwater quality, local groundwater users, and groundwater contributions to adjacent wetlands and surface water features, evaluating the sensitivity of hydrogeological receptors, identifying feasible mitigation measures, and assessing the significance of any potential residual effects in accordance with the criteria outlined in Section 3.5.2.

4.1.5.4.1 Impact Pathways

Excavation below the water table and the dewatering required to maintain dry and stable working conditions represent the primary hydrogeological impact pathway for the project. The site is underlain by fractured metasandstone and slate of the Goldenville Group, and groundwater flow is expected to occur primarily through bedrock fractures. Groundwater flow across the site generally decreases from northeast to southwest. The dewatering assessment indicates groundwater zones of influence with radius of approximately 427 m for the Existing Quarry Pit, 503.5 m for Phase 3, and 306.5 m for Phase 4. The estimated total inflow to the full quarry is 3,935 m³/day, of which 2,420 m³/day is associated with the proposed Phase 3 and Phase 4 expansions. As a result, dewatering may lower groundwater levels locally, alter hydraulic gradients, and change groundwater flow patterns within the PDA and adjacent LAA.

Potential groundwater receptors include the Project monitoring well network, nearby private and industrial wells, and groundwater-supported wetlands and surface water features. A review of

the Nova Scotia Groundwater Atlas identified 185 well records within 2 km of the quarry and 12 records within 1 km of the property boundary, including seven domestic wells and two industrial wells. Most domestic wells are located in the Miller Lake West subdivision, approximately 670 to 1,000 m southwest of the site, although one domestic well record occurs approximately 130 m southwest of the quarry boundary, and its current status is unknown. Accordingly, if the drawdown extends beyond the quarry footprint, there is potential for reduced groundwater availability at nearby receptors.

Potential groundwater quality effects may arise through exposure of fresh fractured bedrock during excavation and blasting, changes in water-rock interaction associated with dewatering, and the handling and discharge of contact water within the quarry. These pathways may increase turbidity or mobilize naturally occurring constituents such as arsenic, antimony, chromium, iron, and manganese. However, the 2025 monitoring results indicate that observed exceedances are generally consistent with historical baseline conditions and documented regional groundwater variability associated with the Goldenville Group, and no discernible trend indicative of quarry-related groundwater quality effects has been identified to date.

An additional impact pathway is related to seasonal snowmelt and major precipitation events. The analytical assessment completed for this report considers groundwater seepage and direct precipitation within the pit area only and does not include snowmelt or surface runoff. As a result, temporary increases in water accumulation and pumping requirements are expected during spring melt and following major rainfall events, which may temporarily increase discharge volumes and dewatering demands above the estimated seepage inflow rates.

4.1.5.4.2 Mitigation

Mitigation measures will be implemented during project design and operation to reduce potential effects on groundwater quantity and quality, protect nearby groundwater receptors, and support management of groundwater conditions through all project phases. These measures will be carried out together with the groundwater monitoring program (GEMTEC, 2026), the existing wetland monitoring program, and the quarry dewatering system described in this report.

Dewatering should be carried out progressively and only to the extent needed to maintain safe working conditions. Groundwater levels should continue to be monitored in both the existing and newly installed wells to track short- and long-term changes, compare conditions with baseline data and model predictions, and help distinguish project-related effects from climatic influences.

A response protocol should also be maintained for neighboring groundwater users. If project-related effects on off-site wells are confirmed, contingency measures, such as well mitigation or an alternative water supply, should be implemented as needed.

Groundwater quality monitoring should continue using the existing low-flow sampling method and laboratory analytical program. Results should be compared with baseline conditions and applicable GCDWQ criteria. Water collected within the quarry should continue to be managed through the approved dewatering system, including the sedimentation pond once it is

operational, to allow settling and controlled discharge. Until then, interim pumping to a filtration bag and discharge to the surrounding vegetated area should continue in accordance with approval conditions. Erosion and sediment control measures should also be maintained around disturbed areas to reduce turbid runoff and protect groundwater and connected surface water features.

Snowmelt and runoff may temporarily increase water volumes above the modelled seepage rates. For this reason, sufficient pumping capacity should be maintained during the spring freshet and after major rainfall events. Post-closure groundwater monitoring should also be completed, as needed, to confirm groundwater recovery and verify that no unexpected groundwater quality effects remain after dewatering stops.

4.1.5.4.3 Residual Effects

The residual hydrogeological effects were assessed assuming that the proposed mitigation measures are in place for all phases of the Project. Under those conditions, the main remaining effect is expected to be localized groundwater drawdown related to quarry dewatering. The dewatering results are considered conservative because the assessment is based on a steady-state approach. The surficial aquifer is likely thinner and less continuous than shown in the conceptual model, and discharge from the sedimentation pond may reduce drawdown to the west of the quarry. The lower groundwater levels recorded in 2025 were also interpreted as being related to regional drought conditions rather than quarry operations.

Residual effects on groundwater quantity are rated as Medium, mainly because dewatering will continue through the operational phase, and the estimated area of influence extends to about 503.5 m from the pit. Potential effects on nearby private and industrial wells are rated as Low, since most known supply wells are outside the immediate area of influence. However, the domestic well record southwest of the site should continue to be considered in ongoing monitoring. Residual effects on groundwater quality are also rated as Low, as the current monitoring results do not show a clear trend related to quarry activity, and the observed exceedances are generally consistent with baseline conditions and regional groundwater variability.

Potential residual effects on nearby surface water features and wetlands are more uncertain due to the current limited understanding of groundwater–surface water interactions in the area. It is not well defined whether nearby streams function predominantly as gaining or losing systems, nor is the degree of hydraulic connectivity between local wetlands and the shallow groundwater system fully understood. As a result, the analytical assessment indicates the potential for groundwater drawdown to extend beyond the quarry footprint to encompass nearby wetland and surface water features. The magnitude of any resulting effects on adjacent wetlands and surface water features remains uncertain. Continued groundwater and surface water monitoring during quarry operations will help further characterize these interactions and evaluate whether adaptive management measures are required.

Groundwater quantity effects are expected to continue during active dewatering and should lessen after pumping stops and site restoration is completed. Groundwater quality effects, if they occur, are expected to be localized and occasional, and should be identified through the monitoring program. Overall, the residual hydrogeological effects are summarized in Table 4.22 and are expected to remain manageable with phased dewatering, controlled discharge, and continued monitoring of groundwater levels and quality.

Table 4.22 Effects assessment of the impact pathways identified for the hydrogeology.

Effect	Magnitude	Duration	Frequency	Extent	Reversibility	Likelihood
Groundwater drawdown and reduced groundwater levels.	Medium	Long Term	Continuous	LAA	Reversible	Almost Certain
Reduced groundwater availability to nearby wells.	Low	Long Term	Sporadic	LAA	Reversible	Possible
Alteration of groundwater flow patterns and groundwater contribution to adjacent wetlands and surface water features.	Medium	Long Term	Continuous	LAA	Reversible	Likely
Groundwater quality changes (e.g., turbidity, metals, pH).	Low	Medium Term	Sporadic	PDA	Reversible	Possible

4.1.6 Surface Water Hydrology

The Surface Water Hydrology VC considers the surface water within the PDA and surrounding catchments, and water quantity and flow dynamics in watercourses and other surface water features within and downstream of the PDA. Potential impacts of the project on site runoff and streamflow are assessed. Water quality is considered part of the Fish and Fish Habitat VC for the purposes of this EA.

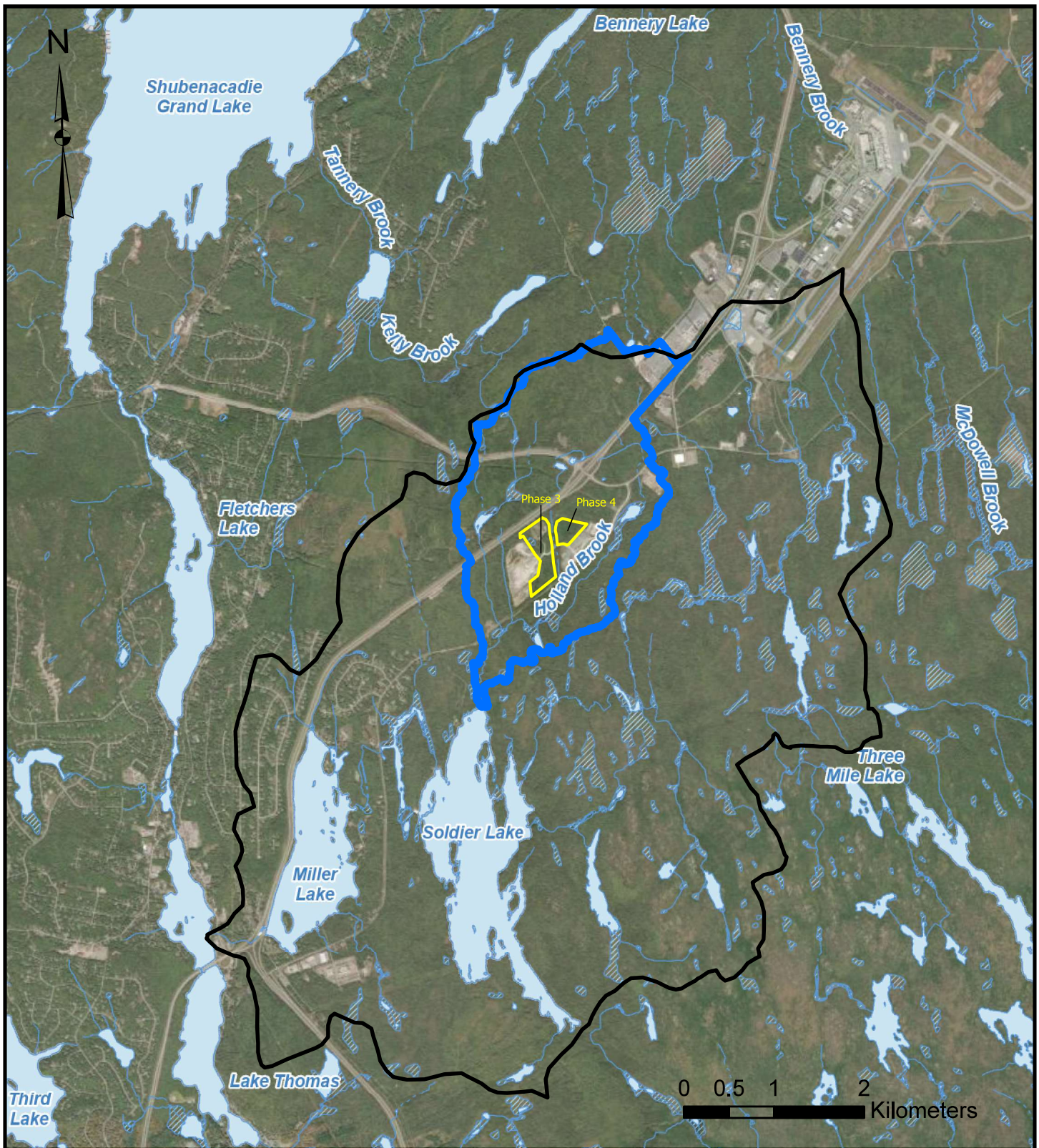
Note, the potential impacts to public surface water supplies and source water protection areas are discussed within Managed and Significant Areas (Section 4.2.8).

4.1.6.1 Methodology

GEMTEC completed a hydrological desktop analysis and field study to support the Environmental Assessment. This work included surface water monitoring at Streams 4, 5, and 6 to define existing conditions and potential impacts along each watercourse. A water balance assessment was also completed to evaluate the potential effects of the proposed quarry expansion on surface runoff and groundwater infiltration. The assessment focused on Streams 4, 5, and 6 and the post-development changes in land use and drainage areas contributing to these streams. Stream 3 was not included in the water balance analysis as the quarry expansion will not modify its catchment.

4.1.6.1.1 Spatial Boundaries

Spatial boundaries used for the Surface Water VC were based on local and regional watersheds. The LAA generated for ecological VCs was based on watersheds containing the site, which provide an appropriate LAA for surface water resources as well (Figure 4.4). This included the drainage area upstream of Soldier Lake. The RAA for surface water resources was based on the Nova Scotia Tertiary watershed 1DG-1-GG. This is a 43.5 km² sub-watershed of the Shubenacadie River basin.



Legend: NS Tertiary Watershed 1DG-1-GG (RAA) Project Development Area (PDA)
 Local Assessment Area (LAA)

Note:
 1. Coordinate system: NAD83 CRS UTM Zone 20.
 2. Aerial Imagery Retrieved from: ESRI World Imagery

Project:
 Goffs Quarry
 Phase 3 & 4 Expansion
 Goffs, Nova Scotia

Drawing:
 Spatial Boundaries for
 Surface Water Resources

Client:
 Scotian Materials Ltd.

Drawn by: JC
 Checked by: SG
 Date: September 2026

Project Number:
 103269.002

Drawing Number:
 Figure 4.4

Revision No.
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4.1.6.1.2 Water Balance Assessment

The water balance assessment was developed using climate normals data obtained from Environment and Climate Change Canada for the Halifax Stanfield International Airport Meteorological Station (ID 8202251) from 1991 to 2020. Information on current and proposed land use and existing soil types was identified in the subsurface investigation in the previous Environmental Assessment completed by Golder Associates Ltd.

Water balance calculations were based on the following equation:

$$P = S + ET + R + I$$

where:

- **P** = precipitation
- **S** = change in soil water storage
- **ET** = evapotranspiration
- **R** = surface runoff
- **I** = infiltration (groundwater recharge)

The mean annual precipitation (“P”) obtained from the Environment and Climate Change Canada for the Halifax International Airport was 1,393 mm/year.

Short-term or seasonal changes in soil water storage (“S”) are expected to occur annually, due to drier summer conditions and higher soil moisture during winter and spring. Long-term changes in soil storage were assumed to be negligible for the purposes of this assessment.

Evapotranspiration (“ET”) represents water losses to the atmosphere from soil, vegetation, and open water surfaces. Potential ET refers to amount of water that could be evaporated with an unlimited water supply. Actual ET is typically less than potential ET under dry conditions (during summer months). The mean annual potential evapotranspiration for the study area is approximately 569 mm/year.

The mean annual water surplus is the difference between P and the actual ET. The water surplus is the total amount of water available for either surface runoff (“R”) or groundwater infiltration (“I”) on an annual basis. Monthly surplus remains after actual evapotranspiration has been extracted from precipitation (rainfall and snow melt), and the maximum soil or snowpack storage is exceeded. The maximum soil storage is represented as water holding capacity (“WHC”) specific to the soil type and land use.

4.1.6.2 Existing Conditions

4.1.6.2.1 Local Drainage Subcatchments

Drainage subcatchments were delineated to reflect pre-development and post-development land use configurations using available topographic mapping and the proposed quarry layout.

The following subcatchments were evaluated:

- **Stream 4 (Pre-development condition):** Approximately 27 ha, represents the drainage area to the southwest property boundary. The subcatchment includes previous phases of development but not Phases 3 or 4.
- **Stream 5 (Pre-development condition):** Approximately 24.1 ha, represents the drainage area of Stream 5 as it joins near the southwest property boundary. This subcatchment includes the existing quarry and a large portion of the proposed Phase 3 expansion.
- **Stream 6 (Pre-development condition):** Approximately 49.2 ha, represents the drainage area to the southeast property boundary, inclusive of the Wetland 7 subcatchment and portions of the proposed Phase 3 and 4 expansions.
- **Wetland 7 (unchanged):** Approximately 25.9 ha, within the upper portion of Stream 6. This catchment area will not change with the proposed quarry expansion, so water balance calculations are not included below.
- **Stream 4 (Post-development condition):** Approximately 54.4 ha, represents the drainage area of Stream 4 to the southwest property boundary in post-development condition. This absorbs the Stream 5 subcatchment and a small portion of the Stream 6 subcatchment which will be routed into Stream 4 during the Phase 3 expansion.
- **Stream 6 (Post-development condition):** Approximately 44.8 ha, represents the drainage area of Stream 6 to the southeast property boundary. The subcatchment includes the expansion in Phase 4. Runoff from the portion of this subcatchment within the Phase 3 development footprint will be diverted to Stream 4.

4.1.6.2.2 Infiltration and Runoff

Based on the results of the subsurface investigation in the previous Environmental Assessment by Golder Associates Ltd, the surficial soils within the Project area were identified as silty sand. As a results, the soils were modelled as fine sand to fine sandy loam for the assessment. Based on the borehole information, the overburden thickness across the quarry ranged between 0.0 m and 4.8 m. Therefore, the water holding capacities were reduced based on the average overburden thickness across the quarry.

The estimated water holding capacity (“WHC”) and Infiltration Factors for each soil type used in this assessment were the same factors identified in the previous Environment Assessment. The information is provided in Table 4.23 below.

The net surplus for each monitoring location was estimated by multiplying the estimated monthly surplus for the assumed WHC by the associated drainage area. Annual evapotranspiration and surplus values were obtained from the Environment and Climate Change Canada for the Halifax Stanfield International Airport Meteorological Station based on the WHC assigned to each area in the quarry. Runoff was calculated as the difference between surplus and infiltration.

Table 4.23 Estimated WHC and Infiltration Factors.

Land Use	Soil Type	WHC (mm)	Overburden/Soil Thickness (m)	Infiltration Factors			
				Topography	Soils	Cover	Total
Quarry	Bedrock	10	0	0.0	0.0	0.0	0.0
Cleared, stripped and grubbed area	Exposed Rock or Silty Sand	75	0	0.1	0.1	0.1	0.3
Pasture and Shrubs	Silt Sand-Till veneer	100	0-0.5	0.1	0.2	0.1	0.4
Mature Trees	Silt Sand-Till veneer	150	0-0.5	0.1	0.2	0.2	0.5
Wetland	N/A	Precip-PE		0.0	0.0	0.0	0.0

4.1.6.3 Effects Assessment

4.1.6.3.1 Impact Pathways

Annual average water balance volumes were calculated for pre-development and post-development conditions. Detailed monthly and annual tabulations are provided in Appendix D.

Streams 4 and 5

The average annual water balance results for Streams 4 and 5 are shown in the tables below. It should be noted Stream 5 routes through Phase 3 of the quarry expansion and runoff from within the subcatchment will be routed into Stream 4 under post-development conditions. Their combined post-development catchment will also include the portion of the Stream 6 subcatchment that falls within the Phase 3 quarry expansion (hence the 3.3 ha increase in total area).

Table 4.24 Stream 4 and Stream 5 Water Balance: Pre-Development.

Catchment	Area	Surplus		Infiltration		Runoff	
	(ha)	(mm/yr)	(m ³ /y)	(mm/yr)	(m ³ /y)	(mm/yr)	(m ³ /y)
Stream 4	27.0	839	226,308	378	101,838	461	124,469
Stream 5	24.1	852	205,572	307	74,006	545	131,566
Total	51.1		431,880		175,844		256,035

Table 4.25 Stream 4 and Stream 5 Water Balance: Post-Development.

Catchment	Area	Surplus		Infiltration		Runoff	
	(ha)	(mm/yr)	(m ³ /y)	(mm/yr)	(m ³ /y)	(mm/yr)	(m ³ /y)
Stream 4	19.7	838	165,373	402	79,379	436	85,994
Stream 5					23,105	821	284,962
(diverted to Stream 4)	34.7	888	308,067	67			
Total	54.4		473,440		102,484		370,956
Change %	+3.3		+9.6%		-42%		+45%

Stream 6

The catchment area for Stream 6 will decrease in the post-development condition. A portion of this catchment will be diverted to the Phase 3 expansion/Stream 4, while the drainage divide will change near the northeast corner of the Phase 4 expansion. The average annual water balance results for Stream 6 are shown in Table 4.26 and Table 4.27 below.

Table 4.26 Stream 6 Water Balance: Pre-Development.

Catchment	Area	Surplus		Infiltration		Runoff	
	(ha)	(mm/yr)	(m³/y)	(mm/yr)	(m³/y)	(mm/yr)	(m³/y)
Stream 6	49.2	820	402,843	393	193,365	426	209,479

Table 4.27 Stream 6 Water Balance: Post-Development.

Catchment	Area	Surplus		Infiltration		Runoff	
	(ha)	(mm/yr)	(m³/y)	(mm/yr)	(m³/y)	(mm/yr)	(m³/y)
Stream 6	34.5	896	289,889	386	133,349	453	156,540
Quarry Phase 4 (discharge to Stream 6)	10.3	883	90,641	53	5,438	830	85,203
Total	44.8		380,530		138,787		241,743
Change %	-4.8		-6%		-28%		+15%

4.1.6.3.2 Mitigation

If the proposed quarry expansion area was left unmanaged, potential effects could include degradation of water quality from suspended sediment and a change in water quality in the wetlands and watercourses throughout the property. Changes in water quality and quantity can affect the aquatic species and habitats as well as interaction with other potential users of the

surface water resources. The Nova Scotia Pit and Quarry Guidelines (Nova Scotia Environment and Labour, 1999) for liquid effluent will be used to define acceptable water quality discharge concentrations. These discharge concentrations will be managed on-site via water quality ponds, discharge controls, and regulated monitoring and reporting.

Clearing, grubbing, and topsoil stripping can increase the potential for sediment erosion especially during periods of heavy rainfall or snow melt. These activities also reduce evapotranspiration, which can result in increased surface runoff and can increase the potential for sediment erosion and deposition.

To the extent possible, surface flow will be directed around the quarry and away from disturbed areas. Sediment ponds will be designed for Phase 3 and 4 of the quarry expansion. These ponds will hold a sufficient volume of water to allow for settling of the suspended sediment and mitigate potential erosion and sedimentation effects as a result of the clearing, grubbing, and topsoil stripping. Additionally, as the quarry develops, exposed soil and stockpiles capable of producing sediment-laden runoff will be stabilized with mulch or hydroseed, as appropriate or practical.

The ponds intended for water quality treatment will likely have an impact on local flood risk as peak runoff rates may be controlled through attenuation. Capturing runoff in ponds within the quarry would allow post-expansion runoff rates (likely to increase due to ground cover changes) to be maintained at pre-expansion levels.

There is not expected to be any potential residential impacts due to surface water as there are no homes near the quarry.

Stream 3

Stream 3 is outside the area impacted by the Phase 3 and 4 quarry expansion and will not be impacted by quarry expansion.

Stream 4

The Stream 4 catchment lies within the groundwater radius of influence of quarry dewatering. As a result, much of the infiltration is expected to be captured by the quarry rather than contributing to Stream 4 as groundwater baseflow.

Under average annual conditions, the water balance analysis indicates minimal runoff to Stream 4 during dry periods. Flow and temperature monitoring will be conducted to assess potential changes.

At the southwest property boundary, runoff contributions to Stream 4 are predicted to increase by approximately 45% compared to pre-development conditions due to the addition of quarry

discharge (includes Stream 5). This increase may be noticeable in the local section of the stream but is considered minor relative to flows within Holland Brook (downstream receiver, no measurable impacts are anticipated). In addition, controlled discharge through sedimentation ponds will attenuate peak flows from the quarry.

Stream 6

Under post-development conditions, the Stream 6 flows within the property are expected to be reduced due to a combination of decreased catchment area and loss of groundwater baseflow. As with Stream 4, infiltration within the Stream 6 subcatchment is expected to be captured by the quarry rather than discharged to Stream 6 as baseflow.

While the total surplus contributing to Stream 6 at the Property boundary is predicted to decrease by approximately 6%, runoff is expected to increase by approximately 15% due to land-use changes from forested areas to quarry floor. As a result, flows at the property boundary are expected to increase. However, this increase is small compared to flows in Holland Brook and is not expected to result in measurable downstream effects. Controlled discharge through sedimentation ponds will further reduce potential peak flow effects.

4.1.6.3.3 Residual Effects

The potential residual surface water hydrology effects of the Project were assessed using predefined criteria (Table 3.6). This assessment assumes the proposed mitigation measures will be fully implemented during the construction and operational phases.

The magnitude of residual effects is generally assessed as relatively low for surface water quality. The magnitude of effects related to surface water quantity is rated as low to medium as drainage changes could impact runoff volumes during rainfall or snowmelt, and peak discharge rates during larger storm events.

The duration of surface water-related residual effects is considered long term, as these impacts may extend through the construction and operational phases and will remain due to changes in topography, catchment boundaries, and ground cover.

In terms of frequency, residual effects on water quality are expected to occur on a regular basis due to ongoing equipment use and surface disturbances throughout the life of the Project. Water quantity impacts are expected to be continuous as baseflow may be altered for the local watercourses through surface changes (and groundwater contributions). The impacts of peak flows and flood risks, however, may be sporadic as this occurs primarily during runoff events.

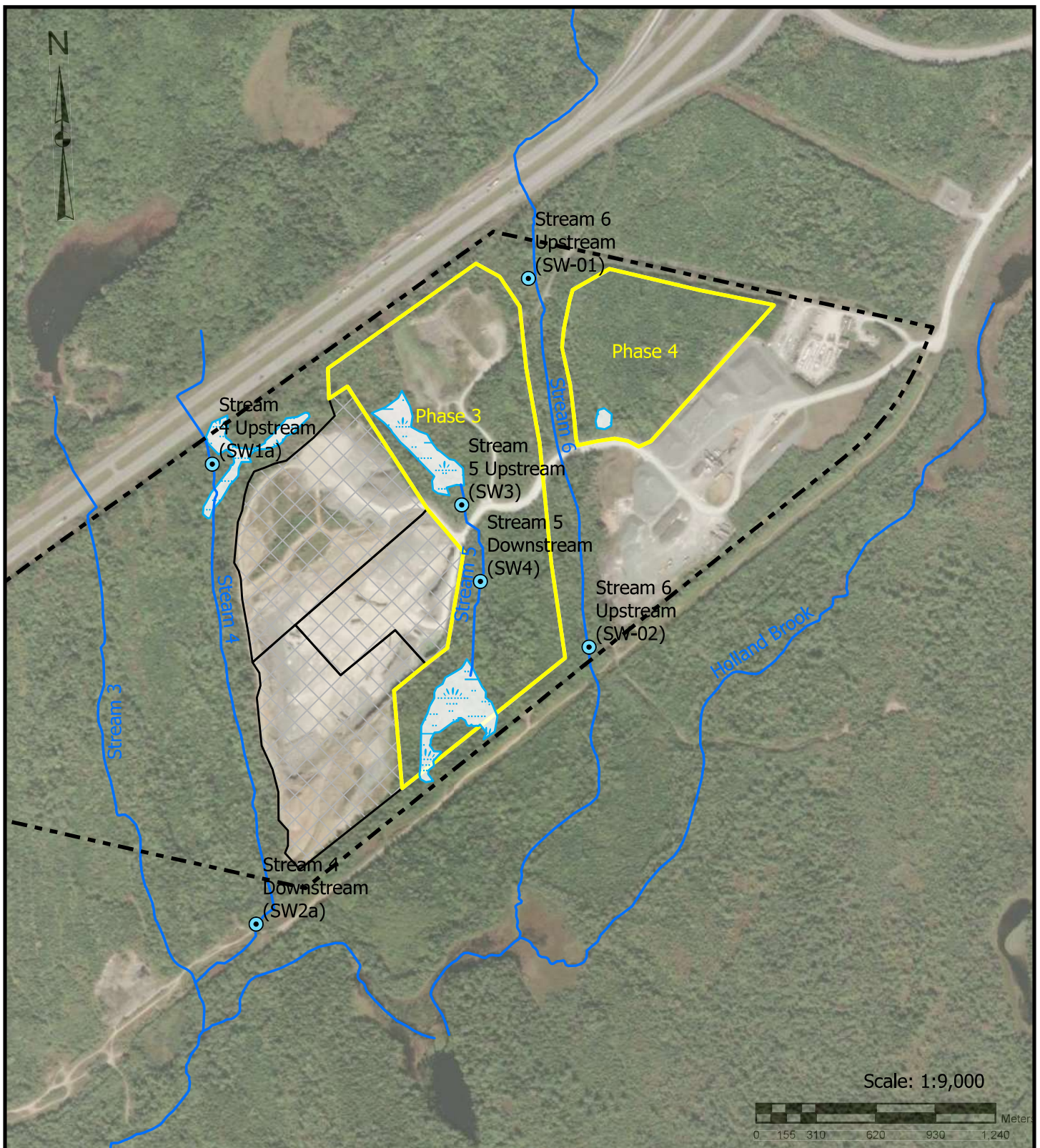
The extent of residual effects will generally be limited to the PDA for surface water quality. While the effects of altered surface water quantity have the potential to extend to LAA.

Surface water quality effects are considered reversible, assuming adherence to mitigation measures as erosion protections and sediment ponds address water quality. The impacts on water quantity are considered irreversible, however, due to alteration of the catchments. The surface water runoff will be captured within the quarry and discharged at a controlled rate to pre-development conditions as per standard practice.

The likelihood of residual effects occurring ranges from Possible to Almost Certain, depending on the nature of the activity.

Table 4.28 Assessment of potential residual effects identified for surface water hydrology.

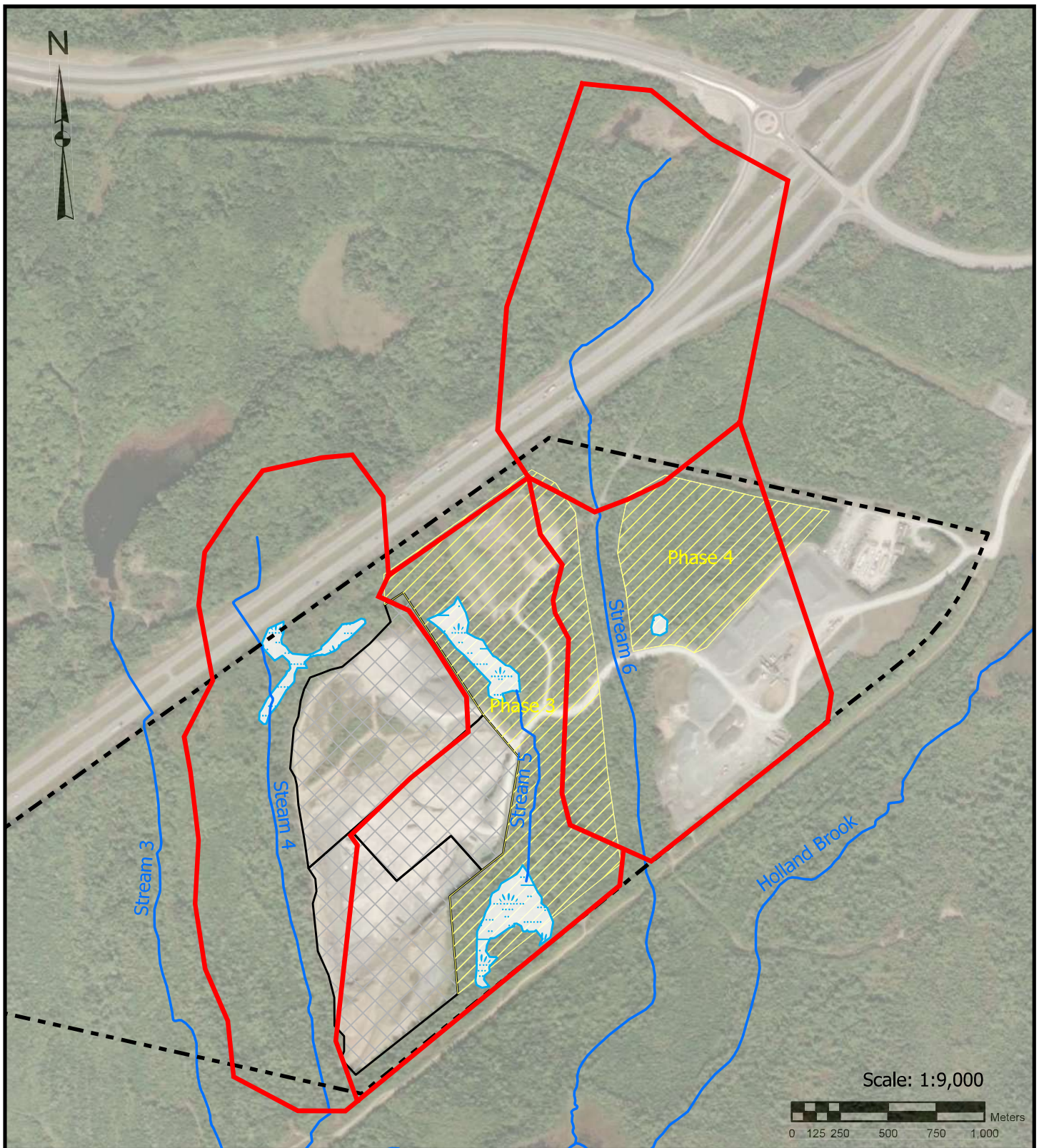
Effect	Magnitude	Duration	Frequency	Extent	Reversibility	Likelihood
Surface water quality impacts	Low	Long Term	Continuous	PDA	Reversible	Possible
Changes to runoff volumes and streamflow	Medium	Long Term	Continuous	LAA	Irreversible	Almost Certain
Increased surface water flood risk	Low	Long Term	Sporadic	LAA	Reversible	Possible



Legend:		Existing Phases		Watercourses (NSHN)
		Quarry Property		Wetlands
		Project Development Area (PDA)		Monitoring Stations

Note:
 1. Coordinate system: NAD83 CRS UTM Zone 20.
 2. Aerial Imagery Retrieved from: ESRI World Imagery

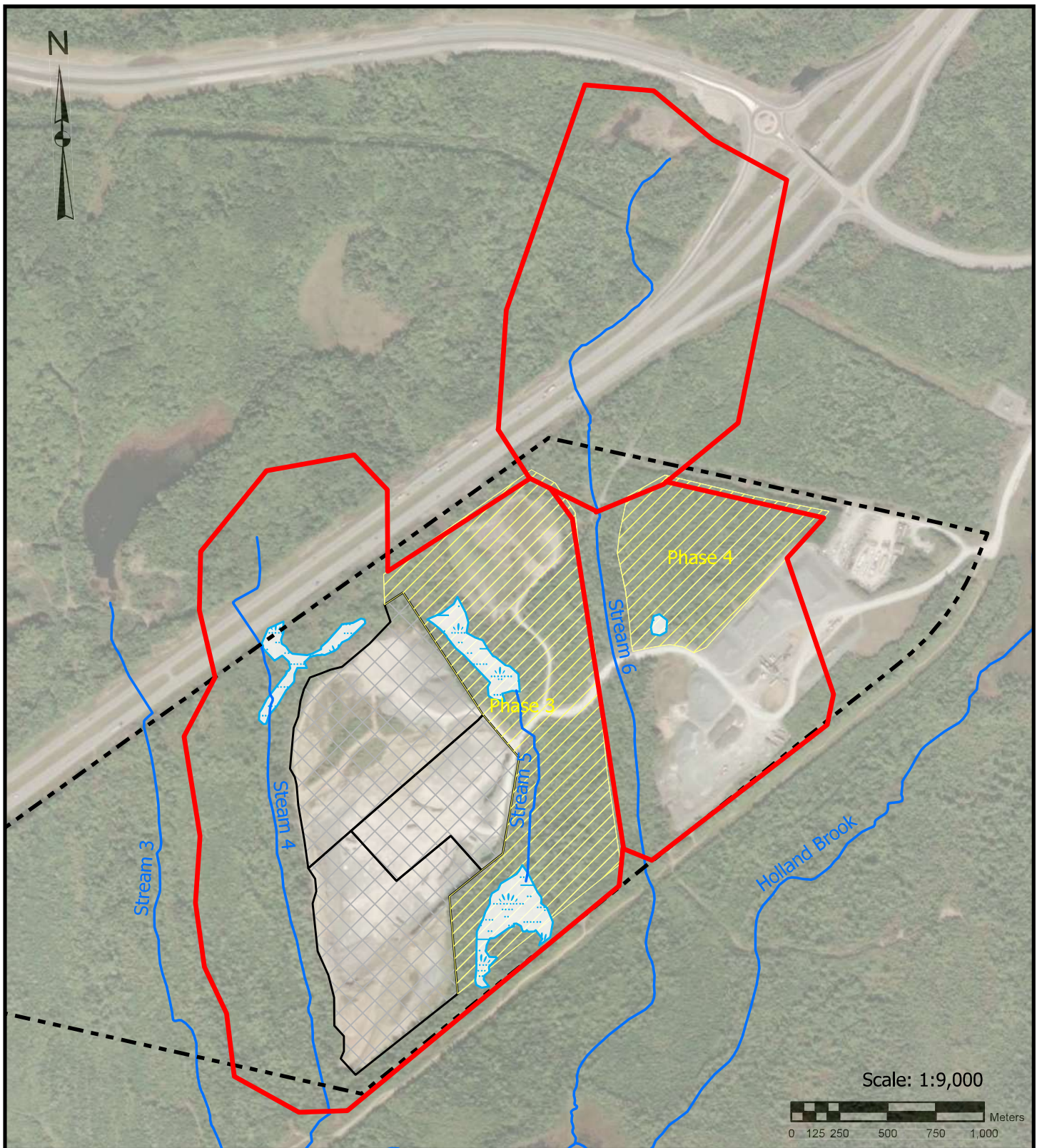
Project: <div>Goffs Quarry Phase 3 & 4 Expansion Goffs, Nova Scotia</div>				Drawing: Surface Water Hydrology Monitoring Stations		 <div>GEMTEC</div> <div>CONSULTING ENGINEERS AND SCIENTISTS</div>
				Client: Scotian Materials Ltd.		
Drawn by:	Checked by:	Date:	Project Number:	Drawing Number:	Revision No.	
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Legend:		Existing Phases		Watercourses (NSHN)
		Quarry Property		Wetlands
		Project Development Area (PDA)		Pre-Development Subcatchments

Note:
 1. Coordinate system: NAD83 CRS UTM Zone 20.
 2. Aerial Imagery Retrieved from: ESRI World Imagery

Project: <div>Goffs Quarry Phase 3 & 4 Expansion Goffs, Nova Scotia</div>				Drawing: Surface Water Hydrology: Pre-development subcatchments		 <div>GEMTEC CONSULTING ENGINEERS AND SCIENTISTS</div>
				Client: Scotian Materials Ltd.		
Drawn by:	Checked by:	Date:	Project Number:	Drawing Number:	Revision No.	
JC	BW	July 2026	103269.002	Figure 4.6	0	



Legend:

Existing Phases	Watercourses (NSHN)
Quarry Property	Wetlands
Project Development Area (PDA)	Post-Development Subcatchments

Note:
 1. Coordinate system: NAD83 CRS UTM Zone 20.
 2. Aerial Imagery Retrieved from: ESRI World Imagery

Project: Goffs Quarry
 Phase 3 & 4 Expansion
 Goffs, Nova Scotia

Drawing: Surface Water Hydrology:
 Post-development subcatchments

Client: Scotian Materials Ltd.

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