Seabrook Quarry Expansion Project

EA Registration Document

May 2023

Prepared for:

Nova Construction Co. Ltd.,
3098 Post Road
Antigonish NS B2G 2L7

Prepared by:

Stantec Consulting Ltd.
102-40 Highfield Park Drive
Dartmouth NS B3A 0A3

File: 121417326

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Abbreviations

°C	degree(s) Celcius
µg	microgram(s)
AC CDC	Atlantic Canada Conservation Data Centre
ANFO	ammonium nitrate/fuel oil
ARIA	archaeological resource impact assessment
ARIA Guidelines	*Archaeological Resource Impact Assessment (Category C) Guidelines* (NSCCTH 2012)
BP	before present
CAAQS	*Canadian Ambient Air Quality Standards* (CCME 2012, 2020a, 2020b, 2021)
CCME	Canadian Council of Ministers of the Environment
cm	centimetre(s)
CO	carbon monoxide
CO_2	carbon dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	catch per unit effort
CRHP	Canadian Register of Historic Places
CWQG-PAL	*Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CCME 1999)
d	day
dBA	A-weighted decibel(s)
DFO	Fisheries and Oceans Canada
DO	dissolved oxygen
E	East
EA	environmental assessment
EA Guide	*Guide to Preparing and EA Registration Document for Pit and Quarry Documents in Nova Scotia* (NSE 2009)
ECCC	Environment and Climate Change Canada
GCDWQ	*Guidelines for Canadian Drinking Water Quality* (Health Canada 2022)
GHG	greenhouse gas
Guidelines, the	Nova Scotia's *Pit and Quarry Guidelines* (NSEL 2003)

H	horizontal
ha	hectare(s)
HADD	harmful alteration, disruption, or destruction (of fish habitat)
HRP	Heritage Research Permit
IA	Industrial Approval
ID	identifier
in	inch(es)
K	hydraulic conductivity
km^2	square kilometre(s)
KMKNO-ARD	Kwilmu'kw Maw-klusuaqn Negotiation Office's Archaeology Research Division
kPa	kilopascal(s)
$ktCO_2e$	kilotonnes of carbon dioxide equivalent
L	litre(s)
LAA	Local Assessment Area
Leq	equivalent sound level
LiDAR	light detection and ranging
Lpm	litre(s) per minute
m	metre(s)
m btoc	metre(s) below top of casing
m^2	square metre(s)
m^3	cubic metre(s)
MARI	Maritime Archaeological Resource Inventory
masl	metre(s) above sea level
MBCA	*Migratory Birds Convention Act*
mbgs	metre(s) below ground surface
MEKS	Mi'kmaq Ecological Knowledge Study
MEL	Municipal Enterprises Limited
MEL Quarry	Municipal Enterprises Limited's adjacent (and not Project-related) Seabrook Quarry
mg	milligram(s)
MGS	Membertou Geomatics Solutions
min	minute(s)
mm	millimetre(s)

MW	monitoring well
N	North
NAPS	National Air Pollution Surveillance
NO	nitric oxide
NO_2	nitrogen dioxide
Nova Construction	Nova Construction Co. Ltd.
NO_x	nitrogen oxides
NRR	Nova Scotia Natural Resources and Renewables
NS ESA	Nova Scotia *Endangered Species Act*
NS WLD	Nova Scotia Well Log Database
NSCCTH	Nova Scotia Communities, Culture, Tourism, and Heritage
NSECC	Nova Scotia Environment and Climate Change
PID	parcel identification number
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter (i.e., fine particulate matter)
ppb	parts per billion
pphm	parts per hundred million
Project, the	Seabrook Quarry Expansion Project
Q/s	specific capacity
RAA	Regional Assessment Area
S1	critically imperiled in Nova Scotia (AC CDC species status rank)
S2	imperiled in Nova Scotia (AC CDC species status rank)
S3	vulnerable in Nova Scotia (AC CDC species status rank)
S4	apparently secure in Nova Scotia (AC CDC species status rank)
S5	secure in Nova Scotia (AC CDC species status rank)
SAR	species at risk
SARA	*Species at Risk Act*
sec	second(s)
SNR	unranked (AC CDC species status rank)
SO_2	Sulphur dioxide
SOCC	species of conservation concern
SU	unrankable (AC CDC species status rank)
SW	surface water monitoring station

T	transmissivity
TRS	total reduced sulphur
TSP	total suspended particulate
TSS	total suspended solids
UNESCO	United Nations Educational, Scientific and Cultural Organization
V	vertical
VC	valued component
VOC	volatile organic compound
W	west
WC	watercourse
WESP-AC	Wetland Ecosystem Service Protocol for Atlantic Canada
WL	wetland
WS	watershed
WSS	Wetland(s) of Special Significance
µS	microsiemens

1.0 INTRODUCTION

Nova Construction Co. Ltd. (Nova Construction) currently produces an average of approximately 150,000 to 200,000 tonnes of aggregate annually from its existing Seabrook Quarry in Seabrook, Digby County, Nova Scotia. To enable quarrying operations to continue at the current rate, Nova Construction is proposing to expand the quarry footprint from 3.99 hectares (ha) to approximately 35 ha, including the associated overburden storage area and aggregate stockpiles ("the Project"). The direction of the proposed expansion is primarily to the north and west of the existing quarry footprint.

Since the Project involves expanding a quarry footprint beyond 4 ha, it will trigger provincial environmental assessment (EA) requirements and must be registered as a Class I Undertaking pursuant to the *Environmental Assessment Regulations* under the Nova Scotia *Environment Act*. The Project is not anticipated to trigger federal impact assessment requirements under the *Impact Assessment Act*. This document is the EA Registration for the Project and has been prepared in accordance with the provincial *Guide to Preparing and EA Registration Document for Pit and Quarry Documents in Nova Scotia* (NSE 2009).

1.1 BACKGROUND

Nova Construction has operated the existing Seabrook Quarry (formerly known as the Parker Mountain Aggregates Quarry) since acquiring it from DJ Lowe Paving and Construction on April 1, 2019. The former Parker Mountain Aggregates Quarry had operated under Industrial Approval (IA) #2002-025843, which was transferred to 3326059 Nova Scotia Ltd. in 2019. Nova Construction and 326059 Nova Scotia Ltd. subsequently amalgamated on April 1, 2021.

Nova Scotia Environment and Climate Change (NSECC) issued Industrial Approval #2021-2794715-00 in 2021, granting approval under Part V of the *Environment Act* for Nova Construction to continue to operate a quarry less than 4 ha in size (i.e., Seabrook Quarry). The Industrial Approval was subsequently amended in February 2022 to modify the configuration – but not the size – of the existing 3.99 ha quarry footprint. The quarry has since been operating under Industrial Approval #2021-2794715-01. It is anticipated that a new Industrial Approval, or an amendment to the existing Industrial Approval, will be required in support of the Project.

Seabrook Quarry currently produces aggregate and associated rock products for roads and construction projects in the region. In addition, it is one of the only local quarries that sells aggregates directly to the public (e.g., to members of the local community who want to purchase gravel for their driveways or landscaping projects). To date, operations at Seabrook Quarry have included grubbing and removal of surficial overburden, drilling and blasting for aggregates, crushing, screening, and stockpiling.

Nova Construction is not aware of any previous issues, concerns, or complaints having been raised by the public, Indigenous groups, or stakeholders in relation to ongoing operations at the existing Seabrook Quarry.

1.2 PROPONENT AND PROJECT IDENTIFICATION

1.2.1 Proponent Information

The Project Proponent is Nova Construction Co. Ltd. (Nova Construction), which is a Nova Scotia registered firm. Corporate information from the Nova Scotia Registry of Joint Stocks is provided in Appendix A.

Nova Construction was incorporated in 1963 and has operated since then in a wide variety of sectors of the heavy civil construction and mining industries, providing a range of commercial and residential services and products such as aggregate, asphalt, concrete, earth moving, and bridge and road building. As a driving force in the road building industry, Nova Construction has built, upgraded, and/or paved more than 500 miles of highway in Nova Scotia, New Brunswick, and Newfoundland for the provincial and federal governments. Through its affiliated companies (Pioneer Coal Ltd., Thorburn Mining Ltd., Evans Coal Mines Ltd., Springhill Coal Mines Ltd.), Nova Construction has opened nine surface mining projects in Nova Scotia over the past 35+ years, including coal mining operations and a gypsum mine. Nova Construction also currently operates 14 NSECC-approved rock quarries in Nova Scotia that supply aggregate products to support construction activities around the province.

Proponent Contact Information		**Company President / CEO**	
Name:	Nova Construction Co. Ltd.	Name:	Donald Chisholm
Mailing Address:	PO Box 1328, Antigonish, NS, B2G 2L7	Official Title:	President
Street Address:	3098 Post Road, Antigonish, NS, B2G 2K3	Address:	3098 Post Road, Antigonish, NS B2G 2K3
Telephone Number:	902-863-4004	Telephone Number:	902-863-4004
Fax Number:	902-863-2291	Fax Number:	902-863-2291
E-Mail Address:	contact@nova-construction.ca	E-Mail Address:	dchisholm@nova-construction.ca
Website:	https://www.nova-construction.ca/		

Contact Person for Purposes of the Environmental Assessment	
Name:	Jennifer McPhail
Official Title:	Project Manager, Stantec Consulting Ltd.
Address:	102-40 Highfield Park Drive Dartmouth NS B3A 0A3
Telephone Number:	506-452-7000
Fax Number:	902-468-9009
E-Mail Address:	Jennifer.mcphail@stantec.com

Donald W. Chisholm — MAY 8, 2023

Proponent Signature — Date

Donald Chisholm – President, Nova Construction Co. Ltd.

1.2.2 Project Information

Name of the Undertaking: The name of the undertaking is the “Seabrook Quarry Expansion Project, Digby County”, which is also referred to herein as “the Project”.

Location of the Undertaking: 11479 Highway 217 in Seabrook, Digby County, Nova Scotia (refer to Figure 2.1-1)

1.3 PURPOSE AND NEED FOR THE UNDERTAKING

The purpose of the Project is to allow Nova Construction to expand the quarry footprint at its existing Seabrook Quarry, in the community of Seabrook, Digby County, Nova Scotia, so that the quarry can continue to operate at its current average production rate of approximately 150,000 to 200,000 tonnes of aggregate per year, depending on local project demands and market conditions.

If the proposed quarry expansion (i.e., the Project) does not proceed, Nova Construction will eventually have to cease operations at Seabrook Quarry when the remaining extractable reserves within the current quarry footprint are exhausted, in approximately eight months to one year. If this occurs, the quarry will not be able to continue to supply aggregate and associated rock products for roads and construction projects in the region or to sell aggregates directly to the public. Nova Construction anticipates the source material in the proposed quarry expansion area (i.e., the Project Area) to be of similar quality to the material currently extracted from the existing quarry.

As is the case for other mines and quarries in Nova Scotia, Seabrook Quarry is an important component of the natural resource sector of the economy that provides essential raw materials to the region’s transportation and construction industries. Seabrook Quarry also provides direct and indirect employment for its workers and suppliers, as well as potential economic spin-off benefits for related industries and surrounding communities. Nova Construction’s ability to access lands with aggregate resources over an extended period of time is critical for the quarry operation to be successful and continue to provide local and regional benefits through employment, the procurement of goods, and tax payments.

2.0 DESCRIPTION OF THE UNDERTAKING

Nova Construction proposes to expand the size of the quarry footprint at the existing Seabrook Quarry, from the previously approved 3.99 ha to approximately 35 ha, to enable continued operations at the site. The direction of the proposed expansion is primarily to the north and west of the existing quarry footprint. The expanded quarry footprint will be entirely contained within the Project Area depicted on Figure 2.1-1. The Project Area represents the spatial extent of potential direct physical disturbance associated with the Project. Nova Construction owns the properties on which the Project Area is located (PID #30192942 and PID #30192926). No other changes to quarry facilities or infrastructure are proposed, beyond physical expansion of the quarry footprint to the north and west within the Project Area.

2.1 GEOGRAPHIC SETTING

The Project Area occupies approximately 54 ha on the site of the existing Seabrook Quarry, which is located at 11479 Highway 217 in the community of Seabrook, Digby County, Nova Scotia, as shown on Figure 2.1-1. The approximate geographic coordinates for Seabrook Quarry are: 274572 m E, 4944548 m N (NAD 83 [CSRS] / UTM Zone 20). The Project Area is included on topographic map number 21A/12.

Nova Construction currently owns two parcels of land in connection with Seabrook Quarry and the Project: PID #30192942 and PID #30192926. For simplicity, these two parcels of land are collectively referred to herein as the “Project property”. Ongoing operations at the existing Seabrook Quarry are currently carried out within the Project property. The Project Area is also located within the Project property. Although Project activities will be carried out entirely within the boundaries of the Project Area, it is anticipated that the final footprint of the expanded quarry will only occupy a portion (i.e., approximately 35 ha) of the approximately 54-ha Project Area. It is assumed, for the purposes of the assessment, that Project activities (and the associated areas of direct physical disturbance) could occur anywhere within the Project Area. No other changes to quarry facilities or infrastructure are proposed, beyond physical expansion of the quarry footprint to the north and west within the Project Area.

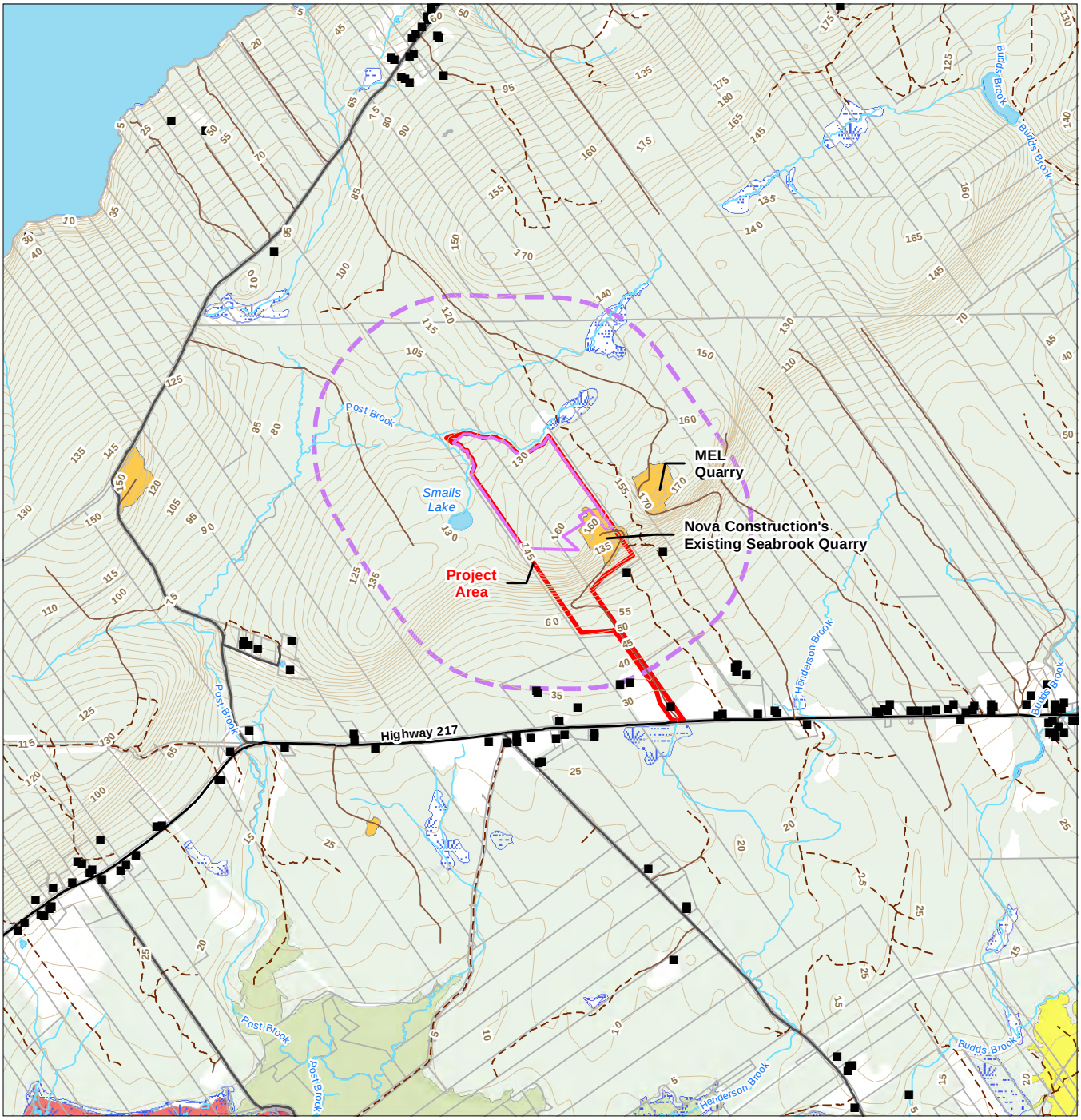
Access to Seabrook Quarry and the Project Area is via a private access road to the south of the existing quarry footprint, off of Highway 217, that leads past the quarry operations offices to a laydown area. This access road is mostly gravel but includes an approximately 150-m paved section at a sharp turn near the laydown area, to reduce dust generation and improve sight lines on the turn. There is also an internal gravel road on-site that is currently used to transport drilling equipment within the existing quarry footprint. The access road and internal site road are both located on the Project property and within the Project Area. No changes to the existing access road, quarry operations offices, or laydown area are proposed as part of the Project.

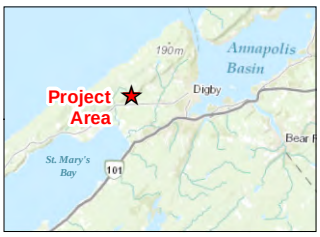
The existing quarry footprint is currently located more than 800 metres (m) from the nearest permanent residence or building foundation. This 800-m buffer will be maintained for the Project; the proposed direction of expansion (i.e., to the north and west of the existing quarry footprint) is away from the nearest permanent residences or building foundations, which are located outside of the Project Area and to the

south of the existing quarry footprint. The existing quarry footprint is also currently located more than 30 m away from the nearest water body (e.g., watercourse or wetland), the Project property boundary, and the nearest public highway (Highway 217). These 30-m buffers will be maintained for the Project.

Municipal Enterprises Limited (MEL) owns the parcels of land immediately to the east of the Project Area (PID #30192975 and PID #302384483) and currently operates a different (not Project-related) aggregate quarry on those properties. This MEL-operated quarry is also known as the Seabrook Quarry, but is referred to herein as the "MEL Quarry" to avoid confusion with the Project currently under assessment (i.e., Nova Construction's proposed Seabrook Quarry Expansion Project).

The surroundings of the Project Area are rural and primarily forested, thereby reducing the potential for visual impacts or other sensory disturbances to the local community.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Canada and Nova Scotia
3. Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

- Building
- Collector Road
- Local Road
- Resource Road
- Track
- Watercourse
- Contour (m)
- Property Boundary
- Wetland
- Waterbody
- Project Area
- 800m Blasting Radius (Expanded Quarry)
- Quarry Expansion Footprint
- Locations of Species of Concern
- Migratory Bird Habitat
- Other Significant Wildlife Habitat
- Existing Pit/Quarry

0 400 800 metres

(At original document size of 8.5x11)
1:34,700

N

Stantec

Project Location
Seabrook
Digby, Nova Scotia

Client/Project 121417326-001_REVB_Fig_2-1-1

Nova Construction
Seabrook Quarry Expansion

Figure No.
2.1-1

Title
Project Location

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2.2 PROJECT COMPONENTS AND ACTIVITIES

The existing Seabrook Quarry is similar to other quarries currently operating in the region. Project activities will be generally consistent with the current quarrying activities approved by NSECC at Seabrook Quarry (Industrial Approval #2021-2794715-01), except that the quarry footprint will progressively expand to the north and west throughout the operation and maintenance phase of the Project. Operation of the existing quarry entails drilling, blasting, and excavation to extract rock that is then processed (i.e., crushed and screened) at mobile facilities on-site to produce aggregate and associated rock products for roads and construction projects in the region. Current infrastructure, facilities, and physical features associated with the quarry consist of the following components, which will continue to be used throughout the Project:

- A private road off of Highway 217 for site access and the hauling of aggregate off-site by truck
- Quarry operations offices
- A laydown area for the portable crushing equipment, screens, portable weigh scales, and other mobile equipment. The laydown area may also be periodically used for the temporary minor stockpiling of unsellable aggregate material on an as-needed basis (e.g., for purposes such as on-site road maintenance and site reclamation).
- The “quarry footprint”, which consists of the active areas of the quarry (i.e., the quarry floor[1], quarry wall[2], and quarry working face[3]) as well as the associated overburden storage area and aggregate stockpiles

As described in Section 2.2.1, grubbed material will be stockpiled between the crest of the quarry working face and the boundary of the Project Area, to be used during both progressive and final reclamation at the end of the life of the quarry. As described in Section 2.2.2, aggregate will be primarily stockpiled in designated areas within the active areas of the quarry footprint (e.g., on the quarry floor).

There is no permanent equipment within the Project Area, and no equipment will be permanently installed as a result of the Project. Mobile equipment will be brought to the Project Area as required to support Project activities and will be relocated throughout the quarry footprint and surrounding Project Area as necessary depending on which phase of the Project is being carried out at any given time.

[1] “Quarry floor” refers to the inside bottom surface (i.e., base or lower limit) of the excavated quarry. The quarry floor is a relatively flat surface upon which quarry personnel, vehicles, and equipment can travel.

[2] “Quarry wall” refers to the vertical excavated face of exposed overburden and aggregate deposits from which material will eventually be extracted/mined during quarrying operations.

[3] “Quarry working face” refers to the portion of the quarry wall from which material is actively extracted/mined during quarrying operations. The top of the quarry working face is referred to as its “crest” and the bottom of the quarry working face is referred to as its “toe”.

The vehicles, equipment, and accessories that are used in the operations will be fairly consistent throughout the life of the Project and may include the following:

- Drills
- Excavators, front-end loaders, and tractors with float
- Portable aggregate crushing and screening equipment
- Portable conveyor belt
- Utility and service vehicles
- Highway-class tandem trucks / dump trucks and tractor trailer trucks

The proposed Project includes site preparation to facilitate expansion of the quarry footprint, operation and maintenance of the progressively expanding quarry footprint, and decommissioning and reclamation of the expanded quarry. The key activities associated with each Project phase are described in Sections 2.2.1 to 2.2.3.

Project activities will be generally consistent with the current quarrying activities approved by NSECC at Seabrook Quarry (i.e., under Industrial Approval #2021-2794715-01), except that the quarry footprint will progressively expand to the north and west throughout the operation and maintenance phase of the Project.

2.2.1 Site Preparation

Site preparation activities will begin with grading and maintenance of the existing quarry floor as necessary for improved access to the quarry footprint by Project personnel, vehicles, and equipment. This phase of the Project will also entail clearing and grubbing for the removal of vegetation and overburden to facilitate expansion of the quarry footprint. Clearing, grubbing, and excavation activities will be spatially limited to a portion of the Project Area and will be completed in a progressive manner wherever possible. Only the area needed for quarry expansion in any given year will be grubbed, and all areas affected by Project activities will eventually be rehabilitated via progressive and final reclamation (Section 2.2.3).

Merchantable timber will be harvested prior to grubbing. Any remaining vegetation and wood/organic material will be saved and used to the greatest extent possible for reclamation activities on-site. Grubbed material, potentially including root mat, subsoil, and topsoil, will be removed by excavators, trucks, and bulldozers, and then stockpiled (in an overburden storage area consisting of berms that are offset from the crest of the quarry working face) for use during future progressive reclamation activities. This overburden storage area will continue to be used for the temporary storage of grubbed material as the quarry footprint expands, and the associated berms will be progressively pushed outward from the crest by dozers as necessary to accommodate the expansion, until the material is eventually used for reclamation purposes (Section 2.2.3). Any unsellable aggregate material that is produced during development of the expanded quarry (if applicable) may be temporarily stockpiled within the laydown area for use, where appropriate, during on-site road maintenance, the construction of on-site features such as berms (e.g., for drainage control, noise buffering, and visual impact mitigation) and settling ponds (if required), as well as for use during site reclamation. Established overburden and aggregate stockpiles will be continuously depleted and replenished on an as-needed basis throughout the course of Project activities (including progressive reclamation), and stockpiled materials will be stabilized as required.

As noted in Section 2.1, a buffer of at least 800 m will be maintained between the expanded quarry footprint and the nearest off-site structure, and a buffer of at least 30 m will be maintained between the expanded quarry footprint and the nearest water body (e.g., watercourse or wetland), the Project property boundary, and the nearest public highway (Highway 217). To leave room for stockpiling grubbed material, grubbed material will be stockpiled between the crest of the quarry working face and the boundary of the Project Area, to be used during both progressive and final reclamation at the end of the life of the quarry. The area of direct physical disturbance associated with the expanded quarry footprint will amount to approximately 35 ha, including the grubbing stockpiles.

In accordance with best practices, standards, and NSECC requirements, mitigation devices/measures will be used to manage runoff generated during Project activities, including site preparation activities. Mitigation devices/measures that are currently in place for runoff control / erosion and sediment control at the existing quarry will be maintained and/or enhanced, where necessary (if applicable), and additional mitigation devices/measures (e.g., diversion ditches, check dams, contour banks, cut-off ditches, straw, hay, mulch, and hydro-seeding [using seed mixes that are free of noxious weeds or invasive species and that contain native species and/or naturalized species that are well-established in Nova Scotia]) may also be employed if necessary. An updated Erosion and Sediment Control Plan will be developed by a qualified professional and submitted to NSECC for review and acceptance prior to the start of construction activities associated with the expansion, including clearing, grubbing, and stripping. Surface runoff will collect on the quarry floor. Overflow from the quarry floor will be directed off-site via rock-lined ditches, and will ultimately infiltrate, evaporate, and/or be trenched off-site into vegetated areas that are located at least 30 m from watercourses, wetlands, or other bodies of water. Check dams and/or hay bales may be added to the ditches as required to reduce suspended solids to an acceptable level before final discharge. Water quality at the final discharge point will be monitored for compliance with the limits specified the Industrial Approval for the Project, in accordance with any requirements specified therein with respect to the parameters to be monitored, the monitoring frequency, and the monitoring methods.

2.2.2 Operation and Maintenance

Quarrying activities will not intensify as a result of the Project expansion. It is therefore expected that proposed Project operation and maintenance activities will remain generally consistent with the current quarrying activities approved by NSECC at Seabrook Quarry under Industrial Approval #2021-2794715-01, except that the quarry footprint will eventually expand by approximately 31 ha (i.e., from the previously approved 3.99 ha to 35 ha) as the quarry wall and quarry working face advance progressively to the north and west within the Project Area. The production rate for the Project is anticipated to remain at the current average rate of approximately 150,000 to 200,000 tonnes of aggregate extracted annually from the existing quarry, depending on local project demands and market conditions. The Project is not expected to result in any change to current blasting, crushing, stockpiling, or trucking activities associated with the existing quarry.

Aggregates will be extracted from the quarry working face via drilling, blasting (with ammonium nitrate/fuel oil [ANFO] and/or emulsion explosives), and excavation. When performing the required drilling and blasting for aggregate production, Nova Construction is dedicated to the health and safety of its employees and the public as well as environmental protection. An extensive in-house drilling and blasting program has allowed the company to perform numerous successful blasts at other quarries, job sites, and affiliated company mines. Nova Construction employs four certified blasters.

Blasting activities at the existing Seabrook Quarry are currently conducted on an as-needed basis, which is typically at least once annually, although additional blasting may be required from time to time to meet market demand. Blasts will continue to be designed and carried out at the same frequency throughout the operation and maintenance phase of the Project. The separation distances specified in section IV of Nova Scotia's *Pit and Quarry Guidelines* (NSEL 2003) (the Guidelines) and section 4 of the current Industrial Approval for ongoing activities at Seabrook Quarry (IA #2021-2794715-01) will be maintained; accordingly, no Project-related blasting will be conducted in the following areas without written approval from NSECC:

- Within 800 m of the foundation or base of a structure located off-site
- Within 90 m of any dug or drilled well that is not a Project-related site monitoring well or a Project-related non-potable process water well
- Within 30 m of the boundary of a public or common highway
- Within 30 m of the bank of any watercourse or the ordinary high-water mark
- Within 30 m of the boundary of any wetland
- Within 15 m of the Project property boundary when a structure on the abutting property is not involved

Blasting during Project operations at Seabrook Quarry will continue in accordance with the Guidelines and the following program:

1. A technical blast design will be prepared by a qualified person.
2. A qualified third party will carry out a pre-blast survey of any structures located within 800 m of the blast (if applicable), in accordance with NSECC's "Pre-Blast Survey" form and *Procedure for Conducting a Pre-Blast Survey* (NSDOE 1993).
3. A competent Project employee will contact the nearest weather office to assess the climate conditions prior to blasting. No blasting will be permitted if a thermal inversion is anticipated by Environment and Climate Change Canada (ECCC) at the scheduled time of the blast.
4. No blasting will occur on any day between 6:00 PM and 8:00 AM, on a Sunday, or on any provincially recognized statutory holiday without prior written approval from NSECC.
5. Prior to any blasting, a notice will be issued to the property owners of any structures located within the 800-m radius pre-blast survey area (if applicable).
6. Blasts will be monitored at the closest residential structure. Air concussion and ground vibration will be monitored to confirm that the following limits are not exceeded:
    a. Air Concussion – 128 A-weighted decibels (dBA)
    b. Ground Vibration – 12.5 millimetres (mm) per second (sec) (0.5 inches [in] per second) Peak Particle Velocity

A summary of blast monitoring results will be kept on file at Nova Construction's head office in Antigonish and provided to NSECC upon request. Blast monitoring results will also be provided to NSECC in an annual report.

Heavy equipment will be used to haul and move extracted material within the quarry footprint. Excavators and front-end loaders will be the primary equipment used to excavate drilled and blasted aggregate material from the quarry working face and haul it to portable crushing equipment on the quarry floor. The various aggregate products will be crushed, screened, and stockpiled in adjacent designated areas in the quarry footprint. Aggregate washing is not currently required at Seabrook Quarry and is not anticipated to be required in support of the Project. A combination of conveyor belts and front-end loaders will be used to move material from the screening equipment to the stockpiles. Aggregate stockpiles will be designed and constructed to reduce segregation of material and prevent mixing of differing classes.

Front-end loaders will be used to load stockpiled aggregate products onto highway-class tandem and tractor trailer trucks when aggregate products require transportation off-site for delivery to customers. The loaded trucks will then be weighed with a portable scale to prevent overweight loads from leaving the quarry. Nova Construction is aware of spring weight restrictions and will adhere to them. The existing access road and trucking route will continue to be used for the transportation of Project-related aggregate products. Trucks leaving the quarry footprint with aggregate products onboard will be fitted with tarps.

The average number of trucks transporting aggregates off-site during the operation and maintenance phase of the Project will be less than 15 trucks per day. However, off-site truck transportation requirements will vary in accordance with current production volumes and future market demand. Therefore, additional trucking may be required at certain times (e.g., to support highway construction projects in the area requiring aggregates). Any such periods of heavier truck traffic will be temporary and are anticipated to be relatively short in duration (i.e., generally less than one month).

Most Project operation activities (e.g., drilling and blasting, crushing and screening, stockpiling, and loading) will generally be conducted during daylight hours. Twenty-four hour operation is not envisioned for the Project. The proposed operating schedule for the expanded quarry is the same as for the existing quarry (i.e., 12 hours/day, five to six days/week for 35 weeks/year, as required to meet the demand for aggregate and associated rock products in local markets).

At the existing quarry, the typical operating schedule is May to December with minimal activity in the winter months; this seasonal operation schedule is anticipated to continue for the operational life of the Project. Load and haul activities may occur approximately eight months of the year, dependent on winter conditions and spring weight restrictions. Crushing and stockpiling operations will normally be conducted during the construction season. The extractable reserves in the Project Area are estimated to last at least 40 years at the current average annual rate of production.

To reduce the generation of particulate emissions (e.g., fugitive dust), Project working areas, laydown areas, and access roadways will be covered with blasted rock. Dust from Project activities will also be controlled where required by using applications of water. Water for dust suppression is currently sourced from a small ephemeral pond to the east of the existing quarry footprint that appears seasonally as a result of surface water runoff and is replenished with off-site water that is imported by truck when the

pond is dry. Waste oil will not be used as a dust suppressant, but other dust control suppressants and measures (e.g., wood chips, calcium chloride, matting, and revegetation) may be considered on an as-needed basis. Details of proposed dust control activities will be submitted to NSECC staff for review as part of the Industrial Approval application or amendment process, including the proposed source of water, expected withdrawal volumes, and associated mitigation measures to reduce impacts. In addition, dust generated by trucking along the access road will be mitigated through speed control, proper truck loading procedures, proper road design, and/or other means as required. Dust emissions during Project activities will be further reduced through the use of covers, screens, enclosures, or other similar methods, where necessary. The presence of on-site berms and vegetative buffers will help to prevent the migration of dust outside of the Project Area.

Monitoring for airborne particulate emissions (dust) will be conducted at the request of NSECC in accordance with the Guidelines and the Nova Scotia *Air Quality Regulations*. The Project will not exceed the following limits for suspended particulate matter at the Project Area boundaries:

- Annual Geometric Mean 70 micrograms per cubic metre (µg/m^3)
- Daily Average 120 µg/m^3

Combustion emissions will be generated from the operation of vehicles and equipment during Project activities. Given the scope of the planned operation the emissions will be minimal and similar to that of a small, localized construction project using a few pieces of heavy equipment. These air emissions will be reduced through proper equipment maintenance and inspection practices, as well as methods to reduce truck and equipment idling where practical.

Berms and vegetative buffers will be used as necessary to maintain Project-related noise at a level that does not exceed the following equivalent sound level (Leq) limits at the Project Area boundaries, in accordance with the Guidelines:

- 65 dBA 07:00–19:00 Hours (Day)
- 60 dBA 19:00–23:00 Hours (Evening)
- 55 dBA 23:00–07:00 Hours (Night)

Noise monitoring will be conducted at the request of NSECC.

As described in Section 2.2.1, surface runoff will collect on the quarry floor, with overflow directed off-site via rock-lined ditches and the potential addition of check dams and/or hay bales as required to reduce suspended solids to an acceptable level before final discharge. During Project operations, water accumulation on the quarry floor will be directed to the diversion ditches via a pump and discharged through a perforated discharge pipe. The final discharge point for the quarry will be located in an area that allows water to be discharged into vegetation. No water will be discharged from the Project Area directly to a watercourse, wetland, or any other body of water at any time. Final discharge of surface runoff to a vegetated area will reduce suspended solids concentrations before the runoff leaves the Project Area or reaches a receiving water body. Water quality at the final discharge point will be monitored for compliance with the limits specified the Industrial Approval for the Project, in accordance with any requirements specified therein with respect to the parameters to be monitored, the monitoring frequency, and the

monitoring methods. No watercourses or wetlands are present within 30 m of the Project Area. Erosion and sediment controls will be inspected on a regular basis (i.e., at least annually), as well as prior to and following substantial precipitation or flow events of 60 mm/24 hours or more, and will be maintained or repaired as necessary for proper function. Records outlining results of these inspections and actions taken to correct any deficiencies (if applicable) will be kept for the duration of the Project and made available to NSECC upon request.

Other maintenance activities that will be carried out during this phase of the Project include maintenance of an accessible quarry floor and regular inspection of the quarry wall, quarry working face, and stockpiles, with stabilization measures carried out as necessary to protect the safety of Project personnel and facilitate efficient and productive Project operations.

2.2.3 Decommissioning and Reclamation

Nova Construction considers the goal and responsibilities of reclaiming (or rehabilitating) a quarry to be a key element of the Project plan and intends to return the Project Area to a state equal to or better than that existed prior to Project-related disturbance, within the scope of existing industry practices. Following the completion of Project quarrying activities, the expanded quarry footprint will be reclaimed and returned to a condition that is consistent with the natural surroundings and the desired final land use. This is generally achieved through grading, contouring, capping with soil, revegetation, and the passage of time. Project-related seeding and/or hydro-seeding will be carried out, as necessary, using seed mixes that are free of noxious weeds or invasive species and that contain native species and/or naturalized species that are well-established in Nova Scotia.

Nova Construction will undertake a progressive reclamation program to offset phased stripping/grubbing activity whenever possible. Progressive reclamation activities will occur incrementally throughout the site preparation/construction and operation/maintenance phases of the Project. In addition to progressive reclamation, final reclamation will take place immediately following completion of the operation and maintenance phase of the Project (i.e., immediately following the final extraction of rock), during the dedicated reclamation and closure phase of the Project.

Overburden from the Project will be stockpiled in an overburden storage area consisting of berms that are offset from the crest of the quarry working face; this material may include root mat, subsoil, and topsoil that will be used to progressively reclaim at the receding end of the expanded quarry footprint. As progressive reclamation occurs, the areas that are being reclaimed will be shaped to blend with the surrounding landscape. Although it is anticipated that all stockpiled overburden material will be used during reclamation, any residual stockpiles of excess overburden that are not used during reclamation (if applicable) will be sloped appropriately and hydro-seeded.

For final reclamation, the last areas that will be left to be reclaimed at the end of the life of the Project are the quarry floor and the working face. The final production blast will be designed to produce adequate material to slope the final working face. The area will then be shaped and contoured with the quarry floor using stockpiled overburden as necessary. The final grading will produce blended slopes. The final desired end land use of the site will ultimately determine the final landform; however, where possible the site will be shaped to blend with the surrounding landscape.

Proposed progressive and final reclamation activities will include, but not be limited to, grading and contouring of all slopes and exposed rock. Dozers and excavators will be used to grade and contour the side slopes of quarry walls so that they are stable and meet legislated slope requirements. A stable sub-base landform will be created to allow for the even spreading of existing stockpiled overburden as well as unused rock. This will allow for a consistent and natural looking final landform. Reclaimed areas will typically be seeded with native and/or naturalized species. Grubbings and stockpiled topsoil/overburden will be used to the extent possible to facilitate natural regrowth of native species. The final landform will be passed over with track-mounted heavy equipment to allow for aeration of the material. This will assist in erosion control and the germination of plant species in reclaimed/revegetated areas. Temporary erosion and sedimentation control measures will be in place (e.g., rock dams with geotextile, hay mulching, etc.) as needed during the establishment of vegetative cover.

Rock-lined ditches and drainage channels will be constructed as necessary to control run-off and prevent erosion of exposed soils. Steeper rock-face slopes will be blasted as required and will be no steeper than 3H:1V (three horizontal metres for each vertical metre), or no steeper than 2H:1V, with a 3-m terrace for every 15 m of slope distance. The rest of the reclaimed Project Area will consist of gradual slopes; however, slopes may be developed that are typical of the Project Area prior to disturbance where practicable.

A detailed Rehabilitation Plan (including associated monitoring plans) will be developed in support of the Industrial Approval application or amendment process for the Project, submitted to NSECC for review and acceptance, and implemented. The main objective of the Rehabilitation Plan will be to provide long term land stability, as well as proper drainage to mitigate erosion following the completion of Project operations. The Rehabilitation Plan will provide details regarding the following:

- Site contouring, drainage patterns, and soil stabilization methods (for long-term erosion control, to mitigate the effects of off-site drainage to adjacent lands and wetlands/watercourses, and to blend with natural topography)
- Slope specifications for a safe and stable site
- Use of overburden for revegetation purposes
- Use of native vegetation
- Dismantling/removal of temporary equipment
- Objectives for existing access roads
- The long-term objective for future use (i.e., final land use) of the Project Area following the completion of decommissioning and reclamation activities

While Nova Construction does not currently intend to leave any Project-related water features (e.g., ponds or standing water) on-site once the reclamation process has been completed, if applicable, the Rehabilitation Plan will also include specifications for any ponds, lake, or flooded quarry features, as well as a management and monitoring plan to address water quality and erosion and sediment control for any water features left on-site (if applicable).

Nova Construction will provide financial security, as required by NSECC under the Guidelines, for assurance that the Rehabilitation Plan will be implemented to the satisfaction of NSECC. Nova Construction will review the Rehabilitation Plan for the Project at least every three years and update it as necessary based on current conditions. The amount of financial security will also be reviewed at least every three years and adjusted as necessary to reflect changes to estimated costs of the Rehabilitation Plan, if applicable.

2.2.4 Accidents and Malfunctions

Accidents and malfunctions could occur during routine Project activities described above in Sections 2.2.1 to 2.2.3. Potential Project-related accident and malfunction scenarios include the accidental release (spill) of petroleum hydrocarbons or other hazardous materials, the failure of mitigation devices (e.g., erosion and sediment controls) to effectively manage site runoff or drainage within the Project Area, and fire.

A hazardous material spill or the failure of mitigation devices to effectively manage site runoff or drainage could adversely affect groundwater quality, surface water quality, riparian habitat and species, and/or aquatic habitat and species. Contaminants from a hazardous material spill could leach into groundwater zones and/or be transported into riparian areas, wetlands, or watercourses (e.g., in surface runoff during very high precipitation events). Similarly, the failure of erosion and sediment controls could result in increased concentrations of total suspended solids (TSS) and/or other contaminants in groundwater resources, riparian areas, wetlands, and/or watercourses. Terrestrial habitat and species, potentially including SAR, SOCC, and sensitive vegetation communities, could also be adversely affected by a hazardous material spill or the failure of erosion and sediment controls (i.e., in areas where associated contamination is present and/or sediments are deposited).

A fire could result in the contamination of groundwater and/or surface water resources, and/or a change in surface water temperature, as well as associated adverse effects on aquatic habitat and species; alteration or loss of terrestrial habitat; injury or mortality of terrestrial species, potentially including SAR, SOCC, and sensitive vegetation communities; and atmospheric emissions of contaminants that adversely affect air quality. A fire could also adversely affect land and resource use if it results in a restriction or change in access to areas used for recreation, tourism, or other purposes.

The risk of an accident or malfunction will be reduced through implementation of the standard mitigation measures and best management practices identified in Table 2.4-1 (in Section 2.4.2 below), including those pertaining to hazardous materials/wastes and dangerous goods; erosion and sediment control, management of runoff, and water quality; and blasting. In the unlikely event of an accident or malfunction, it is anticipated that implementation of the contingency and emergency response measures described in Table 2.4-1 will reduce the magnitude, geographic extent, and duration of potential residual adverse effects on the environment. A Spill Contingency Plan and an Emergency Response Plan have been developed for current operations at Seabrook Quarry and will be implemented, as applicable, in the event of a spill, fire, or other emergency. The Emergency Response Plan prescribes actions to mitigate potential risks to the safety of employees and the public, as well as communication and reporting requirements. Contingency and emergency response equipment and materials will be maintained in good working order on-site, including spill containment and clean-up equipment, fire prevention and

suppression equipment, and contingency erosion and sediment control materials. The drainage and conveyance features that will be in place to manage seepage and runoff within the quarry footprint during routine Project activities will further reduce the risk of spill or fire-related contaminants entering riparian areas, wetlands, watercourses, and other areas where sensitive species, vegetation communities, and/or habitats may be located.

2.3 PROJECT SCHEDULE

The proposed quarry expansion could start as early as September 2023, pending regulatory approval. The estimated timing and duration of the various phases of the Project are as follows:

- **Site Preparation –** Site preparation activities will occur progressively on an as-needed basis over the life of the Project (typically once per year for one to two weeks), with grubbing carried out prior to resource extraction.
- **Operation and Maintenance –** The extractable reserves in the Project Area are estimated to last at least 40 years at the current average annual rate of production. As described in Section 2.2.2, the proposed operating schedule for the expanded quarry is the same as for the existing quarry (i.e., 12 hours/day, five to six days/week for 35 weeks/year, as required to meet the demand for aggregate and associated rock products in local markets). The existing quarry is typically active during construction season (May to December) with minimal activity during the winter months; this seasonal operation schedule is anticipated to continue for the operational life of the Project. Blasting activities at the existing Seabrook Quarry are currently conducted on an as-needed basis, which is typically at least once annually, although additional blasting may be required from time to time to meet market demand.
- **Decommissioning and Reclamation –** Progressive reclamation activities will be carried out concurrently with site preparation and quarrying activities and will therefore overlap temporally with portions of the site preparation/construction and operation/maintenance phases of the Project. It is anticipated that the final reclamation program (contouring, vegetation, and monitoring) will be completed within a one- to three-year period following the conclusion of the aggregate extraction activities associated with the operation and maintenance phase of the Project. Additional details on decommissioning and reclamation timelines will be developed as part of the Industrial Approval application or amendment process and conditions of EA approval.

2.4 ENVIRONMENTAL MANAGEMENT

2.4.1 Plans and Policies

Nova Construction has developed the following plans and policies that have been previously submitted to NSECC for review (i.e., as documentation in support of Nova Construction's 2021 application for Industrial Approval #2021-2794715-00) and are currently in place for the operating Seabrook Quarry:

- Erosion and Sediment Control Plan
- Spill Contingency Plan
- Emergency Response Plan

- Dispute Resolution and Arbitration Policy
- Safety Policy
- Company Rules
- Personal Protective Equipment Program
- Emergency Preparedness Policy
- Hazard Assessment Policy
- Inspection Policy
- Environmental Policy
- Investigation Policy
- Safe Job Procedure Policy
- Safe Work Practice Policy
- Training Policy
- Worksite Visitor Policy

Any Project-related requirement to revise these plans or policies (if applicable) will be completed in conjunction with the Industrial Approval application or amendment process for the Project.

A Project-specific Rehabilitation Plan will be developed, submitted to NSECC for review and acceptance during the Industrial Approval application or amendment process, and implemented throughout the life of the Project.

2.4.2 Standard Mitigation Measures and Best Management Practices

Project activities will be generally consistent with the current quarrying activities approved by NSECC at Seabrook Quarry, except that the quarry footprint will progressively expand to the north and west throughout the operation and maintenance phase of the Project. Nova Construction's current Industrial Approval for ongoing activities at Seabrook Quarry (IA #2021-2794715-01) stipulates requirements related to the following (see Appendix B):

- Separation distances
- Air quality limits
- Noise level limits
- Water quality limits
- Erosion and sediment control
- Blasting limits
- Reclamation (rehabilitation) planning and associated financial security

Table 2.4-1 provides a preliminary list of the general standard environmental mitigation measures and best management practices that are proposed to be implemented as applicable during the site preparation, operation and maintenance, and decommissioning and reclamation phases of the Project. Various follow-up and monitoring programs will also be developed and implemented for the Project, as described in Chapter 5.

Table 2.4-1 Standard Mitigation Measures and Best Management Practices

General / Miscellaneous Measures and Practices, including Design Mitigation
• Project activities will be conducted in compliance with applicable legislation and regulations, the Guidelines, and the terms and conditions of the Project-specific Industrial Approval. • No Project-related direct physical disturbance will occur outside the spatial boundaries of the Project Area. More specifically, Project activities will not be carried out beyond the Project Area, nor will Project components be sited beyond the Project Area, and clearing and grubbing will be limited to the areas required to enable Project activities and/or accommodate Project components. • The Project Area has been designed to avoid an area of high archaeological potential at the confluence of two unnamed watercourses to the north of the existing quarry footprint, as well as the aquatic resources and habitat associated with these two watercourses. The watercourses in question are located approximately 44 m beyond the northwest extent of the Project Area and approximately 86 m beyond the northeast extent of the Project Area, respectively, as shown on Figure 2.1-1.
Solid Waste Management
• Solid waste produced at Seabrook Quarry will be collected and temporarily stored in rubbish bins, dumpsters, or other containers until it is removed by Nova Construction and transported off-site for recycling or disposal at an appropriate provincially-approved waste disposal/management facility in accordance with applicable regulatory requirements. • Efforts will be made to divert solid waste from landfills through re-use or recycling wherever practical to do so, and solid wastes will be sorted on-site to facilitate these efforts. • Grubbed material will be stockpiled for future use during reclamation activities. Grubbed material will be stockpiled between the crest of the quarry working face and the boundary of the Project Area, to be used during both progressive and final reclamation at the end of the life of the quarry. Setback requirements specified in section IV of the Guidelines and section 4 of the current Industrial Approval will be maintained for ongoing activities at Seabrook Quarry (as summarized below in this table under the category of Separation Distances / Setbacks). • Established overburden and aggregate stockpiles will be continuously depleted and replenished on an as-needed basis throughout the course of Project activities (including progressive reclamation), and stockpiled materials will be stabilized as required. • There are no known occurrences of sulphide-bearing material (e.g., acid-generating bedrock) in the immediate Project Area. Nova Construction will immediately contact the NSECC in the event that sulphide-bearing material is encountered in the Project Area. Management and disposal of potentially acid-generating bedrock, if encountered, will be conducted in compliance with the provincial *Sulphide Bearing Material Disposal Regulations*.
Management of Hazardous Materials/Wastes and Dangerous Goods
• No petroleum products, explosives, or other hazardous materials / dangerous goods will be stored on-site. • No hazardous wastes will be stored or managed on-site. • The transportation of explosives will be conducted by a contracted third-party supplier. Any unused explosives (if applicable) will be returned to the supplier for management in accordance with applicable federal and provincial legislation and regulatory requirements. • Project vehicles and equipment will be properly maintained to reduce the risk of leakage. This will include routine inspection of hydraulic equipment and machinery with preventative maintenance to avoid a hazardous material release. • Maintenance of Project vehicles and equipment (including oil changes) will be performed by qualified mechanics employed by Nova Construction. This work may be done on-site at Seabrook Quarry or at Nova Construction's equipment maintenance shop in Antigonish, Nova Scotia. The removal of any hazardous waste products associated with maintenance (if applicable) will be the responsibility of a licensed third-party hazardous waste contractor. The contractor will collect and transport any such hazardous waste products (if applicable) off-site for recycling or disposal at an appropriate provincially-approved hazardous waste disposal/management facility in accordance with applicable regulatory requirements. • The refueling of Project vehicles and equipment will be conducted on-site through the services of a licensed fuel service provider and will be carried out within a designated refueling area that is located no less than 30

Table 2.4-1 Standard Mitigation Measures and Best Management Practices

m away from water bodies (e.g., watercourses and wetlands) and is equipped with appropriately-sized spill response kit(s) and drip tray(s). • The surface of the designated refueling area will be comprised of low permeability material and will be sloped or bermed to prevent spills from entering a watercourse, wetland, or other water resource. • In accordance with the Nova Scotia *Petroleum Management Regulations*, all refueling operations will be supervised to allow for the immediate cessation of petroleum flow in the case of a release and/or overflow.
Separation Distances / Setbacks
• Nova Construction will maintain the following separation distances in accordance with section IV of the Guidelines and the terms and conditions specified in section 4 of the current Industrial Approval for ongoing activities at Seabrook Quarry: – No Project components (including the overburden storage area and aggregate stockpiles) will be located within 30 m of the boundary of a public or common highway, the bank of any watercourse or the ordinary high-water mark, or the Project property boundary. – Nova Construction will not blast within 30 m of the boundary of a public or common highway, within 30 m of the bank of any watercourse or the ordinary high-water mark, or within 15 m of the Project property boundary when a structure on the abutting property is not involved. • Nova Construction will also maintain the following additional separation distances in accordance with the terms and conditions specified in section 4 of the current Industrial Approval for ongoing activities at Seabrook Quarry: – Project activities will not be carried out within 30 m of the boundary of any wetland, within 90 m of any dug or drilled well that is not a Project-related site monitoring well or a Project-related non-potable process water well, or within 800 m of all water supplies. • Grubbed material will be stockpiled between the crest of the quarry working face and the boundary of the Project Area, to be used during progressive and final reclamation at the end of the life of the quarry.
Erosion and Sediment Control, Management of Runoff, and Water Quality
• Nova Construction is familiar with and routinely employs techniques recommended in NSECC's *Erosion and Sediment Control Handbook for Construction Sites* (NSDOE 1988). This document will be used in the design of mitigation devices/measures for the control of runoff, erosion, and sedimentation. In addition, industry best practices will be consulted and reviewed in the development of a comprehensive erosion and sedimentation prevention and control strategy. Typically, a 100-year return period storm event is used in design. Design criteria will be submitted to NSECC for review and approval during the Industrial Approval application or amendment stage of the Project. • An updated Erosion and Sediment Control Plan will be developed by a qualified professional and submitted to NSECC for review and acceptance prior to the start of construction activities associated with the expansion, including clearing, grubbing, and stripping. • Erosion and sediment controls will be installed prior to the commencement of Project activities (i.e., prior to site preparation) and will remain in place until areas disturbed by Project activities are stabilized to mitigate the risk of a sediment release to a watercourse, wetland, or other water resource or into known location of plant SAR and SOCC. • Erosion and sediment controls will be installed as per applicable product specifications or manufacturer's directions. • Erosion and sediment control materials will be clean, non-erodible, non-ore-bearing, non-watercourse derived, and non-toxic. • Operation of the existing quarry has not required the development of settling ponds, as there has been limited runoff associated with current activities. Should settling ponds be required for the Project, they will be designed and constructed so that discharges meet applicable water quality parameters in accordance with the terms and conditions specified in any new or amended Industrial Approval that may be granted by NSECC in support of the Project. Other devices/measures (e.g., diversion ditches, check dams, contour banks, cut-off ditches, straw, hay, mulch, and hydro-seeding [using seed mixes that are free of noxious weeds or invasive species and that contain native species and/or naturalized species that are well-established in Nova Scotia]) may also be used if necessary to control Project-related sedimentation.

Table 2.4-1 Standard Mitigation Measures and Best Management Practices

- No water will be discharged from the Project Area directly to a watercourse, wetland, or any other body of water at any time. Final discharge of surface runoff to a vegetated area will reduce suspended solids concentrations before the runoff leaves the Project Area or reaches a receiving water body.
- Surface runoff will collect on the quarry floor. Overflow from the quarry floor will be directed off-site via rock-lined ditches, and will ultimately infiltrate, evaporate, and/or be trenched off-site into vegetated areas that are located at least 30 m from watercourses, wetlands, or other bodies of water. Check dams and/or hay bales may be added to the ditches as required to reduce suspended solids to an acceptable level before final discharge.
- During Project operations, water accumulation on the quarry floor will be directed to diversion ditches via a pump and discharged through a perforated discharge pipe. The final discharge point for the quarry will be located in an area that allows water to be discharged into vegetation.
- Stockpiled materials and Project working areas will be stabilized and/or graveled as necessary.
- Stockpiles of soil/till will be allowed to revegetate to reduce erosion potential.
- Overburden will be stored using appropriate angles of repose for the material.
- Progressive reclamation activities will include the timely revegetation/stabilization of disturbed areas to reduce the potential for erosion and sedimentation.
- Drainage ditches and swales will be utilized to the greatest extent practicable to divert surface water, originating up-gradient of the Project Area, around the perimeter of the quarry footprint, thereby reducing contact of water with the quarry floor and working faces.
- Erosion and sediment controls will be inspected regularly to confirm that they are working as designed and intended.
- Relevant additional standard mitigation measures and best management practices listed above in this table (i.e., under the categories of Solid Waste Management, Management of Hazardous Materials/Wastes and Dangerous Goods, and Separation Distances) will also be implemented, where applicable and as necessary, to help mitigate potential Project-related effects on water quality.
- During the site preparation phase of the Project, additional mitigation measures will be put in place, if necessary, to achieve the following water quality limits (as specified in section 7I(i) of the terms and conditions of the current Industrial Approval for ongoing activities at Seabrook Quarry) in water resources downstream of the Project Area:
  - Total Suspended Solids (TSS), Clear Flows (Normal Background Conditions)
    - Maximum increase of 25 milligrams per litre (mg/L) from background levels for any short-term exposure (24 hours or less)
    - Maximum average increase of 5 mg/L from background levels for longer term exposure (inputs lasting between 24 hours and 30 days)
  - TSS, High Flow (Spring Freshets and Storm Events)
    - Maximum increase of 25 mg/L from background levels at any time when background levels are between 25 mg/L and 250 mg/L
    - Maximum increase of 10% over background levels when background is greater than 250 mg/L
- During the operation and maintenance phase of the Project, additional mitigation measures will be put in place, if necessary, to achieve the following water quality limits (as specified in section 7(b) of the terms and conditions of the current Industrial Approval for ongoing activities at Seabrook Quarry) for surface water discharges from the Project Area:
  - 25 mg/L of TSS
  - pH of 6.0–9.0

Blasting

- A technical blast design will be prepared by a qualified person so that the prescribed ground vibration and air concussion limits are achieved.
- Blasting activities will be carried out by a licensed blasting employee and in accordance with the facilities standard operating procedure for conducting normal blasting operations.
- Nova Construction will implement appropriate mitigation measures to prevent Project blasting activities from exceeding the air concussion and ground vibration limits specified in section VIII(1)(a) of the Guidelines. These measures will include, but not necessarily be limited to, the following:
  - A Project-specific technical blast design will be prepared by a qualified person to prescribe how the air concussion and ground vibration limits specified in section VIII(1)(a) of the Guidelines will be achieved.

Table 2.4-1 Standard Mitigation Measures and Best Management Practices

- This technical blast design will be implemented by Nova Construction (or their blasting contractor) during Project blasting activities.

- Nova Construction will conduct Project blasting activities in accordance with the Guidelines, including the following requirements:
  - Pre-blast surveys will be conducted for any structures located within 800 m of the point of blast (if applicable). These surveys will be conducted in accordance with NSECC's *Procedure for Conducting a Pre-Blast Survey*.
  - No blasting will occur on Sundays, on statutory holidays prescribed by the Province, or on any day between the hours of 18:00 hours and 08:00 hours.
  - No blasting will take place if a thermal inversion is anticipated at the time of the proposed blast.
- Prior to any blasting, a notice will be issued to the property owners of any structures located within the 800-m radius pre-blast survey area (if applicable).
- In accordance with the terms and conditions of the current Industrial Approval for ongoing activities at Seabrook Quarry, the following blasting limits will not be exceeded during the operation and maintenance phase of the Project:
  - Concussion (Air Blast) 128 dBA within 7 m of the nearest structure
  - 0.5 in/sec (12.5 mm/sec) of ground vibration below grade or less than 1 m above grade in any part of the nearest structure not located in the Project Area

Air, Noise, and Light Emissions

- Air and noise emissions from Project vehicles and equipment will be managed by conducting regular inspection, repair, and maintenance activities as required for operation in accordance with manufacturer's recommendations and to reduce instances of visible sooty emissions or abnormally high sound levels.
- Project vehicles and equipment with exhaust systems will be outfitted with mufflers (and/or other appropriate sound attenuation devices).
- Defective vehicles or equipment will be taken out of service and not permitted to resume operations until they are repaired.
- Project vehicles and equipment will be shut down when stationary for long periods of time.
- The idling of vehicles and equipment will be avoided whenever practical.
- Relevant standard mitigation measures and best management practices listed above in this table (i.e., under the categories of Solid Waste Management; Erosion and Sediment Control, Management of Runoff, and Water Quality; and Blasting) will be implemented, where applicable and as necessary, to help mitigate potential Project-related air and noise emissions.
- To reduce the generation of particulate emissions and fugitive dust, Project working areas, laydown areas, and access roadways will be covered with blasted rock.
- Water or other dust control measures will be applied as necessary to reduce fugitive dust emissions. Waste oil will not be used as a dust suppressant, but other dust control suppressants and measures (e.g., wood chips, calcium chloride, matting, and revegetation) may be considered on an as-needed basis.
- Dust generated by trucking along the access road will be mitigated through speed control, proper truck loading procedures, proper road design, and/or other means as required.
- Additional mitigation measures will be put in place, if necessary:
  - To control Project-related air emissions so that they do not contribute to an exceedance of the maximum permissible ground level concentrations of contaminants specified in Schedule A of the *Air Quality Regulations*
  - To control Project-related noise emissions so that they comply with the equivalent sound level criteria identified in the *Guidelines for Environmental Noise Measurement and Assessment* (NSEL 2005) and do not exceed the following sound level limits at the Project property boundary (as per section VII(1) of the *Pit and Quarry Guidelines*):
    - 55 dBA at night (i.e., 23:00–07:00 hours) as well as all day on Sundays and statutory holidays
    - 60 dBA during the evening (i.e., 19:00–23:00 hours), except on Sundays and statutory holidays when the 55 dBA limit applies
    - 65 dBA during the day (i.e., 07:00 –19:00 hours), except on Sundays and Statutory holidays when the 55 dBA limit applies

Table 2.4-1 Standard Mitigation Measures and Best Management Practices

• The presence of on-site berms and vegetative buffers will help to prevent the migration of dust outside of the Project Area as well as to reduce potential sensory disturbance to off-site receptors from Project-related air, noise, and light emissions. • Artificial lighting will be limited to the amount required for safety and security purposes and will be directional or otherwise designed to reduce spill-over light (i.e., unwanted outdoor light shining further than anticipated) wherever practicable without compromising site safety or security. • Lights will be turned off when not in use. Wherever possible, motion-sensing and/or programmable lights will be installed so that lights are automatically turned on and off as necessary. • Efficient sources of light, such as LED, will be used where practical to reduce the overall magnitude of Project-related light emissions.
Reclamation
• Nova Construction will undertake a progressive reclamation program to offset phased stripping/grubbing activity whenever possible. Progressive reclamation activities will occur incrementally throughout the site preparation/construction and operation/maintenance phases of the Project. In addition to progressive reclamation, final reclamation will take place immediately following completion of the operation and maintenance phase of the Project (i.e., immediately following the final extraction of rock), during the dedicated reclamation and closure phase of the Project. • As progressive reclamation occurs, the areas that are being reclaimed will be shaped to blend with the surrounding landscape. • Steeper rock-face slopes will be blasted as required and will be no steeper than 3H:1V, or no steeper than 2H:1V, with a 3-m terrace for every 15 m of slope distance • Site contouring, soil stabilization, revegetation, and the re-establishment of natural drainage patterns will be carried out for long-term erosion control, to mitigate the effects of off-site drainage to adjacent lands and wetlands/watercourses, and to blend with natural topography. • Temporary erosion and sedimentation control measures will be in place (e.g., rock dams with geotextile, hay mulching, etc.) as needed during the establishment of vegetative cover. • Rock-lined ditches and drainage channels will be constructed as necessary to control run-off and prevent erosion of exposed soils. • Project-related seeding and/or hydro-seeding will be carried out, as necessary, using seed mixes that are free of noxious weeds or invasive species and that contain native species and/or naturalized species that are well-established in Nova Scotia. Certified No.1 seed will be used to reseed disturbed areas, unless Certified No. 1 seed is not available for selected reclamation species (i.e., native species). The final landform will be passed over with track-mounted heavy equipment to allow for perforation of the material. This will assist in sediment control and the germination of plant species in reclaimed/revegetated areas. • A detailed Rehabilitation Plan (including associated monitoring plans) will be developed in support of the application for an Industrial Approval for the Project, submitted to NSECC for review and acceptance, and implemented. The main objective of the Rehabilitation Plan will be to provide long term land stability, as well as proper drainage to mitigate erosion following the completion of Project operations. • Nova Construction will adhere to the reclamation and financial security requirements specified in section IX and X of the Guidelines, including posting financial security for reclamation of the quarry footprint in accordance with section 13 of the *Approvals Procedure Regulation* and section 57 of the *Environment Act.* • Nova Construction will review the Rehabilitation Plan for the Project at least every three years and update it as necessary based on current conditions. The amount of financial security will also be reviewed at least every three years and adjusted as necessary to reflect changes to estimated costs of the Rehabilitation Plan, if applicable • Reclamation, both progressive and final, will see habitat reasonably restored to pre-existing conditions. As abandoned areas are progressively recovered and revegetated, areas proceeding through early forest succession will provide habitat for an intermediate diversity of species which will continue to diversify to similar distributions as existing conditions.
Accidents and Malfunctions – Contingency and Emergency Response Measures
• Contingency and emergency response equipment and materials will be kept on-site and maintained in good working order, including spill containment and clean-up equipment; fire prevention, protection, and response equipment; and contingency erosion and sediment control materials. Mandatory safety orientations will be

Table 2.4-1 Standard Mitigation Measures and Best Management Practices

provided for Project personnel. Appropriate Project personnel will receive additional training regarding contingency and emergency response procedures as well as the proper maintenance and use of contingency and emergency response equipment and materials for spill containment and clean-up; fire prevention, protection, and response; and response to the failure of mitigation devices (e.g., erosion and sediment controls). • A Spill Contingency Plan has been developed for Seabrook Quarry in accordance with provincial *Contingency Planning Guidelines* (NSECC 2016) and will be implemented in the event of an emergency fuel spill. All Project employees and temporary site workers will review Nova Construction's Spill Contingency Plan as part of their site orientation. If an accidental spill of hazardous materials occurs, the Spill Contingency Plan will be initiated, which includes immediate reporting of any spill (regardless of size) to a supervisor and taking measures to stop and contain the release immediately. Supervisors will notify the proper agencies, put in place controls to prevent further spill or release, and initiate clean up to pre-spill conditions. Requirements for containment, clean-up, site restoration, disposal and reporting are provided in the Spill Contingency Plan, as well as a list of equipment available on-site for emergency response to a spill. • In the event of an emergency fuel spill, immediate action will be taken to stop and contain the contaminated material. • As necessary, spills will be reported to the 24-hour environmental emergencies reporting system (1-800-565-1633) in accordance with the *Environmental Emergency Regulations*. • Any release of petroleum hydrocarbons or other hazardous materials (if applicable) will be dealt with by immediately removing the impacted sediments and disposing of them in a manner approved by NSECC and in accordance with applicable regulatory requirements. • Any surface water runoff that may be impacted by petroleum hydrocarbons (if applicable) will be collected and directed for necessary treatment prior to discharge. • An Emergency Response Plan has been developed for current operations, which includes measures to be implemented in the event of a fire, including actions to mitigate potential risks to the safety of employees and the public, as well as communication and reporting requirements. • Fire prevention and suppression systems will be maintained on-site, including fire extinguishers. • Nova Construction will liaise with local emergency providers so that roles and responsibilities are understood, and that the necessary resources required to respond are in place.

2.5 CONSIDERATION OF PROJECT ALTERNATIVES

Potential alternative methods for carrying out the Project include the following:

- Siting the Project at a different location
- Using a different mode of transporting the aggregate and/or a different transportation route
- Using a different method of aggregate extraction
- Implementing different decommissioning and reclamation activities

The Project entails expansion of the existing Seabrook Quarry, which has been operated by Nova Construction since April 1, 2019 – and was previously operated for several years, opening in 2002, under different ownership prior to its acquisition by Nova Construction. Selection of an alternative location for the Project would not be feasible since the location of the Project (i.e., within the boundaries of the Project Area on the Project property) is necessarily and inextricably linked to the currently operational Seabrook Quarry that has already been established on the Project property.

Although Project activities will be carried out entirely within the boundaries of the Project Area, the final footprint of the expanded quarry will only occupy a portion (i.e., approximately 35 ha) of the approximately 54-ha Project Area. The size of the Project Area was selected to allow flexibility for the avoidance of environmentally sensitive features within the Project Area as the quarry footprint progressively expands. In addition to being large enough to allow for various potential configurations of the expanded quarry footprint, the Project Area has also been designed to avoid an area of high archaeological potential at the confluence of two unnamed watercourses to the north of the existing quarry footprint, the aquatic resources and habitat associated with these two watercourses, and adjacent wetland habitat to the northeast. The watercourses in question are located approximately 44 m beyond the northwest extent of the Project Area and approximately 86 m beyond the northeast extent of the Project Area, respectively, as shown on Figure 2.1-1 (in Section 2.1). The adjacent wetland habitat is located approximately 45 m beyond the northeast extent of the Project Area.

Other benefits to siting the Project at its currently proposed location include expanding the existing quarry footprint into an area that is already exposed to air emissions, noise emissions, and other sensory disturbances associated with ongoing quarrying activities, rather than introducing a new quarry into an area that is not already subject to such disturbances. Expansion of the existing quarry will also not require immediate construction of any new facilities (e.g., roads or buildings), as the existing facilities are at present sufficient for current operations as well as proposed Project operations. Additional flow retention structures will be installed/constructed, if required, to accommodate additional surface runoff and dewatering activities as the quarry footprint expands.

The existing access road and trucking route will continue to be used for the transportation of Project-related aggregate products. Trucks are the only suited mode of transportation to deliver aggregate and associated rock products from the Project to the local markets that Seabrook Quarry serves in the region. Furthermore, project locations vary and therefore there is no feasible alternative to truck transportation.

Aggregates are currently extracted from the existing Seabrook Quarry via drilling, blasting, and excavation. These are the only technically viable methods of extracting aggregate from the Project Area due to the nature and characteristics of the rock. Accordingly, there are no feasible alternative means of extracting aggregate material for the Project.

The Project-specific Rehabilitation Plan will include consideration of various alternatives for final land use of the Project Area following the completion of decommissioning and reclamation activities, based on the long-term objectives for future use of the site.

3.0 MI'KMAQ AND PUBLIC INVOLVEMENT

Consultation with potentially affected stakeholders, the general public and regulatory agencies, and engagement with the Mi'kmaq community is an essential component of any EA. Nova Construction acknowledges the importance and value of effective public engagement and envisions a long and mutually beneficial public engagement program for the Project. The purpose of community engagement and consultation is to inform stakeholders, the Mi'kmaq and the community about existing and proposed activities and to identify any issues of concern raised by stakeholders and the Mi'kmaq during the planning and design of the Project and continuing into operation. Engagement efforts completed to date are documented below. Nova Construction will continue to engage with the Mi'kmaq and general public throughout the life of the Project.

3.1 METHODS OF INVOLVEMENT

Engagement efforts to date has involved notifying local officials of Nova Construction's intent to expand the existing quarry operation. This included the submission of a letter to the local MLA and Councillor describing the proposed Project and environmental assessment process that Nova Construction is undertaking. No responses have been received to date. In addition, a community newsletter (Appendix C) was prepared and distributed to nearby residents along Highway 217 (i.e., within approximately 3 km of the existing Seabrook Quarry), municipal offices in the Digby area, and Nova Construction's regular local customers. The community newsletter included details of the proposed expansion, the EA process, and high-level field results.

With respect to the Mi'kmaq of Nova Scotia, Nova Construction has followed the *Proponent's Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia* (NSOAA 2012). Nova Construction has sent letters to the Mi'kmaq on March 28, 2022, including letters to the KMKNO, Bear River First Nation, Acadia First Nation, Millbrook First Nation, Sipekne'katik First Nation, Membertou First Nation, We'koqma'q First Nation and the Native Council of Nova Scotia. This letter included details on the proposed Project, location, Project activities, and the environmental assessment process. The letters also offered the opportunity to meet to discuss potential issues or concerns regarding the Project. A follow-up letter was sent August 24, 2022. No responses have been received to date.

3.2 MI'KMAQ AND PUBLIC COMMENTS

Nova Construction is not aware of any previous issues, concerns, or complaints having been raised by the public, Indigenous groups, or stakeholders in relation to ongoing operations at the existing Seabrook Quarry.

3.3 STEPS TAKEN TO ADDRESS MI'KMAQ AND PUBLIC COMMENTS

No comments have been received to date. The public will be notified of the EA Registration by an advertisement in the Chronical Herald and the Digby Courier. The Mi'kmaq and local officials will be notified of the upcoming paper advertisements indicating that the EA document is available for review at the associated viewing locations. Nova Construction will document any concerns received during the public consultation portion of the EA process.

4.0 ENVIRONMENTAL ASSESSMENT APPROACH, SCOPE, AND METHODS

The Project includes the proposed expansion of a quarry footprint beyond 4 ha; therefore, it must be registered as a Class I Undertaking pursuant to the *Environmental Assessment Regulations* under the Nova Scotia *Environment Act*. The Project is not anticipated to trigger federal impact assessment requirements under the *Impact Assessment Act*. This EA Registration Document has been prepared in accordance with the provincial *Guide to Preparing and EA Registration Document for Pit and Quarry Documents in Nova Scotia* (NSE 2009) (EA Guide).

This chapter describes the EA methods and approach used in the EA Registration.

4.1 SCOPE OF THE PROJECT TO BE ASSESSED

The scope of the Project to be assessed in this EA Registration includes the components and activities described in Chapter 2. The key activities associated with each phase of the Project (i.e., site preparation, operation and maintenance, and decommissioning and reclamation) are described in Sections 2.2.1 to 2.2.3.

4.2 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The scope of this EA Registration has been developed by Nova Construction and Stantec based on the professional judgement and expert knowledge of the Study Team, including Stantec's previous experience with successful environmental approval applications for several other quarry projects in Nova Scotia, and in consideration of the following:

- The guidance provided in the provincial EA Guide (NSE 2009)
- Comments received during public, stakeholder, and Mi'kmaq engagement activities conducted in support of the EA (Chapter 3)
- The results of field studies and data collected in support of the EA

A preliminary Project Information and Scoping Document was submitted to NSECC in January 2022 for discussion. That document provided an overview of the key components and activities associated with the Project, the proposed EA approach and scope of the assessment, and proposed consultation and engagement activities, for the purposes of soliciting feedback from NSECC and facilitating an efficient and effective EA process for the Project. Nova Construction and Stantec subsequently met with NSECC, on February 9, 2022, to present and discuss the contents of the Project Information and Scoping Document in an effort to further focus the scope of the assessment and associated desktop and field studies.

4.2.1 Valued Components

This EA Registration assesses the potential effects of the Project on valued components (VCs). The provincial EA Guide defines a VC as “a resource or environmental feature that is important (not only economically) to a local human population, or has a national or international profile, or if altered from its existing status, will be important for the evaluation of environmental impacts of industrial developments” (NSE 2009).

Section 6 of the provincial EA Guide specifies several biophysical/environmental, socio-economic, and cultural/heritage components of the environment that are recommended for consideration in the EAs of pit and quarry developments in Nova Scotia. For each component that is specified in section 6 of the EA Guide, Table 4.2-1 identifies the corresponding VC(s) that have been selected for consideration in the assessment of Project-related environmental effects in Chapter 5 of this EA Registration, the rationale for selection of each VC, and VC-specific scoping considerations.

Table 4.2-1 Selection and Scoping of Valued Components

Component Specified in EA Guide	VC(s) Selected for Assessment	Rationale for VC Selection and VC-Specific Scoping Considerations	EA Section Reference(s)
Components of the Biophysical/Ecological Environment			
Geology Groundwater	Groundwater Resources	The scope of the Groundwater Resources VC includes groundwater quantity and quality within natural aquifers as well as drinking water wells. This VC was selected for consideration in the assessment of Project-related environmental effects for the following reasons: • Groundwater resources support the life functions of human and non-human biota. • Groundwater resources are essential to the hydrologic cycle and local ecosystems (e.g., wetlands and watercourses). • Groundwater resources are a source of potable water supplies. • Groundwater resources are a potential source of water for agricultural and industrial purposes. • Groundwater resources have potential to be adversely affected by the Project. Potential Project interactions with geological and hydrogeological features are considered as applicable in the assessment of effects on groundwater resources. The description of existing environmental conditions for the Groundwater Resources VC includes existing geological conditions in the LAA and depicts bedrock and surficial geology on mapping.	Section 5.1

Table 4.2-1 Selection and Scoping of Valued Components

Component Specified in EA Guide	VC(s) Selected for Assessment	Rationale for VC Selection and VC-Specific Scoping Considerations	EA Section Reference(s)
Surface Water Fish and Fish Habitat	Aquatic Environment	The scope of the Aquatic Environment VC includes surface water quantity and quality as well as fish and fish habitat. This VC was selected for consideration in the assessment of Project-related environmental effects for the following reasons: • The aquatic environment supports the life functions of human and non-human biota. • The aquatic environment is essential to aquatic life, the hydrologic cycle, and local ecosystems (e.g., wetlands and watercourses) • The aquatic environment has recreational and traditional/cultural value. • The aquatic environment is a potential source of water for potability, agricultural purposes, and industrial purposes. • Fish and fish habitat are protected under the federal *Fisheries Act*. • The aquatic environment has potential to be adversely affected by the Project.	Section 5.2
Wetlands	Wetlands	Wetlands are lands commonly referred to as marshes, swamps, fens, bogs, and shallow water areas that are saturated with water long enough to promote wetland or aquatic processes and that are indicated by poorly drained soil, vegetation, and various kinds of biological activity that is adapted to a wet environment. The scope of the Wetlands VC includes wetland vegetation. This VC was selected for consideration in the assessment of Project-related environmental effects for the following reasons: • Wetlands support a wide range of important ecological, social, traditional/cultural, and economic functions and services in local watersheds. • Wetlands provide important habitat for vegetation and wildlife, potentially including species at risk (SAR) and species of conservation concern (SOCC). • Wetlands are a priority ecosystem for conservation in Nova Scotia due to the valued functions that these ecosystems provide and the cumulative historical loss of wetlands in the province as a result of human activities. Provincial policy and permitting processes are directed at preventing loss of important wetland functions. The *Nova Scotia Wetland Conservation Policy* was introduced in 2011 (and revised in 2019; NSE 2019) to prevent the net loss of wetlands in Nova Scotia. • Wetlands have potential to be adversely affected by the Project.	Section 5.3

Table 4.2-1 Selection and Scoping of Valued Components

Component Specified in EA Guide	VC(s) Selected for Assessment	Rationale for VC Selection and VC-Specific Scoping Considerations	EA Section Reference(s)
Flora and Fauna Species and Habitat	Vegetation	The scope of the Vegetation VC includes SAR and SOCC but excludes secure species. This VC was selected for consideration in the assessment of Project-related environmental effects for the following reasons: • Vegetation that supports biodiversity and are an important component of the terrestrial ecosystems and habitats. • Vegetation that have traditional/cultural value. • Rare and sensitive plants are more vulnerable than secure plant species. • Provincial and federal legislation provides protection to designated plant SAR. • Vegetation that have potential to be adversely affected by the Project.	Section 5.4
	Wildlife and Wildlife Habitat	The scope of the Wildlife and Wildlife Habitat VC includes mammal, herptile, and bird species (secure species as well as SAR and SOCC), and their habitats. This VC was selected for consideration in the assessment of Project-related environmental effects for the following reasons: • Wildlife and wildlife habitat support biodiversity and provide important ecosystem services • Wildlife and wildlife habitat are valued for recreational, economic, and traditional/cultural purposes. • Provincial and federal legislation provides protection to designated wildlife SAR. In addition, most bird species are protected under the federal *Migratory Birds Convention Act*. • Wildlife and wildlife habitat and have potential to be adversely affected by the Project.	Section 5.5
Atmospheric Conditions/Air Quality Noise Levels	Atmospheric and Acoustic Environment	The scope of the Atmospheric and Acoustic Environment VC includes air quality, greenhouse gas (GHG) emissions, and noise and vibration emissions. This VC was selected for consideration in the assessment of Project-related environmental effects due to the following: • The importance of air quality to the health and wellbeing of human and non-human biota • The importance of the atmospheric environment as a pathway for the potential transport of Project-related air contaminants (including dust) to surrounding terrestrial, freshwater, and human environments • The potential for Project-related noise and vibration to cause sensory disturbance affecting human health and wellbeing, land and resource use, and wildlife and wildlife habitat • The potential for noise from Project blasting activities to cause auditory injury to humans or wildlife in proximity to the source • The potential for vibration from Project blasting activities to cause damage to nearby infrastructure/buildings and wells	Section 5.6

Table 4.2-1 Selection and Scoping of Valued Components

Component Specified in EA Guide	VC(s) Selected for Assessment	Rationale for VC Selection and VC-Specific Scoping Considerations	EA Section Reference(s)
		GHGs are also the subject of local, national, and international reduction targets due to their association with climate change, so potential Project-related emissions of GHGs are an issue of scientific and regulatory concern. The assessment of Project-related effects on the atmospheric and acoustic environment considers associated potential human health impacts as applicable. However, any potential effects on other components of the biophysical/ecological environment, socio-economic environment, or cultural/heritage environment that may be associated with Project-related changes in air quality, noise, and vibration are assessed separately in the context of the relevant VC(s).	
Components of the Socio-Economic Environment and the Cultural/Heritage Environment			
Economy Land Use and Value Transportation Recreation and Tourism	Land and Resource Use	The scope of the Land and Resource Use VC includes existing land development (e.g., for residential, commercial, and industrial purposes), transportation, recreation and tourism, agriculture, and resource use (e.g., forestry, mining/quarrying, hunting, trapping, and fishing). This VC was selected in consideration of potential interactions between the Project and the use of the land and resources in the LAA, as well as potential changes to current and future land and resource use that may be associated with Project-related effects on groundwater resources, the aquatic environment, wetlands, rare and sensitive plants, wildlife and wildlife habitat, and the atmospheric and acoustic environment, as applicable. The description of existing environmental conditions for the Land and Resource Use VC describes economic conditions for the region and surrounding communities, including information on the available labour supply and rates of employment. A dedicated Labour and Economy VC (or equivalent) was not selected for consideration in the assessment of Project-related environmental effects because the Project is not expected to increase the intensity of quarrying activities or otherwise result in a change to the current production rate at the existing quarry. No new jobs are predicted to be required in support of the Project since the expanded quarry will be operated by existing employees of the quarry. However, it is anticipated that the Project will extend the operational life of the quarry and therefore also extend the duration of employment for Project personnel. The Project is similarly not anticipated to cause a net change in traffic, and Project interactions with a dedicated Transportation VC (or equivalent) are not deemed to warrant focused assessment, for the following reasons: • The Project is not expected to increase the intensity of quarrying activities or otherwise result in a change to the current production rate at the existing Quarry. • Hauling of blasted rock from the expanded quarry will continue to be via a private access road joining the Quarry to Highway 217.	Section 5.7

Table 4.2-1 Selection and Scoping of Valued Components

Component Specified in EA Guide	VC(s) Selected for Assessment	Rationale for VC Selection and VC-Specific Scoping Considerations	EA Section Reference(s)
		The potential effects of the Project on existing and planned recreation and tourism activities are assessed in the context of land and resource use. A separate VC is therefore not required.	
Human Health	Groundwater Resources Aquatic Environment Atmospheric and Acoustic Environment Land and Resource Use	Potential human health impacts are addressed, as applicable, in the assessments of Project interactions with the aquatic environment, groundwater resources, and the atmospheric and acoustic environment (particularly with respect to relevant government guidelines that have been developed, in part, to be protective of human and ecological health). A separate assessment of Project interactions with human health is therefore not required. Public safety measures, such as controlled site access, fencing and signage, are considered in the assessment of Project interactions with land and resource use.	Section 5.1 Section 5.2 Section 5.6 Section 5.7
Cultural and Heritage Resources	Heritage Resources	For the purposes of the Heritage Resources VC, heritage resources are defined as physical remains that inform us of the human use of and interaction with the physical environment. These resources may be above or below the surface of the ground and cover the earliest Pre-Contact times to the relatively recent past. Heritage resources are generally considered to include archaeological resources (i.e., sites and objects); historic period sites such as cemeteries, heritage buildings, and monuments; and areas of significance to the Mi'kmaq of Nova Scotia or other Indigenous groups. Pre-Contact refers to the time before the arrival of non-Indigenous peoples. The scope of this VC also includes paleontological resources (i.e., fossils). This VC was selected in recognition of the interest of potentially affected Mi'kmaq communities, the general public, and the provincial and federal regulatory agencies involved in the management of these resources. Ground disturbance associated with the Project could affect subsurface heritage resources that may be present in the Project Area.	Section 5.8

In addition to the environmental effects assessment in Chapter 5 of this EA Registration, which considers interactions between the Project and the VCs identified in Table 4.2-1, Chapter 6 assesses Project interactions with the use of lands and resources for traditional purposes by the Mi'kmaq of Nova Scotia. Potential Project-related effects on Mi'kmaq land and resource use are deemed to warrant special consideration in the EA, due to their potential to adversely affect the Aboriginal and treaty rights recognized and affirmed under section 35 of the *Constitution Act, 1982*, and are therefore assessed separately from potential Project-related effects on biophysical/ecological, socio-economic, and cultural/heritage VCs. The assessment in Chapter 6 considers potential effects on Mi'kmaq land and resource use associated with Project-related changes to groundwater resources, the aquatic environment, rare and sensitive plants, wildlife and wildlife habitat, the atmospheric and acoustic environment, and archaeological and heritage resources, as applicable. A Mi'kmaq Ecological Knowledge Study has been completed to support the Project and the results are summarized in Chapter 6.

Other non-VC-focused assessments that are included in this EA Registration are the assessment of Project interactions with other undertakings in the area (Chapter 7) and the assessment of the potential effects of the environment on the Project (Chapter 9).

Assessment methods and scoping considerations specific to the assessment of potential Project-related effects on Mi'kmaq land and resource use, the assessment of potential Project-related effects on other undertakings in the area, and the assessment of potential effects of the environment on the Project are described in Chapter 6, Chapter 7, and Chapter 9, respectively.

The methods employed for the VC-focused assessments of Project-related environmental effects (Chapter 5) are described in Section 4.3 below.

4.2.2 Assessment Boundaries

Spatial boundaries set the geographic areas over which the assessment will be conducted. Temporal boundaries set the timeframe to be considered. These boundaries provide a meaningful and manageable focus for the assessment, as they define the areas within which and the periods during which the VCs are likely to interact with or be influenced by the Project.

Spatial boundaries for the assessment have been selected based on the geographic extent over which Project activities and their effects are likely to occur, as well as other ecological, technical, and social considerations. Each of the following spatial assessment boundaries are defined in Table 4.2-2 and shown on Figure 4.2-1:

- The **Project Area** represents the extent of potential direct physical disturbance for the Project and is consistent for all VCs.
- The **Local Assessment Area (LAA)** encompasses the area in which Project-related effects (direct or indirect) may be experienced and can be predicted or measured with a level of confidence that allows for assessment, and in which there is a reasonable expectation that those potential effects may be a concern. The LAA boundaries are VC-specific and variable depending on the nature of the VC being considered and the anticipated zone(s) of influence.
- The **Regional Assessment Area (RAA)** is a broader area used to describe existing (baseline) conditions and to provide context for the assessment of potential environmental effects.

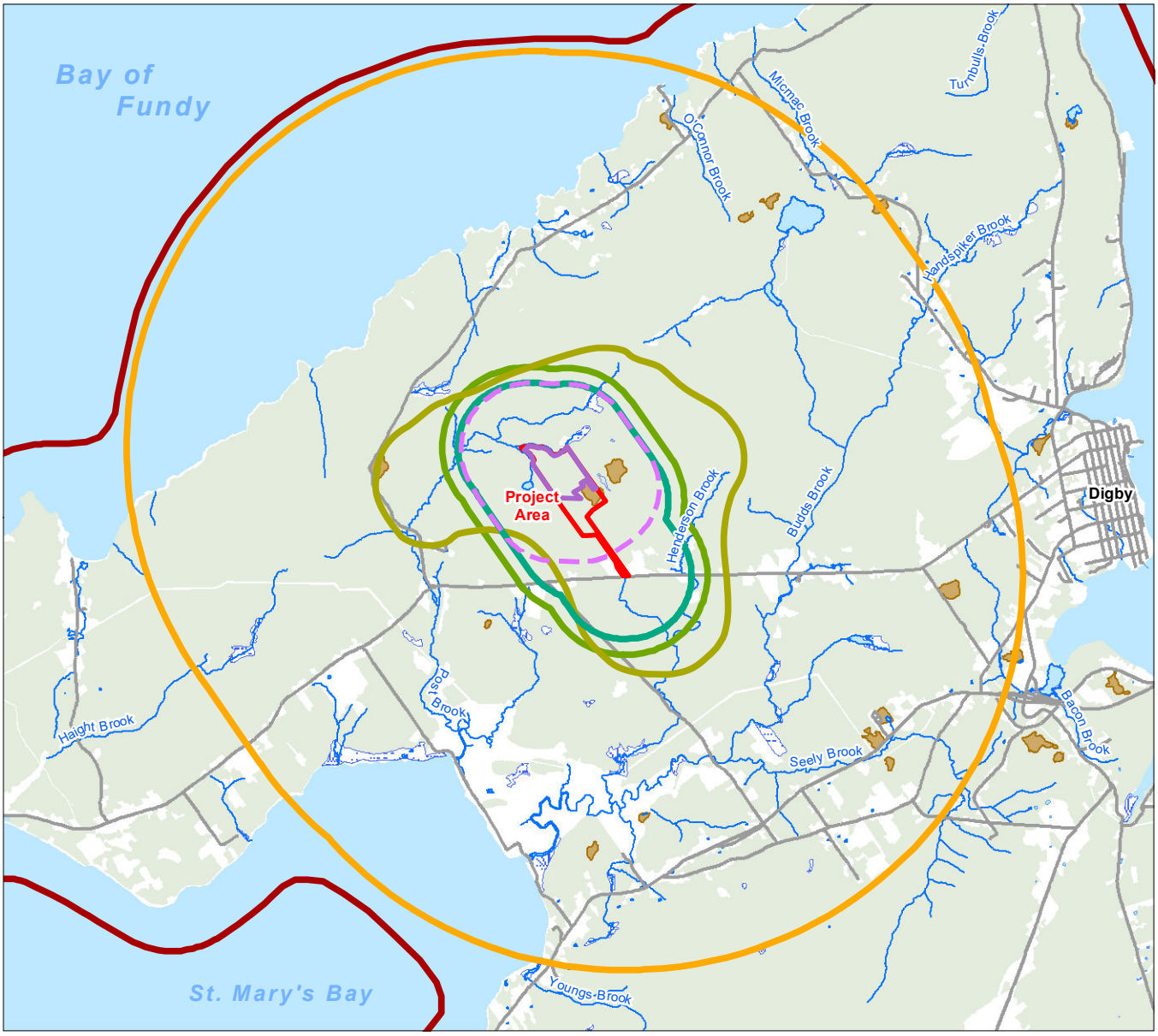
Table 4.2-2 Spatial Assessment Boundaries

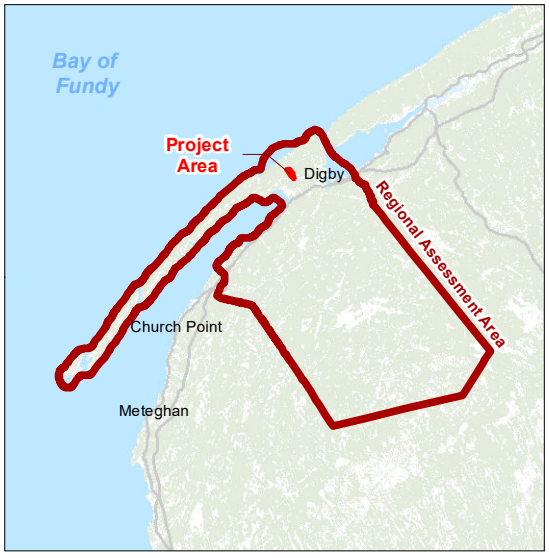
Project Area	
The Project Area (shown on Figure 4.2-1) is approximately 54 ha in size and encompasses the immediate area in which Project activities could occur. It includes the potential areas of direct physical disturbance associated with site preparation, operation and maintenance, and decommissioning and reclamation of the expanded Seabrook Quarry. Although Project activities will be carried out entirely within the boundaries of the Project Area, it is anticipated that the final footprint of the expanded quarry will only occupy a portion (i.e., approximately 35 ha) of the Project Area. However, because the ultimate size and shape of the expanded quarry footprint is not known, it is assumed for the purposes of the assessment that Project activities (and the associated areas of direct physical disturbance) could occur anywhere within the Project Area.	
Local Assessment Area (LAA)	
Groundwater Resources	The LAA for this VC is based on aquifer hydraulic properties, expected groundwater flow directions, and the distance between the quarry footprint and wells that may be affected by excavation and/or blasting. The area of influence or capture area of a typical domestic well is usually less than 100 m. Vibration damage to a well is generally a function of distance between the energy source and the well and the seismic properties of the aquifer materials. Although risk from blasting is expected to be minimal beyond about 200 m in soft rock terrain, an 800-m area of influence is used to be conservative. Thus, the LAA for the Groundwater Resources VC encompasses the Project Area as well as an 800-m buffer surrounding the Project Area (Figure 4.2-1).
Aquatic Environment	The LAA for this VC is based on watershed areas potentially affected by surface runoff from the Project. Thus, the LAA for the Aquatic Environment VC encompasses the immediate Project Area, and the watershed area associated with the headwaters of Post Brook and Henderson Brook to 1 km downstream (Figure 4.2-1).
Wetlands, Vegetation, Wildlife and Wildlife Habitat	The LAA encompasses the Project Area as well as a 1-km buffer surrounding the Project Area (Figure 4.2-1).
Atmospheric and Acoustic Environment	The LAA is based on the airshed within which sensitive receptors (e.g., residential communities) could potentially experience a measurable change in regulated air quality parameters (e.g., airborne particulates) and sound levels. Thus, the LAA for the Atmospheric and Acoustic Environment VC encompasses the Project Area as well as a 5-km buffer surrounding the Project Area (Figure 4.2-1).
Land and Resource Use	The LAA is identical to the LAA defined above for the Atmospheric and Acoustic Environment VC since land and resource users could be affected by sensory disturbance and nuisance impacts within areas subject to measurable air and noise emissions, and this could in turn result in a change in land and resource use within those areas. Thus, the LAA for the Land and Resource Use VC encompasses the Project Area as well as a 5-km buffer surrounding the Project Area (Figure 4.2-1).
Archaeological and Heritage Resources	The LAA is based on the area within which direct Project-related ground disturbance has potential to occur within the Project Area (Figure 4.2-1).
Regional Assessment Area (RAA)	
The RAA is a broader area used to describe existing (baseline) conditions and to provide context for the assessment of potential environmental effects, as applicable. The RAA encompasses both the Project Area and the LAA, as well as the surrounding Municipality of the District of Digby (i.e., the eastern part of Digby County), which occupies approximately 1,659 square kilometres (km^2) (NSDMA 2018). The boundaries of the RAA are identical for all VCs and are shown on Figure 4.2-1.	

Temporal boundaries for the assessment address the potential effects during the site preparation, operation and maintenance, and decommissioning and reclamation phases of the Project over relevant timescales. The overall Project schedule is presented in Section 2.3. The temporal boundaries for the assessment consist of the Project phases indicated in Table 4.2-3 and are generally identical for all VCs, although additional VC-specific sensitivities (e.g., sensitive timing windows and other seasonal factors) are considered, as applicable.

Table 4.2-3 Temporal Boundaries for the Assessment

Project Phase	Anticipated Timing (Approximate)	Anticipated Duration (Approximate)
Site Preparation	2023	As needed throughout site preparation and the operation and maintenance phase of the Project
Operation and Maintenance	2023 to 2063, with the possibility of extension	40+ years
Decommissioning and Reclamation	Following the completion of resource extraction activities	As needed throughout the operation and maintenance phase of the Project (for progressive reclamation) and 1–3 years following the conclusion of the operation and maintenance phase of the Project (for decommissioning and final reclamation)





Legend

- Project Area
- Quarry Expansion Footprint
- Blasting Radius 800 m (Expanded Quarry)
- Road / Highway
- Waterbody
- Wetland
- Existing Pit/Quarry
- LAA Archaeological and Heritage Resources (Same as Project Area)
- LAA Groundwater (800 m)
- LAA Wetlands / Vegetation / Wildlife (1 km)
- LAA Aquatic Environment
- LAA Atmosphere and Acoustic Environment / Land and Resource Use
- Regional Assessment Area

0 1,000 2,000 metres

(At original document size of 8.5x11)
1:1,500,000

N

Stantec

Project Location
Seabrook
Digby, Nova Scotia

Client/Project 121417326_024

Nova Construction
Seabrook Quarry Expansion

Figure No.
4.2-1

Title
Spatial Boundaries for the Assessment

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec, Nova Construction, Enviroshpere, Nova Scotia Dept. of Natural Resources and Renewables, Nova Scotia Dept. of Environment and Climate Change, Government of Canada NRCan CANVEC
3. Service Layer Credits: ESRI 2022

\\ca0213-ppfss01\work_group\1214\active\121417326\03_data\gis_cad\gis\mapping\mxd\report\121417326-024a_Spatial_Boundaries.mxd Revised: 2023-04-18 By: NiWhite

4.3 ENVIRONMENTAL ASSESSMENT METHODS

The methods used to prepare this EA Registration have been developed by Stantec in accordance with the EA Guide and the information requirements specified in section 9(1A)(b) of the *Environmental Assessment Regulations* under Nova Scotia's *Environment Act*. This EA Registration examines the effects that could result from changes to the environment that are caused by Project activities being carried out.

Project-related environmental effects are assessed for each VC during every phase of the Project (i.e., site preparation, operation and maintenance, and decommissioning and reclamation). The focus of the assessment is on residual environmental effects (i.e., the environmental effects that remain after the implementation of planned mitigation measures).

The following subsections describe the methods used to conduct the assessment of potential Project-related effects on each of the selected VCs (as identified in Section 4.3.2).

4.3.1 Description of Existing Environmental Conditions

Existing environmental conditions are described for each VC (Chapter 5) and are established based on data collected during public, stakeholder, and Indigenous engagement activities (Chapter 3) and baseline studies (i.e., desktop analyses and field programs) conducted in support of the EA Registration.

Stantec conducted a variety of desktop and field studies to investigate and establish the existing (baseline) environmental conditions and to determine appropriate mitigation, if necessary, to manage environmental effects from the proposed Project. Information in support of the field and desktop studies and the assessment was gathered through a review of air photos, site mapping, and data from the Atlantic Canada Conservation Data Centre (AC CDC) and other sources, including but not limited to the following: Statistics Canada, Nova Scotia Museum, Nova Scotia Natural Resources and Renewables (NRR), the Nova Scotia Geomatics Centre, and the Nova Scotia Topographic Database.

For the purpose of this assessment, species at risk (SAR) are defined as those species that meet any of the following criteria:

- Species that are listed under Schedule 1 of the federal *Species at Risk Act* (SARA) as *endangered, threatened*, *vulnerable*, or *of special concern*
- Species that are listed under the Nova Scotia *Endangered Species Act* (NS ESA) as *endangered*, *threatened*, *vulnerable*, or of *special concern*
- Species that are not yet listed under provincial or federal legislation but have been identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as being *endangered*, *threatened*, or *of special concern*

Species of conservation concern (SOCC) are defined as those species that do not meet the definition of SAR, but are ranked as S1 (critically imperiled), S2 (imperiled), or S3 (vulnerable) in Nova Scotia by the Atlantic Canada Conservation Data Centre (AC CDC). A numeric range rank (e.g., S2S3) is used by the AC CDC to indicate any range of uncertainty about the status of the species or community in the province (AC CDC 2022a). Refer to Table 4.3-1 for AC CDC status rank and qualifier descriptions.

Table 4.3-1 AC CDC Status Ranks

S-Rank/ Qualifier	Description
S1	Critically Imperiled - Critically imperiled in the province because of extreme rarity (often five or fewer occurrences). May be especially vulnerable to extirpation.
S2	Imperiled – Imperiled in the province because of rarity due to very restricted range, very few populations (six to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3	Vulnerable – Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer).
S4	Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors (80+ occurrences).
S5	Secure – Common, widespread, and abundant in the province.
S#S#	A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community
SNR	Unranked – Provincial conservation status not yet assessed.
SU	Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
B	Breeding - Conservation status refers to the breeding population of the species in the province
N	Nonbreeding - Conservation status refers to the non-breeding population of the species in the province.
M	Migrant - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.
Reference: AC CDC 2020	

An overview of the existing environment is presented using current information about existing conditions and includes the identification of data gaps for the effects assessment (where applicable). The existing environmental conditions for each VC reflect the influences of past and present projects and physical activities on the VC condition leading to the present time.

4.3.2 Potential Environmental Effects

Table 4.3-2 indicates where there is potential for interaction between Project activities and the VCs identified for the assessment. With reference to the Project-VC interactions identified below, each VC assessment subsection in Chapter 5 considers the Project activities that have potential to interact with the VC and result in an environmental effect (i.e., a measurable change that may affect the VC) and describes the nature of the potential Project-related effects on the VC that may occur without the application of mitigation measures. This includes consideration of the pathways through which those potential effects could occur as a result of the Project (i.e., the mechanisms that have potential to cause the effects). Project activities that do not interact with the VC are also identified and the reason for the lack of interaction is explained. Each identified environmental effect is then analyzed based on scientific knowledge, assessment tools such as quantitative modelling (where needed), and professional judgement.

Table 4.3-2 Potential Project-VC Interaction Matrix

Project Activities, by Project Phase	Valued Components							
	Groundwater Resources	Aquatic Environment	Wetlands	Vegetation	Wildlife and Wildlife Habitat	Atmospheric and Acoustic Environment	Land and Resource Use	Archaeological and Heritage Resources
Construction								
Site preparation, including clearing and grubbing to facilitate expansion of the quarry footprint and installation of site management features (e.g., erosion and sediment controls)	✓	✓	✓	✓	✓	✓	✓	✓
Operation and Maintenance								
Presence and operation of Project vehicles, equipment, and site lighting within the Project Area	–	✓	✓	✓	✓	✓	✓	–
Aggregate extraction (i.e., drilling, blasting, and excavation), processing (i.e., crushing and screening), and stockpiling	✓	✓	✓	✓	✓	✓	✓	✓
On-site transportation (hauling/moving and trucking) of aggregates	–	–	✓	✓	✓	✓	✓	–

Table 4.3-2 Potential Project-VC Interaction Matrix

Project Activities, by Project Phase	Valued Components							
	Groundwater Resources	Aquatic Environment	Wetlands	Vegetation	Wildlife and Wildlife Habitat	Atmospheric and Acoustic Environment	Land and Resource Use	Archaeological and Heritage Resources
Decommissioning and Reclamation								
Dismantling (where necessary) and removal of Project equipment, facilities, and infrastructure from the Project Area	–	–	✓	✓	✓	✓	–	–
Progressive and final reclamation of the expanded quarry footprint	✓	✓	✓	✓	✓	✓	✓	✓
Closure of the expanded quarry	–	–	–	–	–	–	✓	–
Notes: ✓ = Potential interaction – = No interaction								

4.3.3 Proposed Mitigation

Technically feasible mitigation measures are proposed to eliminate (e.g., avoid), reduce, or control adverse environmental effects, to address public concerns, and/or to optimize beneficial effects. Types of mitigation measures include Project design mitigation measures and standard environmental protection procedures, such as those identified in Section 2.4.2, as well as VC-specific mitigation measures to address the potential effects on a particular VC, such as those identified in the assessment subsections for each VC in Chapter 5 and summarized in Chapter 8.

4.3.4 Summary of Residual Environmental Effects

In consideration of applied mitigation, residual effects are described in consideration of qualifiers such as magnitude, geographic extent, duration, frequency, degree of reversibility, and possibility of occurrence. The significance of predicted residual effects is then determined in consideration of VC-specific thresholds, which, if a residual effect surpassed, would represent a significant effect.

A level of confidence may be assigned to the significance determination for each VC. A lower level of confidence may be indicative of deficiencies in available information (e.g., data gaps in baseline information or limitations in the availability of existing knowledge related to potential Project-environment interactions) or other challenges. VC-specific deficiencies or challenges associated with the EA process are identified, where applicable.

4.3.5 Proposed Follow-Up and Monitoring Programs

Follow-up and monitoring programs are identified for each VC, where applicable. VC-specific follow-up and monitoring programs include those proposed to verify the accuracy of key EA predictions and the effectiveness of prescribed mitigation measures, as well as compliance monitoring that will be undertaken as necessary to verify compliance with applicable regulatory requirements, including the terms and conditions of any environmental permits, approvals, or authorizations that may be issued in support of the Project.

5.0 VALUED COMPONENTS AND EFFECTS MANAGEMENT

5.1 GROUNDWATER RESOURCES

5.1.1 Description of Existing Environmental Conditions

Groundwater is an integral component of the hydrologic cycle that originates from the infiltration of precipitation or surface water into the ground. This infiltrating water fills voids between individual grains in unconsolidated materials and fills fractures and other void spaces which have developed in consolidated materials. Within the sub-surface, the upper surface of the saturated zone is called the water table. Where the water table intersects the ground surface, interaction between groundwater and surface water can occur. In general, groundwater flows through soil, glacial overburden and bedrock from areas of high elevation (recharge areas) to areas of low elevation (discharge areas) where it discharges from the sub-surface to springs, streams, and lakes. There is a dynamic interaction between groundwater resources and surface water resources in Nova Scotia. Groundwater generally sustains the base flow of streams and certain wetlands during dry periods of the year. More rarely, surface water bodies can contribute to groundwater storage under certain hydrogeological conditions.

An aquifer is a geological formation or group of formations that can store or yield useable volumes of groundwater to wells or springs. The yield of dug or drilled water wells can vary greatly, depending on the hydraulic properties of overburden or bedrock aquifers into which the wells are constructed. Within an aquifer, the natural groundwater quality is directly influenced by the geochemical composition of the sub-surface materials through which the water passes, and the time the water resides within those materials.

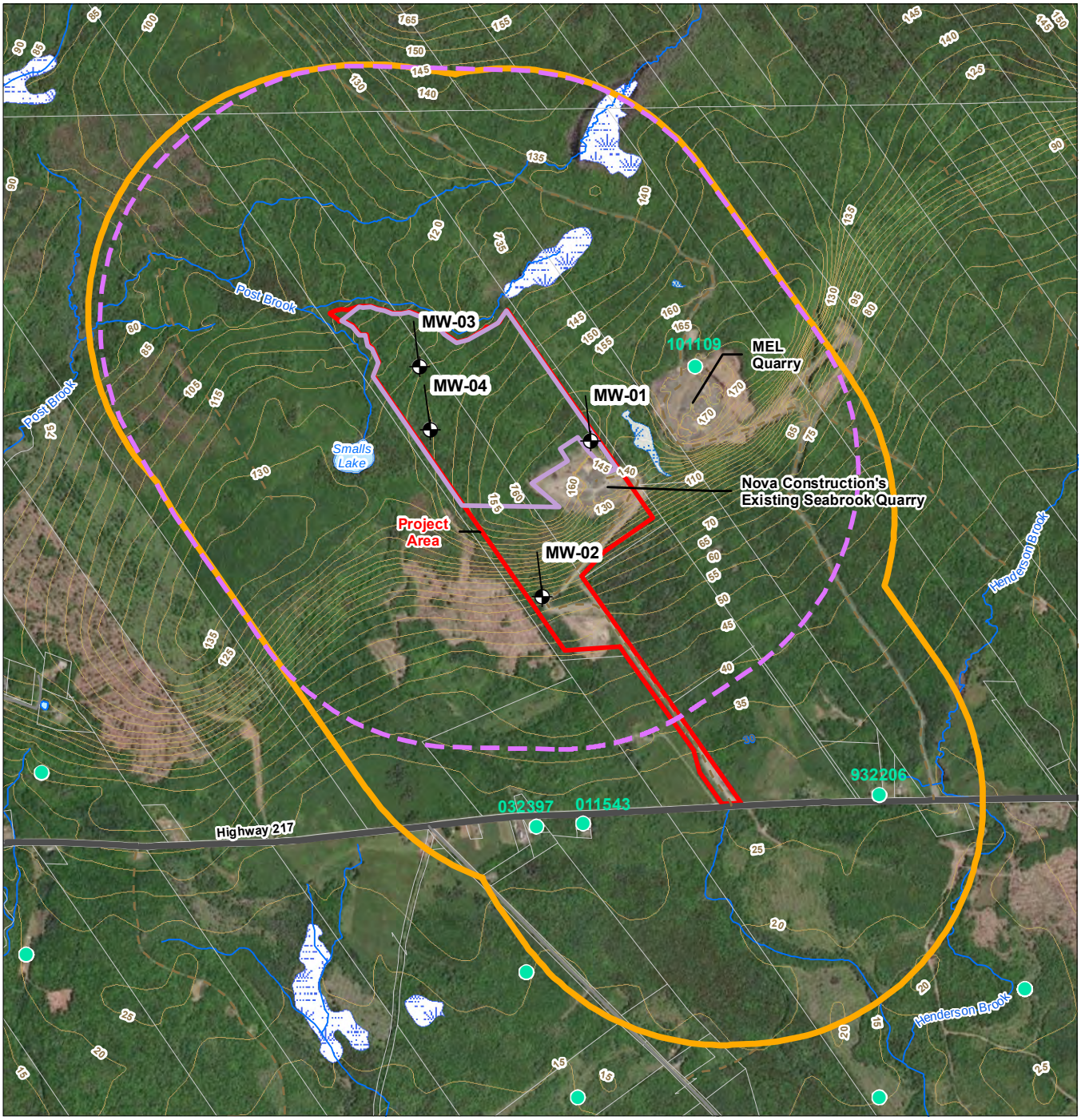
5.1.1.1 Climate

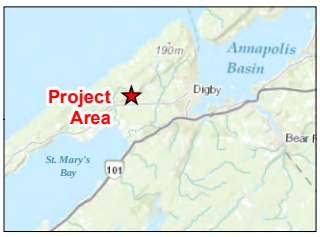
Climate normals for the 30-year period from 1981 to 2010 (inclusive) for the area were obtained from the Bear River, NS climate station, which is located approximately 17 km east of the Project Area (ECCC 2022a), to support an understanding of the contribution of precipitation to the local groundwater supply. Data recorded at the Bear River climate station from 1981 to 2010 (inclusive), indicates that total annual average precipitation is 1,341.9 mm, with 198.9 centimetres (cm) falling as snow and 1,143.9 mm falling as rain. Monthly average precipitation ranges from 77.8 mm to 147.4 mm, with the least occurring in August and the most occurring in January.

5.1.1.2 Physiography and Drainage

The topography of the Project Area generally slopes to the northwest towards the waters of Post Brook which flows southwest and south with an ultimate discharge into St. Mary's Bay, approximately 3 km southwest of the Project Area. A portion of the Project Area slopes to the southeast, with surface water discharging to Henderson Brook that also discharges into St. Mary's Bay (Figure 5.1-1).

Elevations within the Project Area generally range from 160 m above sea level (masl) in the vicinity of the current quarry operations to 30 masl at the entrance to the Project property on Highway 217. The topography of the Project Area is shown on Figure 5.1-1.





Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Nova Scotia Environment and Climate Change; Nova Scotia Natural Resources and Renewables; Natural Resources Canada CanVec,
3. Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- Groundwater Monitoring Well
- Water Wells (NSECC)
- Project Area
- LAA for Groundwater Resources VC
- Quarry Expansion Footprint
- 800 m Blasting Radius (Expanded Quarry)
- Road / Highway
- Local Road
- Resource Road
- Contour (5 m)
- Watercourse
- Waterbody
- Wetland
- Property Boundary

0 250 500 metres

(At original document size of 8.5x11)
1:20,000

N

Stantec

Project Location
Seabrook
Digby, Nova Scotia

Client/Project 121417326-018
Nova Construction
Seabrook Quarry Expansion

Figure No.
5.1-1

Title
Site Topography, Groundwater Monitoring Well Locations, and Water Well Locations

\\Ca0213-ppfss01\work_group\121417\active\121417326\03_data\gis_cad\gis\mapping\mxd\report\121417326-018_GW_LAA_800m_REVB_Fig_5-1-1.mxd Revised: 2023-04-05 By: NiWhite

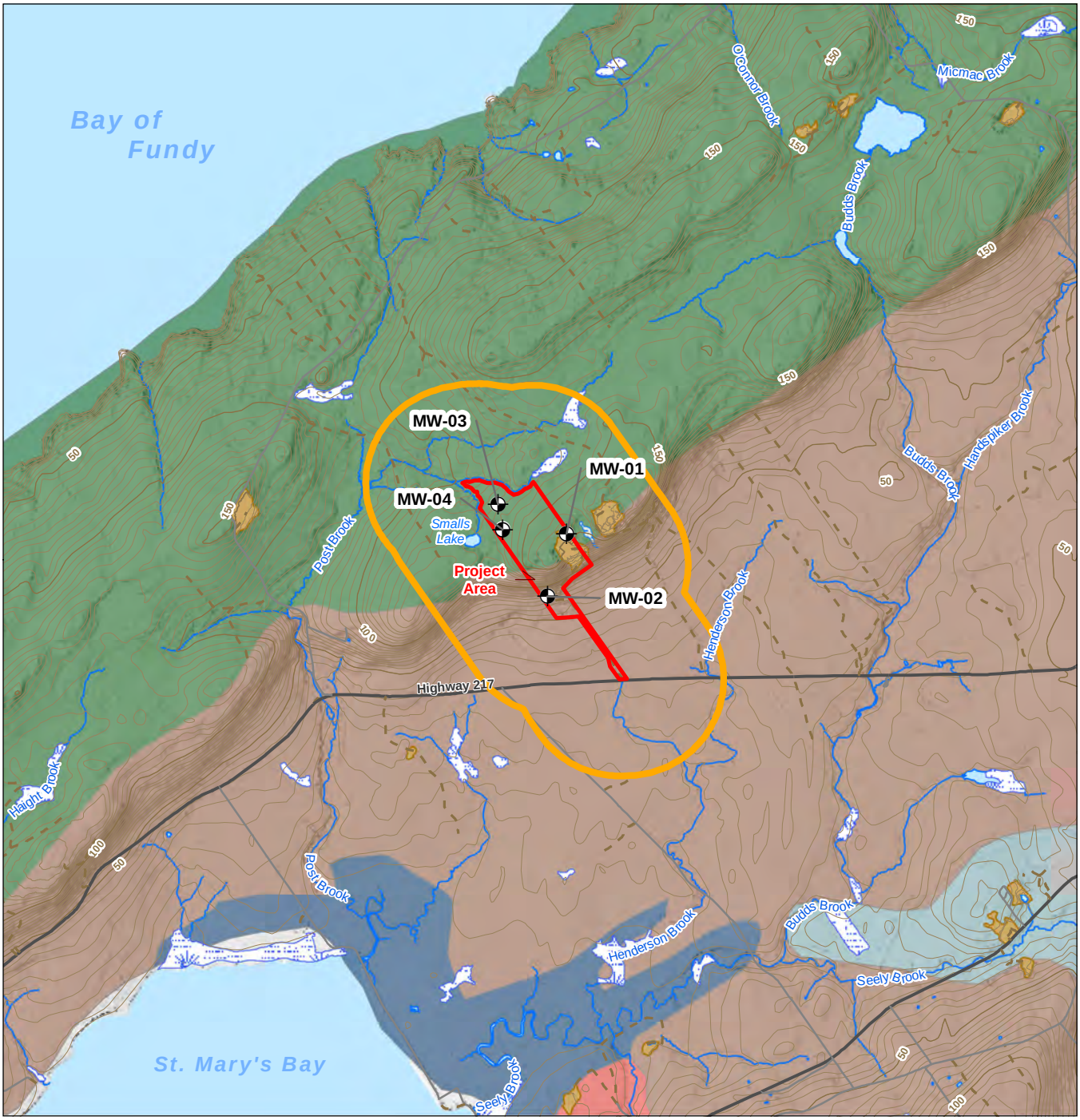
5.1.1.3 Surficial Geology

Available surficial geology mapping indicates that the Project Area predominantly consists of a ground moraine and streamlined drift unit type, with the southern part of the site categorized as a silty till plain and a stony till plain to the north (Stea et al. 1992). The surficial geology of the Project Area is shown on Figure 5.1-2.

5.1.1.4 Bedrock Geology

Beneath the overburden, the bedrock consists of grey-green basalt (East Ferry Member) of the North Mountain Formation in the Fundy Group overlying sedimentary rocks of the Blomidon Formation (Kontak and Webster 2010). Joints, which are important water-bearing structures (secondary porosity), are well developed in the East Ferry basalt. Blomidon Formation sandstone overlies the North Mountain Formation (Keppie 2000).

The bedrock of the Fundy Group, including the North Mountain Formation and the underlying Blomidon Formation, dips 6 to 12 degrees to the northwest from the shorelines of St. Mary's Bay towards Digby Neck and the Bay of Fundy (Trescott 1969). The regional topography of Digby Neck appears to be controlled by the basalt bedrock structure, forming two northeast-southwest trending ridges with an intervening lower area containing wetlands and lakes (e.g., Lake Midway). The existing quarry footprint is situated on the southern ridge. The bedrock geology is shown on Figure 5.1-3.



Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec, Nova Construction, Enviroshpere, Nova Scotia Dept. of Natural Resources and Renewables, Nova Scotia Dept. of Environment and Climate Change, Government of Canada NRCan CANVEC
3. Service Layer Credits: ESRI 2022

- Groundwater Monitoring Well
- Project Area
- LAA for Groundwater Resources VC
- Road / Highway
- Local Road
- Resource Road
- Contour (5 m)
- Watercourse
- Waterbody
- Wetlands
- Existing Pit/Quarry

Surficial Geology

- Glaciofluvial Deposits (Kames and Eskers)
- Glaciomarine Deposits
- Marine Deposits
- Silty Till Plain (Ground Moraine)
- Stony Till Plain (Ground Moraine)

0 600 1,200 metres

(At original document size of 8.5x11)
1:50,000

N

Stantec

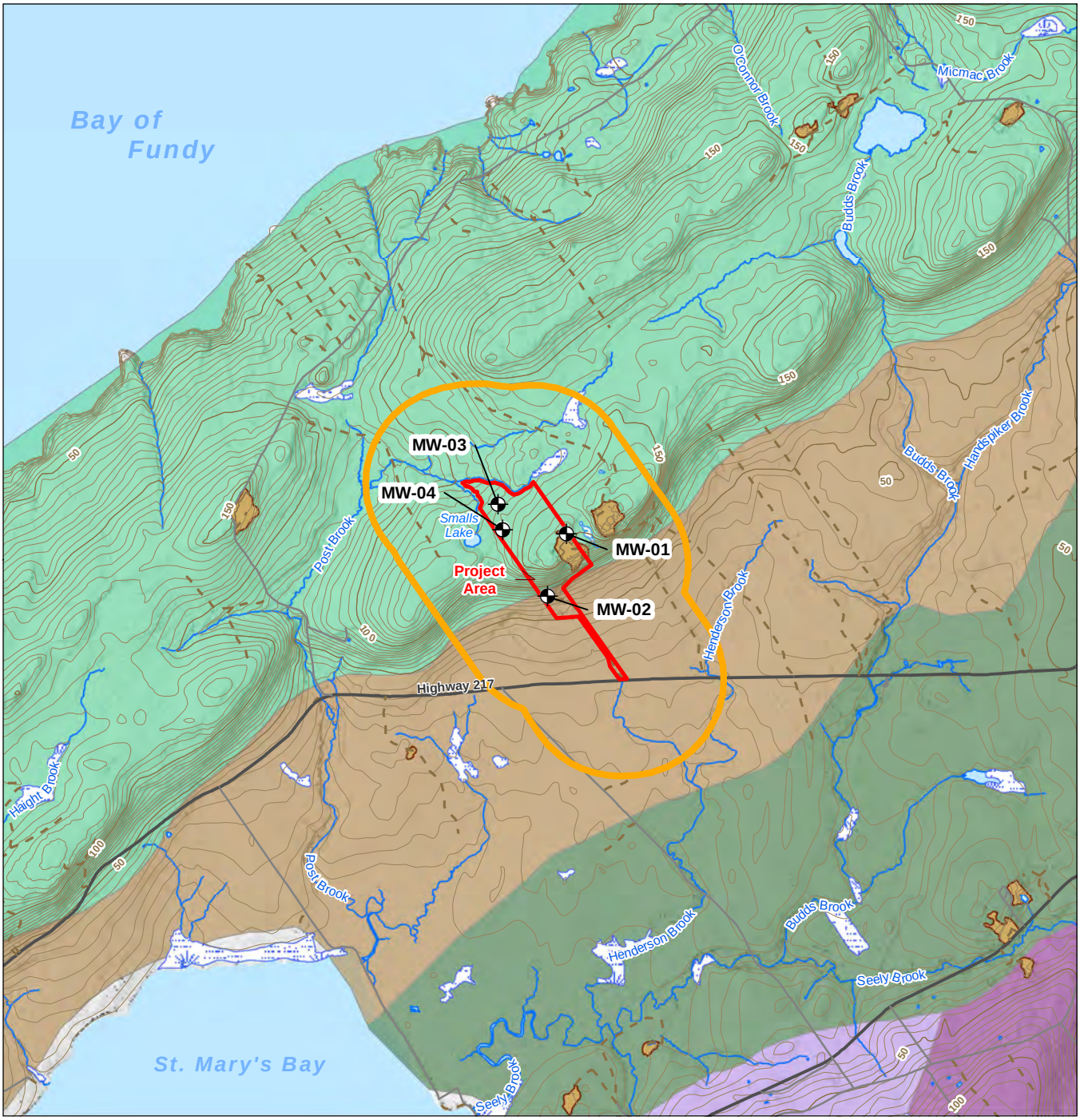
Project Location
Seabrook
Digby, Nova Scotia

Client/Project 121417326_017a
Nova Construction
Seabrook Quarry Expansion

Figure No.
5.1-2

Title
Surficial Geology

V:\1214\active\121417326\03_data\gis_cad\gis\mapping\mxd\report\121417326-017a Surficial Geology.mxd Revised: 2023-01-09 By: mblackwood



Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec, Nova Construction, Enviroshpere, Nova Scotia Dept. of Natural Resources and Renewables, Nova Scotia Dept. of Environment and Climate Change, Government of Canada NRCan CANVEC
3. Service Layer Credits: ESRI 2022

- Groundwater Monitoring Well
- Project Area
- LAA for Groundwater Resources VC
- Road / Highway
- Local Road
- Resource Road
- Contour (5 m)
- Watercourse
- Waterbody
- Wetland
- Existing Pit/Quarry

Bedrock Geology

- Blomidon Formation: southern mainland
- Goldenville Formation
- Halifax Formation
- North Mountain Formation: southern mainland
- Wolfville Formation: southern mainland

0 640 1,280 metres

(At original document size of 8.5x11)
1:10,000,000

N

Stantec

Project Location
Seabrook
Digby, Nova Scotia

Client/Project 121417326_016a
Nova Construction
Seabrook Quarry Expansion

Figure No.
5.1-3

Title
Bedrock Geology

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5.1.1.5 Hydrogeology

Fresh groundwater in the Project Area originates from rainfall recharge through the overburden and fractured bedrock in the vicinity of the Project Area. On a regional scale, groundwater flow direction would be expected to follow topography, with deep groundwater flow towards the Bay of Fundy on the north side of the Project Area, with a southward flow component towards Post Brook that flows towards St. Mary's Bay.

The direction of local groundwater flow in the Project Area is assumed to generally follow local topography. Based on topographic (Figure 5.1-1) and watershed maps, the Project Area is inferred to straddle a groundwater divide, with local groundwater flow in the northwestern portion of the site flowing northwest, and groundwater at the southeastern portion generally flowing southeast. It is expected that the groundwater system in the area will be largely controlled by surface runoff and local recharge.

Shallow groundwater in overburden in the northwesterly portion of the Project Area likely discharges into Post Brook. However, due to the presence of higher topography to the north, deep groundwater in bedrock on the northwestern portion of the property may discharge towards St. Mary's Bay. Current well-density is insufficient to confirm if this is the case. Groundwater at the southeastern portion of the property is expected to discharge into the waters of St. Mary's Bay.

Groundwater recharge and flow directions in the North Mountain basalt units tends to be highly localized and controlled by the presence and orientation of numerous individual sub-horizontal basalt flows and the development of vertical fracturing, including columnar jointing in the basalts. This condition can result in the occurrence of "perched" water tables that result in predominantly downward vertical hydraulic gradients between the horizontal basalt flows.

The Project Area falls within Nova Scotia's volcanic groundwater region (Kennedy and Drage 2008). Based on data from 994 drilled wells in this region, it is characterized by a median drilled well yield of 40.9 L/min and specific capacity (Q/s) of 1.7 cubic metres per day per metre ($m^3/d/m$) (Kennedy and Drage 2009). Constant rate pumping test data from 18 wells in this region (Kennedy and Drage 2009) were processed using the Groundwater Assessments for Subdivision Developments Toolkit (NSE and NSDNR 2011) and showed similar median yield 46.4 litres per minute (L/min) and higher specific capacity 7.1 $m^3/d/m$. The difference in specific capacity is attributed to the larger capacity of wells subjected to constant rate testing, compared to predominantly driller's air-lift yield estimates for domestic water supply wells.

Wells located in the sedimentary groundwater regions typically have higher yield, specific capacity, and transmissivity (T) than those in the volcanic (basalt) groundwater region. Based on pumping test data from 387 drilled wells completed in the sedimentary groundwater region, it is characterized by a median yield of 181.8 L/min and specific capacity of 20.4 $m^3/d/m$ (Kennedy and Drage 2009). A lower median yield of 36.3 L/min and a lower specific capacity 2.3 $m^3/d/m$ were found based on well log data from 35,279 wells in this region (Kennedy and Drage 2009).

Mean water quality (general chemistry and metals) data are also available for the volcanic areas (Kennedy and Drage 2009). Naturally occurring trace metals, such as arsenic, iron, manganese, uranium and occasionally fluoride, may be present in all groundwater regions. Acid rock drainage potential has been mapped as low for the Project Area (Trudell and White 2013).

Water wells within 800 m of the Project Area were identified and reviewed using the georeferenced version of the Nova Scotia Well Log Database (NS WLD) (Figure 5.1-1). Information reviewed included location, construction details, yield and use. The completeness of the inventory of well logs in the NS WLD for the Project Area was confirmed by matching well logs to residences using recent air photography. In rural areas, it can generally be assumed that each residence, agricultural or commercial property has a dug or drilled water supply well. Table 5.1-1 presents a summary of the available well log information for the four drilled wells identified within 800 m of the Project Area using the NS WLD.

Three of the four wells surrounding the Project Area were completed in the sedimentary rocks of the Blomidon Formation, while one, owned by Municipal Enterprises Limited / Dexter Construction, was completed in the North Mountain Formation. The well in the North Mountain Formation reported a well yield of 1.14 Lpm, while the other three reported yields between 22.7–45.4 Lpm.

Table 5.1-1 Summary of Water Well Records within 800 m of Project Area

Community	Well ID	Depth (m)	Casing Length (m)	Depth to Bedrock (m)	Yield (Lpm)	Water Use	Drill Date	Approx. Distance from Existing Quarry Footprint (m)
Roxville	011543	38.06	12.79	11.57	22.7	Domestic	8/27/2001	1,045
Roxville	032397	36.54	12.18	6.09	36.3	Domestic	9/30/2003	1,071
Seabrook	101109*	102.01	12.18	1.22	1.14	Monitoring	10/6/2010	443
Seabrook	932206	42.63	25.58	—	45.4	Domestic	9/17/1993	1,334

Note:
* Well #101109 is located within the footprint of the MEL Quarry.

Hydrogeological site investigations that were conducted in 2022 (see Appendix D) included drilling four groundwater monitoring wells, hydraulic testing (e.g., slug testing) of each well, long term water level monitoring, and one water quality sampling event from each well. The locations of the four monitoring wells (i.e., MW-01, MW-02, MW-03, and MW-04) are shown on Figures 5.1-1 to 5.1-3 above. Well construction details are summarized in Table 5.1-2.

Table 5.1-2 Well Construction Information

Well ID	Date Drilled	Well Total Depth (m)	Screened Geology	Groundwater Level on September 1, 2022 (m btoc)	Mean Hydraulic Conductivity (K) (m/sec)
MW-01	August 8, 2022	9.45	Basalt bedrock	2.76	$1.1x10^{-7}$
MW-02	August 11, 2022	12.19	Overburden	7.53	$3.3x10^{-6}$
MW-03	August 10, 2022	8.08	Basalt bedrock	1.13	$1.1x10^{-6}$
MW-04	August 9, 2022	9.30	Basalt bedrock	5.07	$1.6x10^{-7}$

Notes:
m btoc
= metres below top of casing

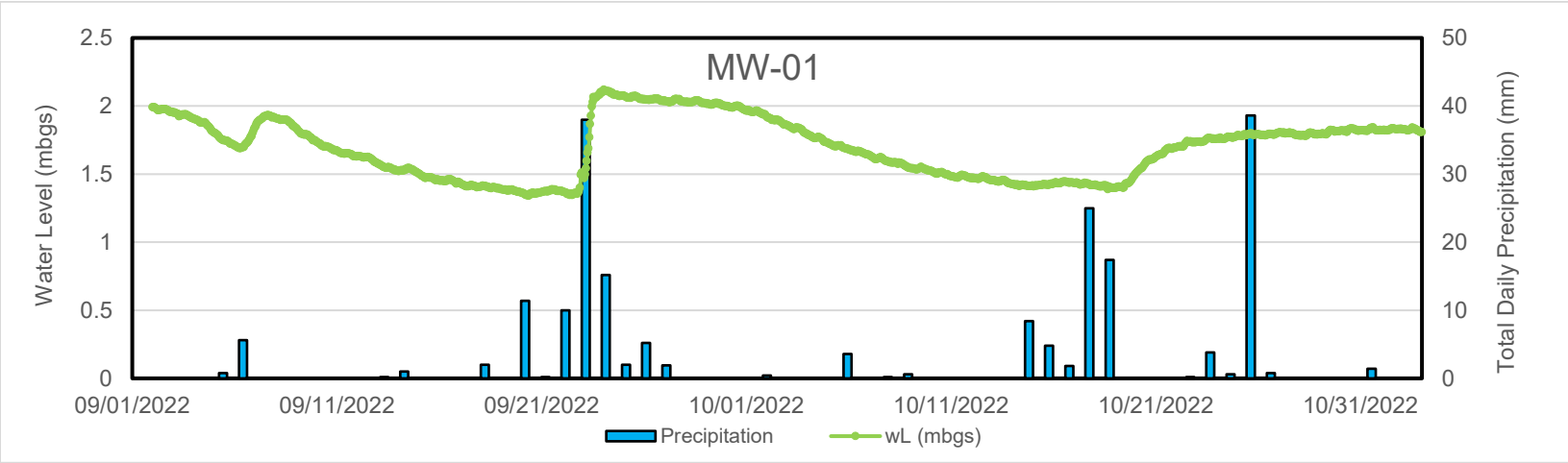
The results of the hydraulic testing analysis indicate the hydraulic conductivity ranged from 1.6×10^{-7} m/s to 3.3×10^{-6} m/s. Water level data collected from September 1 to November 3, 2022 using dataloggers set at one minute intervals is presented in Figure 5.1-4, along with precipitation data collected at the Greenwood, NS climate station (ECCC 2022b) for the same time period. The Greenwood climate station is located approximately 80 km northeast of the Project Area. Although other ECCC climate stations (e.g., the Bear River station referred to in Section 5.1.1.1) are located closer to the Project Area, the Greenwood station was used for the water level data because it is the closest station that has daily precipitation data available. Recorded water levels are all above the planned quarry depth of 25 metres below ground surface (mbgs). All four wells responded to precipitation events with increased water levels (see September 23, 2022 data), which slowly decreased over a period of days to weeks until the next precipitation event. The water level and hydraulic conductivity data for the three wells completed in bedrock indicate that the basalt recovers to static water levels slowly, suggesting that the aquifer does not transmit significant groundwater flow. These results are in agreement with the available well record for a well completed in the North Mountain basalt, that produced a reported well yield of 1.14 Lpm.

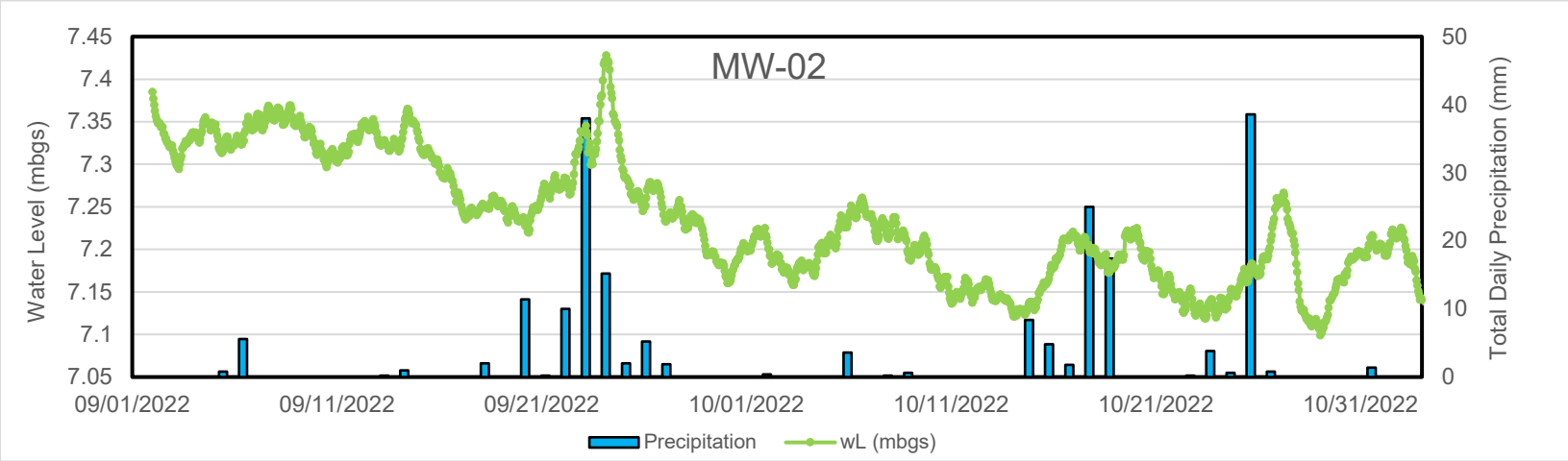
Current quarry operations reportedly operate above the water table, with water levels noted below the quarry floor in a sump. No dewatering is currently conducted beyond occasional surface water removal after a rain event. This lower water table in the current quarry operations may be a result of the existing quarry location at a topographic high. The hydraulic conductivities and slow recovery from precipitation events that were observed in the wells completed in the bedrock aquifer suggest that if the water table was above the current quarry floor, little water was produced through the primarily vertical fractures present in the North Mountain Formation and were systematically dewatered during quarrying operations. A steep cone of depression that does not extend to a great areal extent is expected from quarry operations. Water level data from the monitoring well located closest to the quarry footprint, MW-01, indicates that a hydraulic connection between the quarry and the well does not exist (i.e., the water level in the well is consistently between 1.5 and 2 mbgs, while the quarry floor is currently approximately 23 m below grade). Continued monitoring as recommended below (in Section 5.1.5) will help provide a long-term understanding of the radius of influence of the cone of depression. The predominantly vertical jointing structure of the columnar basalts may also be the reason for the water level responses observed during precipitation events whereby the vertical fractures have a more direct pathway to depth, though without significant jointing in the form of horizontal fractures, aerial connections may not be present.

Water quality samples from the four monitoring wells were collected on August 12, 2022 and were analyzed for general chemistry and metals. Results were compared to both the *Guidelines for Canadian Drinking Water Quality* (GCDWQ; Health Canada 2022) and the Canadian Council of Ministers of the Environment (CCME) Freshwater Short-Term and Long-Term Guidelines (CCME 1999a and updates) to provide a baseline understanding of the groundwater quality within the Project Area.

Concentrations at all monitoring wells, excluding MW-01, are either below the reportable detection limit and /or within the chosen guidelines. The concentration of iron at monitoring well MW-01 (2300 µg/L) exceeds applicable guidelines (300 µg/L). Iron was not detected in MW-02 or MW-03 and was below applicable guidelines at MW-04.

The monitoring wells within the Project Area are non-potable and therefore the GCDWQ do not apply. The concentration of iron at the site exceeds the CCME Short-Term guidelines for the protection of aquatic life, however, no surface water is present in the immediate area of MW-01. High levels of iron are limited to MW-01 located directly north and downgradient of the existing quarry. It is suspected that the ground disturbance of the quarry likely causes the groundwater in the immediate area to be turbid and oxygenated. Any subsurface changes such as these can influence iron concentrations.


MW-01
Water Level (mbgs)
Total Daily Precipitation (mm)
2.5
2
1.5
1
0.5
0
50
40
30
20
10
0
09/01/2022
09/11/2022
09/21/2022
10/01/2022
10/11/2022
10/21/2022
10/31/2022
Precipitation
wL (mbgs)


MW-02
Water Level (mbgs)
Total Daily Precipitation (mm)
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
50
40
30
20
10
0
09/01/2022
09/11/2022
09/21/2022
10/01/2022
10/11/2022
10/21/2022
10/31/2022
Precipitation
wL (mbgs)

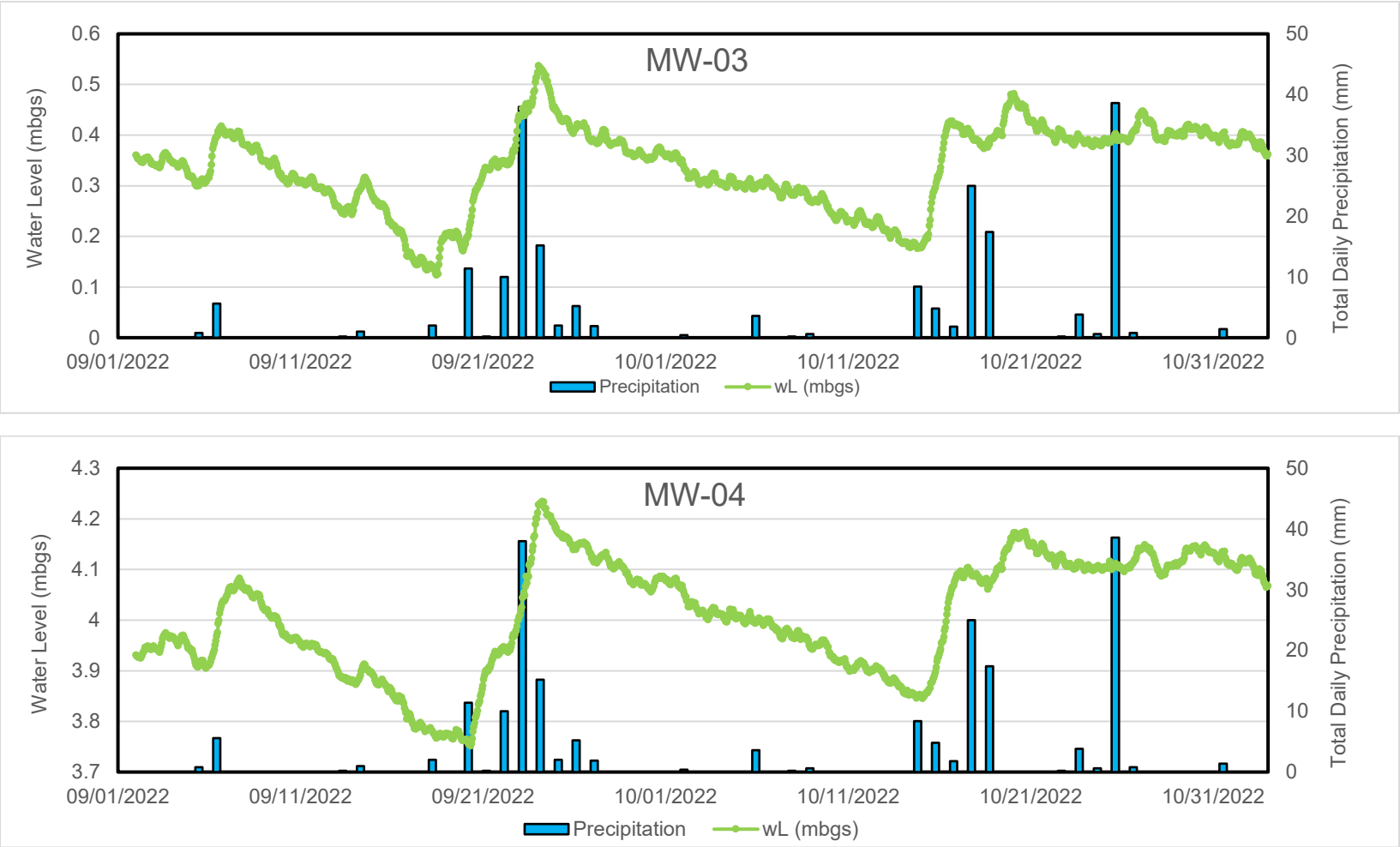


Figure 5.1-4 Groundwater Level (m) and Precipitation (mm) Data Analysis

5.1.2 Potential Environmental Effects

The Project has potential to interact with groundwater resources through effects on groundwater quantity and groundwater quality.

The Project Area footprint is presented in Figure 5.1-1 and is expected to extend to depths of 25 m below ground surface to extract the columnar basalt. Quarrying will extend northward from the existing quarry footprint and will include cutting and grubbing of existing vegetation and soils; excavation and stockpile of surficial materials in the quarry footprint; and breaking and blasting of the bedrock for extraction.

Groundwater Quality Effects

Groundwater quality effects may include contamination of groundwater from temporary increases in nearby turbidity in potable wells as a result of blasting vibrations.

Acid rock drainage is the result of exposure to sulphide rich rocks to oxidizing environments such as rainwater. Earthwork activities around these sulphide rich rocks can increase the rock exposure and thus the acid generation potential. Not all sulphide-containing rocks produce acid drainage. In many cases, rocks contain enough carbonate minerals to buffer the sulphide effect; in these instances, acid rock drainage is not produced. Bedrock underlying the Project Area is reported to be a low acid rock drainage risk (Trudell and White 2013). Acid rock drainage is therefore not considered a potential groundwater quality effect of this Project.

Groundwater Quantity Effects

Effects to groundwater quantity may include a lowered local groundwater table from dewatering. Groundwater yields from nearby domestic wells also have the potential to be affected by damages resulting from blast vibrations.

5.1.3 Proposed Mitigation and Management Measures

In addition to the mitigation and management measures described in Table 2.4-1 (Chapter 2 – Project Description), the following VC-specific mitigation and management measures will be implemented to reduce potential adverse environmental effects on groundwater resources:

- In the event that wells are adversely or permanently affected by site preparation activities, Nova Construction will repair or replace affected wells to conditions that existed prior to blasting.
- Mitigation measures will be implemented on the basis of the well condition survey on wells within 800 m of the Project Area and the nearest well constructed within the basalt bedrock.
- Nova Construction is prepared to provide temporary water supply until a permanent resolution is made, should existing supplies be disrupted either by drawdown of the water table or by damage from blasting associated with the Project.

5.1.4 Residual Environmental Effects

A significant residual environmental effect on groundwater resources is defined as any of the following:

- A reduction in groundwater quantity and/or quality to the point where the yield from an established groundwater supply well or aquifer is no longer suitable or adequate for its intended use
- A reduction in groundwater quality such that an established groundwater supply well or aquifer that meets currently meets guidelines deteriorates to the point where it becomes non-potable or cannot meet the *Guidelines for Canadian Drinking Water Quality* (Health Canada 2022)
- Physical or chemical alteration of an aquifer to the extent that interaction with local surface water results in streamflow or chemistry changes that adversely affect aquatic life at the community or population level or surface water supply
- Contravention of an applicable watershed management target

Project-related residual effects on groundwater quality and groundwater quantity are evaluated below.

Groundwater Quality Effects

Siltation of water in domestic wells nearby the Project Area is a potential effect of the vibrations from rock blasting activities. The effect is temporary in nature and primarily the result of re-suspension of silt at the bottom of a well or from borehole walls. In aquifers with large fracture systems silt may be directly sourced from silt and sediment produced from the blasting; however, the low hydraulic conductivities and limited fracturing of the bedrock suggests that this is unlikely.

Four wells are situated within 800 m of the Project Area. As shown on Figure 5.1-1, the well in closest proximity to the Project Area (i.e., Well #101109) is a monitoring well that is located within the footprint of the adjacent MEL Quarry, approximately 443 m to the northeast of the existing quarry footprint for Nova Construction's Seabrook Quarry. The remaining three wells are all domestic wells that are located more than 800 m away from the existing quarry footprint at Nova Construction's Seabrook Quarry (refer to Table 5.1-1 above in Section 5.1.1.5). The potential for these wells to be affected by blasting vibrations is related to the separation distance, blast magnitude, the physical properties of the bedrock being excavated, and the actual well construction and age. Wells nearest the property, and wells located in the same hydrostratigraphic unit as the quarry activities (basalt bedrock) are the most likely to be affected. A survey of the wells located within 800 m of the blast areas will be conducted including well head inspection, water sampling for general chemistry, metals, and bacteria; and short-term pumping tests (where wells are accessible), to determine the capacity of individual wells and nearby aquifers. Nova Construction is prepared to provide temporary water supply should existing supplies be disrupted by the Project.

Groundwater Quantity Effects

The Project will require excavation of deep bedrock on-site below the surficial and bedrock groundwater tables. Monitoring at the on-site monitoring wells suggests that the average water table is approximately 4 m below surface. Excavation in the Project Area will require collection of groundwater seepage with discharge to an approved surface water body. As the size of the quarry increases, there is potential to

increase groundwater gradients towards the open face of the bedrock, resulting in a water table depression surrounding the quarry. This depression could theoretically extend to existing wells in the vicinity, reducing the groundwater available to those wells.

The groundwater in the current quarry requires minimal dewatering and maintains a water table below the current quarry floor. The monitoring well drilled closest to the quarry exhibited groundwater levels near the ground surface (approximately 2 mbgs) and well above the current quarry floor, indicating that the predominantly vertical fracturing of the basalt bedrock potentially causes isolated flow systems. In addition, low hydraulic conductivities in the three wells drilled in the basalt bedrock indicate that dewatering will occur slowly Continued water level monitoring will be conducted to determine this isolation continues as the quarry footprint increases in size.

Drilled wells located in the sedimentary aquifer with higher yields likely rely on fracture flow for their recharge. It is expected that these wells will behave similar to the monitoring wells on-site, in that their recharge is primarily from vertical gradients from the overburden to the fractured surface of the bedrock. The combination of differing bedrock types and the very low permeability recorded for basalt in the quarry suggests that domestic wells will be hydrologically isolated from quarry activities.

Vibration damage to a drilled or dug well is a potential effect of rock blasting. The likelihood of this effect is generally a function of the distance between the energy source and the receptor well, and the seismic properties of the intervening subsurface materials. With respect to rock type, the risk of water well damage is greater for fractured crystalline bedrock than for overburden wells or soft bedrock (e.g., gypsum, sandstone or shale). Based on experience, the risk from blasting or major excavation is considered to be greatest within 50 m, moderate from 50 to 200 m, and minimal beyond about 200 m.

Summary

While Project activities may result in adverse effects to groundwater resources due to lowering the water table, groundwater effects are not predicted to influence groundwater aquifers elsewhere on the property or in adjacent areas. Residual effects are predicted to extend into the LAA, occur sporadically throughout the life of the Project, and are reversible following reclamation. With the implementation of proposed mitigation measures, Project-related residual effects on groundwater resources are predicted to be not significant.

5.1.5 Proposed Monitoring Programs

Groundwater monitoring will be conducted at the four monitoring wells that were installed during this program. Monitoring of groundwater levels in the wells will continue as the operation proceeds. Groundwater quality samples will be collected quarterly at each well for general chemistry and metals. The duration of the groundwater monitoring program will be determined in consultation with NSECC.

It is also recommended that a survey be conducted for all wells (including monitoring wells) within 400 m of Project blast areas, regardless of well ownership. The survey should include well head inspection; water sampling for general chemistry, metals, and bacteria; and short-term pumping tests (where wells are accessible) to determine the capacity of individual wells and nearby aquifers.

5.2 AQUATIC ENVIRONMENT

5.2.1 Description of Existing Environmental Conditions

5.2.1.1 Regional Context

The Project is located in the Annapolis Valley (Ecodistrict 610), North Mountain (Ecodistrict 920), and Valley Slope (Ecodistrict 710) ecodistricts. The eco-districts are primarily covered in softwood forests and floodplains (NSDNR 2015). Land-use within the watershed is predominately rural, and includes forestry, agriculture, and commercial usages.

Environment Canada's Bear River climate station (Station ID 8200500) and the Annapolis Royal climate station (Station ID 8200100) were used to characterize the climatic conditions within the Project Area. The Bear River station is located approximately 17 km east of the Project Area, and reports precipitation data from 1981 to 2010 (inclusive). The Annapolis Royal climate station is located approximately 30 km northeast of the Project Area, and reports temperature data between 1981 and 2010. As presented in Table 5.2-1, the climate normal precipitation is 1,341.9 mm per year (ECCC 2022a, c). The average rainfall is 1,143.9 mm and the average snowfall is 198.9 cm per year, based on a 30-year period of records from 1981 to 2010 (ECCC 2022a, c). Temperatures typically drop below zero between the months of December through March each year and are highest in July and August (Table 5.2-1).

Table 5.2-1 Representative Climate Values for Seabrook Quarry

30-Year Climate Normals (1981–2010) at Bear River Climate Station													
Parameter	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Rainfall (mm)	83.7	66.2	95.6	98.5	99.0	88.9	79.6	77.8	114.8	111.3	129.3	99.2	1143.9
Snowfall (cm)	63.7	42.1	32.7	9.1	0.3	0.0	0.0	0.0	0.0	0.0	7.7	43.3	198.9
Precipitation (mm)	147.4	108.3	128.3	107.1	99.4	88.9	79.6	77.8	114.8	111.3	137.0	142.1	1341.9
Extreme Snow Depth (cm)	48	70	49	26	3	0	0	0	0	1	24	50	70
30-Year Climate Normals (1981–2010) at Annapolis Royal Climate Station													
Temperature (°C)	-4.3	-3.8	-0.3	5.1	11.1	15.5	18.5	18.6	14.9	9.6	4.9	-1.1	7.4
Sources: ECCC 2022a, ECCC 2022c													

5.2.1.2 Surface Water Quantity

The Project Area is spread over two watersheds in Digby County, “WS-1” and “WS-2”, which span areas of 11.5 km^2 and 11.9 km^2, respectively. As the existing quarry footprint is located on the edge of a watershed divide, the expanded quarry footprint will extend into an adjacent watershed (i.e., WS-2) (Figure 5.2-1). Both watersheds (i.e., WS-1 and WS-2) drain southeast to St. Mary’s Bay and the Atlantic Ocean.

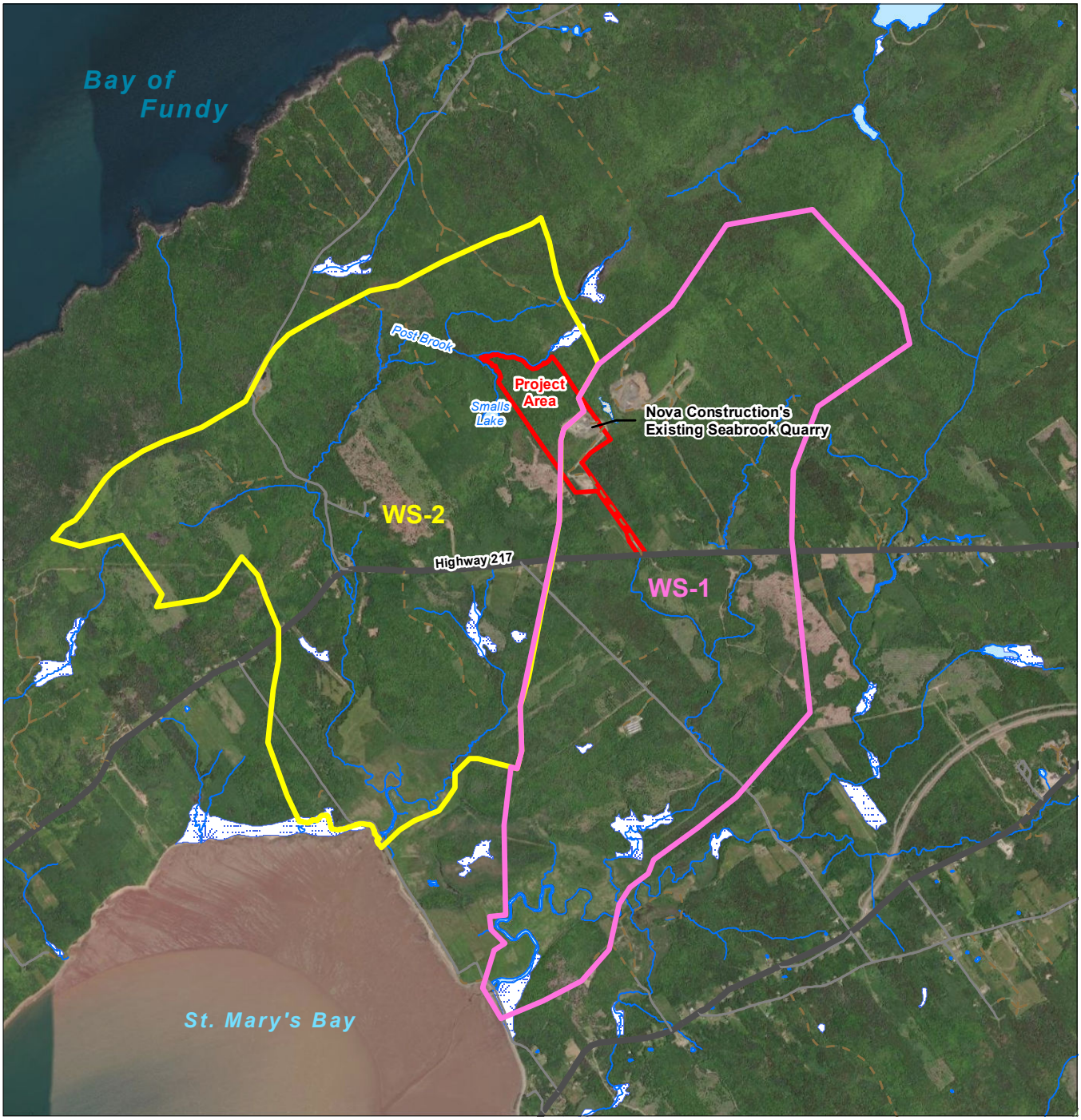
A desktop evaluation and field surveys were completed to identify potential surface water features within or near the Project Area. Prior to conducting field surveys, the location of known or potential watercourses in the LAA was obtained through a review of provincial wetland mapping (NSDNR 2017a), Wet Areas Mapping (Forest Watershed Research Centre 2019), and light detection and ranging (LiDAR) imagery. Two mapped watercourses were identified adjacent to the northern and northwest Project Area boundaries, within the LAA (Figure 5.2-2), referred to as “WC-2” (an unnamed tributary to Post Brook/Post Brook) and “WC-3” (Post Brook). A third watercourse (“WC-1”, another unnamed tributary to Post Brook) is located further north of the Project Area boundary, also within the LAA.

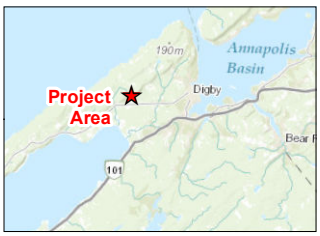
A pre- and post-development water balance has been developed for the Project and has been included as an appended document (Stantec 2022; Appendix E). Based on the results of the pre-development and post-development water balance, the proposed development will result in a nearly negligible reduction in annual infiltration (11.4 mm/year) and an increase in annual runoff (11 mm/year). The results of the water balance are attributed to the decrease in forested land use area in the post-development scenario, as approximately 31 ha of forested land use will be converted to quarry.

5.2.1.3 Surface Water Quality

In situ water quality measurements were collected from two surface water monitoring stations (SW-1 and SW-2, located on WC-1 and at the confluence of WC-2 and WC-3) during the July and September sampling events (Figure 5.2-2). No in situ water quality measurements were collected during the June sampling event due to issues with equipment. In situ measurements included water temperature, dissolved oxygen, and conductivity and pH which were collected with a YSI Multi-Meter and a Hanna Instruments pH meter.

Surface water samples for laboratory analysis were also collected from the two surface water monitoring stations (SW-1 and SW-2) over three different monitoring events (June 29, July 27, and Sept 2, 2022). Results were compared with the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic* Life (CWQG-PAL), short and long-term for freshwater (CCME 1999a). Analytical surface water quality results are presented in Appendix F, and exceedances of the CWQG-PAL are summarized in Table 5.2-2 and Table 5.2-3 below.





Project Area
Pre-Development Watershed
Post-Development Watershed

Road / Highway
Local Road
Resource Road
Watercourse
Waterbody
Wetlands
Property Boundary

0 0.5 1 Kilometres
(At original document size of 8.5x11)
1:50,000

N

Stantec

Project Location
Seabrook
Digby, Nova Scotia

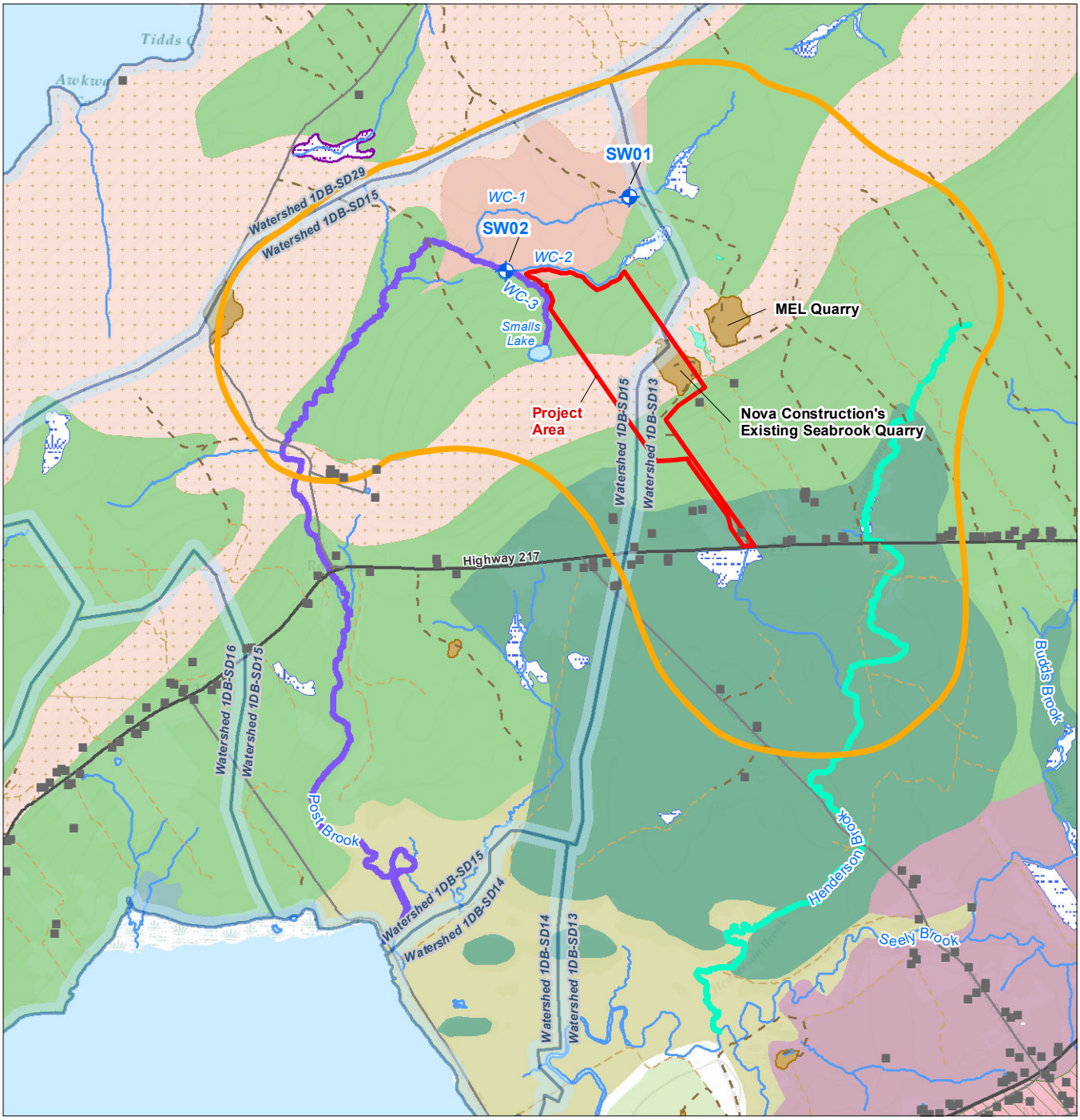
Client/Project 121417326-019
Nova Construction
Seabrook Quarry Expansion

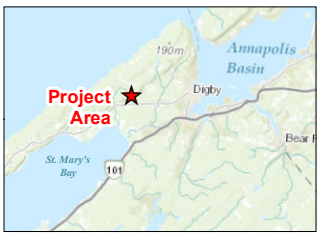
Figure No.
5.2-1

Title
Drainage Areas

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Nova Scotia Environment and Climate Change; Nova Scotia Natural Resources and Renewables; Natural Resources Canada CanVec.
3. Base Map and Imagery Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

\\ca0213-pfss01\work_group\1214\active\121417326\03_data\gis_cad\gis\mapping\mxd\report\121417326-024_ProjectLoc_Drainage.mxd Revised: 2022-12-14 By: NiWhite





Project Area
Building
Property Boundary
Road / Highway
Local Road
Resource Road
Trail
Existing Pit/Quarry
LAA (Aquatic Environment)

Wetlands and Waterways
Watercourse
Henderson Brook
Post Brook
Waterbody
Wetland (NSE)
Wetland of Special Significance (NSE)
Wetland (Envirosphere, 2015)
Secondary Watershed Boundary

Ecosections
Imperfectly drained, medium textured soils on hummocky terrain
Imperfectly drained, medium textured soils on a smooth or flat terrain
Salt marsh
Dyke land
Well drained, coarse textured soil on hummocky terrain
Well drained, medium textured soil on steep slopes or canyons
Well drained, medium textured soil on hummocky terrain
Well drained, medium textured soil on hilly terrain

0 250 500 750 1,000 metres
(At original document size of 8.5x11)
1:36,000

N

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec, Nova Construction, Envirosphere, Nova Scotia Dept. of Natural Resources and Renewables, Nova Scotia Dept. of Environment and Climate Change, Government of Canada NRCan CANVEC
3. Service Layer Credits: ESRI 2022

Stantec

Project Location
Seabrook
Digby, Nova Scotia

Client/Project 121417326_010b
Nova Construction
Seabrook Quarry Expansion

Figure No.
5.2-2

Title
Watercourses and Surface Water Monitoring Stations

The maximum water temperature recorded was 22.4 ºC. According to the CWQG-PAL, the minimum recommended concentrations of dissolved oxygen (DO) are 9.5 mg/L for early life stages and 6.5 mg/L for all life stages (CCME 1999b). Dissolved oxygen concentrations in WC-1 and WC-2 ranged from 3.9 mg/L to 10.09 mg/L; one sample met the guideline for early life stages, two samples met the guideline for all life stages, and one sample failed to meet the guideline for all life stages. The pH ranged from 5.34 to 7.41 and was below the CWQG-PAL recommended range (6.5 to 9.0) for one of the sampling events. Conductivity was low (less than 200 microsiemens [µS] per cm).

Table 5.2-2 In Situ Water Quality Measurements

Sample Location	Date	Temperature (ºC)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductivity	pH
SW-01	Jul 27, 2022	22.4	**3.9**	45.7	—	54.2	**5.34**
	Sept 2, 2022	18.9	7.63	82	64.9	73.8	7.2
SW-02	Jul 27, 2022	17.5	7.66	82.3	—	54.6	7.41
	Sept 2, 2022	16.5	10.09	102.8	58.4	70.1	7.01

Note:
Bold and underline indicates exceedance of the CWQG-PAL guideline
In situ water quality measurements were collected with a YSI Multi-Meter (Model Pro2030, Ohio, USA) and a Hanna Instruments pH meter (Model HI98127, Quebec, Canada)

Total metal concentrations for arsenic, boron, cadmium, copper, lead, manganese, molybdenum, nickel, selenium, silver, thallium, uranium and zinc were within the CWQG-PAL at most sampling locations. Total aluminum and iron were often above CWQG-PAL at both sampling stations for all sampling events (Table 5.2-3). Refer to Appendix F for full water quality sampling results.

Table 5.2-3 Summary of Exceedances for Surface Water Samples

Sample Location	Parameter	Guideline	Jun 29, 2022	Jul 27, 2022	Sept 2, 2022
SW-01	Aluminum	Varies	**170** (100)	**280** (5)	**200** (5)
	Iron	300	**440**	**1300**	**910**
	pH	6.5-9.0	—	**5.34**	—
SW-02	Aluminum	Varies	**350** (5)	**340** (100)	**270** (100)
	Iron	300	**350**	**1100**	**690**

Notes:
Bold and underline indicates exceedance of the applied guideline
(100) number in brackets indicates the calculated guideline
— a dash indicates the result did not exceed guideline

5.2.1.4 Fish Habitat

The potential for watercourses closest to the Project Area (i.e., WC-2 and WC-3) to contain fish habitat were evaluated on July 27, 2022; the potential for WC-1 to contain fish habitat was not evaluated since it is located more than 300 m outside of the Project Area. Fish habitat information collected included habitat type (i.e., riffle, run, pool), substrate type as well as other habitat characteristics (i.e., cover, bank stability). Fish habitat data for transects in WC-2 and WC-3 are provided in Appendix G, as is a photographic log of fish habitat conditions within those two watercourses.

Post Brook originates from Smalls Lake, which is located approximately 140 m west of the Project Area. WC-3 flows north from Smalls Lake and then northwest, eventually joining an unnamed tributary to Post Brook (WC-2), which originates from a wetland located northwest of the existing Seabrook Quarry (i.e., "WL-2" on Figure 5.3-1 in Section 5.3 – Wetlands). WC-2 flows southwest and then west, eventually joining WC-3. Both are classified as first order headwater streams. Beaver activity was observed in the headwaters of both watercourses. Water quality as it pertains to fish habitat is discussed in Section 5.2.1.3.

WC-3 is characterized by shallow runs (89%) and some intermittent pools (11%). At the time of the fish habitat surveys, the average wetted width was 1.2 m (range 0.56 to 4.5 m) and average channel width was 2.2 m (range 1.56 to 5.5 m). The dominate substrate consisted of organics (38%) with the subdominant substrate being boulders (20%). Aquatic vegetation covered 26% of the streambed. The banks were generally stable and riparian vegetation predominately consisted of conifer (48%) and grass (27%).

WC-2 is characterized by shallow runs (74%) and some wetland habitat (26%). At the time of the fish habitat surveys the average wetted width was 1 m (range 0.3 to 4.0 m) and average channel width was 3 m (range 1.76 to 4.2 m). The substrate was dominated by cobble (38%) and boulders (7%). Aquatic vegetation covered 14% of the streambed. The banks were generally stable to moderately stable, and riparian vegetation predominately consisted of grass (36%) and conifer (16%). Approximately 400 m upstream of the confluence of WC-2 with WC-3, a debris jam and a cascade may present potential barriers to fish passage during low flow conditions.

5.2.1.5 Fish Species and Aquatic Species at Risk

Qualitative electrofishing was conducted in WC-2 and WC-3 on September 2, 2022 to confirm if the watercourses were fish-bearing, determine which species were present in the fish community, and identify any species at risk. Electrofishing was conducted using a Smith-Root LR-24 backpack electrofisher, that was adjusted to the appropriate voltage, duty cycle and frequency. A minimum of 300 shocking seconds of effort were applied to each watercourse.

The Nova Scotia Freshwater Fish Species Distribution Records list historic records of fish by county. The following fish have been recorded in Digby County: alewife (*Alosa pseudoharengus*), American eel (*Anguilla rostrata*), Atlantic salmon - Nova Scotia Southern Upland population (*Salmo salar*), banded killifish (*Fundulus diaphanus*), brook trout (*Salvelinus fontinalis*), brown bullhead (*Ameiurus nebulosus*), chain pickerel (*Esox niger*), creek chub (*Semotilus atromaculatus*), four spine stickleback

(*Apeltes quadracus*), golden shiner (*Notemigonus crysoleucas*), lake chub (*Couesius plumbeus*), ninespine stickleback (*Pungitius pungitius*), smallmouth bass (*Micropterus dolomieu*), white perch (*Morone americana*), white sucker (*Catostomus commersonii*), and yellow perch (*Perca flavescens*) (NSDFA 2019).

Brook trout were confirmed present during electrofishing surveys in WC-3 (three captured; 55, 85 and 117 mm long). Total effort of the electrofishing survey was 501 seconds. Catch per unit effort (CPUE) was 0.6 fish per 100 seconds. Brook trout were also caught during electrofishing surveys in WC-2 (two captured; 93 and 120 mm long). Total effort of the electrofishing survey was 355 seconds. CPUE was 0.6 fish per 100 seconds.

No fish species records were listed in the AC CDC report obtained for the Project (a 5 km radius was applied) (AC CDC 2022b; Appendix H). Four SAR/SOCC could potentially occur within the LAA (Table 5.2-4). There is no critical habitat for aquatic SAR reported within 1 km downstream of the Project Area (DFO 2022).

Table 5.2-4 SAR/SOCC That May Occur in the LAA

Common Name	Scientific Name	SARA	COSEWIC	NS ESA	AC CDC
Alewife	*Alosa pseudoharengus*	No status	No status	Not listed	S3B
American Eel	*Anguilla rostrata*	No status (under consideration)	Threatened (2012)	Not listed	S3N
Atlantic Salmon - Nova Scotia Southern Upland population	*Salmo salar*	No status (under consideration)	Endangered (2011)	Not listed	S1
Brook Trout	*Salvelinus fontinalis*	No status	No status	Not listed	S3

5.2.2 Potential Environmental Effects

The Project has potential to interact with the aquatic environment through effects on surface water quantity, surface water quality, fish habitat, and fish health and survival.

Surface Water Quantity

Excavation below the water table during the operation and maintenance phase of the Project could result in groundwater extraction and a subsequent reduction in surface water flows. Similarly, any groundwater that is pumped from the quarry floor during dewatering activities (if required) to an adjacent watershed could conversely represent a source of increased surface water runoff from the Project Area.

Surface Water Quality

No watercourses were identified within the Project Area. However, Smalls Lake and watercourses WC-2 and WC-3 border the downstream extent (i.e., northern boundary) of the Project Area, and WC-1 is located north of the Project Area. As the Project features (e.g., quarry footprint, surface water overflow) will be located at least 30 m from watercourses or waterbodies, no direct effects on surface water quantity are anticipated during site preparation, operation and maintenance, and decommissioning and reclamation of the Project.

Clearing and grubbing activities during the site preparation phase of the Project could reduce evaporation and transpiration from the canopy during rain events such that there is a corresponding increase in surface water runoff from the Project Area. A Project-related increase in surface water runoff could in turn increase sediment erosion and the deposition of sediment, minerals, and ions in watercourses and waterbodies downgradient – particularly during periods of heavy rainfall or snowmelt. Aggregate extraction and stockpiling activities during the operation and maintenance phase of the Project similarly have potential to contribute to increased surface water runoff as well as sediment erosion and deposition.

During operation, the presence and operation of vehicles along roads and blasting could indirectly result in suspended sediments from dust and the roadbed being carried into nearby watercourses and waterbodies, thereby affecting water quality.

Fish Habitat

As described in Section 5.2.2.2., no watercourses or waterbodies are located within the Project Area, however Smalls Lake and watercourses WC-2 and WC-3 border the downstream extent of the Project Area. As the Project features (e.g., quarry footprint, surface water overflow) will avoid fish habitat (i.e., at least 30 m from watercourses or waterbodies), no direct effects on habitat are anticipated during site preparation, operation and maintenance, and decommissioning and reclamation of the Project.

Changes in surface water quantity resulting from groundwater drawdown or quarry dewatering activities have the potential to result in indirect loss of fish habitat due to a reduction in surface or groundwater flows to adjacent waterbodies or watercourses.

During operation, the presence and operation of vehicles along roads and blasting could indirectly result in suspended sediments from dust and the roadbed being carried into nearby watercourses and waterbodies, thereby affecting the quality of fish habitat.

Fish Health and Survival

Groundwater drawdown or quarry dewatering activities could indirectly affect fish health and survival by altering groundwater flows to surface waters. Direct changes could result from the stranding of fish due to groundwater drawdown, while indirect changes could result from changes to fish habitat quality (e.g., water temperature, reduced velocities) (DeBoer et al. 2016; Benejam et al. 2008).

During operation, the presence and operation of vehicles along roads and blasting could indirectly result in suspended sediments from dust and the roadbed being carried into nearby watercourses and waterbodies could result in an increase in suspended sediments. Suspended sediments can inhibit the ability of fish to forage and result in behavioural or physiological changes or the smothering of eggs or benthic invertebrates (Sweka and Hartman 2001; Herbert and Merkens 1961; Kjelland et al. 2015).

The use of explosives (i.e., blasting) near fish habitat could result in injury or mortality to fish species present within the range of the post-detonation compressive shock. Studies indicate that a pressure in excess of 100 kilopascals (kPa) has potential to damage various organs in finfish via rupture and/or hemorrhage, including the swim bladder, kidney, liver, spleen, and sinus venous (Wright 1982 in Wright and Hopky 1998). Vibrations from the detonation of explosives could cause damage to incubating eggs if the peak particle velocity of the blast exceeds 13 mm per second in a spawning bed (Wright and Hopky 1998). The degree of potential damage depends on various factors, including the type of explosive used; the size and pattern of the charge(s); the method of detonation; the proximity of fish to the point of detonation; water depth; and the species, size, and life stage of fish.

5.2.3 Proposed Mitigation and Management Measures

In addition to the mitigation and management measures described in Table 2.4-1 (Chapter 2 – Project Description), the following VC-specific mitigation and management measures will be implemented to reduce adverse environmental effects:

- Nova Construction will develop and implement a Water Management Plan for the Project that will incorporate standard management practices for erosion and sediment control, drainage control, dewatering, and surface runoff. The Water Management Plan will provide details regarding runoff and seepage collection strategies and systems (potentially including berms, drainage ditches, pumps, and settling ponds, if required) to collect and contain surface water runoff and groundwater discharge from the quarry footprint during climate normal and extreme weather conditions. The Plan will also provide details regarding monitoring, maintenance, and upgrading of flow retention/siltation treatment areas. Design criteria will recognize increased likelihood of more intense precipitation events in coming decades.
- Project areas will be routinely monitored to identify areas of potential erosion and appropriate mitigation will be applied. Progressive erosion and sediment control measures will be implemented, as required.
- Project-related blasting activities near water will be conducted in consideration of DFO's *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky 1998), as well as the terms and conditions of the Industrial Approval for the Project.

5.2.4 Residual Environmental Effects

A significant residual environmental effect on the aquatic environment is defined as a residual environmental effect that results in any of the following:

- Alteration of the hydrological regime and/or sediment transport regime beyond the Project Area such that it no longer meets established instream flow needs
- A high-magnitude change in stream flows or lake levels in the RAA (e.g., a Project-caused change in flow or lake levels greater than 10% relative change from existing conditions)
- A Project-related deposit of a deleterious substance into the aquatic environment which results in the death of fish or the harmful alteration, disruption, or destruction (HADD) of fish habitat, as defined by the *Fisheries Act*, that is not authorized and cannot be mitigated
- Unauthorized HADD of fish habitat, as defined by the *Fisheries Act* that cannot be mitigated or offset
- A change in fish health, growth, or survival that is likely to cause a measurable reduction in the abundance, community composition, or population structure of fish populations in the RAA
- Death or life-threatening injury to a SARA-listed species
- Killing, harming, harassing, or destruction of critical habitat of Endangered or Threatened species listed on Schedule 1 of SARA

Overall, the Project has been sited to avoid WC-2 and WC-3 and Smalls Lake (Figure 5.2-1). A minimum 30 m buffer will be maintained around watercourses and waterbodies near the Project in accordance with the *Pit and Quarry Guidelines* to reduce effects to the environment. Maintaining these separation distances is anticipated to avoid potential residual adverse effects on the aquatic environment during the site preparation and operation and maintenance phases of the Project. Implementation of the standard mitigation and management measures that are described in Section 5.2.3 and Table 2.4-1 (Chapter 2 – Project Description) with respect to erosion and sediment control, management of runoff, and water quality will further reduce potential residual adverse effects on the aquatic environment.

Surface Water Quantity

Project-related dewatering will only be conducted on an as-needed basis and, in consideration of the low rate of groundwater recharge in the LAA (refer to Section 5.1 – Groundwater), is anticipated to be required infrequently. The development and implementation of a Project-specific Water Management Plan will be key mitigation to reduce potential residual effects on surface water quantity associated with dewatering and surface runoff. Excavation below the water table is expected to occur with efficient dewatering of the vertical fracture system, thus being negligible in magnitude during the operation and maintenance phase of the Project (Appendix D). No effects to surface water quantity are anticipated.

Pre-quarrying site drainage patterns will be re-established to the extent practicable during the decommissioning and reclamation phase of the Project.

Surface Water Quality

With application of the mitigation and management measures described in Section 5.2.3 and Table 2.4-1 (Chapter 2 – Project Description), the potential residual effects of fugitive dust on surface water quality are anticipated to be negligible.

Fish Habitat

With application of the mitigation and management measures described in Section 5.2.3 and Table 2.4-1 (Chapter 2 – Project Description), including dust mitigation and the maintenance of a 30 m buffer zone from WC-2 an WC-3, the potential residual effects on fish habitat are anticipated to be negligible.

Fish Health and Survival

Detonation of explosives and associated pressures from Project-related blasting near watercourses and waterbodies have the potential to be of sufficient magnitude to adversely affect fish health and survival. Pressures in excess of 100 kPa have the potential to damage various organs in finfish and damage incubating eggs if the peak particle velocity of the blast exceeds 13 mm per second in a spawning bed. As described previously, a minimum 30 m buffer will be maintained around watercourses and waterbodies near the Project and follows the Guidelines to reduce effects to the environment.

In addition, Project-related blasting activities that may occur near water will be conducted in consideration of DFO's *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky 1998), as well as the terms and conditions of the Industrial Approval or Industrial Approval amendment for the Project. With application of these avoidance and mitigation measures, the Project is considered unlikely to result in a substantive change in fish health and survival.

Summary

With the proposed avoidance and mitigation measures in place, the Project is not anticipated to result in substantive residual effects on the aquatic environment. The predicted magnitude of Project-related residual effects on the aquatic environment is generally characterized as negligible (i.e., no measurable change from baseline conditions) and is restricted to the LAA. Potential effects are predicted to occur as multiple irregular events of short-term duration and be reversible following decommissioning and reclamation. With implementation of the mitigation and management measures proposed in Section 5.2.3 and Table 2.4-1 (Chapter 2 – Project Description), including maintenance of a buffer of at least 30 m between the expanded quarry footprint and the nearest water body (e.g., watercourse or wetland), Project-related residual effects on the aquatic environment are predicted to be not significant.

5.2.5 Proposed Monitoring Programs

Surface water monitoring is currently conducted in accordance with the Industrial Approval for the existing quarry, which specifies applicable water quality limits. It is anticipated that similar compliance monitoring requirements will be stipulated in the Industrial Approval for the Project, including the monitoring of water quality downstream of Project activities during the site preparation phase of the Project and the monitoring of surface water discharges from the Project Area during the operation and maintenance phase of the Project. Additional monitoring may be required at the request of NSECC.

Due to the absence of watercourses and waterbodies within approximately 30 m of the Project Area, no further monitoring is proposed in support of the Aquatic Environment VC.

5.3 WETLANDS

5.3.1 Description of Existing Environmental Conditions

Field surveys were conducted in the Project Area on June 29 and July 11, 2022 for the purposes of determining the presence or absence of wetlands in the Project Area, delineating boundaries and conducting functional assessments for any wetlands identified in the Project Area (if applicable), and describing existing wetland conditions in the Project Area. Prior to conducting the field surveys, the location of known or potential wetlands in the LAA was obtained through a review of previous wetland surveys conducted in the LAA, provincial wetland mapping (NSDNR 2017), Wet Areas Mapping (Forest Watershed Research Centre 2019), and LiDAR imagery. Information on the location of potential Wetlands of Special Significance was obtained through a review of provincial data (NSE 2015) and following a review of data collected during wetland surveys. These information sources were used to help identify priority areas for field surveys and to contribute to wetland assessments.

No wetlands were recorded in the Project Area during the wetland field surveys. However, the following two wetland areas were incidentally observed within the LAA during watercourse surveys conducted in support of the assessment of potential Project effects on the aquatic environment (Section 5.2.1):

- An unmapped wetland of unknown size (WL-1) associated with the lacustrine habitat surrounding Smalls Lake.
- A provincially mapped wetland that is approximately 2.6 ha in size (WL-2) and forms part of a large beaver dam complex.

The locations of these wetlands are shown on Figure 5.3-1. WL-1 is located approximately 140 m west of the Project Area. WL-2 is located approximately 45 m northeast of the Project Area and is the wetland in closest proximity to the northern or western boundaries of the Project Area.

Another provincially mapped wetland (WL-3) is located approximately 553 m northeast of the Project Area and is approximately 3.2 ha in size(Figure 5.3-1).

WL-2 and WL-3 were previously identified in 2015 during field work conducted by Envirosphere in support of the EA Registration for the MEL Quarry (MEL 2016). They are described in the Biophysical Assessment Report for the MEL Quarry (Envirosphere 2015) as being transitional between bog and fen conditions. They are dominated by sedges, especially smooth black sedge (*Carex nigra*), and sweet gale (*Myrica gale*) with an understorey of brown sphagnum moss (*Sphagnum fusca*). The western extent of WL-2 was formerly a treed bog was logged. WL-2 and WL-3 both drain to the southwest, towards St. Mary's Bay (Envirosphere 2015).

Envirosphere (2015) also identified two additional unmapped wetlands within the LAA. These wetlands consist of an approximately 0.46-ha treed swamp (WL-4) that has been partially logged and is located in the valley between the existing Seabrook Quarry and the adjacent MEL Quarry, as well as an approximately 0.03-ha cutover remnant of a treed swamp (WL-5) that is located to the north of the MEL Quarry (Figure 5.3-1). WL-4 drains to the south and forms a small intermittent stream that flows downslope. The vegetation in WL-4 consists primarily of a canopy of red maple (*Acer rubrum*), with an herb layer of cinnamon fern (*Osmundastrum cinnamomeum*) over a bed of sphagnum moss (predominantly *Sphagnum girgensohnii*) (Envirosphere 2015).

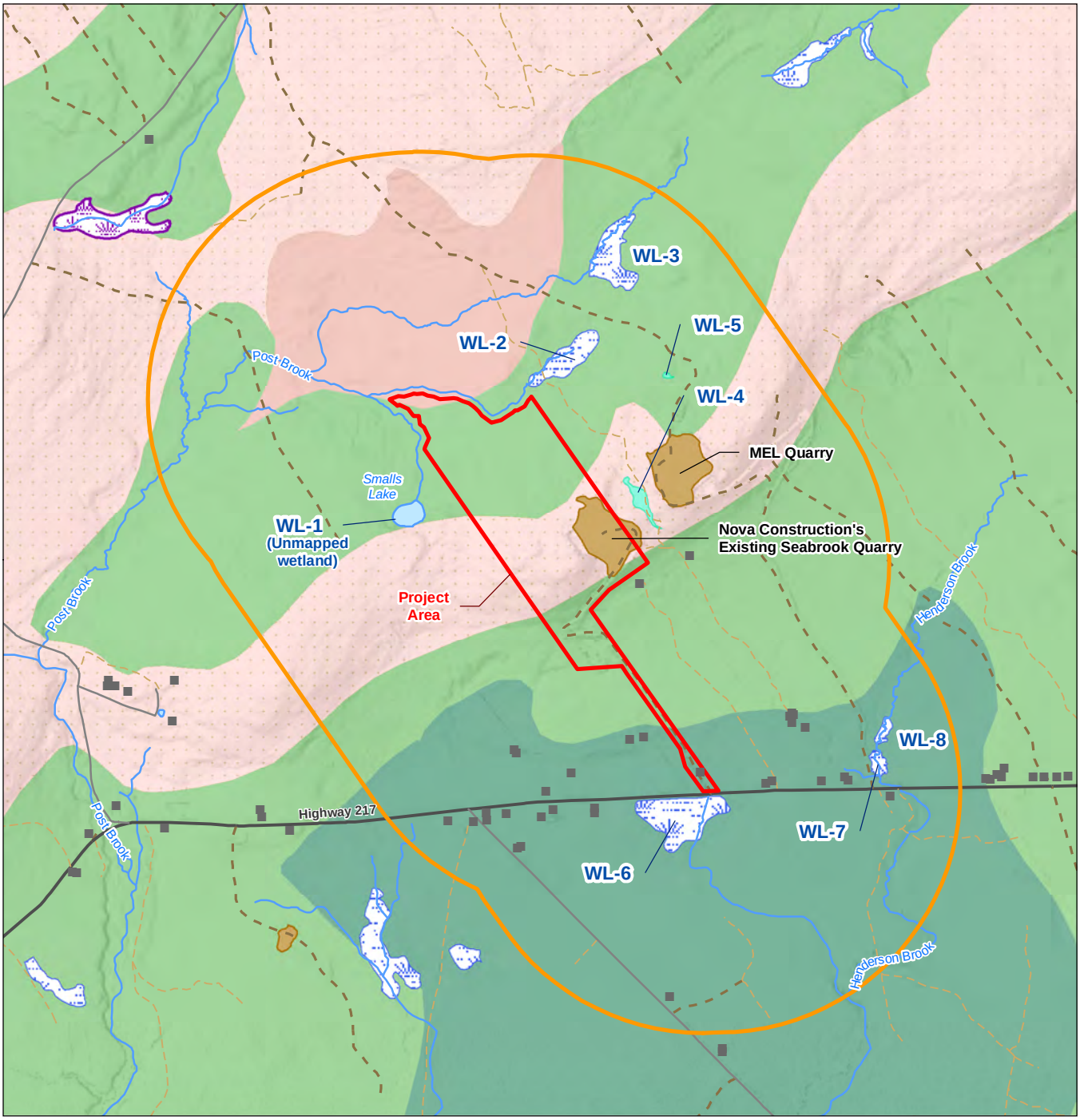
In the northeastern portions of the LAA that were surveyed in support of the EA Registration for the MEL Quarry (MEL 2016), Envirosphere (2015) noted that logging activity has rutted the surface, creating localized, shallow pond-like depressions and linear wet areas that have developed vegetation communities typically associated with wetland conditions (e.g., sedges and rushes) but are anthropogenic in origin.

Provincial wetland mapping also indicates the presence of three wetlands near the southern extent of the LAA, including one wetland located approximately 24 m south of the Project Area and two wetlands located approximately 630 m and 680 m east of the Project Area. These wetlands, WL-6, WL-7, and WL-8, respectively, are not described further since they are each located at least 925 m south of the existing quarry footprint; the Project entails expansion of the quarry footprint in the opposite direction (i.e., to the north and west of the existing quarry footprint).

The *Nova Scotia Wetland Conservation Policy* (NSE 2019) designates the following types of wetlands in the province as Wetlands of Special Significance (WSS):

- All salt marshes
- Wetlands that are within or partially within a site designated under the *Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat*, a Provincial Wildlife Management Area (Crown and Provincial lands only), a Provincial Park, a Nature Reserve, a Wilderness Area, or lands that are owned or legally protected by non-government charitable conservation land trusts
- Intact or restored wetlands that are project sites under the *North American Waterfowl Management Plan* and secured for conservation through the Nova Scotia–Eastern Habitat Joint Venture program
- Wetlands known to support SAR as designated under the federal *Species at Risk Act* or the Nova Scotia *Endangered Species Act*
- Wetlands in designated protected water areas as described within Section 106 of the *Environment Act*

The nearest designated WSS is located approximately 1.2 km northwest of the Project Area and approximately 160 m outside of the LAA, as illustrated on Figure 5.3-1.



Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Stantec, Nova Construction, Envirosphere, Nova Scotia Dept. of Natural Resources and Renewables, Nova Scotia Dept. of Environment and Climate Change, Government of Canada NRCan CANVEC

3. Service Layer Credits: ESRI 2022

- Project Area
- LAA for Wetlands VC
- Building
- Property Boundary
- Road / Highway
- Local Road
- Resource Road
- Trail
- Existing Pit/Quarry

Wetlands and Waterways

- Watercourse
- Waterbody
- Wetland (NSE)
- Wetland of Special Significance (NSE)
- Wetland (Envirosphere, 2015)

Ecosections

- Imperfectly drained, medium textured soils on hummocky terrain
- Imperfectly drained, medium textured soils on a smooth or flat terrain
- Well drained, medium textured soil on hummocky terrain
- Well drained, medium textured soil on hilly terrain

0 300 600 metres

(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Seabrook
Digby, Nova Scotia

Client/Project 121417326_010a
Nova Construction
Seabrook Quarry Expansion

Figure No.
5.3-1

Title
Wetlands

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The *Nova Scotia Wetland Conservation Policy* (NSE 2019) also states that the provincial government will develop a process for classifying additional wetlands or wetland types as WSS. Among the wetland characteristics, functions, and services to be considered during this process are whether the area:

- Supports a significant species or species assemblages (e.g., coastal plain flora)
- Supports high wildlife biodiversity
- Has significant hydrologic value
- Has high social or cultural importance

5.3.2 Potential Environmental Effects

As no wetlands were identified within the Project Area (Section 5.3.1), the Project is not anticipated to result in the direct alteration or loss of wetland habitat. However, the Project has potential to interact indirectly with wetlands in the LAA through effects on wetland hydrology and wetland habitat quality, and these effects could lead to the degradation of wetland functions.

Potential Project interactions with the non-wetland aquatic environment (i.e., non-wetland surface water resources and fish and fish habitat) are assessed separately in Section 5.2. Potential Project interactions with rare and sensitive plants outside of wetlands and potential Project interactions with wildlife and wildlife habitat outside of wetlands are assessed separately in Section 5.4 and Section 5.5, respectively.

Wetland Hydrological Functions

Effects on wetland hydrology and related hydrological functions could occur as a result of potential changes to surface water and/or groundwater flow patterns and site drainage conditions associated with Project activities such as clearing and grubbing during site preparation, potential excavation below the groundwater table and related dewatering activities during operation and maintenance (if applicable), and various earthworks and other activities during decommissioning and reclamation that could alter site drainage. Surface runoff and associated management measures could also affect wetland hydrology during all phases of the Project.

Wetland Habitat Quality

Wetland habitat quality for wetland-associated vegetation and wildlife species (potentially including SAR, SOCC, and species of traditional/cultural importance) could be adversely affected by potential Project-related changes in wetland hydrology, as well as other potential Project-related impacts such as the deposition of fugitive dust emissions, erosion and sedimentation, and sensory disturbances (e.g., air, noise, vibration, and/or light emissions) during all phases of the Project.

5.3.3 Proposed Mitigation and Management Measures

The *Nova Scotia Wetland Conservation Policy* was introduced in 2011 (and revised in 2019; NSE 2019) to prevent the net loss of wetlands in Nova Scotia. As described in the Policy, the application of a hierarchical mitigation sequence for wetland conservation can assist proponents in planning and designing projects in accordance with the Policy's objectives. The mitigation sequence consists of the following alternatives:

- **"Avoidance"** is the preferred alternative in the mitigation sequence. It entails the prevention of adverse effects to wetlands, and can be achieved by choosing an alternate project, design, or site for development. Accordingly, the Project Area has been designed to avoid wetlands (refer to Section 2.5).
- **"Minimization"** is the process of planning, designing, and implementing a project in such a way that reduces unavoidable adverse effects on wetlands. The mitigation and management measures proposed below are consistent with the minimization component of the mitigation sequence.
- **"Compensation"** requires that unavoidable wetland alterations (e.g., draining, filling, flooding, or excavation) are offset through the enhancement, restoration, or creation of wetland habitat at an area ratio commensurate with the loss. In consideration of the Project-specific avoidance and minimization measures described herein, the Project is not anticipated to require wetland compensation. However, this assumption will be confirmed with NSECC prior to the initiation of Project activities. If required, Nova Construction will submit an application for Wetland Alteration Approval to NSECC and will liaise with NSECC as necessary to develop an acceptable Wetland Compensation Plan that consists of one or both of the following:
  - A signed Letter of Understanding between a proponent and a NSECC-recognized wetland restoration professional
  - A detailed plan describing how the proponent will provide compensation for the alteration in contract with a third-party restoration specialist

In addition to the mitigation and management measures described in Table 2.4-1 (Chapter 2 – Project Description), the following VC-specific mitigation and management measures will be implemented to reduce potential adverse environmental effects on wetlands:

- Vegetation clearing will be preferentially conducted during dry and frozen conditions, when possible.
- Exposed soils will be limited to the extent practicable.
- Grading will be directed away from wetlands, where practicable.
- Existing drainage patterns will be maintained to the extent practicable (e.g., through the use of culverts, where necessary).
- Cross drainage will be maintained to allow water to move freely from one side of the road to the other in areas of permanent or temporary access roads.
- Water discharges from the Project Area (e.g., from dewatering activities and surface runoff) will be directed away from wetlands, where practicable.
- Protective layers, such as matting or biodegradable geotextile, clay ramps, packed snow or ice, or other approved materials, will be used for access through wet areas (if applicable) to reduce the potential for rutting, admixing, or compaction.

- The requirement for broad-spraying of herbicide is not anticipated; however, spot-spraying may be required on occasion. If broad-spraying of herbicides is required, it will not be conducted within 30 m of plant SAR or SOCC, wetlands, watercourses, or waterbodies.
- Nova Construction will develop and implement a Water Management Plan for the Project that will incorporate standard management practices for erosion and sediment control, drainage control, dewatering, and surface runoff. The Water Management Plan will provide details regarding runoff and seepage collection strategies and systems (potentially including berms, drainage ditches, pumps, and settling ponds, if required) to collect and contain surface water runoff and groundwater discharge from the quarry footprint during climate normal and extreme weather conditions. The Plan will also provide details regarding monitoring, maintenance, and upgrading of flow retention/siltation treatment areas. Design criteria will recognize increased likelihood of more intense precipitation events in coming decades.
- If it is determined that a Wetland Alteration Approval is required in support of the Project, Project activities will be conducted in accordance with the terms and conditions of the Approval and unavoidable residual adverse effects on wetlands will be offset through development and implementation of a Wetland Compensation Plan that is acceptable to NSECC.

5.3.4 Residual Environmental Effects

A significant residual adverse effect on wetlands is defined as any of the following:

- A loss of wetland functions in a WSS as defined in the *Nova Scotia Wetland Conservation Policy* (NSE 2019) and/or as determined through application of the Wetland Ecosystem Service Protocol for Atlantic Canada (WESP-AC) (NBDELG 2018)
- A net loss of wetland area that threatens the long-term persistence or viability of wetland functions in the RAA
- A decline in abundance and/or change in distribution of a wetland-associated plant species or community such that the integrity (i.e., long-term persistence or viability) of the species or community in the RAA is threatened to the extent that natural recruitment is insufficient to return the population to its former level within several growing seasons
- Contravention of the *Nova Scotia Wetland Conservation Policy* (NSE 2019) or provincial *Environment Act*

As described in Section 2.2.1 and Table 2.4-1 (Chapter 2 – Project Description), a buffer of at least 30 m will be maintained between the expanded quarry footprint and the nearest water feature (e.g., watercourse or wetland). Maintaining this separation distance will further reduce the likelihood and magnitude of potential residual adverse effects on wetland hydrology (e.g., potential changes to site drainage associated with the presence of overburden stockpiles) and wetland habitat quality (e.g., potential erosion and sedimentation effects associated with the presence of overburden stockpiles) during the site preparation and operation and maintenance phases of the Project.

Given that no wetlands are located within approximately 45 m of the northern or western boundaries of the Project Area, and that the direction of the proposed quarry expansion is to the north and west of the existing quarry footprint (within the Project Area), the Project is not likely to cause substantive residual effects on wetland hydrology or wetland habitat quality. Project-related residual effects on wetland hydrology and wetland habitat quality are further evaluated below.

Wetland Hydrological Functions

Clearing, grubbing, and excavation activities will be spatially limited to an approximately 35-ha portion of the Project Area and will be completed in a progressive manner wherever possible. Only the area needed for quarry expansion in any given year will be grubbed, and all areas affected by Project activities will eventually be rehabilitated via progressive and final reclamation. The progressive nature of quarry expansion and reclamation activities will effectively limit the size of the physically disturbed portion of the Project Area that is vulnerable to potential changes in surface water and/or groundwater flow patterns and site drainage conditions at any given time throughout the life of the Project.

Project-related dewatering will only be conducted on an as-needed basis and, in consideration of the low transmissivity of the bedrock in the Project Area, is anticipated to be required infrequently. The development and implementation of a Project-specific Water Management Plan will be key mitigation to reduce potential residual effects on wetland hydrology associated with dewatering and surface runoff.

Pre-quarrying site drainage patterns will be re-established to the extent practicable during the decommissioning and reclamation phase of the Project.

Wetland Habitat Quality

Since much of the wetland habitat that is present within the LAA is already subject to some degree of sensory disturbance from the active Seabrook Quarry and the adjacent active MEL Quarry, Project-related residual sensory disturbance is expected to represent an incremental increase above pre-Project (i.e., current baseline) disturbance levels. However, it is anticipated that the primarily forested nature of the LAA will serve as a natural sound barrier, visual barrier, and barrier against the off-site migration of fugitive dust emissions, thereby reducing the magnitude of potential residual effects on wetland habitat quality in the LAA.

The mitigation and management measures that are currently in place to reduce residual adverse effects on wetland habitat during ongoing operational activities at Seabrook Quarry will be maintained or enhanced (e.g., through the potential establishment of sedimentation ponds, if required) as necessary in support of the Project. Potential Project interactions with groundwater quantity and quality, surface water quantity and quality, wetland-associated species of plants and wildlife, and terrestrial habitat – as well as potential Project-related residual erosion and sedimentation effects and potential Project-related residual air, noise, vibration, and/or light emissions – are not anticipated to be of sufficient magnitude to result in significant residual adverse effects on wetland habitat quality.

Summary

The Project is anticipated to result in residual effects on wetland hydrological functions and wetland habitat quality that are spatially limited to the LAA, continuous in frequency, medium-term in duration (i.e., the residual effects are predicted to extend throughout the life of the Project), and reversible following decommissioning and reclamation. The predicted magnitude of Project-related residual adverse effects on wetlands is generally characterized as negligible (i.e., entailing no measurable change from existing/baseline conditions) to “low” (i.e., entailing measurable changes from existing/baseline conditions that are within the range of natural variability and do not exceed applicable objectives, guidelines, standards, or regulatory limits, nor do they pose a risk to the short-term viability of wetland functions in the LAA). Although there may occasionally be temporary increases in the magnitude of Project-related residual effects on wetlands (e.g., during periods of increased runoff when there could be measurable changes from existing/baseline conditions that may exceed natural variability), the magnitude of predicted residual effects is not anticipated to pose a risk to the short-term viability of wetland functions in the LAA even under those circumstances.

With implementation of the mitigation and management measures proposed in Section 5.3.3, Project-related residual effects on wetlands are predicted to be not significant.

5.3.5 Proposed Monitoring Programs

Due to the absence of wetlands within 45 m of the Project Area, no wetland monitoring programs are proposed.

5.4 VEGETATION

5.4.1 Description of Existing Environmental Conditions

The assessment of vegetation is focused on SAR and SOCC, as defined in Section 4.3.1. AC CDC data returned within a 5-km radius of the Project Area included two vascular plant SAR and two vascular plant SOCC, as well as one lichen SAR and two lichen SOCC (AC CDC 2022b; Appendix H). Table 5.4-1 and Table 5.4-2 identify the vascular plant and lichen SAR and SOCC that are known to occur within 5 km of the Project Area, based on data records from the AC CDC (Appendix H).

Table 5.4-1 Vascular Plant SAR and SOCC Known to Occur Within 5 km of the Project Area

Scientific Name	Common Name	COSEWIC Status	SARA Status	NS ESA Status	AC CDC Rank[1]
Species at Risk					
Fraxinus nigra	Black Ash	Threatened	—	Threatened	S1S2
Thuja occidentalis	Eastern White Cedar	—	—	Vulnerable	S2S3
Species of Conservation Concern					
Carex swanii	Swan's Sedge	—	—	—	S3
Oenothera fruticosa ssp. tetragona	Narrow-leaved Evening Primrose	—	—	—	S2S3

Notes:
[1] S1 = Critically Imperiled, S2 = Imperiled, S3 = Vulnerable, S4 = Apparently Secure, S5 = Secure, SNA = Not Applicable (AC CDC 2022a)
— = No applicable status designation for species

Table 5.4-2 Lichen SAR and SOCC Known to Occur Within 5 km of the Project Area

Scientific Name	Common Name	COSEWIC Status	SARA Status	NS ESA Status	AC CDC Rank[1]
Species at Risk					
Pectenia plumbea	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3
Species of Conservation Concern					
Fuscopannaria ahlneri	Corrugated Shingles Lichen	—	—	—	S3
Heterodermia squamulosa	Scaly Fringe Lichen	—	—	—	S3

Notes:
[1] S1 = Critically Imperiled, S2 = Imperiled, S3 = Vulnerable, S4 = Apparently Secure, S5 = Secure, SNA = Not Applicable (AC CDC 2022a)
— = No applicable status designation for species

Field surveys for vascular plants were conducted within the Project Area on July 11, 2022. During surveys, vascular plant species were recorded on first observation. SAR or SOCC were recorded each time they were observed, and pertinent details such as population size were also recorded. Lichen surveys were not conducted at this time, but habitats were assessed for their potential to support rare lichens known to occur in the surrounding area.

During vegetation surveys conducted in support of the project, 141 vascular plant species were noted (Appendix I). Of these none are SAR, and one is an SOCC: Swan's sedge (*Carex swanii*). This species is ranked S3 by the AC CDC and was returned in AC CDC data for the Project (Table 5.4-1; Appendix H). Swan's sedge was recorded in 16 locations within the Project Area, with the number of plants per observation ranging from 1 to 15 plants (Figure 5.4-1). This species has also been observed by Stantec during surveys conducted for other projects in the Digby area (e.g., the EA for the Highway 101 Digby to Marshalltown Corridor [Stantec 2017]).

The Project Area is entirely forested and consists of several distinct plant communities that correspond with the following vegetation types of the Forest Ecosystem Classification for Nova Scotia (Neily et al. 2010), each of which is common in Nova Scotia:

- MW1 Red spruce – Yellow birch/Evergreen wood fern
- MW4 Balsam fir – Red maple/Wood sorrel – Goldthread
- TH2a Sugar maple/New York fern – Northern beech fern (Yellow birch variant)
- TH5 Beech/Sarsaparilla/Leaf litter
- TH8 Red maple – Yellow birch/Striped maple

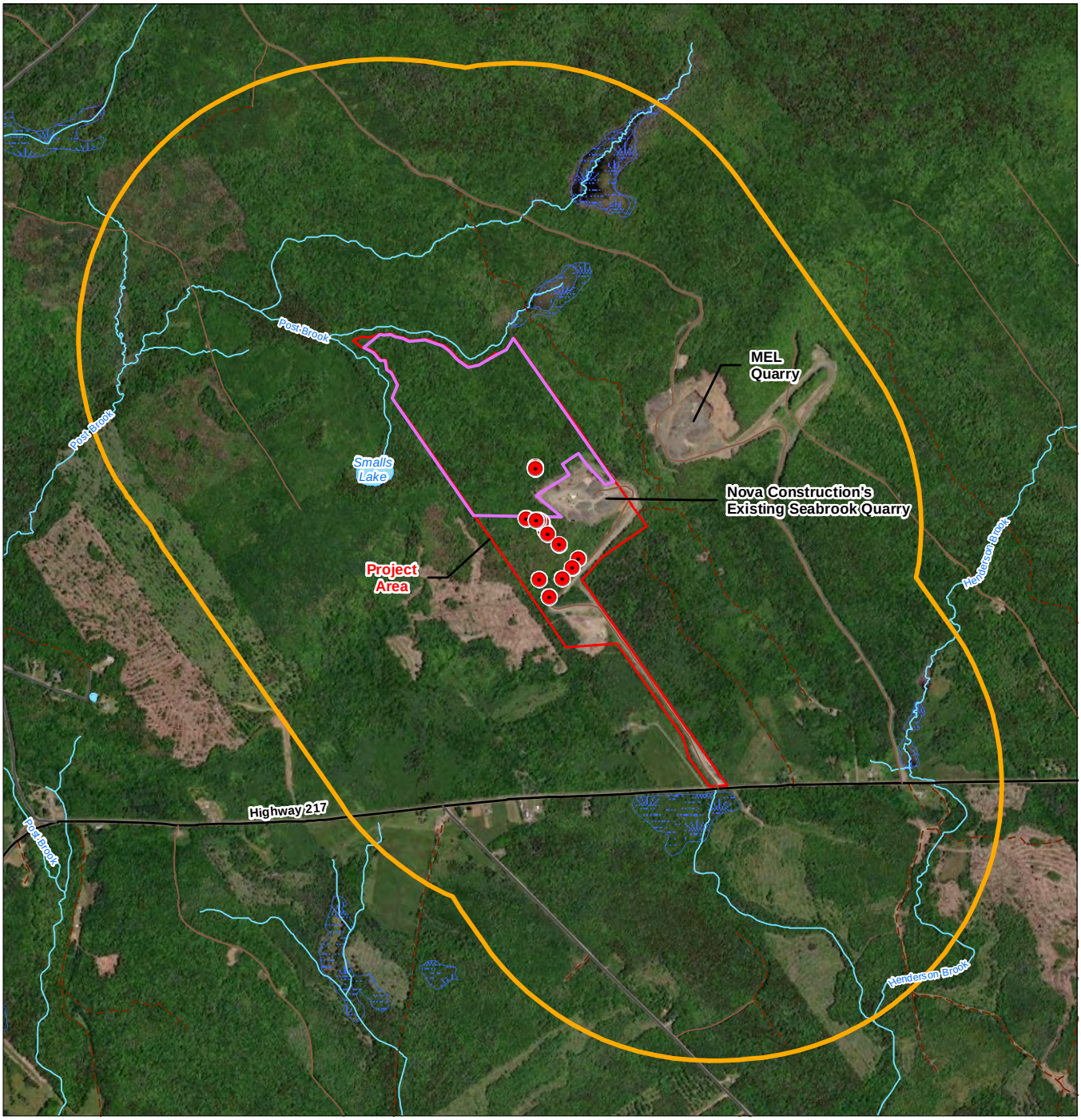
The southern end of the Project Area consists of a steep rocky slope which is occupied by mature mixedwood forest and mature hardwood forest. The mature mixedwood forest is estimated to be 70 years old and found near the toe of slope. It is dominated by red spruce (*Picea rubens*), American beech (*Fagus grandifolia*) and yellow birch (*Betula allegheniensis*) along with small amounts of red maple (*Acer rubrum*). This plant community corresponds to the MW1 Red spruce – Yellow birch/Evergreen wood fern vegetation type of the Forest Ecosystem Classification for Nova Scotia (Neily et al. 2010).

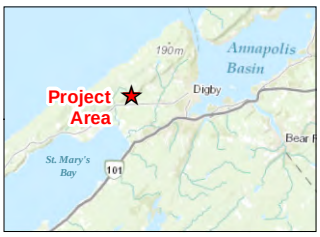
The well drained mature hardwood forest is present on the mid to upper steep slopes on the southern side of the Project Area. This stand was also estimated to be approximately 70 years old. It is dominated by a mixture of American beech and red maple along with lesser amounts of red spruce, yellow birch, and white ash (*Fraxinus americana*). This plant community corresponds to the TH5 Beech/Sarsaparilla/Leaf litter vegetation type of the Forest Ecosystem Classification for Nova Scotia.

Beyond the top of the slope the land slopes gently to the north. This area is covered in mixedwood and hardwood forest, much of which has been harvested in the past 15 years. Small patches of mature forest are imbedded in this matrix of immature forest. The immature forests that cover most of this area consist of immature hardwood and mixedwood forest. The immature hardwood forest corresponds to the TH8 Red maple – Yellow birch/Striped maple vegetation type. In the Project Area this vegetation type is dominated by yellow birch and red maple. The immature mixedwood forest is composed largely of balsam fir (*Abies balsamea*), yellow birch and red maple. It corresponds to the MW4 Balsam fir – Red maple/Wood sorrel – Goldthread vegetation type.

The mature forest imbedded in the immature forest matrix include mature mixedwood and mature hardwood plant communities that range in age from 60 to 70 years old. Both plant communities are situated on mesic sites, often near the sources of small seepages. The mature mixedwood forest inclusion is composed of a mixture of red spruce, red maple and yellow birch and corresponds to the MW1 Red spruce –Yellow birch/Evergreen wood fern vegetation type. The mature hardwood forest plant community is dominated by yellow birch and sugar maple (*Acer saccharum*) along with small amounts of red spruce and red maple. The plant community corresponds to the TH2a Sugar maple/New York fern – Northern beech fern (Yellow birch variant) vegetation type.

It was determined during field surveys that the above-described TH2a vegetation type, located in the northern half of the Project Area, may have potential to support blue felt lichen (*Pectenia plumbea*), a SAR.





Swan's sedge (*Carex swanii*)
Project Area
LAA for Vegetation VC
Quarry Expansion Footprint

Collector
Local Road
Resource Road
Track
Watercourse
Wetland
Waterbody

0 280 560 metres

(At original document size of 8.5x11)
1:22,000

N

Stantec

Project Location
Seabrook
Digby, Nova Scotia

Client/Project 121417326_013
Nova Construction
Seabrook Quarry Expansion

Figure No.
5.4-1

Title
Vegetation Species of Concern Observed Within the Project Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Canada and Nova Scotia
3. Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

5.4.2 Potential Environmental Effects

The Project has potential to interact with vegetation through effects on vegetation SAR, SOCC, and vegetation communities.

Vegetation SAR and SOCC

The progressive removal of vegetation through clearing and grubbing as expansion of the quarry footprint advances will result in the direct mortality of any vegetation that may be located within the expanded quarry footprint, potentially including SAR and SOCC.

Although aggregate extraction will occur in previously disturbed areas that will have already been subject to clearing and/or grubbing, the deposition of fugitive dust emissions produced during various Project operation and maintenance activities (e.g., drilling, blasting, excavation, crushing, screening, stockpiling, and the on-site hauling/moving and trucking of aggregates) could adversely affect the health and survival of plant and lichen species, potentially including SAR and SOCC, by impacting photosynthesis, respiration, and transpiration, as well as allowing the penetration of gaseous pollutants (Farmer 1993).

During periods of heavy precipitation and snowmelt, uncontrolled surface runoff and associated erosion and sedimentation effects could adversely affect the health and survival of vegetation, potentially including SAR or SOCC (if present), by waterlogging the soil and depriving plant species of oxygen. In addition, the force of the water could result in erosion that reduces the stability of soils near plant roots and/or physically damages vegetation, and soil materials and contaminants could be transported and deposited into areas where vegetation, potentiallly including plant SAR and SOCC, are located.

Vegetation Communities

Clearing and grubbing activities during the site preparation phase of the Project will result in the direct physical alteration and loss of vegetation communities within the expanded quarry footprint. In addition to vegetation removal, removal of soils and excavation activities could change vegetation communities that may later regenerate within the area by removing the associated seedbank and compacting and changing the composition of remaining soil layers. Progressive and final reclamation activities (e.g., grading, contouring, capping with soil, and revegetation) during the decommissioning and reclamation phase of the Project will also result in physical alteration of terrestrial habitat that could affect vegetation communities.

Surface runoff and associated management measures could also affect vegetation communities during all phases of the Project, as Project-related surface runoff will be discharged to vegetated areas. Soils in these areas will become more saturated which may be outside of the range of tolerance for species that currently inhabit these areas. Surface water flow may also erode soils or lead to changes in topography and other habitat parameters. These physical alterations could lead to changes in vegetation communities.

Vegetation communities could be adversely affected through the potential introduction and spread of non-native plant species if Project vehicles and equipment are contaminated with soil or vegetative debris from off-site.

Revegetation activities associated with progressive and final reclamation may lead to changes in vegetation communities, through the introduction of new species. Although reclaimed areas would have already been disturbed during previous site activities, seeding in reclaimed areas could introduce species that were not already part of vegetation communities within the Project Area.

5.4.3 Proposed Mitigation and Management Measures

In addition to the mitigation and management measures described in Table 2.4-1 (Chapter 2 – Project Description), the following VC-specific mitigation and management measures will be implemented to reduce potential adverse environmental effects on vegetation:

- To reduce the risk of introducing or spreading exotic and/or invasive vascular plant species, Project vehicles and equipment will arrive at the Project Area clean and free of soil and vegetative debris.
- Areas of vegetation clearing, grubbing, and other physical disturbances will be limited to the extent practicable.
- The boundaries of areas to be cleared will be well-marked prior to the start of clearing activities.
- Known occurrences of plant SAR and SOCC will be avoided, where practicable. The known locations of plant SAR recorded within the Project Area will be identified prior to the commencement of Project activities and appropriate buffers will be flagged and maintained around these areas, where practicable.
- If avoidance of plant SAR is not possible, seed collection and/or transplantation will be considered in consultation with NSECC.
- Grading will be directed away from known occurrence of plant SAR and SOCC, where practicable.
- Water discharges from the Project Area (e.g., from dewatering activities and surface runoff) will be directed away from known locations of plant SAR and SOCC.
- Nova Construction will develop and implement a Water Management Plan for the Project that will incorporate standard management practices for erosion and sediment control, drainage control, dewatering, and surface runoff. The Water Management Plan will provide details regarding runoff and seepage collection strategies and systems (potentially including berms, drainage ditches, pumps, and settling ponds, if required) to collect and contain surface water runoff and groundwater discharge from the quarry footprint during climate normal and extreme weather conditions. The Plan will also provide details regarding monitoring, maintenance, and upgrading of flow retention/siltation treatment areas. Design criteria will recognize increased likelihood of more intense precipitation events in coming decades.

5.4.4 Residual Environmental Effects

A significant residual adverse effect on vegetation is defined as any of the following:

- A decline in abundance and/or change in distribution of a plant SOCC or SAR, or a community of plant SAR or SOCC, such that the integrity (i.e., long-term persistence or viability) of the species or community in the RAA is threatened to the extent that natural recruitment is insufficient to return the population to its former level within several growing seasons
- A disruption in the achievement of self-sustaining population objectives or recovery goals for plant SOCC or SAR in the RAA, or a change that is otherwise contrary to or inconsistent with the goals, objectives, or activities of an applicable recovery plan, action plan, management plan, or another applicable plan, policy, or legislation
- Contravention of the NS ESA or federal SARA

As described in Section 5.4.1 and illustrated on Figure 5.4-1, one plant SOCC is located within the Project Area (i.e., Swan's sedge, observed at 16 occurrences). Although Project activities will be carried out entirely within the boundaries of the Project Area, the final footprint of the expanded quarry will only occupy a portion (i.e., approximately 35 ha) of the approximately 54-ha Project Area. The size of the Project Area was selected to allow flexibility for the avoidance of environmentally sensitive features within the Project Area as the quarry footprint progressively expands. Where practicable, the expanded quarry footprint will be configured to avoid known occurrences of plant SOCC, and appropriate buffers will be established and maintained throughout the life of the Project to reduce potential Project-related direct and indirect disturbances to those individuals and their associated habitat and communities.

Project-related residual effects on vegetation SAR, SOCC, and communities are evaluated below.

Vegetation SAR and SOCC

Progressive clearing and grubbing as expansion of the quarry footprint advances, and the potentially associated residual adverse effect on plant SOCC (i.e., the direct mortality of any plant SOCC that may be located within the expanded quarry footprint), will be spatially limited to within the expanded quarry footprint. Known occurrences of plant SOCC will be avoided and buffered, where practicable. Therefore, the likelihood of this residual effect occurring will depend on the final configuration of the expanded quarry footprint and the feasibility of designing the footprint to avoid the known locations of plant SOCC in the Project Area. It is expected that at least five of the sixteen instances of Swan's sedge will not be affected by the Project, as the area where they are located is not within the planned expanded footprint. In cases where avoidance of plant SOCC is not practicable, this residual effect would be predicted to occur infrequently (i.e., between one and 16 times) as the quarry footprint progressively expands to the north and west within the Project Area. As this plant is ranked S3 (vulnerable), it is believed there are up to 80 known populations within Nova Scotia and based on both AC CDC data (AC CDC 2022b) and work completed by Stantec in the surrounding area, this species appears to be more locally common in this area of the province relative to other areas of Nova Scotia. Therefore, a loss of a portion of the population found within the Project Area is not expected to change the status of this rare species in Nova Scotia.

The potential residual adverse effects of Project-related dust deposition and surface runoff on the health and survival of plant SAR and SOCC are similarly anticipated to extend beyond the expanded quarry footprint into the surrounding Project Area – and could also extend into the LAA. Fugitive dust emissions will be mitigated and managed as described in Table 2.4-1 (Chapter 2 – Project Description). The development and implementation of a Project-specific Water Management Plan will be key mitigation to reduce potential residual effects from surface runoff and associated erosion and sedimentation. Additional mitigation and management measures pertaining to erosion and sediment control, management of runoff, and water quality are described in Section 5.4.3 and Table 2.4-1 (Chapter 2 – Project Description). Water discharges from the Project Area (e.g., from dewatering activities and surface runoff) will be directed away from known locations of plant SAR and SOCC. The potential residual effects associated with dust deposition are predicted to be regular to continuous in frequency, while the residual effects associated with surface runoff and water discharges are predicted to occur less frequently (i.e., occasionally).

During the decommissioning and reclamation phase of the Project, terrestrial habitat within the expanded quarry footprint will be returned to a condition that is consistent with the natural surroundings (including habitat conducive to the potential establishment, and/or re-establishment, of plant SAR and SOCC) through progressive and final reclamation activities including grading, contouring, capping with soil, revegetation, and the passage of time. Although some existing habitat for plant SAR and SOCC within the Project Area may be altered or lost as a result of the Project, it is anticipated that appropriate habitat for plant SAR and SOCC could eventually be restored through reclamation of the expanded quarry footprint; the residual adverse effects of the Project on vegetation SAR and SOCC are therefore predicted to be reversible following the completion of Project activities.

Vegetation Communities

The Project is expected to result in the direct alteration or loss of approximately 31 ha of vegetation communities, potentially including habitat for plant SOCC, through expansion of the quarry footprint from its current size of approximately 3.99 ha to its proposed size of approximately 35 ha. The 31-ha expansion footprint represents approximately 4% of the 768 ha of vegetated habitat area within the LAA. As noted in Section 5.4, the plant communities that occur in the Project Area are common in Nova Scotia.

The residual adverse effects on loss of vegetation communities associated with direct Project-related habitat loss will be spatially limited to within the expanded quarry footprint. The residual adverse effects on habitat quality associated with direct Project-related habitat alteration will similarly be spatially limited to within the expanded quarry footprint. These residual effects are predicted to occur on a regular basis as the quarry footprint progressively expands.

The potential residual effects of surface runoff on vegetation communities are expected to extend beyond the expanded quarry footprint into the surrounding Project Area – and could also extend into the LAA. As described above for plant SAR and SOCC, a Project-specific Water Management Plan will be key mitigation to reduce potential residual effects from surface runoff and associated erosion and sedimentation.

The residual effects associated with surface runoff and water discharges are predicted to occur occasionally.

Following mitigation, the potential residual adverse effects of the Project on vegetation communities that could occur as a result of the introduction and spread of non-native plant species are anticipated be spatially limited to the Project Area.

During the decommissioning and reclamation phase of the Project, terrestrial habitat within the expanded quarry footprint will be returned to a condition that is consistent with the natural surroundings through progressive and final reclamation activities including grading, contouring, capping with soil, revegetation, and the passage of time. It is anticipated that vegetation communities will eventually be restored through reclamation of the expanded quarry footprint; the residual adverse effects of the Project on vegetation communities are therefore predicted to be reversible following the completion of Project activities.

Summary

The Project is anticipated to result in residual effects on vegetation that are generally spatially limited to the LAA, although residual effects on plant SAR and SOCC are not expected to occur beyond the expanded quarry footprint or the Project Area. Residual effects on vegetation are generally anticipated to range from occasional to continuous in frequency, to be medium-term in duration (i.e., the residual effects are predicted to extend throughout the life of the Project), and to generally be reversible following decommissioning and reclamation. However, any residual Project-related mortality of plant SAR and SOCC that may occur would take place infrequently (i.e., between one and 16 times) and would be permanent for the affected individuals and communities. The predicted magnitude of Project-related residual adverse effects on vegetation is generally characterized as “moderate” (i.e., entailing measurable changes from existing/baseline conditions that may exceed natural variability but do not exceed applicable objectives, guidelines, standards, or regulatory limits, nor do they pose a risk to the long-term viability of SAR or SOCC, or vegetation communities in the LAA). Although there may occasionally be temporary increases in the magnitude of Project-related residual effects on vegetation (e.g., during periods of increased runoff or in the event that avoidance of plant SAR or SOCC is not practicable), the magnitude of predicted residual effects is not anticipated to pose a risk to the short-term viability of vegetation in the LAA even under those circumstances.

With implementation of the mitigation and management measures proposed in Section 5.4.3, Project-related residual effects on vegetation are predicted to be not significant.

The level of confidence in the predictions for Project-related residual effects on vegetation is moderate to high. This is based on a good understanding of current existing conditions in the Project Area and LAA (in consideration of information collected during field surveys, as part of desktop data compilation, and GIS data analyses); a good understanding of Project activities, locations, and potential Project-VC interactions; the known effectiveness of proposed mitigation measures; and the knowledge and experience of the assessment team. The level of confidence is reduced to moderate because the potential presence or absence of blue felt lichen in the Project Area is unknown; however, environmental effects mechanisms are well-understood and a follow-up lichen survey is recommended in Section 5.4.5 below to improve prediction confidence.

5.4.5 Proposed Monitoring Programs

A lichen survey will be conducted in the Project Area prior to Project-related vegetation clearing. The purpose of this survey would be to verify that the residual effects assessment for vegetation (as stated in Section 5.4.5) is true in consideration of lichen species that may or may not occur within the Project Area. If lichen SAR are observed within the Project Area, additional mitigation and monitoring may be required for those species. No specific monitoring is recommended for Swan's sedge as significant residual effects on this species are not predicted. Compliance monitoring will be conducted to confirm that environmental mitigation measures for vegetation are implemented and properly maintained.

Water quality at the final discharge point will be monitored for compliance with the limits specified the Industrial Approval for the Project, in accordance with any requirements specified therein with respect to the parameters to be monitored, the monitoring frequency, and the monitoring methods. A vegetation survey is proposed for the area surrounding the discharge point if it is located outside of the Project Area. This survey will determine whether there are any additional plant SAR or SOCC that may be affected by Project water discharges that were not considered in the current assessment.

Post-reclamation monitoring methods and goals will be outlined in a project-specific reclamation monitoring program, to be developed prior to the start of reclamation activities and may include monitoring to determine revegetation success.

5.5 WILDLIFE AND WILDLIFE HABITAT

5.5.1 Description of Existing Environmental Conditions

Field surveys were conducted in the Project Area on June 29 and July 11, 2022, for the purpose of determining fauna presence in the Project Area. Prior to conducting the field surveys, aerial imagery of the Project Area was reviewed to determine the distribution of various habitat types in the Project Area. The AC CDC data report (AC CDC 2022b; Appendix H) was reviewed prior to field surveys to determine which wildlife SAR and SOCC have been recorded within a 5-km radius of the Project Area. These information sources were used to help identify priority areas for field surveys and to contribute to habitat assessments.

Fauna-related surveys included avifauna surveys and incidental observations of mammals and herpetofauna. Habitat types present in the Project Area were also recorded. Avifauna surveys included bird point counts targeting breeding songbirds within land cover classes to characterize the species composition of those units. Incidental bird observations were recorded while travelling between point count sites and during the vegetation and wetland field programs, with a focus on SAR and SOCC. Evidence of breeding activity was gathered using the same criteria used by the Maritime Breeding Bird Atlas (MBBA 2016).

The Project Area is entirely forested and consists of several distinct plant communities that correspond with the following vegetation types of the Forest Ecosystem Classification for Nova Scotia (Neily et al. 2010), each of which is common in Nova Scotia:

- MW1 Red spruce – Yellow birch/Evergreen wood fern
- MW4 Balsam fir – Red maple/Wood sorrel – Goldthread
- TH2a Sugar maple/New York fern – Northern beech fern (Yellow birch variant)
- TH5 Beech/Sarsaparilla/Leaf litter
- TH8 Red maple – Yellow birch/Striped maple

These plant communities are described further in Section 5.4.1 (Description of Existing Environmental Conditions for the Vegetation VC).

Table 5.5-1 identifies the wildlife species, including SAR, SOCC, and secure species, that are known to occur within 5 km of the Project Area based on data records from the AC CDC. The wildlife species identified by AC CDC (2022b; Appendix H) are generally limited to avifauna. However, the Project-specific data report from AC CDC (2022b; Appendix H) also indicates that there are records of either one or more bat hibernacula or one or more of three resident (non-migratory) bat SAR (i.e., little brown myotis [*Myotis lucifugus*], long-eared myotis [*Myotis septentrionalis*], and tricolored bat [*Perimyotis subflavus*]) within 5 km of the Project Area. Although the presence of bat hibernacula within 5 km of the Project Area is considered unlikely due to local geological conditions, bat SAR have potential to occur in the vicinity of the Project.

Table 5.5-1 AC CDC Records of Wildlife Species Known to Occur Within 5 km of the Project Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	NS ESA Status	AC CDC Rank[1]
Species at Risk					
Bank Swallow	*Riparia riparia*	Threatened	Threatened	Endangered	S2B
Barn Swallow	*Hirundo rustica*	Special Concern	Threatened	Endangered	S3B
Bobolink	*Dolichonyx oryzivorus*	Threatened	Threatened	Vulnerable	S3B
Canada Warbler	*Cardellina canadensis*	Special Concern	Threatened	Endangered	S3B
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened	Endangered	S2S3B, S1M
Eastern Wood-Pewee	*Contopus virens*	Special Concern	Special Concern	Vulnerable	S3S4B
Evening Grosbeak	*Coccothraustes vespertinus*	Special Concern	Special Concern	Vulnerable	S3B, S3N, S3M
Olive-sided Flycatcher	*Contopus cooperi*	Special Concern	Threatened	Threatened	S3B
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Special Concern	Endangered	S2B

Table 5.5-1 AC CDC Records of Wildlife Species Known to Occur Within 5 km of the Project Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	NS ESA Status	AC CDC Rank[1]
Little brown myotis, long-eared myotis, and/or tri-colored bat[2]	*Myotis lucifugus, Myotis septentrionalis,* and/or *Perimyotis subflavus*	Endangered	Endangered	Endangered	S1
Species of Conservation Concern					
Black-bellied Plover	*Pluvialis squatarola*	—	—	—	S3M
Black-billed Cuckoo	*Coccyzus erythropthalmus*	—	—	—	S3B
Blackpoll Warbler	*Setophaga striata*	—	—	—	S3B, S5M
Boreal Chickadee	*Poecile hudsonicus*	—	—	—	S3
Brown-headed Cowbird	*Molothrus ater*	—	—	—	S2B
Canada Jay	*Perisoreus canadensis*	—	—	—	S3
Cliff Swallow	*Petrochelidon pyrrhonota*	—	—	—	S2S3B
Common Eider	*Somateria mollissima*	—	—	—	S3B, S3M, S3N
Great Cormorant	*Phalacrocorax carbo*	—	—	—	S2S3B, S2S3N
Killdeer	*Charadrius vociferus*	—	—	—	S3B
Pine Grosbeak	*Pinicola enucleator*	—	—	—	S3B, S5N, S5M
Pine Siskin	*Spinus pinus*	—	—	—	S3
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	—	—	—	S3B
Turkey Vulture	*Cathartes aura*	—	—	—	S2S3B, S4S5M
Willet	*Tringa semipalmata*	—	—	—	S3B
Wilson's Snipe	*Gallinago delicata*	—	—	—	S3B, S5M
Wilson's Warbler	*Cardellina pusilla*	—	—	—	S3B, S5M
Secure Species					
American Bittern	*Botaurus lentiginosus*	—	—	—	S3S4B, S4S5M
Nelson's Sparrow	*Ammospiza nelsoni*	—	—	—	S3S4B
Purple Sandpiper	*Calidris maritima*	—	—	—	S3S4N
Red Crossbill	Loxia curvirostra	—	—	—	S3S4
Spotted Sandpiper	*Actitis macularius*	—	—	—	S3S4B, S5M

Notes:

[1] S1 = Critically Imperiled, S2 = Imperiled, S3 = Vulnerable, S4 = Apparently Secure, S5 = Secure, B = Breeding, M = Migrant (AC CDC 2022a)

[2] The data report from the AC CDC (2022b) does not specify whether this record is for the presence of one or more bat hibernacula and/or the occurrence one or more of the three bat SAR identified above in this table.

— = No applicable status designation for species

Source: AC CDC 2022b

A total of 46 bird species were recorded during the various surveys conducted within the Project Area as part of this EA, including Canada Warbler (*Cardellina canadensis*), gray catbird (*Dumetella carolinensis*), eastern-wood pewee (*Contopus virens*), rose-breasted grosbeak (*Pheucticus ludovicianus*), and turkey vulture (*Cathartes aura*) (Appendix J).

Incidental observations of mammals and herpetofauna revealed species commonly found within the province including American black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), eastern chipmunk (*Tamias striatus*), red squirrel (*Sciurus vulgaris*), snowshoe hare (*Lepus americanus*), spring peeper (*Pseudacris crucifer*), American toad (*Bufo americanus*), and wood frog (*Rana sylvatica*). No mammal or hertofauna SAR or SOCC were observed.

5.5.2 Potential Environmental Effects

The Project has potential to interact with wildlife and wildlife habitat through effects on habitat loss and fragmentation, wildlife behaviour and habitat use, and risk of injury or mortality.

Habitat Loss and Fragmentation

The Project will result in the direct loss of vegetation communities and associated terrestrial wildlife habitat within the expanded quarry footprint. However, since site preparation activities will be carried out progressively on an as-needed basis over the life of the Project, this loss will occur incrementally over a period of approximately 40 years.

Developments resulting in the removal of wildlife habitat and/or the introduction of noise, visual, and olfactory stimuli have the potential to fragment natural habitats. Fragmentation is the partitioning of habitat into discrete units, where some mechanism (e.g., human presence) impedes or prevents the exchange of wildlife between habitat units. Species with limited dispersal capabilities are generally most susceptible to fragmentation. The Project will contribute to local habitat fragmentation while the quarry is operational. There will be little vegetation in the quarry footprint, which will make it difficult for wildlife, particularly herpetiles and small mammals, to move from one side of the Project Area to the other due to lack of cover and increased risk of predation. Forest interior birds are also sensitive to this type of habitat fragmentation because they are affected both by direct habitat loss and through adverse edge influences.

Change in Wildlife Behaviour and Habitat Use

Auditory, visual, and other sensory disturbances (e.g., dust, vibration, and odour) associated with the presence and operation of Project vehicles, equipment, and site lighting; the presence of Project personnel; and potentially disruptive Project activities (e.g., blasting) within the Project Area could affect wildlife behaviour by causing avoidance/displacement and discouraging wildlife species from using habitats in close proximity to Project activities.

Certain wildlife species undergo torpor or hibernation during periods of resource scarcity. Wildlife disturbed during these periods may die from exposure or subsequent starvation due to expenditure of energy. However, because quarrying activities have been taking place at the existing quarry for many years, the Project does not represent an additional source of disturbance to animals in the vicinity of the Project Area and they would also be exposed to similar levels of disturbance during selection of their hibernacula.

Bats are unlikely to hibernate in the active Project Area itself. The presence of bat-accessible rock openings within the LAA is also unlikely given that the geological topography of the area is not as conducive to producing caverns as other areas of the province with karst topography. Though it is possible for quarrying activities to affect bats in nearby areas, these activities would largely deter bats from inhabiting the active quarry footprint.

The existing quarry is typically active during construction season (May to December) and shut down for the winter; this seasonal operation schedule is anticipated to continue for the operational life of the Project. In consideration of the seasonal nature of current and proposed quarrying activities and the frequency of current and proposed blasting activities (i.e., on an as-needed basis, which is typically at least once annually), Project-related blasting is unlikely to overlap temporally with wildlife hibernation. The potential effects of the Project on hibernating wildlife are therefore anticipated to be negligible and are not assessed further.

Risk of Injury or Mortality

Various wildlife species could be subject to injury and mortality risk due to the potential for collisions with or strikes by Project vehicles or equipment during all phases of the Project. Breeding bird species are particularly vulnerable to the risk of injury or mortality during site preparation activities. The nesting season is generally the most critical life history stage for birds, because eggs and nestlings cannot move from a source of disturbance. In Nova Scotia, the breeding season for birds generally occurs between May 1st and August 31st.

During the operation and maintenance phase of the Project, blasting activities have potential to cause auditory injury and/or physical harm to various wildlife species, if any individuals are present in close proximity to the point of blast. There is also risk to open habitat species once their habitat is created following site preparation and during operation. While most bird species construct nests in trees and shrubs, a number of species of birds nest at ground-level (e.g., common nighthawk [*Chordeiles minor*] and killdeer [*Charadrius vociferus*]). Eggs and nestlings located in areas to be cleared would likely be destroyed if clearing occurred during the breeding season. Furthermore, there is potential for bank swallows (*Riparia riparia*) to establish colonies in vertical banks or areas of stockpiled product comprised of sandy material and to be directly disturbed by Project activities. Potential adverse effects due to Project-related noise on bird breeding could also result in abandonment of the nest or increased rates of predation and exposure of hatchlings and eggs during temporary abandonment.

The clearing of mature trees, especially those with *Usnea* species (beard lichens) and small crevices in bark and hollow portions of branches/trunks, can result in loss of bat roosting and maternal colony habitat. AC CDC (2022b) data indicates that one or more of three resident (non-migratory) bat SAR (i.e., little brown myotis, long-eared myotis, and tricolored bat) have potential to occur in the vicinity of the Project. Limited mature habitat, however, has been identified in the Project Area, as it has largely been cut over, leaving only remnant mature forest habitat.

Limited direct mortality of some common non-SAR/SOCC small mammals and herpetile, could occur during certain Project activities associated with site preparation (e.g., clearing and grubbing), aggregate extraction (e.g., drilling, blasting, excavating, crushing, and stockpiling), and progressive and final reclamation (e.g., grading, contouring, capping with soil). Smaller mammals have relatively small home

ranges and tend to stay in close proximity to cover when exposed to high noise levels, making them vulnerable to injury and death due to interactions with heavy equipment during various Project activities. Large and medium-sized mammals are less likely to suffer direct injury or mortality from such activities as they would flee the area in response to human presence and noise. This avoidance behaviour by mammals could result in changes in normal movements, migrations, and other life history processes.

5.5.3 Proposed Mitigation and Management Measures

In addition to the mitigation and management measures described in Table 2.4-1 (Chapter 2 – Project Description) – which contains several relevant measures, including (but not limited to) those pertaining to air, noise, and light emissions as well as those pertaining to blasting activities – the following VC-specific mitigation and management measures will be implemented to reduce potential adverse environmental effects on wildlife and wildlife habitat:

- Good housekeeping practices will be implemented and domestic waste will be contained in receptacles that are secured to prevent the attraction of birds or other wildlife to the Project Area.
- To reduce the risk of wildlife collisions, Project vehicles will be required to comply with posted speed limits on the access road and internal site road. Speed limits will be set in accordance with provincial regulations and industry standards (e.g., for haul roads).
- Sensitive areas (e.g., wetlands, riparian habitat, hibernacula, nests, and roosts) within 30 m of the Project Area will be identified prior to site preparation and appropriate buffers will be established and maintained around these areas, where practicable.
- Migratory birds are protected under the federal *Migratory Birds Convention Act* (MBCA), which prohibits killing migratory bird species, their eggs, or their young. Other bird species not protected under the MBCA, such as raptors, are protected under the provincial *Wildlife Act*. To avoid contravention of these Acts, clearing and grubbing activities will be scheduled, to the extent practicable, outside of the breeding season of most bird species (May 1 to August 31) so that the eggs and flightless young of birds are not inadvertently destroyed.
- In the event that it is not possible to schedule clearing and grubbing activities outside of the bird breeding season, Nova Construction will review the best practical mitigation measures and apply them in accordance with the MBCA. At a minimum, if complete avoidance of these activities during the specified timeframe is not practicable, nest searches will be undertaken by a qualified biologist and avoidance setbacks will be established around active nests.
- Should there be a delay between clearing and operational activities such that operations are initiated during the bird breeding season, nest surveys will be carried out by experienced observers for the purpose of determining the presence and activities of birds, such as common nighthawk, that are known to target cleared areas for nesting. If Project employees encounter birds that they suspect may be nesting, an ornithologist or other suitably qualified professional will be brought on-site to determine whether nesting is occurring and to find the nest (nest locations will not be flagged as this increases the risk of nest predation). If a nest is found, an appropriate setback will be established around the nest in which human activities will be restricted until the young fledge and leave the area or until the nest naturally fails. The period for which bank swallow nests would be considered active would include not only the time when birds are incubating eggs or taking care of flightless chicks, but also a period of time after chicks have learned to fly (since swallows return to their colony to roost).

5.5.4 Residual Environmental Effects

A significant residual environmental effect on wildlife and wildlife habitat is defined as any of the following:

- A decline in abundance and/or change in distribution of a species such that the integrity (i.e., long-term persistence or viability) of the species in the RAA is threatened to the extent that natural recruitment (i.e., reproduction and immigration from unaffected areas) is insufficient to return the population to its former level within several generations
- A change in terrestrial habitat that alters its status or integrity within the RAA
- A disruption in the achievement of self-sustaining population objectives or recovery goals for wildlife SOCC or SAR in the RAA, or a change that is otherwise contrary to or inconsistent with the goals, objectives, or activities of an applicable recovery plan, action plan, management plan, or another applicable plan, policy, or legislation
- Contravention of the provincial *Wildlife Act*, NS ESA, SARA, or MBCA

Project-related residual effects on habitat loss and fragmentation, wildlife behaviour and habitat use, and risk of injury or mortality are evaluated below.

Habitat Loss and Fragmentation

The Project is expected to result in the incremental direct alteration or loss of approximately 31 ha of vegetation communities and associated terrestrial wildlife habitat through expansion of the quarry footprint from its current size of approximately 3.99 ha to its proposed size of approximately 35 ha. The RAA is currently fragmented by human activity, including clearcuts, agriculture, roads, and residential, commercial, and industrial development. As such, it is unlikely that the incremental increase in fragmentation caused by the quarry expansion will have irreversible adverse effects on the wildlife species in the RAA.

During the decommissioning and reclamation phase of the Project, terrestrial habitat within the expanded quarry footprint will be returned to a condition that is consistent with the natural surroundings through progressive and final reclamation activities including grading, contouring, capping with soil, revegetation, and the passage of time. Although approximately 31 ha of existing habitat for wildlife within the Project Area will be directly altered or lost as a result of the Project, it is anticipated that appropriate habitat for wildlife (including SAR and SOCC) can be restored through reclamation of the expanded quarry footprint. Residual habitat loss and fragmentation effects are therefore predicted to be reversible following the completion of Project activities.

Change in Wildlife Behaviour and Habitat Use

The existing Seabrook Quarry has been operating for several years (including as the former Parker Mountain Aggregates Quarry under previous ownership) and is located less than 200 m from another operational quarry (i.e., the MEL Quarry). It is therefore considered unlikely that any wildlife species that are particularly sensitive to human activities currently frequent the Project Area in proximity to the existing quarry footprint. Thus, avoidance behaviour and associated wildlife displacement effects are expected to be limited and highly localized.

Quarrying activities are not anticipated to intensify as a result of the Project. It is therefore expected that proposed Project operation and maintenance activities will remain generally consistent with the current quarrying activities, with the exception of the larger eventual quarry footprint. Since clearing, grubbing, and excavation activities will be spatially limited to a portion of the Project Area at any one time and will be completed in a progressive manner wherever possible, it is anticipated that the wildlife species that do frequent the Project Area in proximity to the existing quarry footprint will become acclimatized to the incremental changes in the geographic extent of Project-related sensory disturbances as the quarry footprint gradually expands over the life of the Project.

Risk of Injury or Mortality

The residual change in mortality risk for avifauna will be greatest during sensitive time periods (e.g., during the bird breeding period) and for eggs or unfledged birds. Risk will be reduced through the application of timing windows for site preparation activities that involve the removal of vegetation (i.e., clearing and grubbing). If vegetation removal is required within the primary nesting period, avian use and nest search surveys will be completed prior to the initiation of Project activities to mitigate the risk to avifauna by identifying and avoiding active nests. Common nighthawk and killdeer are two ground-nesting species that are known to occur within 100 km and 5 km of the Project Area, respectively (AC CDC 2022b). Bank swallows, which are known to occur within 5 km of the Project Area (AC CDC 2022b), and common nighthawks could be attracted habitats created by Project operations. However, these species were not recorded during field surveys and are considered unlikely to use the Project Area based on the lack of suitable habitat that was observed in the existing quarry footprint and the surrounding Project Area during field surveys. If a nest is found, an appropriate setback will be established around the nest in which human activities will be restricted until the young fledge and leave the area or until the nest naturally fails.

Adult birds are unlikely to be killed or injured during Project activities as they would flee the area when exposed to human activity in close proximity. Such avoidance behaviour by adult birds could result in changes in normal movements, migrations, and other life history processes. The residual effects of such avoidance behaviour would be temporary, as birds would likely return to adjacent habitats after site preparation is complete provided that this habitat is not already fully occupied by that species or a species with a similar niche.

Blasting activities at the existing Seabrook Quarry are currently conducted on an as-needed basis, which is typically at least once annually, although additional blasting may be required from time to time to meet market demand. Blasting activities will be conducted in accordance with the standard mitigation measures and best management practices prescribed in Table 2.4-1 (Chapter 2 – Project Description), including adherence to the concussion (air blast) and ground vibration limits that are specified in the terms and conditions of the current Industrial Approval for ongoing activities at Seabrook Quarry. Blasting is unlikely to pose a substantial risk of injury or mortality to wildlife since it is anticipated that most wildlife species would avoid areas where blasting may occur, as there would be noticeable activity in the area prior to the blast.

Summary

Residual effects related to habitat loss use and fragmentation, wildlife behaviour and habitat use, and risk of injury or mortality will occur within the Project Area; residual indirect effects may extend beyond the Project Area into the LAA. Project-related residual effects on wildlife and wildlife habitat are generally predicted to be continuous in frequency (although residual injury and mortality effects are only anticipated to occur occasionally), medium-term in duration (i.e., the residual effects are predicted to extend throughout the life of the Project), and reversible following decommissioning and reclamation. The predicted magnitude of Project-related residual adverse effects on wildlife and wildlife habitat is characterized as “moderate” (i.e., measurable changes from existing/baseline conditions that may exceed natural variability but do not exceed applicable objectives, guidelines, standards, or regulatory limits, nor do they pose a risk to the long-term viability of rare and sensitive plants in the LAA).

With implementation of the mitigation and management measures proposed in Section 5.5.3, Project-related residual effects on wildlife and wildlife habitat are predicted to be not significant.

5.5.5 Proposed Monitoring Programs

Based on a consideration of existing conditions and the likely residual effects of the Project, no monitoring programs are currently recommended for wildlife and wildlife habitat.

5.6 ATMOSPHERIC AND ACOUSTIC ENVIRONMENT

5.6.1 Description of Existing Environmental Conditions

5.6.1.1 Climate

A review of historic meteorological data collected at the Annapolis Royal climate station (ID 8200100; Coordinates: 44.75 N, 65.52 W; Elevation: 7.7 m) operated by ECCC was completed. The Annapolis Royal station is located approximately 30 km northeast of the Project Area. Although other ECCC climate stations (e.g., the Bear River station referred to in Section 5.1.1.1) are located closer to the Project Area, the Annapolis Royal station is the closest station that has calculated climate normals with respect to temperature. Climate normals from 1981 to 2010, the most recently published, for the Annapolis Royal Station are summarized in Table 5.6-1 (ECCC 2022c). The climate normals for Annapolis Royal Station indicate that the daily average temperature ranges from -4.3 °C in January to 18.6 °C in August. Precipitation was lowest during the summer (June to August) and highest during the fall (September to November).

Table 5.6-1 Summarized Climate Normals for Annapolis Royal (1981-2010)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature °C													
Daily average	-4.3	-3.8	-0.3	5.1	11.1	15.5	18.5	18.6	14.9	9.6	4.9	-1.1	7.4
Standard Deviation	2.7	1.8	1.6	1.7	1.5	1.1	1.3	0.6	1.4	1.4	1.2	1.9	2.6
Daily maximum	-0.7	0.1	3.4	9	15.8	20.4	23.3	23.3	19	13.2	8	2.1	11.4
Daily minimum	-7.8	-7.6	-4	1.2	6.2	10.2	13.3	13.4	10.3	5.9	1.7	-4.1	3.2
Record high	18.5	17.5	21.7	26	30	34	32.2	32.8	30	25.6	22.2	19.4	
Record low	-26	-27.2	-24.4	-13.3	-6.1	-3.3	-1.1	0	-2.2	-8.3	-13.3	-23.9	
Average Precipitation (mm) / Snow (cm) / Rainfall (mm)													
Precipitation	114.4	85.2	94.3	94.7	86.4	74.4	68.7	68.5	110.3	120.4	125.3	112.5	1155.2
Snowfall	54.9	33.5	27.3	7.7	0.4	0	0	0	0	0	7.3	31.2	162.4
Rainfall	59.5	51.6	67	87	86	74.4	68.7	68.5	110.3	120.4	118	80.2	991.8
Precipitation days (>0.2 mm)	13.7	10.9	11.3	11.3	11	11.1	8.6	8.3	10.2	11.2	13.2	12.9	133.5
Snowy days (>0.2 cm)	9.2	6.4	5	1.7	0.05	0	0	0	0	0	1.4	5.2	28.9

5.6.1.2 Particulate

Current quarry operation activities such as blasting, processing/crushing, and trucking have the potential to contribute to increased ground-level suspended particulate. As per Nova Construction's Industrial Approval (IA #2021-2794715-01) air emissions, including total suspended particulate (TSP), have been maintained below maximum permissible ground level concentrations as set in Nova Scotia's *Air Quality Regulations* (N.S. Reg 8/2020). The maximum permissible ground level concentrations from Nova Scotia's *Air Quality Regulations* are shown in Table 5.6-2. TSP is maintained below 120 µg/m^3 for a 24-hour averaging period and below 70 µg/m^3 for an annual averaging period.

Table 5.6-2 Maximum Permissible Ground Level Concentrations of Air Contaminants

Air Contaminant	Averaging Period	Maximum Permissible Ground Level Concentration	
		Micrograms per Cubic Metre (µg/m^3)	Parts per Hundred Million (pphm)
Carbon Monoxide (CO)	1 hour	34,600	3,000
	8 hours	12,700	1,100
Hydrogen Sulphide (H_2S)	1 hour	42	3
	24 hours	8	0.6
Nitrogen Dioxide (NO_2)	1 hour	400	21
	Annual	100	5
Ozone (O_3)	1 hour	160	8.2
Sulphur Dioxide (SO_2)	1 hour	900	34
	24 hours	300	11
	Annual	60	2
Total Suspended Particulate (TSP)	24 hours	120	–
	Annual	70 (geometric mean)	–
Source: Schedule A of the provincial *Air Quality Regulations* under Nova Scotia's *Environment Act*			

Ambient air quality is monitored in Nova Scotia through seven monitoring stations operated by NSECC in accordance with the National Air Pollution Surveillance (NAPS) program. Ambient air stations can monitor fine particulate matter (i.e., particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]), carbon monoxide (CO), sulphur dioxide (SO_2), total reduced sulphur (TRS), and nitrogen oxides (NO_x).

The Project Area is located in Nova Scotia's Western Air Zone which has two ambient air quality monitoring stations: Aylesford Mountain and Kentville. The Aylesford Mountain Station (NAPS ID: 0307001) is located approximately 85 km northeast of the Project Area and measures ($PM_{2.5}$). Data collected in 2020 indicates that the average $PM_{2.5}$ concentration was 10 µg/m^3 for a 24-hour averaging period and 4.5 µg/m^3 for an annual averaging period (NSECC 2022a). The Kentville Station (NAPS ID: 031101) is located approximately 114 km northeast of the Project Area and measures $PM_{2.5}$, NO_x, nitric oxide (NO), and nitrogen dioxide (NO_2). Data collected in 2020 indicates that the average $PM_{2.5}$ concentration was 12 µg/m^3 for a 24-hour averaging period and 6 µg/m^3 for an annual averaging period (NSECC 2022b).

Minimum and maximum average monthly values and monthly average values for January 2016 to December 2021 for the Kentville station are shown in Table 5.6-3.

Nova Scotia does not have ambient air criteria in place for fine particulate matter, however, the *Canadian Ambient Air Quality Standards* (CAAQS) (CCME 2012) sets the maximum permissible ground-level concentration of $PM_{2.5}$ at 27 µg/m^3 for a 24-hour averaging period and 8.8 µg/m^3 for an annual averaging period.

Table 5.6-3 Summarized Air Quality Data for Kentville Station

	$PM_{2.5}$ (µg/m^3)	**NO (ppb)**	**NO_2 (ppb)**	**NO_x (ppb)**
Applicable Standards				
Nova Scotia *Air Quality Regulations* (1-hour average)	—	—	212	—
Canadian Ambient Air Quality Standards (24-hour average)	27	—	—	—
Measurements				
Minimum	0	0	0	0
Maximum	66.2	22.5	20.3	31.8
Average (1-hour)	5.3	0.32	0.88	1.20

Note:
— =Indicates no available criteria

The Nova Scotia *Air Quality Regulations* maximum permissible ground level concentration for NO_2 is set at 400 µg/m^3 or 212 ppb for a 1-hour averaging period. The concentration of NO_2 as recorded at the Kentville Station did not exceed this criterion for January 2016 to December 2021 (NSECC 2022c). The concentration of $PM_{2.5}$ exceeded the Nova Scotia *Air Quality Regulations* maximum permissible ground level concentration on February 1, 2020 and is shown as the maximum $PM_{2.5}$ concentration from January 2016 to December 2021.

The data presented from the Kentville Station (Table 5.6-3) may be influenced by the urban setting which includes increased industry and population, and therefore air quality in the rural setting of the Project Area may be better.

5.6.1.3 Greenhouse Gases

According to the most recently published data from Canada's National Inventory Report, the quantity of GHG emissions released to the atmosphere in Canada in 2020 was 672,000 kilotonnes of carbon dioxide (CO_2) equivalent ($ktCO_2e$), of which 14,600 $ktCO_2e$ were released in Nova Scotia (ECCC 2022d). In 2020, Nova Scotia's GHG emissions represented approximately 2.2% of Canada's emissions.

Nova Scotia's *Greenhouse Gas Emissions Regulations* apply to any facility that emits greater than 10 $ktCO_2e$ GHGs in one calendar year. Under these regulations, Nova Construction is not required to report Project-related GHG emissions.

5.6.1.4 Noise

Provincial noise level guidelines have been published under the *Guidelines for Environmental Noise Measurement and Assessment* (NSEL 1990) and the *Pit and Quarry Guidelines* (NSEL 2003). Both of these guideline documents prescribe noise criteria for daytime hours (7:00–19:00) at 65 dBA, evening hours (19:00–23:00) at 60 dBA, and nighttime hours (23:00–7:00) at 55 dBA. For the data to be considered representative, the measurement duration is to be a minimum of two continuous hours of data in each time period and is to be measured on the property boundary of sensitive receptors (e.g., the nearest permanent residence).

The nearest permanent residence is located more than 800 m south from the existing quarry footprint, and the buffer will be maintained for the duration of the Project as the proposed direction of expansion is to the north and west of the existing quarry footprint.

The Project is located in a rural area; the nearest urban center is the town of Digby which has industry rooted in fisheries and aquaculture. A major highway, highway #101 is located approximately 3 km south of the Project Area. Given the Project Area comprises an existing quarry operation, baseline noise levels in the Project Area are characterized by heavy equipment use.

Typical noise ranges at 15 m from heavy construction equipment are provided in Table 5.6-4 (USDOT 2006). Noise levels will decrease by approximately 6 dBA at a doubling of distance from the source for a point source as rule of thumb.

Table 5.6-4 Typical Noise Ranges from Construction Equipment from 15 m

Type of Equipment	Noise Level Range (dBA)
Backhoes	74 - 92
Front Loaders	75 - 94
Trucks (e.g., pickup, dump truck, flat-bed truck)	55 - 84
Excavators	85

Noise monitoring was carried out in the region as part of an EA for the expansion of the adjacent MEL Quarry and reported average sound levels ranged from 23 dBA to 56 dBA (GHD 2020). Average sound levels for each time period were below maximum permissible sound levels.

5.6.1.5 Light

The Project Area is located in a rural location. Ambient light monitoring was not completed since a nighttime light conditions are expected to be minimal, and typical of a relatively undeveloped rural area. Quarry activities mainly take place during daytime hours when artificial lighting is not necessary and furthermore, the proposed expansion would be to the northwest which is the opposite direction of the nearest permanent residence.

5.6.2 Potential Environmental Effects

The Project has potential to interact with atmospheric and acoustic environments through effects on air quality, noise, and light.

Air Quality

Project activities, including clearing and grubbing to facilitate expansion of the quarry footprint, the operation of Project vehicles and equipment, and aggregate extraction (i.e., drilling, blasting, and excavation), processing (i.e., crushing and screening), and stockpiling activities, have the potential to reduce local air quality. Air contaminants may be released during Project activities in the form of combustion gases (SO_2, NO_x, and CO) and particulate matter (total suspended particulate [TSP], particulate matter less than 10 microns in diameter [PM_{10}], and $PM_{2.5}$) from the operation of diesel and gas-powered equipment. Fugitive dust (particulate matter including TSP, PM_{10}, $PM_{2.5}$, and trace metals) will be generated from earth and material moving and handling activities, and blasting and equipment movements.

Noise

Noise effects are anticipated to result from activities requiring the use of heavy equipment as well as vehicle operations. Blast energy that liberates into the atmosphere can generate air overpressure and noise. Currently, blasting is completed once annually and this frequency will remain constant with the expansion.

Light

Most Project operation activities (e.g., drilling and blasting, crushing and screening, stockpiling, and loading) will generally be conducted during daylight hours. Artificial lighting will be limited to the amount required for safety and security purposes and will be directional or otherwise designed to reduce spill-over light (i.e., unwanted outdoor light shining further than anticipated) wherever practicable without compromising site safety or security. Potential effects from lighting are therefore anticipated to be negligible and are not assessed further.

5.6.3 Proposed Mitigation and Management Measures

Mitigation and management measures for air, noise and light emissions are described in Table 2.4-1 (Chapter 2 – Project Description), and no additional VC-specific mitigation and management measures are proposed. Mitigation measures related to blasting activities are also described in Table 2.4-1.

5.6.4 Residual Environmental Effects

A significant residual environmental effect on the atmospheric environment is defined as any of the following:

- A reduction in air quality beyond the Project Area such that the maximum ground-level air contaminant concentration associated with the Project, in combination with the conservative background concentration, frequently exceeds the applicable ambient air quality standard presented in Table 5.6-3. “Frequently” is defined as once per week for 1-hour and 8-hour objectives, once per month for 24-hour objectives, and once for annual objectives.
- An increase in existing sound levels beyond the Project Area that exceed 65 dBA during the day (7:00 to 19:00) 60 dBA during the evening (19:00 – 23:00), or 55 dBA during the night (23:00 – 7:00) or on a Sunday or a statutory holiday

Project-related residual effects on air quality and noise are evaluated below.

Air Quality

Project activities have the potential to result in the release of air contaminant and GHG releases, including:

- Air contaminants and GHGs generated from the combustion of fossil fuels (e.g., diesel and gasoline) by heavy mobile equipment and vehicles
- Particulate matter (dust) generated by land clearing, earth moving activities, material handling, and blasting
- Particulate matter (dust) generated by equipment movements on unpaved roads
- Particulate matter (TSP, PM_{10}, and $PM_{2.5}$) and trace metals (within the dust) released during aggregate handling and crushing (material loading / unloading and transfer, aggregate and material hauling, crushing and screening)
- Fugitive releases of NO_X, SO_2, CO, particulate matter (TSP, PM_{10}, and $PM_{2.5}$), and trace metals (within the dust) from blasting

Mitigation measures will be implemented to control Project-related air emissions so that they do not contribute to an exceedance of the maximum permissible ground level concentrations of contaminants at off-site locations, as specified in Schedule A of the *Air Quality Regulations.* To reduce the generation of particulate emissions and fugitive dust, Project working areas, laydown areas, and access roadways will be covered with blasted rock. Water or other dust control measures will be applied as necessary to reduce fugitive dust emissions. Dust generated by trucking along the access road will be mitigated through speed control, proper truck loading procedures, proper road design, and/or other means as

required. With the implementation of mitigation measures (detailed in Table 2.4-1) the impact of the proposed Project on air quality is anticipated to be similar to the existing operation, with no change from previous operations at the quarry.

Noise

The Project is not expected to result in any change to current blasting, crushing, stockpiling, or trucking activities associated with the existing quarry. As activities will be primarily limited to daytime hours, existing nighttime sound levels will not be affected by the proposed Project. Noise emissions from Project vehicles and equipment will be managed by conducting regular inspection, repair, and maintenance activities as required for operation in accordance with manufacturer's recommendations and to reduce instances of visible sooty emissions or abnormally high sound levels. Project vehicles and equipment with exhaust systems will be outfitted with mufflers (and/or other appropriate sound attenuation devices). Overall, the impact of the Project on ambient noise levels is anticipated to be similar to the existing operation, with little or no change from previous operations at the quarry.

Blasting activities at the existing Seabrook Quarry are currently conducted on an as-needed basis, which is typically at least once annually, although additional blasting may be required from time to time to meet market demand. Blasts will continue to be designed and carried out at the same frequency throughout the operation and maintenance phase of the Project and therefore effects are anticipated to be consistent with current operations. Nova Construction is not aware of any previous issues, concerns, or complaints having been raised by the public, Indigenous groups, or stakeholders in relation to ongoing operations at the existing Seabrook Quarry.

Summary

Overall, the proposed Project is an expansion of a currently operating quarry in an area historically influenced by industrial operations with the intention of extending the life of the existing Seabrook Quarry. Activities within the Project Area are anticipated to be similar to the current operations, and there is no predicted increase in air and noise emissions as a result of the expansion. Nova Construction is not aware of any previous issues, concerns, or complaints having been raised by the public, Indigenous groups, or stakeholders in relation to ongoing operations at the existing Seabrook Quarry. Residual effects are predicted to extend into the LAA, occur sporadically throughout the life of the Project, and be reversible following reclamation. With the implementation of proposed mitigation measures, Project-related residual effects on atmospheric and acoustic environment are predicted to be not significant.

5.6.5 Proposed Monitoring Programs

As per the current Industrial Approval, monitoring of ambient air contaminants and noise will be conducted at the request of NSECC.

5.7 LAND AND RESOURCE USE

5.7.1 Description of Existing Environmental Conditions

5.7.1.1 Population and Economy

The Project is located in Digby County, approximately 2 km from the nearest rural community of Roxville to the west, and Seabrook which is 2 km east of the quarry. Both Roxville and Seabrook are primarily rural communities with residential properties along the Highway 217 corridor. In addition to residential, other land use in the area consists of fishing, farming, and logging.

The quarry currently employs up to 12 people and typically operates from May to December with minimal activity during the winter. The Project will operate for 12 hours/day, five to six days/week for 35 weeks/year, as required for the demand of aggregate. The proposed expansion of the quarry is not anticipated to increase the number of employees.

The quarry is located within Digby County. Digby County faces similar challenges of other rural Nova Scotia communities with declines in population and economic growth, and an aging population. Digby County's population has decreased 4.8% from 2011 to 2016 (StatsCan 2016). Statistics for Digby County show a median age of 51 years old in comparison to the province at 45 years old, with 47% of the population between the ages of 20 to 59 (StatsCan 2016). The median income of residents in Digby County is $23,215 in comparison to median income of Nova Scotia as a whole at $35, 676. The employment rate also is lower in comparison to the provincial median, with Digby County's employment rate of 60.6 compared to the provincial median of 69.7% (StatsCan 2016). The unemployment rate in Digby County was recorded at 15% in contrast to the provincial rate of 10% unemployment (StatsCan 2016).

The Digby County population is predominantly rural (88%), with agriculture, forestry, fishing and hunting, comprising 17% of the income force, followed by retail trade at 13% (Municipality of Digby n.d.). Digby County's other main economic forces are coastal fishing, transportation use, tourism, natural environment, and culture. The fishery in the Digby Neck is dominated by lobster, scallop, sea urchins, and traditional fishing, food processing, and manufacturing. The Town of Digby has access to the State of Maine through ferry services from Yarmouth, which provides substantial tourism opportunities for the region (Town of Digby n.d.).

5.7.1.2 Land Use

Digby County does not have specific planning and development control mechanisms in place to regulate quarry or pit developments; this is typically left to the Province. However, the County values economic diversification outside of its dominant sectors of agriculture, fishing, and fur production which the expansion of the quarry can provide (Nova Scotia Federation of Agriculture 2017). Land surrounding the Seabrook Quarry is predominantly rural, including forestry, agriculture, and commercial usage. There are approximately 28 single-use dwellings within a 5 km area around the quarry. Roxville and Seabrook are the closest communities to the Seabrook Quarry located approximately 2 km to the west and east,

respectively. Seabrook Quarry is the only local quarry that sells aggregate directly to individuals in the community for projects like home and backyard renovations, paving, and landscaping. There is also a quarry located adjacent to the Project Area that is owned by MEL (i.e., the MEL Quarry). There are no permanent buildings within 800 m of the Project Area. Recreational land use is discussed below in Section 5.7.1.4.

5.7.1.3 Transportation

The quarry is accessed from Highway 217 which forms a corridor of rural commercial and residential areas and provides transportation to the Town of Digby, the Bay of Fundy, Mount Pleasant, and Gulliver's Cove. Highway 217 extends Culloden Road to the Bay of Fundy and is an important access route for tourism. The existing access road and trucking route will be used for the transportation of Project-related aggregate products. Access to the quarry (and the associated Project Area) is via a private access road to the south of the existing quarry footprint, off of Highway 217, that leads past the quarry operations offices to a laydown area. Access to the site is constructed with proper sight lines to reduce any safety concerns for entering/exiting onto Highway 217. No changes to the existing access road are proposed as part of the Project.

5.7.1.4 Recreation and Tourism

The natural areas throughout the RAA host a variety of recreational and tourism activities, including hunting and trapping, fishing, hiking, ATV use and camping (MEL 2016). Residents in the vicinity of the quarry use the woods roads and small side roads for ATV usage and woodland access (MEL 2016).

Hunting and Trapping

Hunting is a common pastime in Nova Scotia for the conservation and management of big and small wild game (Government of Nova Scotia 2022). There are over 110,000 people in the province that have Wildlife Resource Cards, which permit recreational, social and economic benefits of hunting and trapping (Government of Nova Scotia 2022). Residents and non-residents are also required to purchase a Wildlife Habitat Stamp which is a base license allowing individuals to buy hunting, fur-harvesting, or snaring stamps, snare rabbits, or to hunt other harvestable wildlife. A portion of the Wildlife Habitat Stamp contributes to the Nova Scotia Habitat Conservation Fund which is used to research, enhancement, and protection of wildlife habitat across the province (Government of Nova Scotia 2022). The Seabrook Quarry falls in Deer Management Zone 105, which allows deer harvest of either sex (antlered or antlerless) with a general or archery/muzzleloader licence, a Wildlife Habitat Stamp, and a valid Deer Hunting Stamp (Government of Nova Scotia 2022). Bonus Deer Hunting Stamps, when available, authorize the holder to take an additional deer from within the zone specified on the stamp (Government of Nova Scotia 2022). The open seasons for hunting, including trapping and snaring, vary per species (Table 5.7-1).

Table 5.7-1 2022–2023 Open Seasons for Hunting in Digby County

Target Species	2022–2023 Open Season	
	Start Date	End Date
Beaver	November 1	March 31
Bobcat	November 1	February 28
Otter	November 1	February 28
Mink, Muskrat, Red Squirrel, Skunk, and Weasel	November 1	March 31
Fox and Coyote	October 15	March 31
Raccoon (Trapping)	November 1	March 31
Raccoon (Hunting)	October 15	March 31
Lynx, Marten, and Fisher	Closed Season	
Deer (Archery and Muzzleloader)	September 12	December 10
Deer (Youth)	October 14	October 22
Deer (General)	October 28	December 3
Bear (Hunting)	September 12	December 3
Bear (Snaring)	October 1	December 3
Snowshoe Hare (Hunting and Snaring)	November 1	February 28
Ruffed Grouse	October 1	December 31
Ring-Necked Pheasant	October 1	December 15
Coyote	January 1	December 31
Bullfrog	July 15	September 30
Crow	September 1	March 31
Red Squirrel	November 1	February 28
Source: Government of Nova Scotia 2022		

Table 5.7-2 provides a summary of wildlife species harvested in Digby County, and indication of percent total for the province (Government of Nova Scotia 2021). The total deer and bear harvested in Digby County accounts for 20% and 6% of the provincial total, respectively (Government of Nova Scotia 2021). The furbearers that are harvested in Digby County account for a total of 39% of the provincial total, equating to 8,156 individuals caught and 11 species (Government of Nova Scotia 2021).

Table 5.7-2 Summary of Wildlife Harvested in Digby and Nova Scotia in 2021

Animal	Calculated Harvest in Digby County	Percent (%) of total for province	Provincial calculated harvest
Large Mammal			
Deer	1461	20	7420
Black Bear	20	6	331
Fur Harvest			
Beaver	94	7	1405
Muskrat	37	1	2534
Otter	9	3	353
Mink	3	2	129
Bobcat	24	4	577
Fox	1	1	166
Racoon	26	4	654
Skunk	0	0	11
Squirrel	5	3	195
Weasel	7	8	85
Coyote	74	4	1665
Lynx	0	0	0
Marten	0	0	1
Fisher	7	2	381
Total for all Furbearers	*287*	*39*	*8156*
Source: Government of Nova Scotia 2021			

Field staff observed old hunting blinds in the Project Area about 100 m apart from each other along the western edge of the Project Area to the west of the existing quarry footprint. An abandoned and somewhat dilapidated camper, which may have been used as a hunting camp or perhaps as a break room for past quarry or lumbering personnel, was observed in the woods on the east side of the Project Area just north of the existing quarry footprint (refer to Section 5.8). Although field staff only encountered bird species during 2022 surveys, the Project Area may potentially host furbearing species, although based on field surveys the potential for furbearers is considered low (refer to Section 5.5 for additional details on species present in the LAA and RAA).

Recreational and Commercial Fishing

Fishing provides important recreational and commercial opportunities to Digby County residents and tourists. Within the province, there are six fishing areas managed by the Department of Fisheries and Aquaculture. The Project Area is in Provincial Recreational Fishing Area 4 as per the *Recreational Fishing Regulations*, Schedule "A" under Section 81 of the *Fisheries and Coastal Resources Act, S.N.S. 1996, c.25.*, which permits recreational fishing primarily for brook trout from April 1 to September 30. There are two small watercourses located to the north of the Project Area which are fish-bearing streams (refer to Section 5.2 for additional details on aquatic habitat). Larger streams in the RAA including Henderson Brook, Post Brook and Budd's Brook, support recreational fishing, primarily for brook trout.

Parks and Protected Areas

Digby is surrounded by natural landscape that is used by both residents and tourists. The Seabrook Quarry is less than 8 km from the Annapolis Basin Lookoff Provincial Park and Digby Pines Resort and Spa. The provincial park is a small picnic area overlooking the Annapolis Basin, a sub-basin of the Bay of Fundy.

There are also several hiking trails in Digby County including Mount Pleasant, which is less than 5 km away from the Project Area. Other trails nearby include the Van Tassel Lake (4 km), Digby Railbed Trail (5 km), Gulliver's Cove (7 km), Basin Sunset Trail (8 km), Acacia Valley (10 km), Missing Link Trail (20 km), Balancing Rock Trail (41 km), Central Grove Trial (50 km) (AllTrails n.d; Digby Trails n.d.).

The Seabrook Quarry is within the designated Southwest Nova Biosphere Reserve, which is recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO). The designation is for protecting the balance between nature and people, including relatively undeveloped areas, consideration for the role of the Mi'kmaq population, and overall cultural, commercial, and historical importance of the area. The Southwest Nova Biosphere Reserve is one of 18 designated UNESCO sites in Canada and is comprised of the counties of Digby, Annapolis, Yarmouth, Shelburne, and Queens. The total Greater Biosphere Region Cooperation Zone of the Southwest Nova Biosphere Reserve is 1.54 million ha with the core areas (Kejmkujik National Park and National Historic Site and Tobeatic Wilderness Area) accounting for 141,900 ha (UNESCO 2018). Current projects in the UNSECO site include development of a decision-support system, integrated community sustainability planning, monarch butterfly conservation, tourism, and conservation of cultural and heritage land use. The Project Area, LAA and RAA entirely overlap with the Greater Biosphere Region Cooperation Zone; however, they are not within the core areas of the Zone. Development throughout the UNESCO site is not restricted but encouraged to be undertaken in a responsible manner which respects the surrounding environment and long-term sustainability.

5.7.2 Potential Environmental Effects

The Project has potential to interact with land and resource use through effects on population and economy, land use, transportation, recreation and tourism, and public safety.

Population and Economy

Given activities associated with the proposed quarry expansion are anticipated to be similar to the current operations, effects to population and economy are not anticipated as a result of the Project. The proposed expansion will allow for continued production of valuable products which support development and infrastructure in the RAA and in the province resulting in a positive effect to the regional economy. The Project will allow these benefits and employment to continue at approximately current levels into the future.

Land Use

The existing quarry is being expanded from an approved 4 ha quarry to a 35-ha quarry on lands owned by Nova Construction. Given the history of quarrying activity within the Project Area, as well as the adjacent (non-Project) MEL Quarry, and the distance between the Project Area and residences (e.g., further than 800 m), Project activities are considered consistent with current surrounding land use. The quarry expansion will continue to be operated according to the provincial *Pit and Quarry Guidelines*, including maintaining setbacks from adjacent land uses. The quarry will also be operated in accordance with Conditions of EA Approval and any new permit conditions. Quarry activities are not expected to affect existing residential, agricultural, industrial uses of nearby areas. Land use and value are therefore not predicted to be affected by the Project.

Transportation

Activities within the Project Area are anticipated to be similar to the current operations, and there is no increase in vehicle traffic as a result of the expansion. Transportation activity associated with the quarry expansion is expected to be consistent with current operations and therefore no new effects are predicted to occur to local transportation infrastructure. However, since the Project will extend the life of the quarry, effects on transportation are anticipated to continue over a longer duration.

Recreation and Tourism

There are limited tourist sites located in close proximity to the Project Area, and therefore the expansion of the quarry is not expected to affect tourism in the area. From Highway 217, considering vegetation height, topographic elevation, and other structures, 16% of the Project Area is visible.

Recreational use in the LAA is limited to local use, including hiking, fishing and/or hunting, as evidenced by observed presence of abandoned or disused hunting shelters, and could be affected by Project activities. Project activities could affect the use of lands available for outdoor recreation through a loss of area and/or a change in access to areas used for recreational purposes. Recreational users in the LAA may also be affected by sensory disturbance (i.e., noise, dust, visual) resulting from Project activities potentially affecting the quality of the outdoor recreation experience.

Public Safety

Project activities may result in concerns with site security and public safety related to the quarry operation.

5.7.3 Proposed Mitigation and Management Measures

In addition to the mitigation and management measures described in Table 2.4-1 (Chapter 2 – Project Description), the following VC-specific mitigation and management measures will be implemented to reduce potential adverse environmental effects on land and resource use:

- Restricted access zones surrounding quarry operations will be implemented during site preparation and will remain in place throughout the life of the Project. Signage will be installed around the Project property to alert the public and land users of the presence of the Project and its facilities.
- Future final land and resource end-uses will be considered in the preparation of the Rehabilitation Plan and determined in conjunction with the needs of the local community, Mi'kmaq of Nova Scotia and stakeholders.
- Mitigation measures identified in other VCs will also reduce the potential effects on land and resource use (Section 5.1 – Groundwater Resource; Section 5.2 – Aquatic Environment; and Section 5.5 – Wildlife and Wildlife Habitat).

5.7.4 Residual Environmental Effects

A significant residual environmental effect on land and resource use is defined as:

- A change or disruption that widely restricts or degrades present land and resource use capability to a point where current land and resource use activities cannot continue at or near current levels in the RAA and for which the environmental effects are not mitigated or compensated
- Non-compliance with established land use plans, policies, or by-laws, or incompatibility with adjacent or historical land use activities as designated through a regulatory land use process.

Project-related residual effects on recreation and tourism and public safety are evaluated below.

Recreation and Tourism

Recreational use within the LAA is limited to local use, including fishing and/or hunting. The existing quarry and the proposed expansion area are not likely to have a substantive effect on informal recreational uses in the Project Area given the quarry is not located on Crown land and therefore recreational users will require permission from Nova Construction to pursue their activities in the Project Area. Restricted access zones surrounding quarry operations will be implemented during site preparation and remain in place throughout the life of the Project due to concerns with site security and public safety related to the existing quarry operation.

Project activities will produce noise and dust from equipment operation and blasting which have the potential to affect recreational users in the vicinity of the Project Area and LAA through sensory disturbances (i.e., noise, dust, visual) potentially affecting the quality of the outdoor recreation experience. The Project is not expected to result in incremental change to current blasting, crushing, stockpiling, or trucking activities associated with the existing quarry except for extending the duration of those activities into the future. As discussed in Section 5.6, efforts will be made to reduce the generation of dust as well as exhaust emissions produced by equipment operation and blasting. Blasting activities at the existing Seabrook Quarry are currently conducted on an as-needed basis, which is typically at least once annually, although additional blasting may be required from time to time to meet market demand. Blasts will continue to be designed and carried out at the approximately the same frequency throughout the operation and maintenance phase of the Project and therefore effects are anticipated to be consistent with current operations. To date, Nova Construction is not aware of any previous issues, concerns, or complaints having been raised by the public, Indigenous groups, or stakeholders in relation to ongoing operations at the existing Seabrook Quarry.

The viewscape can be altered by physical features or works associated with the Project that are visible from outside the Project Area. Visual effects from the development of the quarry may alter land use within the LAA and result in visual disturbance to recreational users. From Highway 217, considering vegetation height, topographic elevation, and other structures, 16% of the Project Area is visible. This visible area is where the current quarry exists; the further expansion to the north of the existing quarry footprint will not be visible from Highway 217. While the Project will result in changes to the visual landscape immediately adjacent to the Project Area, a barrier of trees in the prescribed setbacks will shield the site from view.

Public Safety

The Project will not result in any incremental effects on the safety of travelers, as it will not entail new effects on traffic on public roads. Restricted access zones surrounding quarry operations will be implemented during site preparation and will remain in place throughout the life of the Project due to concerns with site security and public safety related to the existing quarry operation.

Summary

The Project is a proposed expansion of a currently operating quarry in an area historically influenced by industrial operations including an adjacent quarry owned and operated by a separate company. Project activities are consistent with current uses in the area and are intended to extend the life of the existing quarry operation. Recreational use near the Project Area will be affected over a minimum 40-year time period by the advancing quarry activities. Dust and noise will be mitigated as conditions of permitting. The quarry expansion will continue to be operated according to the provincial *Pit and Quarry Guidelines*, including setbacks from adjacent land uses. The quarry will also be operated in accordance with Conditions of EA Approval and any new permit conditions. While Project activities may result in adverse effects to recreational use and public safety, including loss of available land/access, and sensory disturbance, land and resource use activities are predicted to continue at or near current levels. Residual effects are predicted to extend into the LAA, occur sporadically throughout the life of the Project, and be reversible following reclamation. With the implementation of proposed mitigation measures, Project-related residual effects on land and resource use are predicted to be not significant.

The level of confidence in the predictions for Project-related residual effects on land and resource use is moderate to high. This is based on information collected as part of desktop data compilation and understanding of current existing conditions, GIS data analyses, understanding of Project activities, locations and described interactions, the known effectiveness of mitigation measures, and experience of the assessment team. A moderate level of confidence was given because some of the desktop data were limited in terms of availability (e.g., intensity of recreational usage) or scale (e.g., big game hunting areas to support harvest evaluation); however, environmental effects mechanisms are well-understood.

5.7.5 Proposed Monitoring Programs

A dedicated follow-up and monitoring plan is not proposed for the Land and Resource Use VC. Details of monitoring programs required by NSECC (e.g., noise, dust) will be developed at the request and in consultation with NSECC and outlined in the Industrial Approval amendment application.

5.8 HERITAGE RESOURCES

5.8.1 Description of Existing Environmental Conditions

Heritage resources are non-renewable resources consisting of places, buildings, objects, or sediment deposits located above or below the ground. Every heritage resource is unique, and its significance lies in the story it tells and how this story contributes to human history by broadening our understanding of our shared human past. As non-renewable resources, damage to or loss of heritage resources would mean a permanent loss of the resources and the wider contextual information they may have provided. They are relatively permanent, although highly tenuous, features of the environment and can include Pre-Contact or Historic Period archaeological sites and objects of significance for Mi'kmaq or other groups, built heritage resources, and naturally occurring palaeontological resources (i.e., fossils).

The review for heritage resources has been undertaken through the completion of historical, archaeological, built heritage, and palaeontological research. Nova Scotia Communities, Culture, Tourism, and Heritage (NSCCTH) provides guidance for conducting a professional archaeological resource impact assessment (ARIA), such as the *Archaeological Resource Impact Assessment (Category C) Guidelines* (NSCCTH 2012) (ARIA Guidelines).

Consultation and engagement activities have been ongoing as part of the heritage resources component of the Project. During the background research for heritage resources, regulatory agencies and Mi'kmaq communities were contacted to gather information on potential heritage resources in the Project Area.

5.8.1.1 Approach and Methods

Information on the existing conditions (i.e., known information) regarding heritage resources was gathered through a combination of documentary research, consultation, and an ARIA conducted within the Project Area in 2022.

The following sources were consulted or reviewed to gather an understanding of the general and specific history of the Project Area:

- Published, unpublished, and online works about local history, the environment, and previous archaeological work carried out in the area
- Kwilmu'kw Maw-klusuaqn Negotiation Office's Archaeology Research Division (KMKNO-ARD) to gather information pertaining to traditional or historical Indigenous land use of the Project Area
- Relevant Maritime Archaeological Resource Inventory (MARI) forms
- Historical aerial photographs, maps, and historical and archival records of the Project Area and adjoining properties to gain information on historical land use
- Reports on file at NSCCTH for previous archaeological work and studies conducted near the Project
- Representatives from NSCCTH
- The Canadian Register of Historic Places (CRHP) for any built heritage located within or near the Project Area.

For information regarding archaeological resources, the Special Places division of NSCCTH was contacted ahead of the 2022 ARIA to request a list of reports on file for previous archaeological work and studies conducted near the Project. A Heritage Research Permit (HRP) application detailing the methodology to be employed for the Project's ARIA was also submitted and approved by the Special Places division.

The field component of the ARIA involved archaeological field survey (walkover) of the entire Project Area in consideration of the ARIA Guidelines, the results of the background research, and the professional judgement of the Stantec Archaeology Team. Walking pre-defined transects in the Project Area, any areas of elevated potential for archaeological resources were identified and delineated as "Polygons" using handheld GIS devices with 3-5 m accuracy. Polygons are typically identified for additional archaeological mitigation, if warranted (e.g., shovel testing).

Built heritage resources are typically identified through a review of federal and provincial databases for built heritage resources. There are no built heritage resources in the Project Area.

A review of published maps on the geology of the Project Area provided information on the potential for there to be fossils in bedrock layers that may be encountered during site preparation and operation and the results from this review will be described below.

5.8.1.2 Archaeological Resources

Pre-Contact Period

While knowledge from oral histories can be used to understand information on past ways of life of Indigenous peoples, the study of the material culture through archaeological research is more widely used for gathering information on the Pre-Contact Period in Nova Scotia. While no ARIAs have previously taken place specifically inside the Project Area, several ARIAs have previously been conducted in the surrounding area (e.g., CRM Group 2010, 2015, and 2020; Davis MacIntyre 2010a, 2010b, 2011, and 2012; Fowler and Weatherbee 2019; In Situ 2002). The nearest ARIA to the Project (CRM Group 2015) was for a previous quarry expansion project conducted in 2015 on an adjacent property on behalf of MEL. Where relevant, information provided by these assessments is presented below.

The earliest period of human occupation in Nova Scotia is *Sa'qewe'l L'nu'k* (the Ancient People) or "Palaeo-Indian" period (13,000–9,000 years before present [BP]), which saw the arrival of peoples who harvested caribou, possibly along with a variety of other fauna, following deglaciation of the region (Bonnichsen et al. 1991). This period is best represented in Nova Scotia by the Debert-Belmont site complex near Truro, NS.

Sites of the following *Mu Awsami Kejihaw'k L'nu'k* (the Not so Recent People) or the Archaic Period (9,000–3,000 years BP), are characterized in part by distinctive ground stone tool industries. In Nova Scotia, sites of this period are known primarily from interior locations, and for the most part date only to the latter half of this period (the Late Archaic). Nevertheless, it is inferred that people were present in the province throughout this period, and that they focused on harvesting coastal resources and resources along in interior waterways. The scarcity of evidence for occupation early in the period and on the coast is assumed due to effects of rising sea levels; such sites would now be situated in marine environments.

The last phase of the Pre-Contact Period, *Kejihawek L'nu'k* (the Recent People) or Woodland/Ceramic period (3,000–500 years BP), sees the appearance of ceramic technology in the context of wide-ranging interactions with other peoples of the greater northeast. Coastal archaeological sites are more clearly documented (albeit still threatened by rising sea levels and coastal erosion) and, in some cases, include substantial shell middens, indicating the harvesting of marine shellfish. Nevertheless, both marine and terrestrial resources figured in the seasonal round during this time, with some regional variation (Nash and Miller 1987; Davis 1991).

A review of the NSCCTH MARI online database indicates that several pre-contact archaeological sites have been identified at Bear River, Smiths Cove, Little Joggins, and Brighton, as well as marine-based sites identified through scallop dragging off the coast of Digby Neck between Centreville and Gulliver's Head. Those sites at Little Joggins and Brighton are the closest pre-contact sites to the Project at just under 7 km away. There are no registered pre-contact archaeological sites inside the Project Area.

An historical entry from Gilpin (1873: 229) states that “a large, barbed arrowhead of amethyst was found at Digby Neck”, which also affirms a pre-contact presence in the area. According to the KMKNO-ARD (2022), the is no Mi’kmaq word for Henderson’s Mountain within the Project Area, but the Mi’kmaq word for Digby Town is *Weskewinaq* which means “cheerful place” and is indicative of a type of naming that reflects an intimate understanding and repeated use of an area.

Historic Period

The Historic Period is defined as the period from the arrival of mostly European-derived peoples to North America, approximately 500 years ago, until the modern era. For Mi’kmaq communities, this period is referred to as *Kiskukew’k L’nu’k* (Today’s People) or Contact Period (500 BP–Present), which saw the growth of European settlement in the region, and with it, a variety of changes for *Kiskukew’k L’nu’k* associated with trade, conflict, and disease (Whitehead 1991).

The first settlers to arrive in Nova Scotia, and one of the first European settlements in North America, were the French who established themselves at Port Royal in 1605 after a failed attempt the previous year to settle at St. Croix Island on the border of what is now Maine and New Brunswick. Acadian settlement, however, did not extend west of the Annapolis Basin until after “Le Grand Dérangement” of 1755 when they were offered grants along St. Mary’s Bay in 1768 (Wilson 1900).

The nearby Town of Digby was first settled in 1766 by English immigrants from Brandywine, New England who originally named the area Conway (NSA 1967). By 1783 large numbers of Loyalists arrived from New England and renamed the place Digby in honour of Admiral Robert Digby, a Royal Navy officer who served briefly as a Member of Parliament. Digby would eventually become a major seaport of Nova Scotia. Closer to the Project, the community of Seabrook was established not long after Digby as an agricultural extension to the west (NSA 1967). Seabrook probably got its name because of its location on a small stream that empties into St. Mary’s Bay. By 1956, Seabrook had a population of 56. Divisions of land grant lots had been surveyed for the entire Digby Neck by at least 1786. The Project Area comprises the majority of Lot 9 and a small portion of Lot 10 in Division “E” of the township land grants (CLIMC 2022: Map Sheet 13) and these lots were granted to John Hill (Lot 9) and John Small (Lot 10). Smalls Lake, approximately 700 m west of the Project Area is likely named after the family of settler John Smalls. A.F. Church’s (1871) map of Digby County shows several residential structures along Route 217, some of which have the surname Small associated with them which may be related to the settler John Small. None of these houses, however, fall in the Project Area.

Review of historic aerial photography shows a road extending northwest from Route 217 into the John Hill lot with agricultural plots on either side of it (NRCan 1945: A8779-035). A portion of this road is now used as the main quarry access road. Less than half a kilometre northward from Route 217, the agricultural plots terminate and the remaining land that comprises the Project Area is entirely undeveloped.

A review of the NSCCTH MARI online database indicates only two registered Historic Period archaeological sites within a 10 km radius of the Project Area. One is located 6.3 km away in Conway and is attributed to Black Loyalist, historic Mi'kmaq, or Black/Mi'kmaq settlement in the 19th century (Davis MacIntyre 2011) and the other is a possible Colonial Period (1604–1867) homestead located 6.6 km away at Gulliver's Cove (CRM Group 2010). There are no registered Historic Period sites located inside the Project Area.

According to KMKNO-ARD (2022), at least two historic Mi'kmaq encampments were known in the Digby Town area, one along the northern shoreline of The Raquette and the other immediately south of the golf course in the woods towards a spur line which ran into the Pine Resort. In addition, postcards from the early 20th century show Mi'kmaq encampments in the area of the Digby Pines.

Results of the ARIA

The archaeological survey of the Project Area took place on June 14, 2022, under HRP Permit #A2022NS77. The Project Area is largely encompassed by the southwest portion of Henderson Mountain, and the assessment began along the eastern side of the Project Area, just north of the existing quarry footprint, where the crest of this part of the mountain is located. Transects were completed in a northwest-southeast direction and were spaced approximately 20 m apart as vegetation cover and visibility allowed.

No above ground or exposed features, deposits, or artifacts of archaeological significance were identified during the assessment and the majority of the Project Area in general was characterized as exhibiting low potential for sub-surface heritage resources largely due to sloping and poorly drained terrain. Two small areas of elevated archaeological potential, however, were identified in the northwest corner of the Project Area in association with the confluence of two streams and will be discussed in further detail below.

The survey found that environmental conditions were relatively undifferentiated throughout the Project Area although the topography varied greatly. North of the existing quarry footprint, terrain sloped gradually downwards in a northwest direction for the entire north half of the Project Area. West of the quarryt, terrain sloped more sharply down toward the west and on the southwest and south sides of the existing quarry, slopes are exceedingly steep (i.e., 35–40 degrees) in a southward direction to the point that it was not practical from both a safety and an assessment standpoint to cover off the entirety of the area southwest of the quarry footprint. That is, slopes of this magnitude are not conducive to past human settlement or activity. Level terrain was also scarce at the crest of this part of the mountain with terrain generally undulating in various directions.

Vegetation cover was relatively open and predominantly composed of tolerant hardwoods with immature to semi-mature birch and maple being the most prominent by far. Occasional immature and semi-mature spruce and fir trees were also noted as well as a dense thicket of balsam fir that cut across the Project Area (northeast-southwest) about mid-way down the northern half of the Project Area. The understory was composed of frequent low to knee-high ferns over occasionally hummocky duff terrain with exception to frequent low-lying wet areas composed of exposed dark silts and occasional standing water. Tree throws revealed a cobble substrate just below the duff surface with poor soil development. Frequent boulder scatters were noted throughout the terrain at the crest of the mountain.

Visible signs of past human activity throughout the Project Area were limited to a woods road that meandered through the Project Area's north end and, probably in relation to this road, a large amount of skidder activity as a result of lumbering operations in recent decades. Deep skidder ruts, many of which were filled with water, were noted throughout the Project Area. In addition, two dilapidated hunting blinds about 100 m apart from each other were noted along the western edge of the Project Area to the west of the existing quarry footprint. Finally, a disused and somewhat dilapidated camper was noted in the woods on the east side of the Project Area just north of the existing quarry, which may have been used as a hunting camp or perhaps as a break room for past quarry or lumbering personnel.

A confluence of two streams was noted in the northwestern corner of the Project Area, one of which is Post Brook which drains from Smalls Lake and empties into St. Mary's Bay. In association with these streams, two areas of high potential for sub-surface archaeological resources were identified and delineated by polygons. These streams do not appear to be substantial enough within the context of Indigenous navigability by canoe and are unlikely to be the basis of long-term settlement; however, they are fish-bearing (Section 5.2) and could have provided the basis for an overland route between the Annapolis Basin or the Fundy coast and St. Mary's Bay. As such, the level and well-drained areas delineated by the Polygons in the vicinity of the streams supports the potential for short-term past human activity.

Polygon MPR-POLY-007 delineates a small area (approximately 150 square metres [m²]) in open mixed wood over level and dry duff terrain overlooking the unnamed stream at the base of a gradual slope to the north. It is situated approximately 30 m to the south of the unnamed stream and about 180 m east of its confluence with Post Brook. Polygon MPR-POLY-008 is larger (approximately 1000 m²) and encompasses all stream banks of the confluence itself. Terrain within the polygon is characterized by open mixed wood over level and dry duff terrain ranging from 1 to 2 metres above water levels. Given their proximity to the watercourses, these polygons are categorized as exhibiting high archaeological potential. If avoidance of these polygons is not possible during any ground-breaking phase of the Project, then additional mitigation (i.e., shovel testing at 5 m intervals) is recommended within their boundaries. Aside from these two polygons, the Project Area exhibits low potential for heritage resources.

5.8.1.3 Built Heritage Resources

A review of the CRHP (Parks Canada n.d.) found that there are no registered historic places or heritage sites located within 5 km of the Project Area. Furthermore, no buildings of heritage value were found during the ARIA. As a result, given that interactions between built heritage resources and Project activities are not anticipated, built heritage will not be assessed further in this VC.

5.8.1.4 Paleontological Resources

While no specific paleontological report was prepared and no fieldwork with respect to paleontological resources was required during assessment of the Project, the potential for paleontological resources to be affected by Project activities is low. A review of published maps shows that the Project Area is located entirely on bedrock comprised of tholeiitic plateau basalt from the North Mountain Formation of the Fundy Group which dates to the Early Jurassic Period (Keppie 2000). Tholeiitic basalt is fine-grained extrusive

igneous rock derived from molten magma. There are no fossils known from this type of rock and it is unlikely that any would be found. As a result, given that interactions between paleontological resources and Project activities are not anticipated, paleontological resources will not be assessed further in this VC.

5.8.2 Potential Environmental Effects

The Project has potential to interact with heritage resources through damage to archaeological and resources.

Archaeological resources are typically located on or in the soil layers of the earth. Therefore, site preparation activities that involve initial ground disturbance have the greatest potential to adversely affect them. Ground disturbance may disturb or destroy archaeological sites and objects and, equally importantly, may disturb or destroy the context (i.e., the horizontal and vertical location relationships between these objects), which provide significant information on their order of deposition in the ground as well as what natural processes have taken place in the ground since their deposition. Site clearing and grubbing as well as the installation of site management features (e.g., rock-lined ditches, drainage channels, site contouring) require some level of ground disturbance that could affect the integrity of archaeological resources that may be present. These disturbances could result in the loss of the archaeological resources and the information they provide on the history of the area.

5.8.3 Proposed Mitigation and Management Measures

In addition to the mitigation and management measures described in Table 2.4-1 (Chapter 2 – Project Description), the following VC-specific mitigation and management measures will be implemented to reduce adverse environmental effects on Heritage Resources:

- Avoidance of areas of elevated archaeological potential identified during the ARIA will be implemented.
- Where avoidance of areas of elevated archaeological potential is not practicable, archaeological shovel testing, as per the ARIA Guidelines, will be implemented prior to any clearing or other site preparation activities at these locations to determine if archaeological resources are present at these locations.
- Develop and implement a Heritage Resources Accidental Discovery Plan in the unanticipated event that heritage resources are discovered during project development.
- Consultation Work with NSCCTH's Special Places Coordinator and/or the paleontological staff at the Nova Scotia Museum to develop appropriate mitigation should any significant heritage resources be discovered during Project activities.

5.8.4 Residual Environmental Effects

A significant residual adverse effect is defined as a residual Project-related change to heritage resources that results in unmitigated disturbance to, or destruction of, heritage resources considered by affected Mi'kmaw communities, other communities, and/or provincial heritage regulators to be of major importance due to factors such as rarity, condition, spiritual importance, or research importance.

As noted in Section 5.8.1.2, the majority of the Project Area in general was characterized as exhibiting low potential for sub-surface heritage resources, except for two small areas of elevated archaeological potential located in the northwest corner of the Project Area in association with the confluence of two streams. With the implementation of the mitigation described in Section 5.8.3 (i.e., avoidance of the areas of elevation archaeological potential, or the implementation of archaeological shovel testing with additional mitigation based on the results, as warranted), residual adverse environmental effects on archaeological resources are not anticipated. Further, there is no anticipated interaction between built heritage and paleontological resources. Project-related residual effects on heritage resources are therefore predicted to be negligible and not significant.

5.8.5 Proposed Monitoring Programs

Given that Project-related residual effects on heritage resources are predicted to be negligible, no monitoring programs are warranted for this VC.

6.0 POTENTIAL IMPACTS ON THE MI'KMAQ OF NOVA SCOTIA

Aboriginal and Treaty rights are recognized and affirmed in Section 35(1) of the *Constitution Act, 1982*, which provides constitutional protection for these rights in Canada. The Supreme Court of Canada has held that the federal and provincial Crown (i.e., the Government of Canada and the Government of Nova Scotia) each have a legal duty to consult and, where appropriate, accommodate Indigenous groups when contemplating conduct that may adversely impact potential or established Aboriginal or Treaty rights (e.g., the issuance of a permit that enables the Project to proceed). This section describes the Mi'kmaq of Nova Scotia and the potential Project-related impacts to Aboriginal and Treaty Rights through potential changes in Mi'kmaq land and resource use.

6.1 OVERVIEW OF THE MI'KMAQ OF NOVA SCOTIA

There are 13 Mi'kmaw First Nation communities in Nova Scotia (Figure 6.1-1):

- Acadia First Nation
- Annapolis Valley First Nation
- Bear River First Nation
- Eskasoni First Nation
- Glooscap First Nation
- Membertou First Nation
- Millbrook First Nation
- Paq'tnkek First Nation
- Pictou Landing First Nation
- Potlotek First Nation
- Sipekne'katik First Nation
- Wagmatcook First Nation
- We'koqma'q First Nation

Figure 6.1-1 Mi'kmaw First Nations in Nova Scotia (Government of Nova Scotia 2011)

The General Assembly of Nova Scotia Mi'kmaq Chiefs represents the governance for the Mi'kmaq of Nova Scotia. Mi'kmaw people living off-reserve are represented by the Native Council of Nova Scotia.

6.2 CURRENT LAND AND RESOURCE USE

The Bear River Reserve, belonging to the Bear River First Nation, is the closest Mi'kmaw community to the Project Area (located 17 km from the Project Area) and is 633.8 ha. The current on-reserve population is 108 and off reserve population is 226 (Bear River First Nation n.d.). The Mi'kmaq have a history of continuous occupation in this area that spans centuries and begins hundreds of years before European contact.

A Mi'kmaq Ecological Knowledge Study (MEKS) was undertaken in 2022 by Membertou Geomatics Solutions (MGS). The purpose of the MEKS was to:

- Determine historic and current Mi'kmaq land and resource use in the Project Area
- Provide an inventory of species of significance to the Mi'kmaq in the Project Area
- Provide an analysis of potential effects of the Project on Mi'kmaq land and resource use
- Provide recommendations for further action or mitigation

MEKS information was gathered by three means:

- Literature and archival research
- Interviews
- Field sampling

For the literature and archival research, various archival documents, maps, oral histories and published works were reviewed for information regarding the past or present Mi'kmaq occupation of the Project Area (note that this is referred to as the "Project Site" in the MEKS) and MEKS "Study Area". The MEKS Study Area represents areas within 5 km of the Project Area.

Interviews were the key source of information regarding Mi'kmaq use in the MEKS Study Area (5 km radius). Twenty-eight interviews were undertaken with individuals from the communities of Bear River and Acadia (Yarmouth, Wildcat, Ponhook). Interviewees were shown maps of the MEKS Study Area and asked various questions regarding their traditional use activities, including where they undertook those activities, when they undertook them, and what type of resource they used.

Site visits took place in June of 2022. MGS staff, accompanied by a representative of Nova Construction and a Mi'kmaq knowledge holder from Paq'tnkek conducted the site visit of the Project Area. Throughout the site visit various species (and subspecies) of plants, trees, and animal signs/tracks were observed.

The study included the historic past (distant past to 25 years past), recent past (11-25 years ago) and current use (within the last 10 years) for Mi'kmaq land and resource use. The information gathered considered species, location, use, availability and frequency of use to further the understanding of the traditional use relationship the Mi'kmaq maintain within the Project Area and MEKS Study Area. As reported in the MEKS, no Mi'kmaw traditional use has been identified in the Project Area (MGS 2022). Lobster, clam and trout fishing were identified as the highest frequency fishing activities reported by interviewees in the MEKS Study Area. Gathering sweetgrass was also reported by interviewees as a high frequency activity. Deer, rabbit, partridge, pheasant, and duck hunting was reported in the MEKS Study Area by most interviewees (MGS 2022). Overall, the activities took place primarily in the Recent Past and Historic Past timeline categories (MGS 2022).

The draft MEKS has been submitted to the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) for review and has not yet been finalized.

6.3 POTENTIAL IMPACTS TO THE MI'KMAQ OF NOVA SCOTIA

The assessment of potential impacts to the Mi'kmaq of Nova Scotia focuses on the interactions among changes to related biophysical and socio-economic VCs and change in conditions, attributes, sites, lands, resources, or structures of relevance for the Mi'kmaq. The interrelationship among various related biophysical and socio-economic VCs plays an important role in how changes to the environment may affect the conditions and material circumstances for the Mi'kmaq. For example, changes in surface water quality may influence fish health, which could in turn affect country foods and Mi'kmaq health conditions. The identification of potential impacts, therefore, relies on the assessments provided for the biophysical and socio-economic VCs, provided in Chapter 5.

The Project may remove areas historically or currently used by the Mi'kmaq for traditional purposes, such as hunting, fishing or gathering. Restricted access to the Project Area will remain throughout operation and decommissioning activities. As noted in the MEKS, no traditional use was identified in the Project Area. The availability of resources currently used for traditional purposes can be affected by a change in the landscape that removes habitat for wildlife, fish and plants relied upon for traditional food, medicine, or materials, or by a change in mortality or health of these resources potentially reducing their numbers. The MEKS identified fishing, hunting, and gathering activities in the MEKS Study Area; however, as shown in Appendix A of the MEKS, these activities occur outside of the Project Area and mainly along the perimeter of the MEKS Study Area.

Interviewees expressed some concern for disturbing artifacts that may be present, as well as potential disruptions that may occur to the ecology of the surrounding area. Based on the information gathered for the MEKS, it is likely that potential Project interactions with traditional land and resource use will be effectively managed through a variety of mitigative measures that are technically feasible. These include mitigative measures described throughout this environmental assessment to protect other VCs that are of concern to traditional use (e.g., vegetation, wildlife, fish and fish habitat) as well as chance find procedures in the event of an artifact discovery.

7.0 OTHER UNDERTAKINGS IN THE AREA

Under section 12 of the Nova Scotia *Environmental Assessment Regulations*, the Minister must consider other undertakings in the area of a proposed project registered as a Class 1 Undertaking. For this EA, environmental effects associated with other undertakings that may potentially act in combination with the environmental effects of the Project include other nearby quarries and wind power projects. Potential environmental effects associated with these other undertakings are described below, along with a discussion of the potential for these other undertakings to act in combination with the environmental effects of the Project.

The MEL Quarry is located on Highway 217, approximately 160 m from the Seabrook Quarry. The MEL Quarry is approximately 90.5 hectares in size. A third quarry in the RAA, Parker Mountain, is 45 km east of the existing Seabrook Quarry. Generic potential environmental effects from quarry operations include:

- Dust, noise, and light emissions from quarrying and associated traffic
- Loss/alteration of riparian and wetland areas including erosion, sedimentation, increased water temperature, elevated nutrient levels, decreased dissolved oxygen, and/or changes to hydrological patterns
- Loss and/or change in terrestrial habitat including a direct effect on SAR and/or SOCC in the area through direct disturbance or by causing indirect changes to their habitat resulting in a loss of individuals or change in species abundance or distribution
- Change in recreational and/or traditional land and resource use (e.g., loss or impeded access, effects on harvested species)

These quarry operations already operate in proximity to each other, and the expansion of the Seabrook Quarry is not anticipated to affect these other operations. However, given the size and proximity of the MEL Quarry to the Project, there will be a cumulative loss and/or alteration of habitat as well as recreational use of the land in the RAA. No changes are predicted with respect to cumulative noise or dust to local communities given that Project operations will not increase in intensity or expand closer to residential properties.

Emera Inc. operates a 30 MW wind power project approximately 7.5 km west of the Seabrook Quarry, near Gulliver's Cove. This wind farm has been operating since 2010. There are also several single turbine wind farms in the Digby and Digby Neck area. Wind farms often require clearing of land for turbine pads, access roads, substations and power line resulting in habitat loss during construction. During operations, adjacent habitat and wildlife may be affected by noise and light emissions and the turbines represent a collision risk for birds and bats leading to injury or mortality of individuals. Wind power projects larger than 2 MW are subject to environmental assessment under the *Environment Act* and must implement mitigation and monitoring programs to reduce adverse effects on wildlife and local communities. Wind power projects must also abide by municipal bylaws to help reduce potential disturbance to residents.

While the Project can result in adverse environmental effects (described in Chapter 5), these effects will be managed through the implementation of mitigation measures identified in this assessment, thereby reducing the Project's contribution to potential cumulative effects with these other undertakings. The Project is not predicted to affect any of these existing undertakings. Since the Project is not expected to result in an increase in operational activity (including traffic) residual adverse effects from the Project are not predicted to contribute to existing adverse effects from other undertakings, beyond a cumulative loss of habitat. As noted in Section 2.2.3, the Project will involve progressive reclamation of habitat and effects on habitat are expected to be reversible in the long term. It is anticipated that other future undertakings will be required to implement similar mitigation measures and standards, further reducing potential for other undertakings to contribute additional adverse effects.

8.0 EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT

Table 8.1-1 provides a summary of the potential environmental effects and associated mitigation and management measures to reduce residual adverse effects. Mitigation measures provided below are VC-specific mitigation in addition to the mitigation and management measures described in Table 2.4-1 (Chapter 2 – Project Description). Summary of significance of residual effects is also provided in the table below.

Table 8.1-1 Summary of Effects of the Undertaking on the Environment

VC	Potential Effects	Mitigation	Significance of Residual Effect
Groundwater Resources	Effects on local groundwater quality and quantity	• In the event that wells are adversely or permanently affected by site preparation activities, Nova Construction will repair or replace affected wells to conditions that existed prior to blasting. • Mitigation measures will be implemented on the basis of the well condition survey on wells within 800 m of the Project Area and the nearest well constructed within the basalt bedrock. • Nova Construction is prepared to provide temporary water supply until a permanent resolution is made, should existing supplies be disrupted either by drawdown of the water table or by damage from blasting associated with the Project.	Not significant
Aquatic Environment	Effects on local surface water quality and quantity Effects on fish habitat and fish health and survival	• Nova Construction will develop and implement a Water Management Plan for the Project that will incorporate standard management practices for erosion and sediment control, drainage control, dewatering, and surface runoff. The Water Management Plan will provide details regarding runoff and seepage collection strategies and systems (potentially including berms, drainage ditches, pumps, and settling ponds, if required) to collect and contain surface water runoff and groundwater discharge from the quarry footprint during climate normal and extreme weather conditions. The Plan will also provide details regarding monitoring, maintenance, and upgrading of flow retention/siltation treatment areas. Design criteria will recognize increased likelihood of more intense precipitation events in coming decades. • Project areas will be routinely monitored to identify areas of potential erosion and appropriate mitigation will be applied. Progressive erosion and sediment control measures will be implemented, as required. • • Project-related blasting activities near water will be conducted in consideration of DFO's *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky 1998), as well as the terms and conditions of the Industrial Approval for the Project.	Not significant

Table 8.1-1 Summary of Effects of the Undertaking on the Environment

VC	Potential Effects	Mitigation	Significance of Residual Effect
Wetlands	Effects on wetland hydrological functions and wetland habitat quality	• Vegetation clearing will be preferentially conducted during dry and frozen conditions, when possible. • Exposed soils will be limited to the extent practicable. • Grading will be directed away from wetlands, where practicable. • Existing drainage patterns will be maintained to the extent practicable (e.g., through the use of culverts, where necessary). • Cross drainage will be maintained to allow water to move freely from one side of the road to the other in areas of permanent or temporary access roads. • Water discharges from the Project Area (e.g., from dewatering activities and surface runoff) will be directed away from wetlands, where practicable. • Protective layers, such as matting or biodegradable geotextile, clay ramps, packed snow or ice, or other approved materials, will be used for access through wet areas (if applicable) to reduce the potential for rutting, admixing, or compaction. • Nova Construction will develop and implement a Water Management Plan for the Project that will incorporate standard management practices for erosion and sediment control, drainage control, dewatering, and surface runoff. The Water Management Plan will provide details regarding runoff and seepage collection strategies and systems (potentially including berms, drainage ditches, pumps, and settling ponds, if required) to collect and contain surface water runoff and groundwater discharge from the quarry footprint during climate normal and extreme weather conditions. The Plan will also provide details regarding monitoring, maintenance, and upgrading of flow retention/siltation treatment areas. Design criteria will recognize increased likelihood of more intense precipitation events in coming decades. • If it is determined that a Wetland Alteration Approval is required in support of the Project, Project activities will be conducted in accordance with the terms and conditions of the Approval and unavoidable residual adverse effects on wetlands will be offset through development and implementation of a Wetland Compensation Plan that is acceptable to NSECC.	Not significant

Table 8.1-1 Summary of Effects of the Undertaking on the Environment

VC	Potential Effects	Mitigation	Significance of Residual Effect
Vegetation	Effects on vegetation SAR, SOCC, and communities	• To reduce the risk of introducing or spreading exotic and/or invasive vascular plant species, Project vehicles and equipment will arrive at the Project Area clean and free of soil and vegetative debris. • Areas of vegetation clearing, grubbing, and other physical disturbances will be limited to the extent practicable. • The boundaries of areas to be cleared will be well-marked prior to the start of clearing activities. • Known occurrences of plant SAR and SOCC will be avoided, where practicable. The known locations of plant SAR recorded within the Project Area will be identified prior to the commencement of Project activities and appropriate buffers will be flagged and maintained around these areas, where practicable. • If avoidance of plant SAR is not possible, seed collection and/or transplantation will be considered in consultation with NSECC. • Grading will be directed away from known occurrence of plant SAR and SOCC, where practicable. • Water discharges from the Project Area (e.g., from dewatering activities and surface runoff) will be directed away from known locations of plant SAR and SOCC. • Nova Construction will develop and implement a Water Management Plan for the Project that will incorporate standard management practices for erosion and sediment control, drainage control, dewatering, and surface runoff. The Water Management Plan will provide details regarding runoff and seepage collection strategies and systems (potentially including berms, drainage ditches, pumps, and settling ponds, if required) to collect and contain surface water runoff and groundwater discharge from the quarry footprint during climate normal and extreme weather conditions. The Plan will also provide details regarding monitoring, maintenance, and upgrading of flow retention/siltation treatment areas. Design criteria will recognize increased likelihood of more intense precipitation events in coming decades.	Not significant

Table 8.1-1 Summary of Effects of the Undertaking on the Environment

VC	Potential Effects	Mitigation	Significance of Residual Effect
Wildlife and Wildlife Habitat	Habitat loss and fragmentation, change in wildlife behaviour and habitat use, risk of injury or mortality	• Good housekeeping practices will be implemented and domestic waste will be contained in receptacles that are secured to prevent the attraction of birds or other wildlife to the Project Area. • To reduce the risk of wildlife collisions, Project vehicles will be required to comply with posted speed limits on the access road and internal site road. Speed limits will be set in accordance with provincial regulations and industry standards (e.g., for haul roads). • Sensitive areas (e.g., wetlands, riparian habitat, hibernacula, nests, and roosts) within 30 m of the Project Area will be identified prior to site preparation and appropriate buffers will be established and maintained around these areas, where practicable. • Migratory birds are protected under the federal *Migratory Birds Convention Act* (MBCA), which prohibits killing migratory bird species, their eggs, or their young. Other bird species not protected under the MBCA, such as raptors, are protected under the provincial *Wildlife Act*. To avoid contravention of these Acts, clearing and grubbing activities will be scheduled, to the extent practicable, outside of the breeding season of most bird species (May 1 to August 31) so that the eggs and flightless young of birds are not inadvertently destroyed. • In the event that it is not possible to schedule clearing and grubbing activities outside of the bird breeding season, Nova Construction will review the best practical mitigation measures and apply them in accordance with the MBCA. At a minimum, if complete avoidance of these activities during the specified timeframe is not practicable, nest searches will be undertaken by a qualified biologist and avoidance setbacks will be established around active nests. • Should there be a delay between clearing and operational activities such that operations are initiated during the bird breeding season, nest surveys will be carried out by experienced observers for the purpose of determining the presence and activities of birds, such as common nighthawk, that are known to target cleared areas for nesting. If Project employees encounter birds that they suspect may be nesting, an ornithologist or other suitably qualified professional will be brought on-site to determine whether nesting is occurring and to find the nest (nest locations will not be flagged as this increases the risk of nest predation). If a nest is found, an appropriate setback will be established around the nest in which human activities will be restricted until the young fledge and leave the area or until the nest naturally fails. The period for which bank swallow nests would be considered active would include not only the time when birds are incubating eggs or taking care of flightless chicks, but also a period of time after chicks have learned to fly (since swallows return to their colony to roost).	Not significant

Table 8.1-1 Summary of Effects of the Undertaking on the Environment

VC	Potential Effects	Mitigation	Significance of Residual Effect
Atmospheric and Acoustic Environment	Reduction in local air quality, sound quality, and adverse visual lighting effects	• Mitigation and management measures for air, noise and light emissions are described in Table 2.4-1 (Chapter 2 – Project Description), and no additional VC-specific mitigation and management measures are proposed. Mitigation measures related to blasting activities are also described in Table 2.4-1.	Not significant
Land and Resource Use	Effects on population and economy, land use, transportation, recreation and tourism, and public safety	• Restricted access zones surrounding quarry operations will be implemented during site preparation and will remain in place throughout the life of the Project. Signage will be installed around the Project property to alert the public and land users of the presence of the Project and its facilities. • Future final land and resource end-uses will be considered in the preparation of the Rehabilitation Plan and determined in conjunction with the needs of the local community, Mi'kmaq of Nova Scotia and stakeholders. • Mitigation measures identified in other VCs will also reduce the potential effects on land and resource use (Section 5.1 – Groundwater Resource; Section 5.2 – Aquatic Environment; and Section 5.5 – Wildlife and Wildlife Habitat).	Not significant
Heritage Resources	Damage to archaeological resources	• Avoidance of areas of elevated archaeological potential identified during the ARIA will be implemented (i.e., Polygons MPR-POLY-007 and MPR-POLY-008 on Figure 5.8-1). • Where avoidance of areas of elevated archaeological potential is not practicable, archaeological shovel testing, as per the ARIA Guidelines, will be implemented prior to any clearing or other site preparation activities at these locations to determine if archaeological resources are present at these locations. • Develop and implement a Heritage Resources Accidental Discovery Plan in the unanticipated event that heritage resources are discovered during project development. • Consultation Work with NSCCTH's Special Places Coordinator and/or the paleontological staff at the Nova Scotia Museum to develop appropriate mitigation should any significant heritage resources be discovered during Project activities.	Not Significant

9.0 EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING

The definition of an environmental effect often includes any change to the Project that may be caused by the environment. Environmental effects could be related to climate and meteorological conditions (including climate change), geological events (e.g., earthquakes, landslides) and wildfire.

As all Project activities occur outside, climate and meteorological conditions could have important implications for the Project. The quarry remains operational 35 weeks per year, and meteorological conditions, including severe weather, are factored into existing operations at the Seabrook Quarry.

Future climate change could result in increased air temperatures, increased frequency and intensity of precipitation, an increase in the frequency and magnitude of storm events, and increased incidence of flooding and erosion. Predicted sea level rise is not expected to affect the Project given the interior location of the Seabrook Quarry within the province. Potential effects of climate change associated with extreme temperatures, heavy precipitation, winds, and storms could include delay and/or interruption of Project activities; loss of electrical power; and damage to site access, infrastructure, and equipment. Extreme precipitation and associated surface water runoff could potentially cause flooding, erosion, washout of site roads, and failure of erosion and sedimentation controls. These effects in turn could affect surface water resources, fish and fish habitat and wetlands. Severe weather and impacts to the Project could also potentially affect the health and safety of site workers.

Weather forecasts will be monitored and prior to extreme weather events, appropriate preventative measures will be taken to reduce the risk of damage to the Project. This will include inspections and maintenance of sediment and erosion control measures prior to and following significant precipitation events. The risk from erosion and sedimentation during extreme weather will be greatly reduced once site soils have been stabilized through revegetation in reclaimed areas. Nova Construction's existing Erosion and Sediment Control Plan will be updated by a qualified professional and submitted to NSECC for review and acceptance prior to the start of site preparation activities associated with the expansion, including clearing, grubbing, and stripping.

Scheduling activities also to avoid severe weather can also mitigate the effects of severe climate events on the operation of the quarry.

Geological events like earthquakes may impact the operation of the quarry, but Eastern Canada is located in a stable continental region and has a low rate of seismic activity (Fader 2005). Most recently, a seismic event with a magnitude of 2.5 occurred west of Yarmouth in 2021, and another event in 2018 with a magnitude of 3.1 (NRCan 2021). No significant earthquakes with a magnitude greater than 4.4 have occurred in Nova Scotia since 2012, located off the coast of Shelburne (NRCan 2021). Erosion, rockfall or slope failures would be more likely to occur over the life of the Project. Geological hazards will be managed through engineering design and inspection/maintenance of erosion and sediment control structures.

Wildfires are another environmental event that may impact the Project. There were a total of 113 wildfires reported in 2021 throughout the province, and only four wildfires reported in Digby County resulting in less than two hectares burned (NRR 2021). There is potential for wildfire to limit production during an event. Worker health and safety could be affected and on-site equipment may be impacted if unable to be evacuated and removed in such an event. The Emergency Response Plan for the Seabrook Quarry describes emergency response measures, roles and responsibilities, and reporting procedures in the event of a fire at or near the quarry.

As noted above, a variety of mitigative strategies will be employed to reduce the risk of potential effects of the environment on the Project to acceptable levels. In summary, climate and meteorological conditions (including climate change), geological events, and wildfire are not anticipated to significantly affect the operation of the Project over its proposed lifetime.

10.0 OTHER APPROVALS REQUIRED

In addition to the registration as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and *Environmental Assessment Regulations*, other relevant regulations include the amendment to the existing Industrial Approval (IA #2002-025843) under the *Activities Designation Regulations.* No additional municipal approvals, including Water Approvals, are expected to be required. There are no known triggers for an impact assessment under the federal *Impact Assessment Act* (2019).

11.0 FUNDING

No public or government funding is involved in the execution of this undertaking. All costs will be solely funded by Nova Construction.

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12.2 Personal Communications

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