FIELD PROGRAMS : METHODOLOGY

Fish and Fish Habitat Assessment: Fish and fish habitat assessments, habitat characterization, and water quality sampling were conducted at McGree Brook, the primary watercourse within the Project Site, between mid-June and mid-November 2024. Methods followed protocols outlined in the *Nova Scotia Fish Habitat Suitability Assessment: A Field Methods Manual* (NSLC AAS, 2018) and the *Reconnaissance (1:20 000) Fish and Fish Habitat Inventory* (RISC, 2001, 2006).

Key parameters assessed included:

- **Channel Biophysical Features**: Channel/wetted width, bankfull depth, pool depth, bank height, gradient, barriers to fish movement.
- **Geomorphology**: Channel morphology, confinement, pattern, and bank features.
- **Fish Habitat**: Substrate composition, instream cover, spawning, and migration suitability.
- **Velocity**: Flow characteristics.
- **Riparian Features**: Vegetation stage and type, dominant species, crown closure.
- **Disturbance Indicators**: Erosion, sediment deposits, abandoned channels.
- **Water Quality**: Conductivity, TDS, pH, and temperature.
- **Watercourse Classification**: Permanent, intermittent, ephemeral.
- **Watercourse Stage**: High, mid, low, dry, frozen.

Watercourses were classified by channel width and flow regime (Table 7.15).

Table 7.15: Watercourse Classification

Type	Channel Width	Description
Large Permanent	>5 m	Defined channel, year-round flow, fish habitat.
Small Permanent	<5 m	Defined channel, year-round flow, fish habitat.
Intermittent	<2 m	Seasonal flow, may be fish-bearing.
Ephemeral	<1 m	Infrequent flow, minor scour, not fish habitat.
No Channel	N/A	No defined channel, surface, or subsurface drainage.

Fish Habitat Quality Assessment: Habitat suitability was evaluated using in situ water quality data and assessments of:

- **Spawning Habitat**: Flow, depth, groundwater upwelling, substrate size, and embeddedness.
- **Rearing Habitat**: Cover abundance and type, flow, and connectivity.
- **Migration**: Upstream/downstream connectivity, depth, flow.

- **Foraging Habitat**: Invertebrate presence, substrate, riparian cover.
- **Overwintering Habitat**: Deep pools (>50 cm), water quality, and year-round flow potential.

Substrate Classification: Substrate classification was adapted from Bain and Stevenson (1999), the Wentworth Scale (Wentworth, 1922), and other sources. Substrate types included:

- **Fines**: <2 mm
- **Silt & Clay**: <0.06 mm
- **Sand**: 0.06–2 mm
- **Small Gravel**: 2–16 mm
- **Large Gravel**: 16–64 mm
- **Cobble**: 64–256 mm
- **Boulder**: >256 mm
- **Bedrock**: Continuous slab (>2 m diameter)

Interpretation & Classification: Fish habitat quality was ranked from 'None' to 'Good' based on observed features, and a conservative approach classified intermittent and permanent watercourses as potentially fish-bearing. Field data were considered a snapshot of typical seasonal conditions. When habitat suitability spanned multiple species, rankings prioritized the most sensitive likely species, typically salmonids (e.g., Brook Trout).

FIELD PROGRAMS : RESULTS

Water Quality: Water quality was generally good across the sampled locations, with pH levels ranging from 7.30 to 7.64, which is within the ideal range for many freshwater species (US EPA, 2025c) (Table 7.16). Conductivity values ranged from 171 to 175 µS/cm, suggesting no major influence from salts or pollutants. The TDS levels (70-72 mg/L) indicate relatively low levels of dissolved solids. Sampling locations are shown in Drawing 7.1.6.2.

Table 7.16: Water Quality at McGee Brook

Location	pH	Conductivity (µS/cm)	TDS (mg/L)
FFH1	7.30	175.0	-
FFH2	7.40	171.0	72
FFH3	7.54	171.1	70
FFH4	7.64	173.0	-
FFH5	7.53	172.2	70

Note: Blank cells indicate that TDS was not recorded

Watercourse Characteristics: The watercourse was classified as a small permanent watercourse based on channel width and flow regime (Table 7.17).

The morphology of McGee Brook varied across the survey locations. Wetted widths ranged from 7 to 8 m, and bankfull heights ranged from 1.25 to 1.75 m. Flow velocity could only be measured at FFH5, with a velocity of 0.136 m/s. Habitat types included pools, runs, and riffles, with pools reaching depths from 0.75 m to 1.60 m. Most locations had substrates dominated by fines, though gravel and cobble were present at FFH5.

Woody debris and undercut banks were observed at various locations, adding complexity to the habitat and providing cover for aquatic organisms. Overall, the watercourse conditions — such as the presence of pools, woody debris, and undercut banks — are considered suitable for some species of fish, including salmonids, particularly where these features provide both cover and rearing habitat. However, no spawning habitat was identified in any of the survey locations. While fast-flowing sections of the brook were observed during Wood turtle surveys, these areas are predominantly composed of fine substrate rather than the clean gravel required for salmonid reproduction (DFO, 2018).

Fish presence was observed near FFH5, but no specific species were identified. Minnows were also noted in various sections of the watercourse. A freshwater mussel (Eastern pearlshell) was observed during the fish and fish habitat assessment, and additional mussels were noted during a subsequent field visit for the Wood turtle survey, indicating the presence of mollusc habitat within the watercourse.

Based on field observations and the conservative classification system described in the methodology, the fish habitat potential within McGee Brook was rated as *Good*, particularly for rearing life stages. While the stream appears to provide adequate habitat for juvenile and adult salmonids, the lack of spawning habitat suggests the area may not support the full life cycle of these species.

Additionally, a woody debris barrier was observed in the stream, which may influence water flow and provide cover. Some eroding banks were also noted along the watercourse, which could potentially affect stability.

Riparian vegetation consisted of tree species such as white elm, northern red oak, and red maple, with shrubs including choke cherry (*Prunus virginiana*), speckled alder, and Virginia rose (*Rosa virginiana*). Herbaceous vegetation included reed canary grass, bluejoint reed grass (*Calamagrostis canadensis*), and goldenrod (*Solidago*) species. These riparian plants provide essential habitat and cover for both terrestrial and aquatic species.

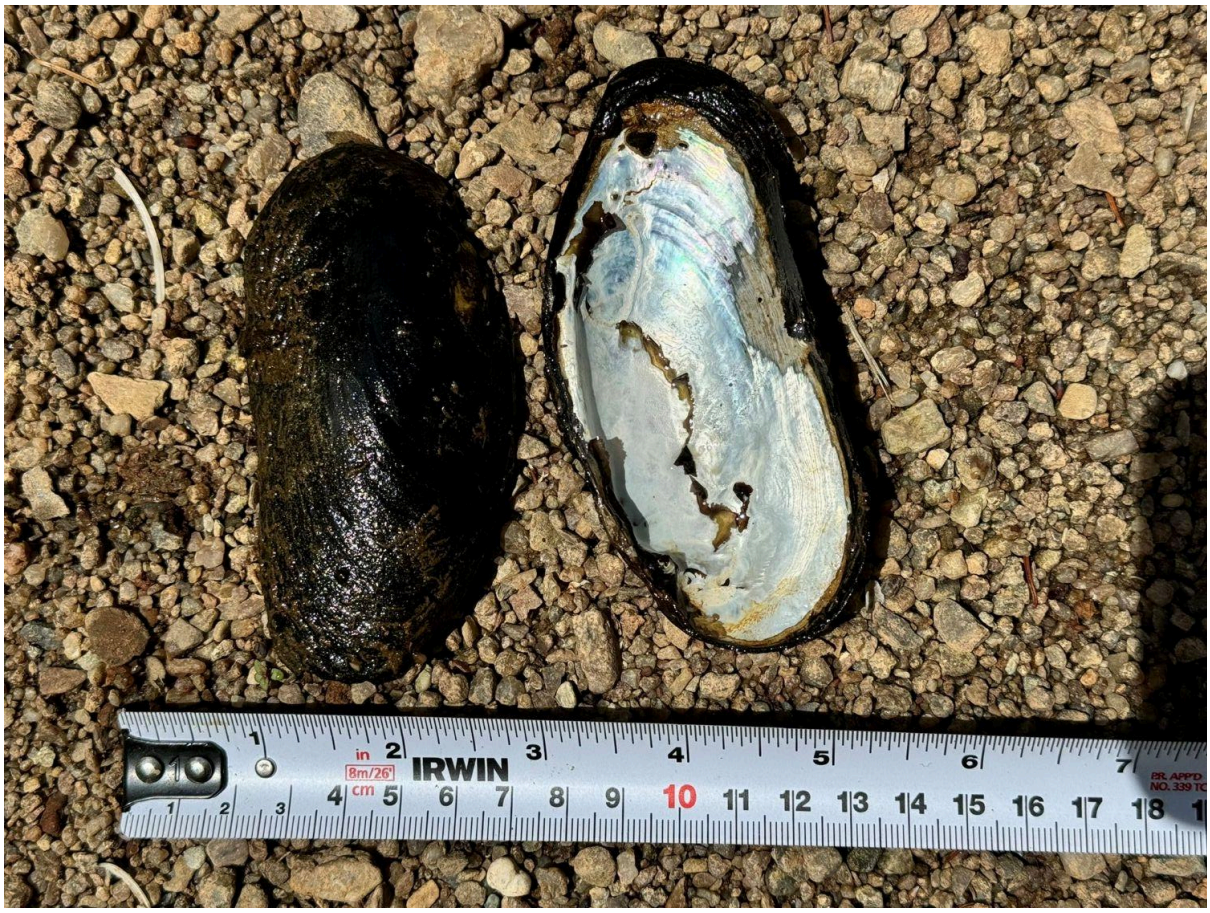


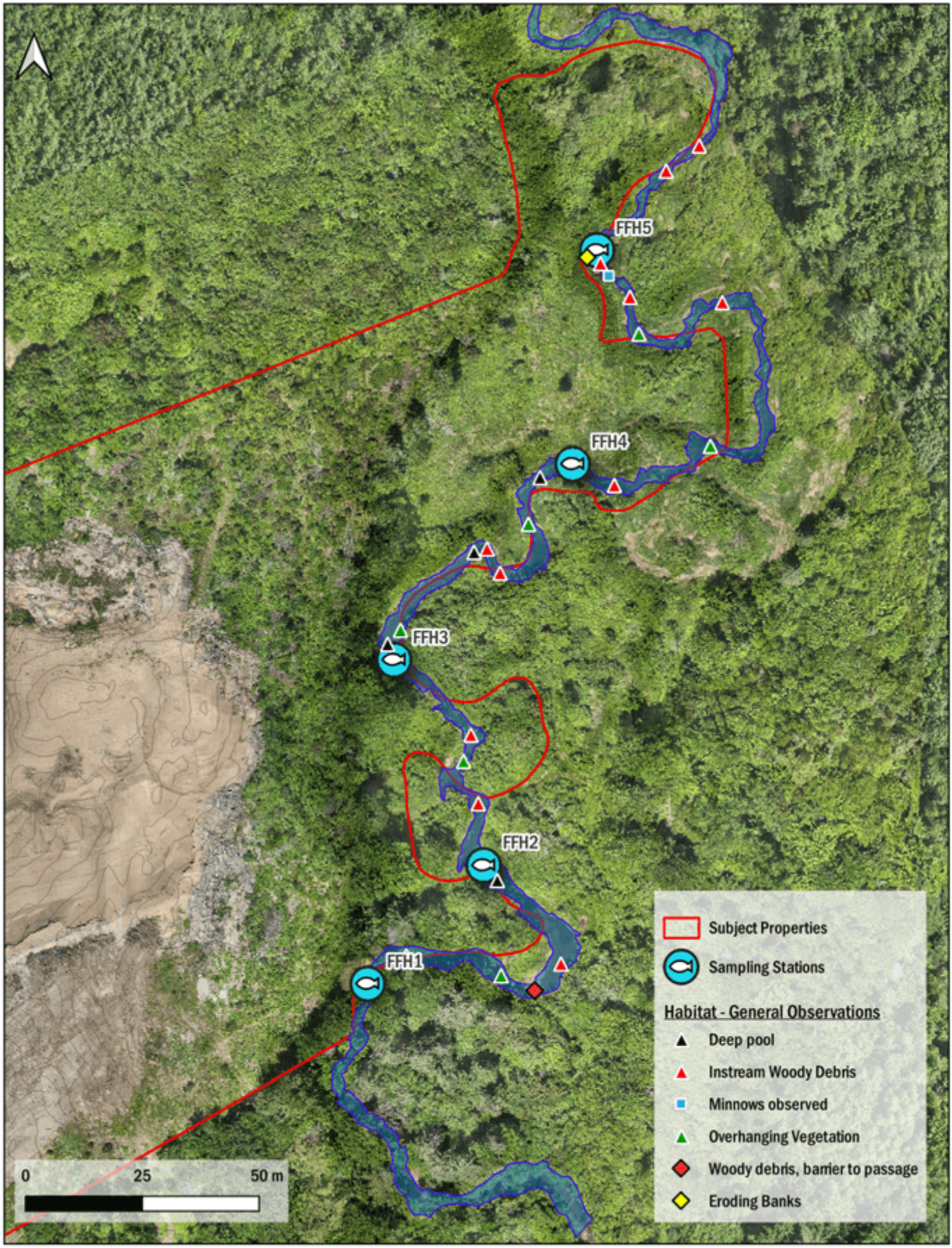
Figure 7.1.6.1: Eastern pearlshell (*Margaratifera margaratifera*) shells encountered in McGee Brook.

Table 7.17: McGee Brook Characteristics

Location	Bankfull Height (m)	Bankfull Width (m)	Wetted Depth* (m)				Wetted Width (m)	Pool Present (Y/N)	Pool Max Depth (m)	Velocity (m/s)	Substrate (%)	Habitat Type	Instream Cover
			Q1	Q2	Q3	Thalweg							
FFH1	1.25	7.5	0.20	0.30	0.20	0.30	3.0	Y	0.75	-	Fines: 100	Run	Undercut Banks
FFH2	1.25	8.0	1.00	1.50	1.00	1.50	8.0	Y	1.50	-	Fines: 100	Pool	Woody Debris
FFH3	1.50	8.0	1.00	1.60	0.75	1.60	5.0	Y	1.60	-	Fines: 100	Run	Undercut Banks, Woody Debris
FFH4	1.50	7.0	0.30	0.70	0.25	0.75	2.5	Y	0.75	-	Fines: 100	Run	Woody Debris
FFH5	1.75	7.0	0.15	0.25	0.20	0.25	1.0	N	N/A	0.136	Fines: 90 Gravel: 5 Cobble: 5	Riffle	Undercut Banks, Woody Debris

*Each watercourse had four depth measurements

Note: Blank cells indicate that the flow was too slow to measure



Drawing 7.1.6.2: Fish and Aquatic Habitat Sampling Locations

Figure 7.1.6.2: Typical conditions of McGee Brook.

Figure 7.1.6.3: Station FFH1 - Typical conditions. Looking upstream.

Figure 7.1.6.4: Station FFH2 - Typical conditions. Looking upstream.

Figure 7.1.6.5: Station FFH3 - Typical conditions. Looking upstream.

Figure 7.1.6.6: Station FFH4 - Typical conditions. Looking upstream.

Figure 7.1.6.7: Station FFH5 - Typical conditions. Looking downstream.

7.1.7 CLIMATE CHANGE

REGULATORY CONTEXT

Several federal and provincial laws and regulations are relevant to the operations of the Project with respect to GHG emissions and climate change.

FEDERAL

- ***Canadian Environmental Protection Act*** **(S.C. 1999, c. 33) -** CEPA provides the legal authority for managing GHGs as toxic substances under Schedule 1. It enables the development of sector-specific regulations to limit emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and other GHGs that contribute to climate change. While the Project is not expected to exceed reporting thresholds, CEPA provides the overarching framework for federal climate change regulations and emissions reporting.
- ***Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*** **(S.O.R./2010-201) -** These regulations, enacted under CEPA, set GHG emission standards for new passenger cars and light-duty trucks sold in Canada. They are intended to reduce emissions from the transportation sector over time. While not directly applicable to Project equipment, the regulations contribute to national GHG reduction efforts, including emissions associated with aggregate transport.
- ***Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations*** **(S.O.R./2013-24) -** These regulations, enacted under CEPA, establish GHG emission standards for new on-road heavy-duty vehicles and engines, such as dump trucks and transport vehicles. While the Project does not manufacture vehicles, its reliance on regulated vehicle types means its mobile emissions are indirectly influenced by these federal standards.
- ***Greenhouse Gas Pollution Pricing Act*** **(S.C. 2018, c. 12, s. 186) -** This Act establishes a federal carbon pricing system to reduce GHG emissions. While the Project is not expected to be a major emitter, fuel use during operations may be subject to carbon pricing under this legislation.

PROVINCIAL

- ***Environment Act*** **(S.N.S. 1994-95, c. 1) -** This Act provides the legal framework for environmental protection in Nova Scotia, including air quality management. It supports pollution prevention and regulatory measures to limit emissions that may impact air quality. Project activities must comply with air quality standards set under this legislation.

- ***Environmental Goals and Climate Change Reduction Act*** **(S.N.S. 2021, c. 20)** - This Act sets the framework for Nova Scotia's commitment to reducing GHG emissions and addressing climate change. It outlines specific targets for emission reductions, renewable energy adoption, and climate resilience. The Project will need to consider the Act's goals and ensure compliance with carbon reduction targets, including the adoption of practices that minimize its contribution to climate change and align with provincial sustainability objectives.

DESKTOP REVIEW : METHODOLOGY

A GHG emissions assessment for the Project was conducted in accordance with the *Guide to Considering Climate Change in Environmental Assessments in Nova Scotia* (NSE, 2011a) and the *Guide to Considering Climate Change in Project Development in Nova Scotia* (NSE, 2011b). The assessment followed a systematic approach to identify, quantify, and evaluate all significant sources of GHG emissions associated with the proposed project.

Emission Source Identification: Climate change refers to long-term changes in temperature, precipitation, and other atmospheric conditions driven in part by increasing concentrations of GHGs in the atmosphere. GHGs such as CO_2, CH_4, and N_2O are emitted from both natural processes and human activities, including transportation, industry, and land use changes.

There are no GHG monitoring stations located at or near the Project, and no site-specific GHG measurements are available. However, baseline conditions can be generally described by considering the current land use and typical emission characteristics of the surrounding area. The Project Site is situated in a suburban area with mixed land use, including residential, agricultural, and forested areas, with likely limited existing GHG emissions beyond those associated with occasional vehicle use, home heating, and agricultural activity.

At the provincial scale, Nova Scotia's GHG emissions were approximately 14.8 megatonnes of carbon dioxide equivalent (CO_2e) in 2022. The province's largest GHG-emitting sectors are electricity generation (39%), transportation (35%), and buildings (14%). Emissions in Nova Scotia have generally declined since 2005, largely due to changes in energy generation and efficiency improvements across sectors (CER, 2024).

To provide a general understanding of the Project's potential contribution to GHG emissions, estimated annual emissions were calculated. The assessment identified two primary categories of GHG emissions associated with the sand pit operation: (1) direct emissions from on-site equipment operations and (2) indirect emissions from aggregate transportation. The identification process involved a thorough review of operational activities, equipment specifications, and material handling requirements.

Direct emission sources include the operation of heavy diesel-powered equipment required for extraction, processing, and material handling activities. The equipment inventory consists of an excavator, front-end loader,

two dump trucks, a mobile screening unit, and a water truck for dust suppression. These units represent the core operational equipment necessary to maintain continuous sand pit operations throughout the active season.

Indirect emissions encompass the transportation of extracted aggregate materials from the site to end-use destinations. This component represents a significant portion of the project's total carbon footprint and requires detailed analysis of haulage patterns, vehicle specifications, and delivery distances.

Operational Boundary Definition: The operational boundaries were established to encompass all activities directly controlled or influenced by the sand pit operation. The assessment assumes an operational schedule of approximately 200 working days per year, reflecting typical seasonal constraints and market demand patterns in the regional aggregate industry.

Equipment utilization rates were estimated based on standard industry practices and the specific operational requirements of the Project. The analysis assumes eight hours of daily operation for primary extraction and processing equipment, with reduced operating hours for auxiliary equipment such as the water truck used for dust suppression activities.

Emission Calculation Methodology: GHG emissions were calculated using established emission factors from ECCC and the United States Environmental Protection Agency. The methodology applies fuel consumption rates specific to each equipment type, operating hours, and standardized emission factors for diesel combustion.

For transportation emissions, the assessment utilized industry-standard fuel efficiency data for loaded dump trucks operating under mixed road conditions. The analysis incorporated round-trip distances, annual material volumes, and vehicle payload capacities to determine total fuel consumption and associated emissions.

All emissions are reported in CO_2e, incorporating the global warming potential of CO_2, CH_4, and N_2O emissions associated with diesel combustion processes.

Precipitation Patterns: The Nova Scotia county-level Climate Risk Summary for Kings County (NSECC, 2022a) and the province-wide technical synthesis (Eyzaguirre et al., 2022) were used to project precipitation levels into the future. These draw on an ensemble of 27 global climate models statistically summarized as medians over 30-year periods (early: 2015-2045; mid: 2035-2065; late: 2065-2095), with results shown for RCP8.5 (high-emissions).

DESKTOP REVIEW : RESULTS

Table 7.18 below summarizes the GHG emission estimates for the Project.

Table 7.18: Greenhouse Gas Emissions Summary

Category	Equipment /Activity	Fuel Consumption (L/year)	Emission Factor (kg CO_2e/L)	Annual Emissions (tonnes CO_2e)
On-site Operations	Excavator	40,000	2.68	107.2
	Front-end Loader	32,000	2.68	85.8
	Dump Trucks (2 units)	48,000	2.68	128.6
	Mobile Screener	24,000	2.68	64.3
	Water Truck	18,000	2.68	48.2
	Subtotal: On-site	**162,000**		**434.1**
Transportation	Aggregate Haulage	187,500	2.68	502.5
	Subtotal: Transportation	**187,500**		**502.5**
Total Project Emissions		**349,500**		**936.6**

On-Site Equipment Emissions: The analysis of direct emissions from on-site equipment operations indicates a total annual emission rate of 434.1 tonnes CO_2e. The largest individual contributor is the combined operation of two dump trucks, accounting for 128.6 tonnes CO_2e annually, followed by the excavator at 107.2 tonnes CO_2e per year.

Transportation Emissions: Transportation of aggregate materials represents a substantial component of the project's GHG footprint. Based on an estimated annual extraction volume of 75,000 tonnes and an average round-trip delivery distance of 100 km, transportation activities generate approximately 502.5 tonnes CO_2e annually. This estimate reflects 3,750 individual truck loads per year, each carrying an average payload of 20 tonnes.

Total Project Emissions: The combined GHG emissions from the Project operation total 936.6 tonnes CO_2e annually. This figure represents the sum of direct equipment emissions and transportation-related emissions. The total emissions remain well below the 10,000-tonne threshold established under provincial climate change guidelines, eliminating the requirement for a formal GHG Management Plan while maintaining the obligation to implement reasonable mitigation measures.

Precipitation Patterns: Projected changes in precipitation for Kings County, Nova Scotia indicate a clear trend toward a wetter overall climate, with most of the increase concentrated in the cool season (NSECC, 2022a). Projections compared to a 1981-2010 baseline show total annual precipitation rising from 1,227 mm to

1,313 mm by mid-century (+7%) and 1,363 mm by late century (+11%) under a high-emissions pathway (NSECC, 2022a). Snow contributions decline substantially as more cold-season precipitation falls as rain: snow days drop from 38.6 to 25.6 by mid-century and 17.6 by late century (NSECC, 2022a). Seasonally, province-wide synthesis results show winter precipitation increasing more than summer (winter up roughly 8-16% by mid/late century; summer increases are smaller), while the overall wet-day distribution remains skewed to fall and winter (Eyzaguirre et al., 2022). These shifts imply higher cold-season runoff and reduced snow storage compared to the historical regime (Eyzaguirre et al., 2022).

Heavy-precipitation behaviour also changes in ways relevant to design and operations. In Kings County, days with ≥20 mm of rain increase from 14.5 to 16.9 by mid-century and 18.6 by late century (+17% and +28%, respectively) (NSECC, 2022a). Provincial indices show intensification of short-duration extremes, with the maximum 1-day rainfall rising from ~53 mm (baseline) to ~59 to 63 mm by mid/late century and the maximum 5-day total increasing by ~6 to 15 mm under high emissions, consistent with national assessments that project more frequent heavy downpours across Canada (Bush & Lemmen, 2019; Eyzaguirre et al., 2022). In practice, that means greater loadings on stormwater systems and higher pluvial flood and erosion risk even where annual totals rise modestly (Bush & Lemmen, 2019).

7.1.8 AIR QUALITY AND ATMOSPHERIC CONDITIONS

REGULATORY CONTEXT

Several federal and provincial laws and regulations are relevant to the operations of the Project with respect to air quality and atmospheric conditions.

FEDERAL

- ***Canadian Environmental Protection Act*** **(S.C. 1999, c. 33) -** CEPA governs the prevention and control of pollution in Canada, including air pollutants. It provides the legal framework for the management of air quality by establishing regulations for substances that may be harmful to human health or the environment. This Act supports the establishment of air quality standards and regulatory measures to manage pollutants such as nitrogen dioxide (NO_2), ozone (O_3), and fine particulate matter ($PM_{2.5}$), which refers to particles smaller than 2.5 micrometres (µm) in diameter, which are also of concern for the Project Area.

PROVINCIAL

- ***Environment Act*** **(S.N.S. 1994-95, c. 1) -** This Act provides the legal framework for environmental protection in Nova Scotia, including air quality management. It supports pollution prevention and

regulatory measures to limit emissions that may impact air quality. Project activities must comply with air quality standards set under this legislation.

- ***Pit and Quarry Guidelines*** **(1999, Revised 2003)** - These guidelines set air quality limits for pit and quarry operations in Nova Scotia. They establish maximum allowable levels for particulate emissions, including dust, to help minimize air quality impacts. Compliance with these guidelines helps mitigate potential air quality effects associated with the Project.

- ***Air Quality Regulations*** **(N.S. Reg. 8/2020)** - Under the *Environment Act,* S.N.S. 1994-94, c. 1, these regulations set the maximum permissible ground-level concentrations for several air pollutants including carbon monoxide (CO), hydrogen sulfide (H_2S), NO_2, O_3, sulfur dioxide (SO_2), and total suspended particulate, at ambient air quality monitoring stations across the province. The regulations establish both short-term and long-term (annual) standards aimed at maintaining air quality within acceptable limits to protect human health and the environment.

DESKTOP REVIEW : METHODOLOGY

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

- NSECC Ambient Air Quality Data (NSECC, n.d.-b)
- NSECC Daily Climate Data (NSECC, n.d.-a)

DESKTOP REVIEW : RESULTS

AIR QUALITY: Air quality in the Project Area was assessed using data from the two nearest ambient air quality monitoring stations: Aylesford Mountain, approximately 5.5 km northeast of the Project, and Kentville, approximately 30 km east.

Data from 2020 to 2024 were reviewed for key parameters [NO_2, nitrogen monoxide (NO), nitrate (NO_3), O_3, and $PM_{2.5}$] from the Kentville monitoring station. The Aylesford monitoring station currently records only O_3 and $PM_{2.5}$; therefore, data for these parameters were analyzed for the same period (2020 to 2024). Additionally, NO_2, NO, and NO_3 data from Aylesford were reviewed from 2013 to 2017, though this dataset is incomplete due to gaps in monitoring.

The results indicate that measured concentrations remained below the applicable regulatory thresholds (Table 7.19).

Table 7.19: Maximum Ambient Air Quality Conditions in Aylesford and Kentville Compared to Provincial Regulations

Parameter	Averaging Period	NO_2 (ppb)	NO (ppb)	NO_3 (ppb)	O_3 (ppb)	$PM_{2.5}$ (µg/m3)
Aylesford (2013-2017)	1 hour	12.3	25.2	37.5	-	-
	24 hours	3.3	1.1	3.7	-	-
	Annual	0.3	0.2	0.5	-	-
Aylesford (2020-2024)	1 hour	-	-	-	70.1	182.7
	24 hours	-	-	-	57.9	20.8
	Annual	-	-	-	32.6	3.8
Kentville (2020-2024)	1 hour	17.3	23.9	33.6	66	66.1
	24 hours	5.1	3.8	6.5	53.5	29.9
	Annual	0.7	0.3	1.1	29.1	4.9
NS AAQS Schedule A	1 hour	210	-	-	82	-
	24 hours	-	-	-	-	-
	Annual	50	-	-	-	-

Source: NSECC (n.d.-b)

ATMOSPHERIC CONDITIONS: Local temperature, precipitation, and wind data were obtained from the Greenwood A meteorological station (Climate ID 8202000), located approximately 4.5 km southwest of the Project. Climate data over 10 years (January 1, 2015, to January 1, 2025) was analyzed (Table 7.20).

For temperature, daily values were averaged for each month over the 10 years, except for extreme maximum and minimum temperatures, which represent the highest and lowest recorded values for each month during this period.

For precipitation, daily rainfall and snowfall totals were summed for each month and then averaged over the 10 years to provide monthly mean values.

For wind, the average maximum wind gust speed was calculated for each month over the 10 years, and the most frequently occurring wind direction was identified.

Table 7.20: Climate Data From the Greenwood A Meteorological Station (2015-2024)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature													
Daily Avg. (°C)	-3.6	-3.8	-0.3	5.5	11.3	16.4	20.6	20.2	15.9	10.0	4.5	-0.3	8.1
Daily Max (°C)	0.8	1.1	4.3	10.7	17.6	22.4	26.7	26.1	21.9	15.7	8.8	3.8	13.4
Daily Min (°C)	-8.1	-8.6	-4.9	0.4	5.0	10.3	14.6	14.2	9.9	4.3	0.2	-4.4	2.8
Extreme Max (°C)	19.0	20.0	18.6	22.5	31.8	33.6	35.0	35.5	32.8	26.7	25.0	18.3	35.5
Extreme Min (°C)	-26.5	-25.2	-20.1	-14.4	-2.8	-1.5	5.9	4.9	-2.0	-5.3	-12.3	-17.5	-26.5
Precipitation													
Rain (mm)	57.5	46.1	53.0	73.4	71.5	103.5	95.7	100.5	101.1	91.7	101.1	84.8	979.8
Snow (cm)	79.7	72.6	41.6	9.5	0.9	0.0	0.0	0.0	0.0	0.2	8.5	36.0	248.8
Wind													
Max Hourly Speed (km/h)	50.3	50.4	50.5	47.5	44.3	41.9	40.3	39.4	42.2	45.2	50.1	50.6	46.6
Most Frequent Direction	W	W	W	W	W	W	W	W	W	W	W	W	W

Source: NSECC (n.d.-a)

Over the 10 years (2015 to 2025), the average monthly temperature ranged from -3.8°C in February to 20.6°C in July, with an annual mean temperature of 8.1°C. The highest recorded extreme temperature was 35.5°C on August 7, 2018, while the lowest was -26.5 °C on January 22, 2022.

Monthly precipitation varied throughout the year. Average rainfall ranged from 46.1 mm in February to 103.5 mm in June, while snowfall was recorded during the colder months, with an average monthly maximum of 79.7 cm in January. Over the 10 years, the annual average rainfall was 979.8 mm, and the annual average snowfall was 248.8 cm.

Wind conditions were characterized by an average maximum wind gust speed of 46.6 km/h, with monthly averages ranging from 39.4 km/h in August to 50.6 km/h in December. The predominant wind direction over the 10 years was west.

7.1.9 SOIL AND GEOLOGY

REGULATORY CONTEXT

Several federal and provincial laws and regulations are relevant to the operations of the Project with respect to soil and geology.

FEDERAL

- ***Canadian Environmental Protection Act*** **(S.C. 1999, c. 33)** - CEPA addresses the prevention and management of pollution, including the regulation of hazardous substances that may contaminate soil. Sand pit operations may involve activities that could introduce contaminants, such as fuel storage, equipment maintenance, or chemical use.

PROVINCIAL

- ***Environment Act*** **(S.N.S. 1994-95, c. 1)** - This Act provides the legal framework for environmental protection in Nova Scotia, including the management of soil and geological resources. It supports pollution prevention, site remediation, and regulatory measures to prevent contamination from industrial activities. Sand pit operations must comply with this legislation to ensure proper site management and reclamation.

- ***Pit and Quarry Guidelines*** **(1999, Revised 2003)** - These guidelines outline requirements for the management of overburden, erosion control, and site rehabilitation at pit and quarry operations in Nova Scotia. They set standards for minimizing soil disturbance, managing stockpiles, and restoring excavated areas to promote long-term environmental stability. Compliance with these guidelines helps mitigate soil erosion and supports land rehabilitation efforts for the Project.

- ***Mineral Resources Act*** **(S.N.S. 2016, c. 3) -** This Act governs the exploration and development of mineral resources in Nova Scotia, including sand extraction. It includes provisions for the protection of soil and the management of geological impacts during extraction activities. Compliance with the Act ensures that the project follows sustainable practices while minimizing environmental disturbances, particularly to soil and geology.

- ***Mineral Resources Regulations*** **(N.S. Reg. 196/2018) -** These regulations, enacted under the *Mineral Resources Act,* S.N.S. 2016, c. 3, govern the exploration and development of mineral resources, including sand extraction, in Nova Scotia. They establish requirements for exploration licensing, environmental protection, land reclamation, and community engagement to ensure that mineral operations are conducted responsibly, minimizing adverse impacts on soil and geological features.

DESKTOP REVIEW : METHODOLOGY

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

- Aerial imagery and topography
- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- Nova Scotia Geoscience Atlas (NSNRR, n.d.-c)
- Mineral Resource Land Use Atlas (NSNRR, n.d.-a)
- Nova Scotia Acid Rock Drainage Risk (NSNRR, n.d.-b)
- Karst Risk Map of Nova Scotia (NSNRR, 2019)

DESKTOP REVIEW : RESULTS

TOPOGRAPHY: The Project Site lies within the Annapolis Valley Ecodistrict (610), part of the Valley and Central Lowlands Ecoregion. Spanning over 140 km, the Annapolis Valley Ecodistrict stretches from Boot Island to just west of Digby. The region is predominantly flat, with a gradual slope to the northeast toward the Minas Basin along the Cornwallis River and southwest toward the Annapolis Basin along the Annapolis River. Both rivers originate from the Caribou Bog area near Berwick, which sits at an elevation of about 50 masl. The significant tidal influences of the Bay of Fundy affect these rivers and their tributaries. The flattest sections of the Annapolis Valley are found in Kings County, characterized by sandy glaciofluvial outwash plains, while the rest of the ecodistrict features gentle terrain shaped by various glacial deposits (Neily et al., 2017).

The elevation within the Project Site varies from approximately 37 masl to 27 masl.

SURFICIAL GEOLOGY: The Project Site primarily consists of Silty Till Plain, a unit of ground moraine and streamlined drift from the Wisconsinan stage (Drawing 7.1.9.1). This unit is characterized by silty, compact material with flat to rolling topography. It has moderate drainage and buffering capacity, making it suitable for agriculture. The thickness ranges from 3 to 30 m, with the material deposited by melting ice sheets.

Kame Field and Esker Systems are also present, consisting of gravel, sand, and silt. The topography includes steep-sided mounds, hummocks, and sinuous ridges, with thickness ranging from 4 to 20 m. These deposits are common sources of aggregate, but the land is stony and has limitations for crop use due to rapid drainage and irregular terrain.

Finally, to the northeast, Alluvial Deposits are found along river valleys and floodplains (e.g., McGee Brook). Composed of gravel, sand, and mud, these deposits form flat or gently sloping areas, with thicknesses reaching up to 20 m in larger floodplains. They provide important groundwater and aggregate resources, but have limitations due to flooding and poor drainage.

BEDROCK GEOLOGY: The Project Site is underlain by the Wolfville Formation, which belongs to the Fundy Group and extends from the Minas Basin to Annapolis Royal (Drawing 7.1.9.2). This formation dates from the Middle to Late Triassic period and is composed of fluvial sandstone and conglomerate, along with aeolian sandstone and minor deltaic-lacustrine deposits. The thickness of the formation exceeds 300 m. Well log data from the Project Site indicates that the depth to bedrock may reach up to approximately 41.11 m (NSNRR, 2025b), which reflects substantial glacial overburden above the Wolfville Formation.

LIKELIHOOD OF GEOLOGICAL HAZARDS: A review of the Nova Scotia Acid Rock Drainage Risk interactive map indicates a low risk for the Project Site and surrounding Project Area. Given the Wolfville Formation's composition of fluvial sandstone and conglomerate, the likelihood of acid rock drainage (ARD) is low, as there are no known occurrences of sulphide-bearing slates within the Project Area.

The Karst Risk Map of Nova Scotia classifies the Project Area as a Low-Risk zone for karst topography.

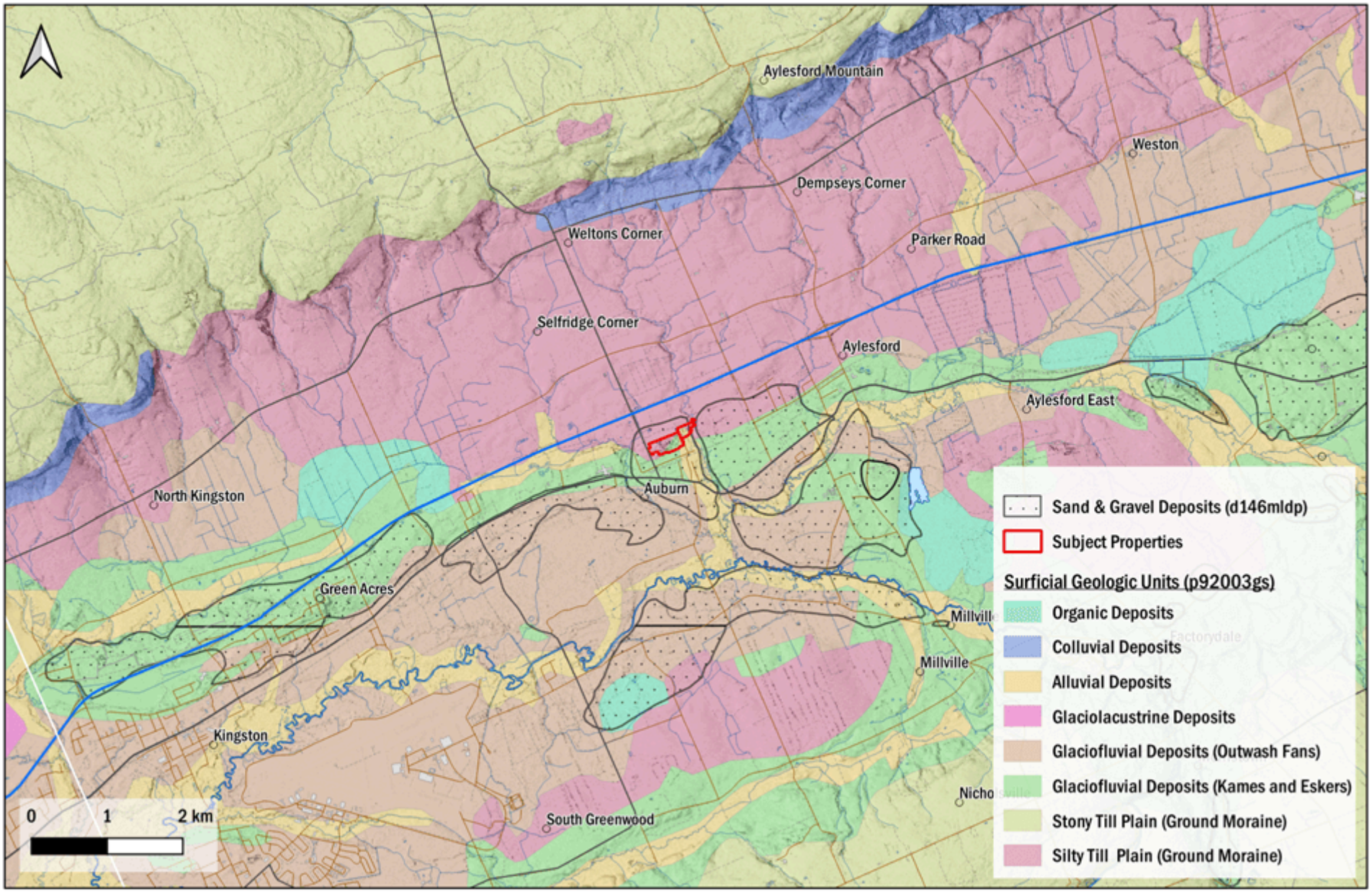
The Mineral Resource Land Use Atlas identifies a Medium Risk for radon in indoor areas within the Project Site, with the surrounding area also showing a mix of low- to medium-risk zones. This Atlas also identifies a Medium Risk for arsenic and a Low Risk for uranium contamination in groundwater wells within the Project Area.

OVERBURDEN CONDITIONS AND PIT AREA: The overburden at the Project Site primarily consists of Silty Till Plain, which has been partially removed in the existing pit area, exposing sand deposits.

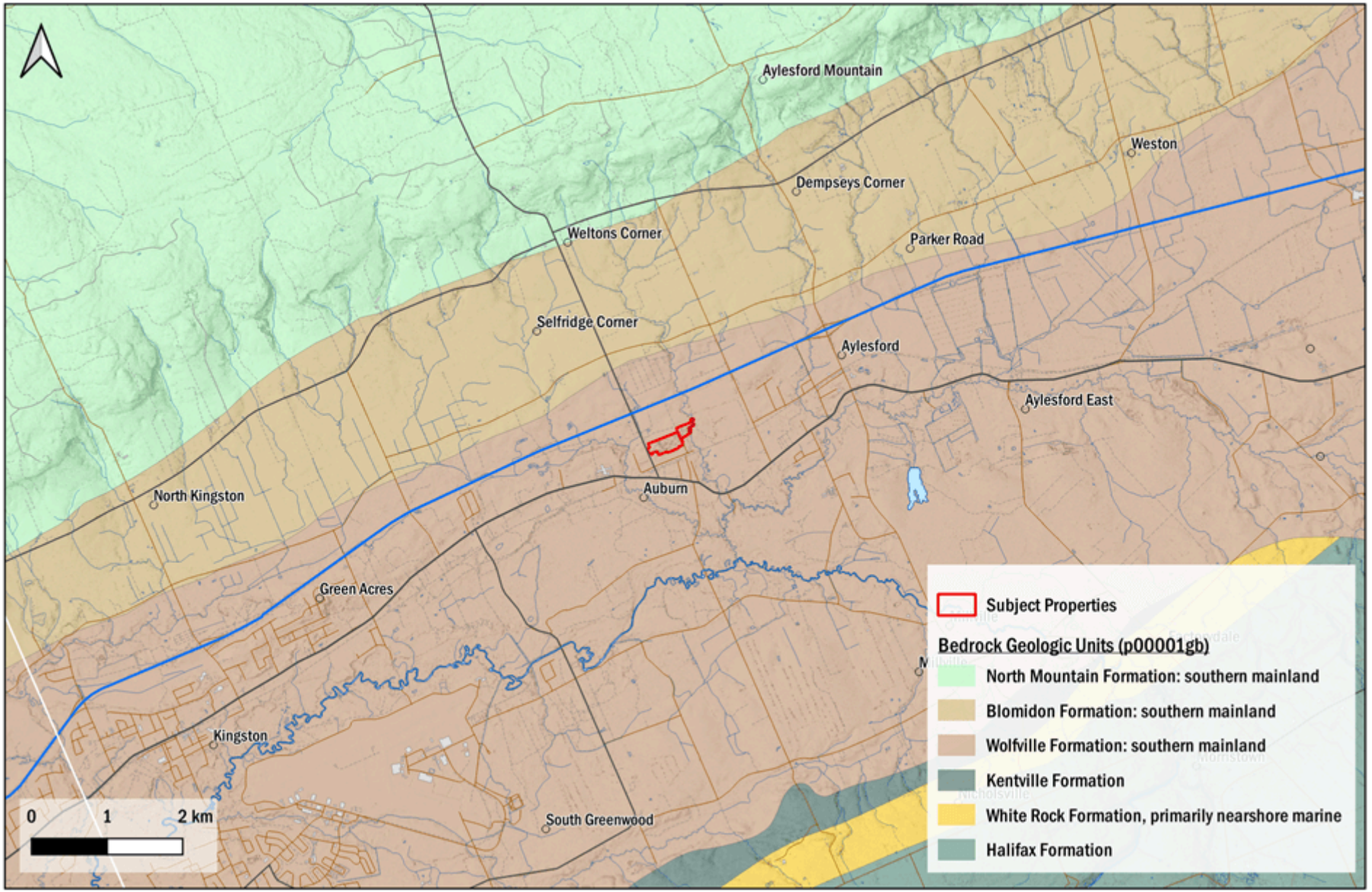
Using topographic mapping, the depth of the pit is estimated to be approximately 10 m. This estimate is based on contour data and may not fully capture localized variations in elevation.

The pit substrate consists of sand with some rock, consistent with the surrounding geological conditions.

Figure 7.1.9.1: Photograph of the existing exploration pit showing exposed sand deposits.



Drawing 7.1.9.1: Surficial Geology



Drawing 7.1.9.2: Bedrock Geology

7.2 SOCIOECONOMIC ENVIRONMENT

7.2.1 LOCAL ECONOMY, LABOUR FORCE, AND EMPLOYMENT

REGULATORY CONTEXT

Several federal, provincial, and municipal laws and regulations are relevant to the operations of the Project with respect to the local economy, the labour force, and employment.

FEDERAL

- ***Income Tax Act*** **[R.S.C. 1985, c. 1 (5th Supp.)] -** This Act governs taxation in Canada, including payroll and corporate taxes. The Project's economic activities will be subject to applicable tax regulations.

PROVINCIAL

- ***Labour Standards Code*** **(R.S.N.S. 1989, c. 246) -** This Code establishes minimum employment standards in Nova Scotia, including provisions for wages, hours of work, overtime, vacation entitlements, and employee protections. The Project must comply with these standards to ensure fair labour practices and adherence to provincial employment regulations.
- ***Occupational Health and Safety Act*** **(S.N.S. 1996, c. 7) -** This Act establishes the framework for workplace health and safety in Nova Scotia, outlining the responsibilities of employers to ensure a safe working environment. For sand pit operations, compliance with this Act is essential to protect workers from potential hazards associated with excavation and material handling activities.

MUNICIPAL

- ***Land Use By-Law*** **(Municipality of the County of Kings, By-Law 106) -** This by-law regulates land use, zoning, and development within the Municipality of the County of Kings. It establishes various land use zones and outlines the types of activities permitted within each zone, including provisions for industrial and aggregate-related industries. The by-law also sets requirements for development permits, ensuring that any proposed activities comply with zoning regulations and local land use policies. Compliance with this by-law ensures the Project adheres to municipal requirements for zoning and development approval, promoting responsible land use and environmental protection.

DESKTOP REVIEW : METHODOLOGY

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

- Municipality of the County of Kings Website (MoCK, 2024c)

- 2016 and 2021 Census Data (Statistics Canada, 2017, 2023)
- Kings County Agricultural Profile (NSFA, 2021)

DESKTOP REVIEW : RESULTS

OVERVIEW OF THE ECONOMY IN THE PROJECT REGION: The Project is located in Kings County, part of the Annapolis Valley Economic Region, which also includes Annapolis and Hants counties. Kings County, Nova Scotia's third-largest municipality, has a diverse economy driven by several key sectors:

- **Agriculture:** Kings County is a major agricultural hub, known for its fruit orchards, vineyards, and dairy farms. In 2021, the county was home to 120 fruit and tree nut farms, representing 19% of the provincial total. It also contains 50% of Nova Scotia's poultry and egg farms. Additionally, over 70% of the province's wineries are located in Kings County, supporting both agricultural production and tourism.
- **Tourism:** The region attracts visitors for its wineries, Acadia University in Wolfville, historic sites, and outdoor recreation activities along the Bay of Fundy.
- **Manufacturing:** Kings County is home to Michelin Tire Inc., an international tire manufacturer, contributing significantly to the manufacturing sector.
- **Aggregate Production:** Several pits and quarries operate in Kings County, providing construction materials to local and provincial markets.
- **Military:** Kings County is home to 14 Wing Greenwood at Canadian Forces Base Greenwood, the largest airbase on the East Coast, which provides significant employment in the region.
- **Healthcare Services:** Healthcare services in Kings County, including Valley Regional Hospital, support both local residents and the surrounding region.
- **Commercial Hubs:** The towns of Kentville, New Minas, and Wolfville serve as commercial centres, providing retail, professional services, and other businesses that support the regional economy.

EMPLOYMENT AND LABOUR FORCE: The demographic profile of Kings County and the Annapolis Valley Economic Region provides important context for assessing the local labour force and employment opportunities. Population growth, age distribution, and income levels are key factors that influence the availability of workers and economic activity in the area.

Kings County's population grew by 3.8% from 2016 to 2021, in line with the 4.5% growth in the Annapolis Valley and the 5% growth in the province (Table 7.21).

Table 7.21: Population Characteristics From 2016 to 2021

Statistics	Kings County	Annapolis Valley	Nova Scotia
Population (2021)	62,914	129,306	969,383
Population (2016)	60,600	123,749	923,598
Population Change From 2016 to 2021	+3.8%	+4.5%	+5.0%
Total Private Dwellings (2021)	30,366	62,284	476,007
Land Area	2,120.31 km^2	8,352.72 km^2	52,824.71 km^2
Population Density (2021)	29.7/km^2	15.5/km^2	18.4/km^2

Source: Statistics Canada (2023)

The age distribution in Kings County is similar to that of the Annapolis Valley and Nova Scotia as a whole. However, Kings County has a slightly higher proportion of adults aged 65 and over, compared to both the Annapolis Valley and the province (Table 7.22). Additionally, the average and median ages in Kings County and the Annapolis Valley are slightly higher than the provincial averages.

Table 7.22: Age Distribution in 2021

Statistics	Kings County	Annapolis Valley	Nova Scotia
0-14 years	9,040 (14.4%)	18,870 (14.6%)	136,710 (14.1%)
15-64 years	38,985 (62.0%)	79,945 (61.8%)	617,345 (63.7%)
65+ years	14,895 (23.7%)	30,495 (23.6%)	215,325 (22.2%)
Average age	44.9	45.2	44.2
Median age	47.2	48.0	45.6

Source: Statistics Canada (2023)

While the median total income of households increased from 2015 to 2020 in Kings County, the Annapolis Valley, and the province, unemployment rates rose, and employment rates decreased (Table 7.23). Specifically, Kings County saw a 1.7% increase in unemployment and a 3.2% decrease in employment.

Table 7.23: Employment Rates, Unemployment Rates, and Median Household Income (2016 vs. 2021)

Statistics	Kings County	Annapolis Valley	Nova Scotia
Employment Rate (2021)	51.1%	51.0%	51.9%
Employment Rate (2016)	54.3%	53.8%	55.2%
Unemployment Rate (2021)	11.0%	11.1%	12.7%
Unemployment Rate (2016)	9.3%	9.7%	10.0%
Median Total Income of Household (2020)	$68,000	$68,500	$71,500
Median Total Income of Household (2015)	$57,776	$58,135	$60,764

Source: Statistics Canada (2023, 2017)

The local economy in Kings County is diverse, with key sectors contributing to employment and economic activity. These sectors are crucial for understanding labour force availability and how they align with the Project's needs.

The top five industries in Kings County in both 2016 and 2021 were healthcare and social assistance, retail trade, public administration, manufacturing, and educational services (Table 7.24). Each industry saw increases in employment in 2021 when compared to 2016, except for retail trade (1.4% decrease) and public administration (0.3% decrease).

Table 7.24: Top Industries for the Employed Labour Force in Kings County (2016 vs. 2021)

Industry	2016	2021
Total Labour Force Aged 15+ Years (25% Sample Data)	30,170 (100%)	30,305 (100%)
Healthcare and Social Assistance	4,270 (14.2%)	4,955 (16.4%)
Retail Trade	4,115 (13.6%)	3,710 (12.2%)
Public Administration	3,105 (10.3%)	3,035 (10%)
Manufacturing	2,630 (8.7%)	2,860 (9.4%)
Educational Services	2,345 (7.8%)	2,545 (8.4%)

Source: Statistics Canada (2023, 2017)

LABOUR FORCE, SKILLS, AND LOCAL BUSINESS SUPPORT: The availability of a skilled workforce is critical to the Project.

Labour Force and Skills: The regional labour force includes workers trained in healthcare, retail, administration, and manufacturing. However, employment in trades and construction-related fields, such as heavy equipment operation and mechanics, is also relevant to the Project.

Relevant Skillsets for Pit Operations: Heavy equipment operators, general labourers, and truck drivers will be required. Training in occupational health and safety (OHS) and first aid is typically required for these roles. The second most common occupation in Kings County is in 'trades, transport, and equipment operators and related occupations', suggesting that these skills are likely available. Further, OHS and first aid training are accessible locally throughout the Project Region, ensuring that workers can meet basic safety requirements.

Local Business Support: Several sectors may provide auxiliary support to the Project, including:

- Fuel suppliers for heavy machinery
- Heavy equipment mechanisms
- Trucking companies for material transport
- Construction and engineering firms for site development and monitoring

Project Phases and Employment Opportunities:

- During operation, employment will be steady, with ongoing demand for equipment operators and truck drivers.
- During reclamation, fewer workers may be required, but some roles (e.g., environmental monitoring and revegetation) may increase.

7.2.2 LAND USE AND PROPERTY VALUES

REGULATORY CONTEXT

Several provincial and municipal laws and regulations are relevant to the operations of the Project with respect to land use and property values.

PROVINCIAL

- ***Assessment Act*** **(R.S.N.S. 1989, c. 23)** - This Act establishes the framework for property assessment in Nova Scotia. Under this Act, the Property Valuation Services Corporation is responsible for determining the market value of properties for taxation purposes.
- ***Municipal Government Act*** **(S.N.S. 1998, c. 18)** - This Act grants municipalities the authority to create land use by-laws and planning strategies, and collect property taxes. The Project must comply with relevant municipal by-laws and planning regulations to ensure alignment with local land use policies and community interests.

MUNICIPAL

- ***Land Use By-Law*** **(Municipality of the County of Kings, By-Law 106) -** This by-law regulates land use, zoning, and development within the Municipality of the County of Kings. It establishes various land use zones and outlines the types of activities permitted within each zone, including provisions for industrial and aggregate-related industries. The by-law also sets requirements for development permits, ensuring that any proposed activities comply with zoning regulations and local land use policies. Compliance with this by-law ensures the Project adheres to municipal requirements for zoning and development approval, promoting responsible land use and environmental protection.

- ***Municipal Planning Strategy*** **(Municipality of the County of Kings, By-Law 105) -** The Municipal Planning Strategy establishes the long-term vision for land use and development in the Municipality of the County of Kings. It outlines goals and policies related to residential, agricultural, industrial, and resource-based land uses, including the regulation of aggregate operations. The strategy provides direction for zoning, subdivision, and infrastructure planning to ensure that development aligns with municipal priorities for environmental protection, community wellbeing, and sustainable growth. Adherence to the strategy ensures that the Project is consistent with the County's land use planning framework.

- ***Tax Collection Fees By-Law*** **(Municipality of the County of Kings, By-Law 78) -** This by-law authorizes the Municipality to collect property taxes under the *Municipal Government Act,* S.N.S. 1998, c. 18 and the *Assessment Act,* R.S.N.S. 1989, c. 23. It outlines applicable fees for executing tax warrants and recovering unpaid taxes. While not directly related to land use, it supports municipal operations and ensures compliance with financial obligations associated with property ownership.

DESKTOP REVIEW : METHODOLOGY

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

- Municipality of the County of Kings By-law 106 - Land Use By-law (MoCK, 2024b)
- ViewPoint Map (ViewPoint, 2025)
- Nova Scotia Finance and Treasury Board Report (Storring, 2021)

DESKTOP REVIEW : RESULTS

MUNICIPAL LAND USE: ZONING OF THE PROJECT AREA: The Project is situated within two primary zoning categories as defined by the *Municipality of the County of Kings Land Use By-law*: A2 - Rural Mixed Use and O1 - Environmental Constraints (Drawing 7.2.2.1).

A2 - Rural Mixed Use Zone: The majority of the existing sand pit and most of the expansion area are located within the A2 - Rural Mixed Use Zone. This zone is designed to facilitate a blend of agricultural, residential, and resource uses, allowing for the growth of agricultural industries while accommodating rural housing demands. The zone prioritizes agricultural uses over non-agricultural uses in the event of a conflict.

Examples of permitted uses in this zone include:

- **Residential Uses:** One-unit dwellings, mobile homes, semi-detached dwellings, two-unit dwellings, and recreational cabins are permitted, subject to the by-law's general regulations.
- **Non-Residential Uses:** Agricultural-related industries, forest industry uses, fish farms, community facilities, places of worship, and wildlife rescue centres.
- **Agricultural Uses:** A wide range of agricultural activities are permitted, including livestock operations, greenhouses, farming, vineyards, farm markets, and other agriculturally supportive uses.

This zoning designation is intended to accommodate the existing sand pit and the majority of the proposed expansion area for the project. The inclusion of agricultural and resource industries within the A2 zone supports the compatibility of sand pit operations with the surrounding land uses while also aligning with municipal goals for agricultural growth and rural development.

O1 - Environmental Constraints Zone: A portion of the proposed sand pit expansion area falls within the O1 - Environmental Constraints Zone. This zone is intended to protect areas identified as environmentally sensitive due to risks such as flooding, erosion, slope failure, and other unique features that make development in these areas potentially harmful.

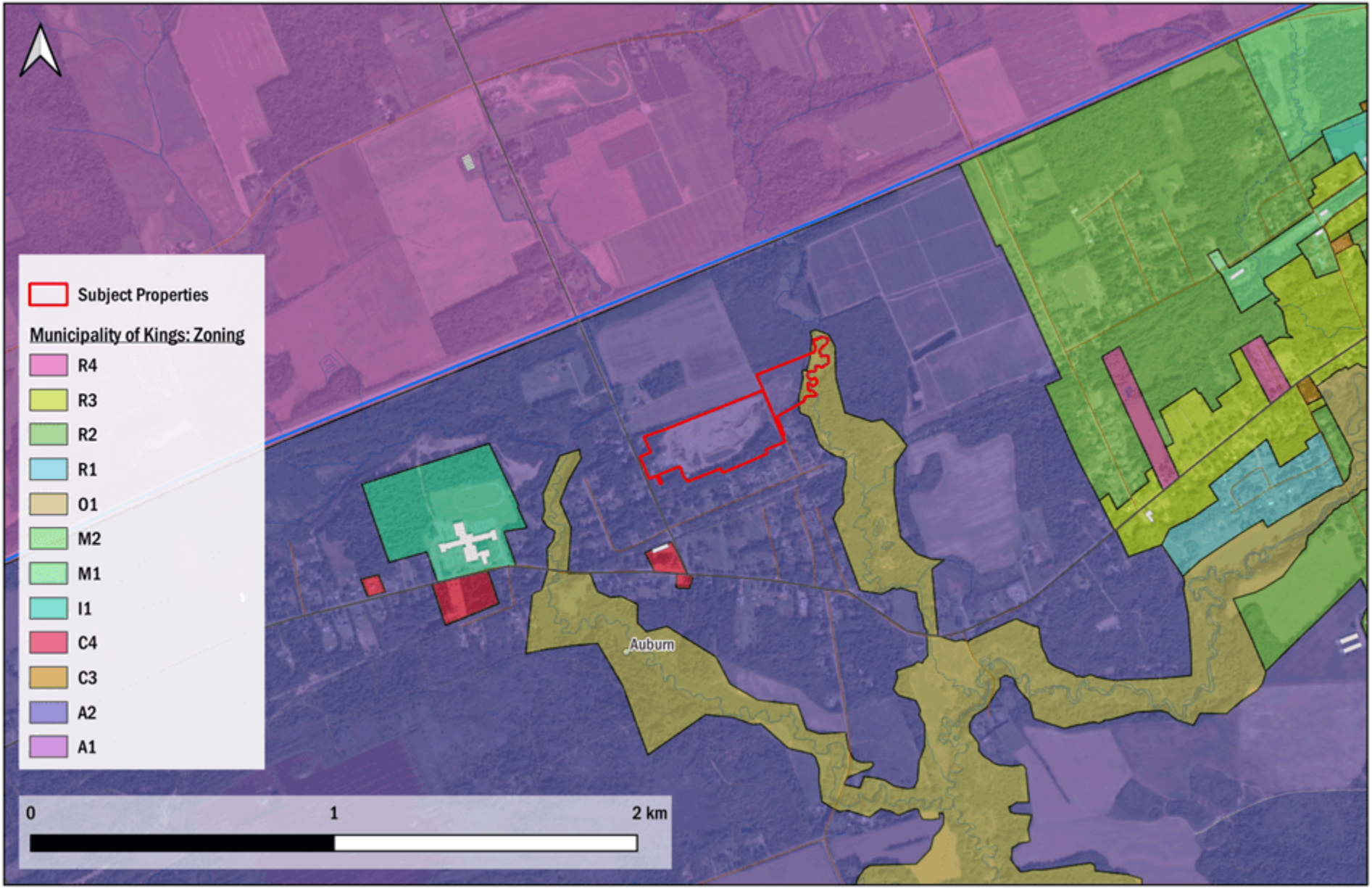
Permitted uses in this zone include:

- **Non-Residential Uses:** Agricultural uses, fishing uses, remote-controlled aircraft fields (existing), and forestry uses

For the proposed project, a 30 m setback from watercourses has been incorporated into the design to ensure that sand pit operations do not encroach into sensitive environmental areas covered by the O1 zoning, which also encompasses adjacent wetlands.

SURROUNDING LAND USES: The Project Site is surrounded by a mix of land uses. To the south and west, residential properties are situated within close proximity. To the north and east are agricultural fields, aligning with the A2 zoning and complementing the rural landscape.

Most of the surrounding Project Area is within zones A1 and A2, with several agricultural fields situated within zone A1.



Drawing 7.2.2.1: Land Use Zoning

BROADER LAND USES IN THE REGION: The broader Project Region is predominantly rural, with a mix of agricultural, residential, and resource-based land uses. South of the Project, land is primarily designated as N1 (Resource), which preserves large tracts of uninhabited forested land for resource development. 14 Wing Greenwood, a major regional employer and military installation, is located approximately 4.5 km southwest of the Project. The majority of land in the Project Region is privately owned, with several parks and protected areas nearby, which are discussed further in Section 7.2.4.

PROPERTY VALUES: The property values within the Project Area were assessed by reviewing several nearby properties, categorized by land use types, including residential, agricultural, commercial, forest/woodland, and vacant land. Property sizes and assessment values were averaged for each land type using data from ViewPoint (2025) based on a sample size of five properties per category. The average assessment value per acre was then calculated for each category (Table 7.25).

Table 7.25: Property Assessment Values by Land Use

Land Use	Average Property Size (Acres)	Average Assessment Value ($)	Average Assessment Value per Acre ($)
Residential	0.8	285,420	355,000
Agricultural	24.4	39,660	1,622
Commercial	1.1	232,460	215,240
Forest/Woodland	5.1	2,700	534
Vacant Land	2.4	26,060	10,987

Source: ViewPoint (2025)

To provide additional context, property value data from Statistics Canada's Canadian Housing Statistics Program (CHSP), as discussed in a 2021 report by the Nova Scotia Finance and Treasury Board, was reviewed. This report provides a broader regional perspective on assessment values and ownership trends in Nova Scotia, using data from the CHSP. According to CHSP data, the median assessment value of residential properties in Nova Scotia was $131,000 in 2020, a slight increase from $129,000 in 2019. For Kings Subdivision A, where the Project Area is located, the median assessment value was $132,000 in 2020, indicating slightly higher property values compared to the provincial median.

It is important to note the differences between the ViewPoint dataset and the CHSP data. The ViewPoint data represents a small, localized sample of five properties per land-use category, while the CHSP data provides a broader perspective based on median values, focusing primarily on residential properties. While the CHSP data reflects trends at the provincial and regional levels, the ViewPoint data encompasses a wider variety of land uses relevant to the Project Area. These differences in methodology and scope contribute to variations in reported

property values, which should be considered when assessing potential impacts on property values in the context of the Project.

7.2.3 TRANSPORTATION AND INFRASTRUCTURE

REGULATORY CONTEXT

Several provincial laws and regulations are relevant to the operations of the Project with respect to transportation and infrastructure.

PROVINCIAL

- ***Carriage of Freight by Vehicle Regulations*** **(N.S. Reg. 24/95)** - These regulations, under the *Motor Vehicle Act,* R.S.N.S. 1989, c. 293, impose insurance and inspection requirements for vehicles over 4,500 kg. They ensure the safe and compliant transportation of freight by regulating vehicle standards, load securing, and safety measures. Compliance with these regulations is important for the project to ensure the legal and safe transport of materials.

- ***Spring Weight Restriction Regulations*** **(N.S. Reg. 46/2025)** - These regulations, made under the *Public Highways Act,* R.S.N.S. 1989, c. 371, impose restrictions on the weight of vehicles operating on specific roads in Nova Scotia during the thawing of road surfaces. If the Project involves heavy transportation during the spring, it will need to comply with these restrictions to avoid exceeding weight limits and to ensure the protection of the provincial road network.

- ***Pit and Quarry Guidelines*** **(1999, Revised 2003)** - In accordance with provincial regulations, the active area of a pit or quarry operation must be located at least 30 m from the boundary of a public or common highway unless consent is obtained from Nova Scotia Public Works (NSPW). Similarly, excavation 'working faces' and blasting activities must adhere to the same separation distance unless prior written consent is granted by the Department. These regulations ensure safe distances from transportation corridors and minimize disruption to public infrastructure.

DESKTOP REVIEW : METHODOLOGY

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

- Road Weight Designations Map (NSPW, 2024)
- Spring Weight Road Restrictions Map (NSPW, 2025a)
- Traffic Volumes - Provincial Highway System Data (NSPW, 2025b)

DESKTOP REVIEW : RESULTS

TRANSPORTATION: The Project Site is accessed via a private road off Morden Road (Highway 361), a local road that connects to the broader transportation network. Morden Road connects to Highway 221 to the north and Highway 1 to the south. Highway 1 is a key transportation corridor that provides access to nearby communities and markets.

For wider regional distribution, Highway 101, a major east-west highway running through the northern part of Nova Scotia from Bedford to Yarmouth, is a primary route to markets beyond the local area, including connections to Halifax and other provincial destinations. Highway 101 can be accessed via Victoria Road in Aylesford.

Another major east-west highway, Highway 103, runs along the South Shore from Halifax to Yarmouth and serves as a key route to markets in that region. Common routes from the Project Site to Highway 103 include Highway 12, which begins in Kentville and runs south to Chester, and Highway 10, which begins in Middleton and runs south to Bridgewater. Aylesford Road also provides an alternative route to Highway 103.

The key roads leading to the Project Site are subject to various weight designations. The *Road Weight Designations Map* for Nova Scotia identifies the weight restrictions on major routes. Morden Road has an 'Intermediate Weight' designation of 49,500 kg, as does the portion of Highway 1 from Morden Road to Victoria Road. The remainder of Highway 1 alternates between different road weight designations, ranging from 41,500 kg to 62,500 kg. Victoria Road and Highway 101 have a 'Maximum Weight' designation of 62,500 kg, while Highway 12 and Highway 10 have a 'B Train' designation of 62,500 kg.

Additionally, the Project Area is affected by spring weight restrictions, which are in place to protect road infrastructure during thawing periods. These restrictions, outlined in the *Spring Weight Restriction Regulations,* N.S. Reg. 46/2025, are in effect each spring and impact most non-major roads. The key highways used for the Project, including Highway 1, Highway 101, Highway 103, Highway 10, and Highway 12, as well as other major routes, are exempt from these restrictions.

Traffic volumes on the primary roads used for transporting materials and equipment to and from the Project Site are monitored by the provincial government. The *Traffic Volumes Provincial Highway System* data offers insights into traffic levels on these routes. The nearest 'Traffic Volume Section' to the Project site is a 5.7 km stretch along Highway 1, from Victoria Road in Aylesford to Route 201 in Auburn. The Annual Average Daily Traffic along this section was 4,490 in 2024. Since the Project is already in operation, the proposed expansion of the sand pit is not expected to significantly increase traffic volumes, as the current transportation activity will remain largely the same.

UTILITIES AND INFRASTRUCTURE: The Project Site is currently serviced by the existing public road network, including Morden Road, which provides direct access to the sand pit. There are no on-site water or wastewater systems, as the operation does not use a well or septic field. Sanitary facilities are provided via portable restrooms. The site does not require permanent infrastructure, and no new utility connections are anticipated for this expansion.

The site is located within the reach of existing power lines and transmission lines, which supply electricity to nearby areas. These power lines are part of the regional infrastructure and will support any temporary power needs for the expanded operation.

7.2.4 RECREATION AND TOURISM

REGULATORY CONTEXT

Several municipal by-laws are relevant to the operations of the Project with respect to recreation and tourism.

MUNICIPAL

- ***Land Use By-Law*** **(Municipality of the County of Kings, By-Law 106) -** This by-law regulates land use, zoning, and development within the Municipality of the County of Kings, including provisions for recreational and tourism-related activities. It establishes various land use zones, such as the Commercial Recreation (P1) Zone, which is designated for development permits, outdoor recreation, and leisure-based businesses. Compliance with this by-law helps maintain designated areas for recreation and tourism while supporting responsible land use planning.
- ***Municipal Planning Strategy*** **(Municipality of the County of Kings, By-Law 105) -** The Municipal Planning Strategy outlines long-term land use policies and development goals for the Municipality of the County of Kings, including provisions for recreation and tourism. It identifies areas designated for commercial and public recreation, supports tourism-related economic development, and aims to balance growth with environmental and community interests. The strategy guides decision-making on zoning, infrastructure, and land use to ensure that recreational and tourism activities align with broader municipal planning objectives.

DESKTOP REVIEW : METHODOLOGY

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

- Nearby Trails (AllTrails, n.d.)
- Fishing Areas (Fish Nova Scotia, n.d.)
- Parks and Protected Areas (Government of NS, n.d.)

- Tourism Nova Scotia (Tourism Nova Scotia, n.d.)
- Parks Canada (Parks Canada, n.d.)
- Municipality of the County of Kings Website (MoCK, 2024c)

DESKTOP REVIEW : RESULTS

RECREATION AND TOURISM OVERVIEW: Recreation and tourism activities in the Project Region contribute significantly to both the local quality of life and the economy. These activities include outdoor recreation like hiking, fishing, and snowmobiling and tourism attractions such as parks, trails, wineries, and cultural sites. Scenic landscapes are also a key component of nature-based tourism, with ecotourism and sustainable tourism initiatives becoming increasingly popular. Local businesses, including accommodations, restaurants, and other hospitality services, rely heavily on tourism traffic.

RECREATIONAL ACTIVITIES AND SITES IN THE REGION

Hiking Trails: Several trails are located within the Project Region, including the 110 km Harvest Moon Trailway, which spans from Annapolis Royal to Grand Pré. This trailway, a partnership of 22 trails, is commonly used for hiking, cycling, ATV riding, snowmobiling, dog walking, and more. It runs within 200 m of the Project Site.

Other smaller trails in the region include the Kingston Family Fitness Trail, an 800 m loop located approximately 7 km southwest of the Project, and the Factorydale Falls Trail, an 800 m out-and-back trail near Nicholsville, approximately 7.5 km southeast of the Project. The Fales River Trail, a 2.1 km trail in Greenwood, is frequently visited by birders and is located about 8 km southwest of the Project.

The Aylesford Mountain Loop, located within the Aylesford Mountain Nature Reserve, is a 10 km loop trail approximately 8 km northeast of the Project, commonly used for hiking and mountain biking. Crystal Falls, located approximately 9 km south of the Project near Harmony, is a 3.9 km out-and-back trail that leads to a scenic waterfall and pond, popular year-round for birding and hiking, as well as swimming and mountain biking in the summer.

Fishing and Hunting: The Annapolis River, located near the Project Site, is a popular fishing destination for species such as Brook Trout, Striped Bass, and American Shad. Additionally, Aylesford Lake, approximately 16 km southwest of the Project, is well known for fishing for Smallmouth Bass and Chain Pickerel.

No significant hunting areas have been identified near the Project, though hunting may occur on private or Crown lands in accordance with provincial regulations.

Parks and Protected Areas: Nearby parks and protected areas include Clairmont Provincial Park (~3 km east), a small picnic park within a stand of red pine, the North Mountain Woodlands Conservation Lands (~7 km northwest), and the Aylesford Mountain Nature Reserve (~8 km northwest).

Additionally, various local parks and recreational areas are within a short distance of the Project, including sports fields, playgrounds, and community parks. Examples include facilities at West Kings District High School, located 500 m east of the Project, which has multiple sports fields and recreational amenities.

Several campgrounds are also located nearby, including Klahanie Kamping Ltd., approximately 3 km east of the Project, and Yogi Bear's Jellystone Park Camp Resort, approximately 8 km west of the Project. Nearby golf courses include the Greenwood Golf Club, approximately 5 km southwest of the Project, and the Berwick Heights Golf Course, approximately 6 km northeast.

Scenic Areas and Lookoffs: The Annapolis Valley is renowned for its diverse scenic landscapes, including coastal views, agricultural fields, and rolling forested hills, which support a strong nature-based tourism industry.

A popular destination is The Lookoff, otherwise known as the Canning Lookoff, located on the North Mountain. It offers panoramic views of the Annapolis Valley, with farmland, forests, and the Bay of Fundy and Minas Basin in the distance.

Crystal Falls, located approximately 9 km south of the Project, is a notable natural attraction featuring a scenic waterfall and pond, surrounded by mixed forest.

The Project Region also offers several scenic drives, particularly along the Evangeline Trail (Highway 1), which winds through the Annapolis Valley, passing through towns such as Kentville and Wolfville. This route provides views of orchards, vineyards, and the Bay of Fundy. Additionally, stretches of Highway 101 offer elevated viewpoints of the surrounding landscape.

The Project is within 15 km of the Bay of Fundy, near several scenic coastal communities including Harbourville, Margaretsville, and Port George. These areas are popular tourist destinations known for their rocky shores, lighthouses, art shops, and oceanfront views.

TOURIST ATTRACTIONS AND BUSINESSES RELIANT ON TOURISM

Museums and Cultural Sites: The Project Region contains several museums, historic sites, and cultural attractions that contribute to local tourism:

- **Fort Anne National Historic Site** (Annapolis Royal) - One of Canada's oldest national historic sites, showcasing military history and early colonial settlement.
- **Port-Royal National Historic Site** (Annapolis Royal) - A significant French settlement dating back to 1605, marking one of the earliest European settlements in Canada, providing insight into early colonial life.

- **Greenwood Military Aviation Museum** (Greenwood) - Preserves the history of aviation in the region, with exhibits on the Royal Canadian Air Force operations and aircraft displays.
- **Berwick Apple Capital Museum** (Berwick) - Highlights the history of the apple industry in the Annapolis Valley.
- **The Kentville Heritage Centre** (Kentville) - Offers exhibits on local history, including agriculture, railways, and early settlement.
- **Grand Pré National Historic Site** (Grand Pré) - A UNESCO World Heritage Site recognized for its historical significance to the Acadian culture, this site commemorates the tragic deportation of the Acadians in the 18th century.

Tourist-related Businesses: The regional economy benefits from businesses that depend on seasonal and year-round tourism, including:

- **Accommodations** - Several hotels, inns, and bed-and-breakfasts serve visitors, particularly in towns such as Kentville, Berwick, and Annapolis Royal.
- **Restaurants and Cafés** - Local eateries serve both residents and visitors, offering a mix of casual dining, bakeries, seafood, and restaurants featuring regional specialties.
- **Wineries and Breweries** - The Annapolis Valley is home to renowned wineries such as Planters Ridge Winery, Domaine de Grand Pré, and Lightfoot & Wolfville Vineyards, which attract wine tourism and host tasting events. Craft breweries, cideries, and distilleries also contribute to the tourism industry.
- **Farm Markets and Agritourism** - Farmers' markets, such as the Kentville Farmers Market, and U-pick farms like Dempsey Corner Orchards provide fresh local produce and artisan goods, drawing both locals and visitors. Local greenhouses also contribute to agritourism in the region.
- **Recreational Outfitters and Guides** - Businesses offering kayaking, cycling rentals, and guided tours contribute to nature-based tourism in the region.
- **Retail and Artisan Shops** - Local artisans, galleries, and gift shops provide handcrafted goods, arts, and souvenirs, catering to tourists exploring the Annapolis Valley.

7.3 CULTURAL AND HERITAGE RESOURCES

7.3.1 ARCHAEOLOGICAL RESOURCES AND HISTORICAL SITES

REGULATORY CONTEXT

Several provincial laws and regulations are relevant to the operations of the Project with respect to archaeological and historical resources.

PROVINCIAL

- ***Special Places Protection Act*** **(R.S.N.S. 1989, c. 438)** - This Act protects archaeological and historical sites in Nova Scotia. It prohibits any exploration or excavation on land, including land covered by water, for the purpose of seeking heritage objects without a heritage research permit. The Project will comply with the Act, and any necessary archaeological investigations will be conducted under the appropriate permit.

DESKTOP REVIEW AND FIELD PROGRAMS : METHODOLOGY

In accordance with the *Special Places Protection Act,* R.S.N.S. 1989, c. 438, an Archaeological Resource Impact Assessment (ARIA) was completed for the proposed pit expansion by Cultural Resource Management Group Limited (CRM Group), under Heritage Research Permit A2025NS030. The assessment was conducted in accordance with provincial guidelines and included Mi'kmaq engagement, background research, and archaeological fieldwork.

The desktop component involved a review of historic and environmental mapping, previous archaeological studies, and heritage site databases to evaluate archaeological potential within the Project Site. The field component involved an archaeological reconnaissance survey conducted in March 2025 to identify any surface indications of archaeological resources or areas of elevated archaeological sensitivity.

Further details of the assessment methodology were documented in the ARIA report, which was submitted to Nova Scotia Communities, Culture, Tourism, and Heritage (NSCCTH) and approved on August 1, 2025.

DESKTOP REVIEW AND FIELD PROGRAMS : RESULTS

No archaeological resources were identified during the March 2025 reconnaissance survey. However, one area within the Project Site was identified as having high potential for Pre-contact Mi'kmaq archaeological resources. Based on these findings, CRM Group has recommended avoiding this area during project activities to prevent potential impacts to archaeological resources.

Further details of the results were documented in the ARIA report, which was submitted to NSCCTH and approved on August 1, 2025.

7.3.2 MI'KMAQ CULTURAL RESOURCES

REGULATORY CONTEXT

Several federal and provincial laws and regulations are relevant to the operations of the Project with respect to Mi'kmaq cultural resources.

FEDERAL

- ***The Constitution Act*** **(1982, c. 11) -** This Act affirms the treaty and Aboriginal rights of Indigenous peoples in Canada, as recognized under Section 35. These rights include cultural and heritage protections, relevant to the Project's consideration of Mi'kmaq cultural resources. The duty to consult arises from Section 35, which mandates the Crown to consult with Indigenous peoples when a proposed action may affect their rights, stemming from the Honour of the Crown. This consultation process is essential for addressing Mi'kmaq concerns during the Project.

- ***Peace and Friendship Treaties*** **(1725-1779) -** The Mi'kmaq of Nova Scotia hold treaty rights, established under the historic Peace and Friendship Treaties, to hunt, fish, and gather for food and to earn a moderate livelihood. These rights were affirmed and clarified by the Supreme Court of Canada in the landmark *R. v. Marshall* (1999) decision, which recognized the Mi'kmaq's continuing entitlement to harvest and trade in their traditional territories. These treaties remain in effect and are constitutionally protected under Section 35 of the *Constitution Act, 1982*.

- ***United Nations Declaration on the Rights of Indigenous Peoples Act*** **(S.C. 2021, c. 14) -** This Act affirms the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) as a universal human rights instrument applicable in Canadian law. It commits the federal government to aligning Canadian laws with UNDRIP in consultation and cooperation with Indigenous peoples. The Declaration includes provisions relevant to the protection of cultural sites:

    - **Article 11(1):** Indigenous peoples have the right to practice and revitalize their cultural traditions and customs, including the right to maintain, protect, and develop the past, present, and future manifestations of their cultures, such as archaeological and historical sites.

    - **Article 12(1):** Indigenous peoples have the right to maintain, protect, and access their religious and cultural sites in privacy.

PROVINCIAL

- ***Special Places Protection Act*** **(R.S.N.S. 1989, c. 438)** - This Act protects archaeological and historical sites in Nova Scotia. Under the Act, a heritage research permit is required for any exploration or excavation related to cultural or heritage objects. The Project will ensure compliance with this Act, as well as all necessary permits, in consultation with relevant stakeholders.

- ***Terms of Reference for a Mi'kmaq-Nova Scotia-Canada Consultation Process*** **(2010)** - This consultation process is used whenever Canada or Nova Scotia engages in consultation with one or more Mi'kmaq Bands regarding decisions or activities that may impact Mi'kmaq Aboriginal or treaty rights, including those related to Crown land, water, or natural resources. The process aims to ensure that consultation is conducted meaningfully, respecting the Mi'kmaq's Section 35 rights. While it does not guarantee agreement on outcomes, it is the preferred framework for consultation between the parties.

DESKTOP REVIEW AND FIELD METHODS : METHODOLOGY

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

- Peace and Friendship Treaties (Government of Canada, 2015a)
- Town of Annapolis Royal Website (Town of Annapolis Royal, n.d.)
- 2021 Census Data (Statistics Canada, 2023)

ARIA STUDY

As part of the ARIA conducted under Heritage Research Permit A2025NS030, CRM Group included Mi'kmaq engagement and a focus on identifying potential Pre-contact Mi'kmaq cultural resources. The assessment was carried out in accordance with provincial guidelines and involved both background research and archaeological fieldwork.

The background study included a review of historic and environmental mapping, previous archaeological studies, and heritage site databases to evaluate archaeological potential. Fieldwork included an archaeological reconnaissance of the Study Area in March 2025 to search for, document, interpret, and make management recommendations for cultural heritage resources and areas of elevated archaeological potential.

Further details of the assessment methodology were documented in the ARIA report, which was submitted to NSCCTH and approved on August 1, 2025.

DESKTOP REVIEW AND FIELD METHODS : RESULTS

The Project is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq, the founding people of Nova Scotia. Archaeological evidence indicates that the Mi'kmaq have inhabited Nova Scotia for 9,000 to 11,000

years. Within the Annapolis Valley, the Mi'kmaq lived in the region known as Kespukwik, later renamed Annapolis Royal by European settlers. The Mi'kmaq had a deep connection to the land, utilizing its resources for their food, social, and ceremonial practices. This connection has shaped the Mi'kmaq culture and traditions for millennia.

The Mi'kmaq were part of the larger Algonquin-speaking peoples who lived in northeastern North America. Over the thousands of years they inhabited the region, several periods of settlement have been identified by archaeologists, each revealing the Mi'kmaq's relationship with the land and ecosystems. The Mi'kmaq developed technologies, practices, and belief systems that were closely tied to the natural resources of their homeland. Today, Mi'kmaq cultural heritage and practices continue to be vital to communities across Nova Scotia, including in the Annapolis Valley.

The Mi'kmaq of the Annapolis Valley are part of the Mi'kmaq Nation, which is party to the Peace and Friendship Treaties signed with the British Crown in the 18th century, including the 1725–26 Treaty ratified at Annapolis Royal, the 1752 Treaty with Chief Jean-Baptiste Cope, and the 1760–61 Halifax Treaties. These treaties, which remain in effect and are constitutionally protected under Section 35 of the *Constitution Act, 1982*, affirm Mi'kmaq rights to hunt, fish, and gather towards earning a moderate livelihood (Government of Canada, 2015a).

Three First Nations communities are located within proximity of the Project:

- **Annapolis Valley First Nation (AVFN)** - Approximately 17 km east of the Project Site, AVFN is one of the Mi'kmaq communities in the Annapolis Valley, with a strong cultural connection to the region. In 2021, AVFN had a population of 743.
- **Glooscap First Nation** - Approximately 50 km east of the Project Site, Glooscap First Nation is a nearby Mi'kmaq community with historical ties to the region. In 2021, Glooscap First Nation had a population of 111.
- **Bear River First Nation** - Approximately 80 km southwest of the Project Site, Bear River First Nation is a nearby Mi'kmaq community in the Annapolis Valley, located in both Annapolis County and Digby County. In 2021, Bear River First Nation had a population of 156.

Information on engagement with the Mi'kmaq of Nova Scotia can be found in Section 6.1.

ARIA STUDY

No archaeological resources were identified during the March 2025 archaeological reconnaissance conducted by the CRM Group. However, one area within the Project Site was identified as having high potential for Pre-contact Mi'kmaw archaeological resources. CRM Group has recommended that the area be avoided during project activities.

Further details of the results were documented in the ARIA report, which was submitted to NSCCTH and approved on August 1, 2025.

7.4 HUMAN HEALTH AND WELL-BEING

7.4.1 NOISE LEVELS

REGULATORY CONTEXT

Several provincial and municipal laws and regulations are relevant to the operations of the Project with respect to noise levels.

PROVINCIAL

- ***Guidelines for Environmental Noise Measurement and Assessment*** **(NSECC, 2023)** - These guidelines provide direction for proponents required to assess environmental noise as part of the regulatory process under the *Environment Act,* S.N.S. 1994-95, c. 1. Applicable to activities regulated by the *Activities Designation Regulations*, N.S. Reg. 47/95, the guidelines outline noise measurement standards, permissible sound levels, and compliance expectations for noise assessments. The guidelines ensure that noise impacts are quantified accurately, showing the maximum noise expected from the proposed activity and demonstrating compliance with provincial environmental standards.

- ***Pit and Quarry Guidelines*** **(1999, Revised 2003)** - These guidelines outline noise level limits for pit and quarry operations at property boundaries, specifying acceptable sound levels during different times of the day (day, evening, night) to ensure compliance with provincial standards. Regular monitoring and reporting are required to maintain these limits and minimize noise disturbances in surrounding areas.

MUNICIPAL

- ***Noise Control By-Law*** **(Municipality of the County of Kings, By-Law 84)** - This by-law regulates noise that may disturb residents, particularly from construction and excavation activities, including equipment operation. It sets restrictions on noise during specific hours, with exemptions, and enforcement at the Municipality's discretion. Given the site's A2 - Rural Mixed Use zoning, which allows a combination of residential, agricultural, and rural uses, there may be noise-sensitive areas nearby. Noise control measures will be implemented to minimize disruption and ensure compliance with both the by-law and zoning requirements.

DESKTOP REVIEW : METHODOLOGY

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

- Nova Scotia Civic Address File Data (GeoNOVA, 2025)
- Noise Assessment of Stone/Aggregate Mines: Six Case Studies (Bauer & Babich, 2007)
- FHWA Highway Construction Noise Handbook (U.S. Department of Transportation, 2006)
- Noise in Mining (Government of Ontario, 2022)
- Noise From Construction Equipment and Operations, Building Equipment, and Home Appliances (U.S. EPA, 1971)

DESKTOP REVIEW : RESULTS

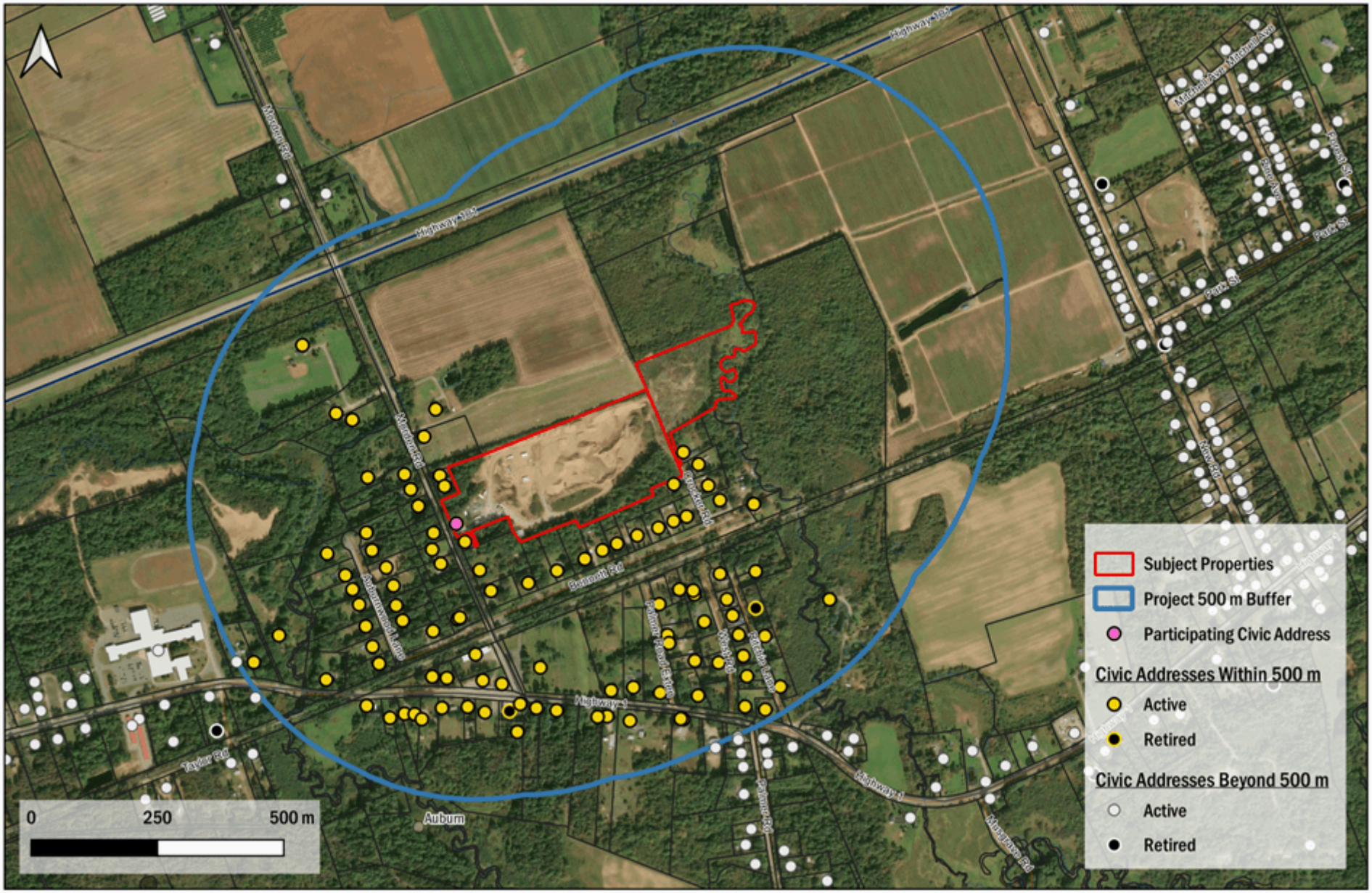
The Project is located in a mixed-use rural area that includes agricultural lands, scattered residences, and natural areas. The baseline acoustic environment is characteristic of such settings: generally quiet but subject to intermittent and localized noise from human activity. Agricultural operations, including farm machinery and livestock activity, contribute to the existing ambient soundscape, particularly during daytime hours. Vehicular traffic from nearby highways adds a persistent background level of anthropogenic noise, which is more noticeable during the day.

The site is an existing sand pit operation currently active under an Industrial Approval for extraction at a scale below 4 ha. To date, there are no known noise complaints related to the ongoing operation. Existing noise sources include on-site heavy equipment (e.g., trucks and loaders) and transport vehicle traffic to and from the pit. Blasting is not required for sand extraction and is not part of current or future operations.

Noise levels in the area are expected to vary between day and night, with increased daytime contributions from farming activity, personal vehicle traffic, and occasional community or seasonal events. At night, reduced human activity results in a quieter environment. These fluctuations create a variable but predictable acoustic baseline for the area.

Residential receptors are located in the Project Area (see Drawing 7.4.1.1). A total of 101 civic addresses are located within 500 m of the Project, based on mapping of nearby residences. Of these, 99 are considered active residences, two are known to be unoccupied or retired addresses, and one is a participating residence located within the Project Site.

The physical environment also influences how sound propagates from the pit. The Project Site includes existing berms and pit walls, which can act as barriers to reduce sound transmission. Forested areas surrounding the pit provide additional acoustic buffering. The substrate, consisting primarily of sand, may also contribute to groundborne vibration dampening.



Drawing 7.4.1.1: Noise Receptors

During operation, typical noise sources include excavation and loading equipment, transport trucks, and potentially screening units. These noise sources vary in intensity depending on equipment type and distance. Table 7.26 provides reference noise levels for typical quarry equipment at 15 m, along with estimated sound levels at 150 m. The 150 m values were calculated using the inverse square law for sound propagation in a free field. For a point source in open space, sound levels decrease by approximately 6 dBA with each doubling of distance. The general formula is:

$$L_2 = L_1 - 20 \times \log_{10}(d_2 / d_1)$$

Where:

- L_1 = original sound level at distance d_1 (e.g., 15 m)
- L_2 = estimated sound level at distance d_2 (e.g., 150 m)

Applying this to the case of estimating noise at 150 m from a known value at 15 m:

$$L_2 = L_1 - 20 \times \log_{10}(150 / 15)$$
$$L_2 = L_1 - 20 \times \log_{10}(10)$$
$$L_2 = L_1 - 20 \text{ dBA}$$

Therefore, 20 dBA is subtracted from the measured level at 15 m to estimate noise levels at 150 m.

Table 7.26: Typical Noise Levels by Equipment

Equipment	Noise Level at 15 m (dBA)	Estimated Noise Level at 150 m (dBA)
Backhoe	78[1]	58
Chain Conveyor*	97-100[2]	-
Dozer	82[1]	62
Dump Truck	76[1]	56
Excavator	85[1]	65
Flat Bed Truck	74[1]	54
Front-end Loader	79[1]	59
Grader	85[1]	65
Mobile Processing Plant**	85[3]	65
Pickup Truck	75[1]	55
Screening Unit**	81-85[3]	61-65

*Chain conveyor noise levels are reported without a specified measurement distance. As such, attenuation to 150 m is not estimated.

**Values for mobile processing plants and screening units are inferred from similar equipment, as direct measurements are not available in the cited sources.

Sources: [1]U.S. Department of Transportation (2006)
[2]Government of Ontario (2022)
[3]U.S. EPA (1971)

7.4.2 DUST AND EMISSIONS

REGULATORY CONTEXT

Several federal and provincial laws and regulations are relevant to the operations of the Project with respect to dust and emissions.

FEDERAL

- ***Canadian Environmental Protection Act*** **(S.C. 1999, c. 33)** - CEPA regulates air pollutants and GHG emissions that may impact air quality and human health. Sand pit operations can generate dust and emissions from activities such as material handling, vehicle operation, and combustion sources. Compliance with federal air quality standards and emission regulations helps mitigate potential environmental effects.

PROVINCIAL

- ***Environment Act*** **(S.N.S. 1994-95, c. 1)** - This Act provides the legal framework for managing environmental impacts, including air quality and emissions. It mandates the prevention of air pollution and requires compliance with regulatory standards for air quality. Sand pit operators must implement dust control measures, monitor emissions, and ensure that activities do not exceed permissible limits to protect air quality and public health in accordance with the Act.

- ***Air Quality Regulations*** **(N.S. Reg. 8/2020)** - Under the *Environment Act,* S.N.S. 1994-94, c. 1, these regulations set permissible limits for various air pollutants, including SO_2, O_3, and other air contaminants. For sand pit and quarry operations, dust control measures may be required to minimize emissions and prevent the degradation of air quality.

- ***Pit and Quarry Guidelines*** **(1999, Revised 2003)** - These guidelines establish limits for dust emissions and particulate matter from pit and quarry operations. If requested by the Department, operators must monitor suspended particulate levels at or beyond the property boundary. Monitoring methods and specific limits are outlined to ensure compliance with air quality standards.

DESKTOP REVIEW : METHODOLOGY

The review of dust sources and emissions from heavy equipment and vehicles was based on typical operations in sand pit and quarry settings, informed by industry standards.

DESKTOP REVIEW : RESULTS

DUST: Dust is a common byproduct of sand pit operations and can be generated from various activities. The sources of dust emissions in the Project Area can be grouped into the following categories:

Sources of Dust

- **Site preparation and excavation:** Dust is commonly generated during site preparation activities, such as the removal of topsoil and vegetation and the excavation of sand materials. These activities disturb loose particles, which can become airborne, especially in dry conditions.

- **Processing and stockpiling:** Dust is also produced during the screening and stacking of sand.

- **Vehicle and machinery movement:** The movement of vehicles, including haul trucks, and machinery in the pit, contributes to dust emissions by disturbing exposed surfaces. Additionally, dust can be generated by the transport of aggregate in open truck beds.

- **Wind erosion:** In dry conditions, wind can carry dust from exposed surfaces of the pit and stockpiles into the surrounding area.

Current Dust Conditions

Dust levels in the area are typically elevated during certain operational activities, such as excavation and stockpiling, and may vary depending on seasonal weather conditions (e.g., wind and precipitation). Currently, dust suppression techniques, including the application of lignin-based solutions and chloride mixtures, are used on haul roads, stockpiles, and processing areas.

EMISSIONS: Emissions are produced by various activities within sand pit operations, primarily from the use of heavy equipment and vehicles. The sources of emissions in the Project Area include:

Sources of Emissions

- **Heavy equipment:** Diesel-powered equipment, such as excavators, loaders, and bulldozers contributes to air emissions, including nitrogen oxides (NO_x), SO_2, CO, CO_2, and particulate matter.
- **Transport vehicles:** Haul trucks used for transporting materials can release emissions, particularly CO_2, CH_4, and NO_x. Idling trucks can also contribute to unnecessary emissions.
- **Volatile organic compounds (VOCs):** The use of diesel fuel, lubricants, and other chemicals in equipment can lead to the release of VOCs, which are emitted into the atmosphere during operation.

Current Emission Conditions

Emissions from heavy equipment and vehicles are common in sand pit operations. The baseline level of emissions in the area is not yet quantified but can be expected to follow typical emission patterns from similar industrial activities, particularly during active operation periods.

7.4.3 SAFETY AND COMMUNITY WELL-BEING

REGULATORY CONTEXT

Several provincial and municipal laws and regulations are relevant to the operations of the Project with respect to safety and community well-being.

PROVINCIAL

- ***Occupational Health and Safety Act*** **(S.N.S. 1996, c. 7)** - This Act establishes the framework for workplace health and safety in Nova Scotia. It outlines the responsibilities of employers, employees, and contractors to ensure a safe working environment, including hazard identification, training, and

emergency preparedness. Compliance with this Act will help mitigate occupational risks associated with the Project.

- ***Environment Act*** **(S.N.S. 1994-95, c. 1)** - The purpose of this Act is to promote the protection, enhancement, and responsible use of the environment, with a focus on safeguarding human health and maintaining ecosystem integrity. It includes provisions for managing environmental impacts, public safety, and ensuring the reclamation of disturbed areas, which are crucial to the long-term well-being of communities.

- ***Pit and Quarry Guidelines*** **(1999, Revised 2003)** - These guidelines outline safety protocols and environmental measures for pit and quarry operations in Nova Scotia, including public safety, dust control, and land reclamation. They help minimize risks to the community and ensure the safe restoration of the site, supporting the overall safety and well-being of local residents.

MUNICIPAL

- ***Emergency Management By-Law*** **(Municipality of the County of Kings, By-Law 110)** - This by-law establishes protocols for declaring a State of Local Emergency and outlines the roles and responsibilities of the Kings County Regional Emergency Management Organization. These measures are designed to ensure a coordinated and effective response to emergencies, thereby safeguarding public health, safety, and property within the community.

DESKTOP REVIEW : METHODOLOGY

The desktop review was based on industry standards and regional regulations, as well as typical safety and community measures for resource extraction projects in Nova Scotia.

DESKTOP REVIEW : RESULTS

Safety and community well-being in the Project Area are influenced by existing land use, transportation infrastructure, and public safety measures. This section provides an overview of relevant safety considerations for workers, the public, and the surrounding community.

WORKER HEALTH AND SAFETY: Workplace safety in resource extraction industries in Nova Scotia is governed by the *Occupational Health and Safety Act,* S.N.S 1996, c.7 . Businesses operating in the region, including resource industries, adhere to standard OHS measures, which typically include:

- Safe work procedures and training programs.
- Use of personal protective equipment.
- Regular inspection and maintenance of equipment.

PUBLIC SAFETY CONSIDERATIONS: The existing sand pit currently implements safety measures to ensure public safety, including:

- Restricted access through fencing, gates, and safety signage.
- Site stability measures, such as berms and maximum slope angles, to reduce terrain hazards.
- Dust and air quality controls to mitigate dust emissions.

TRANSPORTATION SAFETY: Existing road networks in the region support both residential and industrial traffic. The existing pit operations follow these practices to ensure transportation safety:

- Driver and operator training requirements for drivers and equipment operators.
- Weight limit restrictions on public roads.
- Routine vehicle inspections and maintenance to ensure road safety.

WATER RESOURCES PROTECTION: The existing pit operations adhere to practices to minimize potential impacts on water resources. These include measures to prevent surface water runoff and groundwater contamination, such as sediment controls and adherence to setback requirements from water bodies. Additionally, the requirement for contingencies to reduce the risk of fuel or hazardous substance leaks affects water resources.

COMMUNITY CONSIDERATIONS AND LONG-TERM PLANNING: Community engagement is a recognized practice for addressing public concerns related to industrial activities in Nova Scotia. Additionally, resource extraction sites in the province are typically subject to long-term planning requirements, including progressive site rehabilitation to support land-use compatibility following operations. The Proponent has maintained a long history of community engagement and is conducting an engagement program as part of this EA registration. More information on the public and stakeholder engagement activities is provided in Chapter 6.

CHAPTER 8: EFFECTS OF THE PROJECT ON THE ENVIRONMENT

The following effects assessment examines how the Project may interact with VECs and evaluates potential environmental effects and mitigation measures to reduce or eliminate negative effects. Residual effects are those environmental effects that remain after mitigation has been applied and can be characterized based on their magnitude, geographic extent, duration, frequency, and reversibility, as described in Table 8.1 below.

Table 8.1: Residual Effects Assessment Criteria

Criteria	Rating Term	Definition
Magnitude The degree of variation in measurable parameters, or the VEC compared to baseline conditions	VEC-specific (e.g. will be described in the discussion for each VEC)	VEC-specific.
Geographic Extent The geographic area impacted by the effect	Local	Effects do not extend beyond the LAA.
	Regional	Effects extend into the RAA.
Duration The length of time the effect lasts, or how long it takes for the parameter or VEC to return to baseline conditions or become undetectable	Short-term	Effects that occur during site preparation or other short-term activities, typically lasting less than a year and not persisting beyond the activity phase.
	Medium-term	Effects that occur during the active extraction and processing phases typically lasting while the project is in operation.
	Long-term	Effects that persist beyond the life of the project, occurring after decommissioning rehabilitation, and lasting for a period of 5 years or more
Frequency How often the effect occurs, including the rate of occurrence and its repetition during the Project's phases	Rarely	Occurs once during the Project.
	Intermittent	Occurs periodically throughout the Project lifespan.
	Ongoing	Continues consistently throughout operations.
Reversibility The likelihood of the effect returning to baseline conditions after the project activity ceases.	Reversible	The effect is short-lived and expected to return to baseline quickly (e.g. within one year or less).
	Partially Reversible	The effect will persist for 1 to 5 years, and/or is expected to partially revert to baseline conditions.
	Irreversible	The effect is permanent and not reversible.

If residual effects are identified based on the criteria in Table 8.1, their significance is evaluated based on the following criteria (Table 8.2).

Table 8.2: Residual Environmental Effects Significance Criteria

Rating Term	Definition
Significant	An effect that causes a moderate to high change in baseline conditions, persists for a medium to long duration, and occurs on an ongoing basis. This effect may require additional mitigation, monitoring, or recovery actions.
Not Significant	An effect that results in a negligible to low change, is expected to return to baseline conditions in the short to medium term, and occurs rarely or intermittently. Ongoing effects of low magnitude, with proper mitigation, are still considered not significant and do not require additional mitigation or monitoring.

For each VEC, the assessment follows these steps:

1. **Identification of Geographic Extent of Assessment Boundaries:** Identifies the spatial assessment boundaries (LAA and RAA, where applicable).
2. **Identification of Relevant Project Activities:** Identifies specific project activities (outlined in Section 4.4) that may interact with the VEC.
3. **Description of Assessment Criteria:** Describes the assessment criteria and provides the VEC-specific definition for magnitude.
4. **Description of Potential Effects:** Describes the nature and severity of potential effects.
5. **Mitigation Measures:** Identifies measures to reduce or eliminate potential negative effects.
6. **Monitoring Programs:** Outlines programs to track the effectiveness of mitigation measures and ensure compliance.
7. **Characterization and Significance of Residual Effects:** Identifies and characterizes residual effects based on the criteria in Table 8.1, and evaluates their significance using the criteria in Table 8.2.

8.1 EFFECTS ON THE BIOPHYSICAL ENVIRONMENT

8.1.1 EFFECTS ON SURFACE WATER AND GROUNDWATER

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for surface water and groundwater includes the Project Site and Project Area (i.e., areas directly adjacent to Project activities, such as McGee Brook and adjacent groundwater wells).
- **Regional Assessment Area:** The RAA for surface water and groundwater includes the broader McGree Brook Watershed and groundwater or aquifers within the watershed.

PROJECT INTERACTIONS

The following project activities may interact with surface water and groundwater:

- Site Preparation
- Extraction Operations
- Stockpiling
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on surface water and groundwater. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable change in surface water or groundwater quality or quantity. No alterations to hydrology or flow regimes. No impact on surrounding aquatic or groundwater systems.
- **Low** - Minor changes in surface water or groundwater quality or quantity, with limited alteration to hydrology or flow regimes. Effects are local and unlikely to cause measurable disruption to the surrounding environment.
- **Moderate** - Measurable changes in surface water or groundwater quality or quantity. Hydrology or flow regimes may be altered, but can be managed with standard mitigation measures. Temporary impacts to aquatic or groundwater systems may occur, but are not expected to be long-term.
- **High** - Significant alterations in surface water or groundwater quality or quantity, with substantial changes to hydrology or flow regimes. Major impacts to surrounding aquatic or groundwater systems may occur, potentially affecting resource sustainability.

DESCRIPTION OF EFFECTS

SURFACE WATER

Project activities such as site preparation, extraction operations, stockpiling, and reclamation activities have the potential to influence surface water through changes to flow patterns, sedimentation, and water quality. However, given site conditions and the presence of a natural vegetated buffer around McGee Brook, significant effects are not expected. Vegetated buffers are known to protect water quality by reducing flow velocity, filtering sediment, decreasing soil erosion, preventing streambank collapse, and allowing infiltration into underlying soils (US EPA, 2021).

- **Runoff and Sedimentation:** Soil disturbance during site preparation and extraction could increase erosion risk, particularly during heavy rainfall events. Stockpiled materials may also contribute to sediment transport if exposed to runoff. However, McGee Brook is located along the northeastern edge of the site, and there is a natural buffer between the Project footprint and the Brook. Additionally, no mapped watercourses or major flow accumulation features exist within the Project Site itself, reducing the likelihood of sediment transport to nearby water bodies. The Project Site is underlain by well-drained sandy soils, which have relatively high infiltration rates (ranging from 2.0 to 11.0 cm per hour, depending on compaction and moisture conditions) (Carsel & Parrish, 1988; Rawls et al., 1983; USDA NRCS, 2008). This promotes infiltration of precipitation and minimizes overland flow, even during heavy rainfall events, reducing the risk of sediment-laden runoff entering McGee Brook. Additionally, erosion and sedimentation measures will be installed where needed to reduce the risk of runoff impacting McGee Brook.

- **Changes to Drainage Patterns:** The sandy substrate and past excavation activities already influence surface water movement within the Project Site. Extraction, stockpiling, and reclamation may result in minor, localized changes to flow, but no significant alterations to drainage patterns are expected. Stormwater is retained within the site, and no ditches or retention ponds are required to manage stormwater. No surface water is expected to flow out of the Project Area.

- **Water Quality:** Water quality impacts are unlikely due to the nature of operations. There is some potential for suspended sediment from exposed soils during excavation and stockpiling; however, this risk is reduced by the well-drained soils, on-site stormwater infiltration, and the naturally vegetated buffer between the Project and McGee Brook. A 30 m buffer is maintained between the Project footprint and McGee Brook, which further reduces the risk of sedimentation and contamination reaching surface waters. Processing and transportation activities are not expected to have a measurable effect on surface water. Although spills from equipment operation (e.g., fuel or hydraulic fluid) could introduce contaminants, the absence of watercourse crossings or direct hydrological

connections between the Project footprint and McGee Brook makes it unlikely that such contaminants would reach surface waters.

- **Climate Change Considerations:** Higher winter precipitation and more frequent heavy rain increase the potential for short-lived overland flow, erosion, and sediment transport from exposed soils, even where average conditions support infiltration. The time to peak precipitation fall may decrease, increasing local flooding risk.

GROUNDWATER

Project activities such as excavation and stockpiling are not expected to result in significant impacts to groundwater resources, including domestic wells, as excavation will occur above the groundwater table, ensuring that the water table is not disrupted.

- **Groundwater Recharge and Flow:** The Project Site is situated within a glaciofluvial aquifer composed of clean, well-sorted sand characterized by high permeability and rapid infiltration capacity, with published infiltration rates typically ranging from 2.0 to 11.0 cm/hr (approximately 0.5 to 3.0 x 10^{-5} m/s), depending on compaction, grain size distribution, and moisture conditions (Carsel & Parrish, 1988; Rawls et al., 1983). Excavation will be limited to at least one metre above the groundwater table, and verified by groundwater level monitoring, and no pumping or dewatering activities are planned. As such, there is expected to be no hydraulic connection with the underlying saturated zone, and consequently, no drawdown in the local or regional groundwater table. No significant recharge to the aquifer is expected from surface water infiltration through the pit floor beyond accumulated rainwater and snowmelt that permeates through the sand. Reclamation activities such as re-vegetation may enhance groundwater recharge by improving soil infiltrability through increased porosity and preferential flow pathways (Qiu et al., 2023). However, changes to recharge rates will be minor and localized. Although McGee Brook lies along the northeastern edge of the Project Site, no watercourses occur within the active Project footprint. Given the sandy substrate and expected infiltration on-site, direct impacts to groundwater recharge within the LAA from project activities are anticipated to be minimal, and negligible when considering the RAA.

- **Groundwater Quality:** The potential for water quality degradation exists in the event of accidental spills of chemicals or fuels during operations. Maintaining equipment in good mechanical condition and conducting regular inspections, as well as abiding by a spill response contingency plan, will help to ensure that groundwater quality is not affected by the Project.

- **Climate Change Considerations:** More winter rain and less snow are expected to shift a portion of groundwater recharge to earlier in the year and could raise seasonal high water levels to earlier in the year relative to the historical regime.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on surface water and groundwater during the Project.

GENERAL WATER RESOURCES MITIGATIONS

Erosion and Sediment Control

- An Erosion and Sediment Control Plan will be developed and implemented.
- Erosion control methods (e.g., silt fences) will be used where necessary.
- Progressive reclamation will be implemented to reduce exposed soils and minimize erosion risks.

Surface Water Management

- Minimize sand compaction areas to foster infiltration as a form of stormwater management
- Stormwater management practices will be implemented to direct runoff toward infiltration areas and reduce sediment transport to McGee Brook.
- The creation of new ditches or diversions will be avoided to maintain existing drainage patterns.
- A Surface Water Management Plan will be developed to monitor surface water quality and quantity.
- No project activities (including refueling) will be conducted, nor will vegetation be removed, within 30 m of a surface watercourse (e.g., McGee Brook), which also encompasses the adjacent wetland.

Water Quality Protection

- A Spill Response and Contingency Plan will be developed for quick action in the event of spills of fuel or hazardous material.
- Equipment will be regularly inspected and maintained to prevent fuel leaks.
- If effluent leaves the site, total suspended solids (TSS) will be monitored to ensure compliance with water quality standards.
- NSECC will be contacted immediately in the unlikely event that sulfide-bearing materials are encountered during excavation.

GROUNDWATER MITIGATIONS

Groundwater Recharge and Flow

- Dewatering or pumping activities that could affect groundwater recharge will be avoided.
- Excavation will not occur within 1 m of the maximum annual water table elevation.
- A Groundwater Management and Monitoring Plan will be developed.

- Groundwater monitoring will be conducted throughout operation to ensure that excavations do not extend lower than 1 m above the water table, following an adaptive management approach.
- Operations will cease if groundwater is encountered during excavation.

MONITORING

Monitoring will be conducted to ensure the effectiveness of mitigation measures and to detect any unforeseen impacts on surface water and groundwater quality, flow, and drainage patterns.

- Sediment levels in stormwater runoff will be monitored, especially after heavy rainfall.
- Erosion control measures (e.g., silt fences) will be inspected quarterly and after significant precipitation events to ensure their effectiveness.
- Site drainage will be inspected regularly, particularly after heavy rainfall, to detect any significant changes.
- A Groundwater Monitoring Plan will be developed by a licensed hydrologist and implemented throughout operation to monitor groundwater levels and recharge rates.
- Groundwater monitoring will also ensure compliance with the excavation buffer (minimum 1 m above the water table) as part of the adaptive management approach.
- Erosion and sedimentation controls will be inspected after precipitation of 25 mm or more.

CONCLUSION

After mitigation measures, the residual effects on surface water and groundwater are anticipated to be:

- **Magnitude** - Low, as minor changes in surface water or groundwater quality, quantity, or hydrology are expected.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Area.
- **Duration** - Medium-term, as effects will last throughout the operational and reclamation phases but are expected to diminish once operations conclude and the site is fully reclaimed.
- **Frequency** - Intermittent, as disturbances to surface water and groundwater may occur periodically during the site preparation, extraction, and reclamation phases.
- **Reversibility** - Reversible, as the effects are expected to diminish over time with proper reclamation and mitigation measures.
- **Significance** - Not significant, as the residual effects are negligible in magnitude, localized, and temporary, with effective mitigation measures in place.

8.1.2 EFFECTS ON WETLANDS

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for wetlands includes the Project Site.
- **Regional Assessment Area:** The RAA for wetlands includes the broader McGee Brook Watershed.

PROJECT INTERACTIONS

The following project activities may interact with wetlands:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on wetlands. The VEC-specific definition for magnitude is:

- **Negligible** - No loss of wetland habitat and no measurable change in wetland hydrology, plant diversity, soils, or overall wetland function.
- **Low** - A minor loss in wetland habitat, altering a portion of a wetland but having minimal impacts to overarching wetland hydrology, plant diversity, soils, and wetland function. Effects are local, causing no measurable hydrological disruption to the McGee Brook River Watershed.
- **Moderate** - Wetland habitat loss leading to measurable changes to a wetland's hydrology, plant diversity, soils and overall wetland function. Alterations can be managed with standard mitigation measures. Effects are local, unlikely to cause measurable hydrological disruption to the greater McGee Brook Watershed.
- **High** - Loss of wetland habitat leading to significant alterations in wetland hydrology, plant diversity, soils and overall function. These effects are significant enough to impact the hydrology of the McGee Brook Watershed.

DESCRIPTION OF EFFECTS

There will be no direct effects on wetlands as there are no planned wetland alterations required for the Project. Further, wetland areas are contained within a vegetated buffer for McGee Brook. The effects on wetlands will primarily be indirect from dust, invasive species, and Project Site runoff.

- **Dust:** Loose particles will be disturbed and become airborne, especially in dry conditions, during different project activities. Site preparation and excavation will generate dust during topsoil and vegetation removal; processing and stockpiling will produce dust when screening and stacking; vehicle and machinery movement on site will produce dust when disturbing exposed surfaces such as those found on access roads and open pit surfaces; and wind will blow dust from the exposed surfaces on site into the surrounding area. Dust can impact wetland vegetation on the Project Site by impeding plant photosynthesis and transpiration, which could result in reduced growth, increased risk for disease, and even mortality (Javanmard et al., 2019). Broad-leaved deciduous plants are particularly vulnerable to dust. Excessive fugitive dust could cause sedimentation in wetlands, potentially altering hydrology, reducing water quality, and affecting fish, invertebrate, and amphibian respiration, breeding, and feeding. Impacts will primarily be limited to the edges of the Project Site and will be reduced through the mitigation measures detailed below.

- **Invasive Species:** Wetlands are particularly vulnerable to invasive species. A disproportionately high percentage of the most invasive species are wetland plants, many of which form monotypes that reduce wetland biodiversity, alter habitat structures, and disrupt ecosystems (Zedler & Kercher, 2004). Invasive species spread into wetlands through flowing water (e.g., runoff), wind dispersal, wildlife vectors, and through anthropogenic disturbances. Invasive species can spread on boots, clothing, construction equipment, and transportation vehicles (NPS, n.d.). Disturbances such as those on the Project Site create favourable environmental conditions for invasive species to establish and spread, such as open canopies, exposed soil, and altered hydrology, which reduce competition with native plants, allowing invasive species to establish on site and spread to surrounding habitats (Dix et al., 2010). To reduce invasive species spread, the mitigation measures below will be implemented.

- **Runoff:** Runoff can exacerbate many of the negative effects impacting wetlands. Nutrient loading from runoff can fuel invasive species proliferation in wetlands (Bansal et al., 2019). Additionally, as many invasive wetland species use water for seed dispersal and transport of whole plants and plant fragments (Zedler & Kercher, 2004), runoff can facilitate this proliferation. Runoff can also lead to sedimentation within wetlands, which (as described in the effects of dust above) can lead to negative impacts on wetland function and wetland fish, amphibian, and invertebrate species health. The mitigations below will limit the effects of runoff on wetlands within the Project Site.

- **Climate Change Considerations**: Heavier short-duration rainfall can increase flashy inflows to wetlands and mobilize sediment/nutrients from disturbed areas, potentially altering the wetland's natural hydroperiod and increasing risk of sediment delivery at wetland edges.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on wetlands during project activities:

- Dust suppression techniques, including the application of lignin-based solutions and chloride mixtures, will be used on haul roads, stockpiles, and processing areas.
- Speed limits for vehicles on-site will be implemented to reduce dust emissions.
- Disturbed areas will be minimized to the extent possible and progressively reclaimed to reduce the potential for dust generation.
- Enclosed or covered trucks will be used for material transport to minimize dust generation.
- Dust-generating activities will be timed to avoid periods of excessive wind, and activities will be paused when wind speeds are high.
- Storage areas and material stockpiles will be designed with prevailing wind directions in mind to reduce the potential for dust dispersion if required.
- Loose site materials and products will be tied down, covered, and/or stored prior to inclement weather or wind events to prevent them from becoming airborne.
- An Erosion and Sediment Control Plan will be developed and implemented.
- Buffers of 30 m from the bank or ordinary high water mark of any watercourse will be implemented, which also encompasses adjacent wetlands.
- Vehicles will be routinely cleaned and inspected to reduce the spread of invasive species seeds and pollen.
- Stormwater management practices will be implemented, if needed, to direct runoff toward infiltration areas and reduce sediment transport into a wetland, water resource, or beyond the property boundary.
- Roads, pits, and other disturbed areas will be graded in ways that limit slope and direct runoff and drainage away from watercourses and wetlands.

MONITORING

A dedicated wetland monitoring program is not necessary as the Project will not involve any wetland alterations. Erosion and sediment control measures upgradient of wetlands will be monitored quarterly and after severe storm events of 25 mm precipitation or more to ensure sediment is not transferred into wetland areas.

CONCLUSION

After mitigation measures, the residual effects on wetlands are anticipated to be:

- **Magnitude** - Negligible, as no direct impacts to wetland area or function are anticipated, and no anticipated indirect wetland losses of area or function due to hydrological changes are expected.

- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site and the immediate surrounding areas.
- **Duration** - Medium-term, as indirect effects will last throughout the operational and reclamation phases but are expected to diminish once operations conclude and the site is fully reclaimed.
- **Frequency** - Intermittent, as indirect effects to wetland species may occur periodically during the site preparation, extraction, and reclamation phases.
- **Reversibility** - Reversible, as the indirect effects are expected to cause minimal impact that diminishes with proper mitigation measures and reclamation.
- **Significance** - Not significant, as the residual effects are low in magnitude, localized, and temporary, with effective mitigation measures in place.

8.1.3 EFFECTS ON FLORA

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for flora includes the Project Site.
- **Regional Assessment Area:** The RAA for flora includes the Project Site and all adjacent natural environment.

PROJECT INTERACTIONS

The following project activities may interact with flora:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on flora. The VEC-specific definition for magnitude is:

- **Negligible** - No anticipated loss of flora SOCI or SAR, or changes to their supporting habitat.
- **Low** - No anticipated loss of flora SOCI or SAR, but minor loss of their supporting habitat.
- **Moderate** - Minor loss of flora SOCI or SAR and their supporting habitat, but populations remain largely intact.
- **High** - Loss of an entire population of flora SOCI or SAR, and/or major loss of their supporting habitat.

PRIORITY SPECIES : METHODOLOGY

A multi-step screening approach was applied to identify flora species for consideration in this effects assessment:

- **Initial species pool:** The assessment considered:
    - All SAR and SOCI flora species observed during field surveys conducted on the Project Site; and
    - SAR flora species reported by ACCDC to occur on or within 5 km of the Project Site.
- **Evaluation of potential occurrence:** Species identified from these sources were reviewed for either direct observation on the Project Site or the presence of suitable supporting habitat.
- **Priority species determination:** Species were identified as priority species if they are legally listed SAR and were either observed on the Project Site or considered likely to occur based on the presence of suitable habitat. This approach aligns with the definition provided in Chapter 5.

Flora SOCI that did not meet the criteria for priority species are still described below to acknowledge their presence and inform general mitigation planning.

SPECIES DESCRIPTIONS

The following SAR and SOCI flora species were identified during field surveys or through ACCDC data. SAR are shown in bold:

- **Long-branched frostweed (*Crocanthemum canadense*)**
- American beech (*Fagus grandifolia*)
- Pinebarren golden heather (*Hudsonia ericoides*)
- White elm (*Ulmus americana*)

Each of these species is described in more detail below, including habitat requirements and observed or potential site interactions.

Long-branched frostweed

Long-branched frostweed, otherwise known as rockrose, is listed as 'Endangered' under the provincial ESA. It is a perennial herb characterized by showy yellow flowers. In Nova Scotia, it is generally associated with the dry, sandy *Corema* barrens (heathland) of the Annapolis Valley. These barrens are a unique and rare habitat type, with only about 3% remaining in the province. Currently, the population of frostweed in Nova Scotia is estimated to include between 7,650 and 8,450 mature individuals. Frostweed populations in Nova Scotia are genetically

unique compared to those in other regions, such as Quebec and New England. Threats to frostweed include historic and ongoing land use changes such as agriculture, housing development, sand quarrying, and other forms of development. Additionally, changes in natural disturbances, including suppression of fire, loss of caribou (which historically grazed and suppressed competition), and the invasion of scotch pine (*Pinus sylvestris*) (which causes shading), have altered the habitat for frostweed (NSLF, 2021a).

Long-branched frostweed was identified to be within 0.4 km ± 1.2 km from the Project Site by ACCDC; however, this observation has a spatial precision of 3.7, meaning the actual occurrence could be anywhere within a 2.8-8.9 km range (ACCDC, 2024a). Given this level of uncertainty and the absence of frostweed in site-specific surveys, it is unlikely that the species is present within the Project Site, though suitable habitat may have existed historically. As a result, this species was not identified as a priority species for this assessment.

American beech

American beech is a large, deciduous tree native to eastern North America, including Nova Scotia. It is characterized by smooth, silver-gray bark and dark green, elliptical leaves that turn brilliant yellow and orange in the fall. The tree produces edible nuts enclosed in a woody husk resembling a burr.

In Nova Scotia, American beech is typically found in mature mixed and hardwood forests, often in association with species such as sugar maple, yellow birch, and red spruce. These forests are commonly located on moist, well-drained slopes and rich bottomlands (Neily et al., 2023).

American beech was identified by ACCDC to be within 5 km of the Project Site and observed during field surveys. However, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment.

Pinebarren golden heather

Pinebarren golden heather is a low-growing, mat-forming shrub native to eastern North America, including Nova Scotia. It is characterized by needle-like leaves and bright yellow flowers that bloom in late spring to early summer. This species is a member of the Coastal Plain Flora and has a restricted range, occurring in Newfoundland, Prince Edward Island, and Nova Scotia in Canada, and down the eastern seaboard of the U.S. from Maine to Rhode Island (Nova Scotia Wild Flora Society, 2011).

In Nova Scotia, pinebarren golden heather is found in open, sandy habitats such as coastal barrens, thin pine barrens, and granite outcrops. It typically grows in full sun and is associated with fire-prone ecosystems, as fire kills living plants but stimulates germination of the seedbank (Nova Scotia Wild Flora Society, 2011).

Pinebarren golden heather was identified by ACCDC to be within 5 km of the Project Site; however, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment.

White elm

White elm, also known as American elm, is a large deciduous tree native to eastern North America, including Nova Scotia. It is characterized by its large, serrated leaves and a broad canopy, typically growing in moist, fertile soils along rivers, streams, and bottomlands. However, white elm populations have been significantly affected by Dutch Elm Disease, caused by the fungus *Ceratocystis ulmi*, which has greatly reduced their presence in many areas. Despite this, the species remains common in mixed forest stands (Bey, n.d.).

In Nova Scotia, white elm can be found in areas with rich, moist soils and is often part of mixed hardwood forests. It plays an important ecological role in these communities, although it is now less abundant due to the impact of the disease (Bey, n.d.).

White elm was identified by ACCDC to be within 5 km of the Project Site and observed during field surveys. However, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment.

PRIORITY SPECIES : RESULTS

Based on the screening criteria and the definition of priority species used in this EA, no priority flora species were identified. Long-branched frostweed, the only flora SAR reported in the ACCDC database, was not identified during field surveys and is considered unlikely to occur based on habitat availability.

General mitigation measures to protect native flora and minimize disturbance to habitat will be applied during all phases of the Project.

DESCRIPTION OF EFFECTS

The activities most impactful to flora species on site will be those associated with site preparation, such as clearing and grubbing, which will result in the direct removal of vegetation. Less notable will be the impacts from extraction operations, processing, stockpiling, and reclamation activities, causing dust which can coat plants, inhibiting photosynthesis. Buildup of particles on leaf surfaces can disrupt stomatal activity and hinder gas exchange, leading to decreased photosynthetic efficiency and plant growth (Farmer, 1993; Sharifi et al., 1997). Additionally, there is potential for construction equipment, vehicles, and workers to spread and introduce invasive species. However, given the relatively small area of alteration, poor habitat connectivity, and lack of SAR flora identified on site, significant effects are not expected.

- **Vegetation Clearing:** As part of the site preparation activities, vegetation has been cleared for sand pit operations, and will be further cleared for the 1.46 ha expansion area. No SAR flora species were identified on site, although three SOCI vascular plants were identified in and adjacent to the Project Site: American beech (S3S4), pinebarren golden heather (S2), and white elm (S3S4). These species occurrences will be avoided, as detailed in the mitigations section below.

- **Dust:** Loose particles will be disturbed and become airborne, especially in dry conditions, during different project activities. Site preparation and excavation will generate dust during topsoil and vegetation removal; processing and stockpiling will produce dust when screening, stacking of sand; vehicle and machinery movement on site will produce dust when disturbing exposed surfaces such as those found on access roads and open pit surfaces; and wind will blow dust from the exposed surfaces on site into the surrounding area. This dust can impede plant photosynthesis, which could result in reduced growth, increased risk for disease and even the mortality (Javanmard et al., 2019) of plants within and adjacent to the Project Site. Broad-leaved deciduous plants are particularly vulnerable to dust. Impacts will primarily be limited to the edges of the Project Site and will be reduced through the mitigation measures detailed below.

- **Invasive Species:** Invasive flora species are harmful to local species as they can crowd them out, outcompeting for sunlight and nutrients. Invasive species invasions typically result in decreased species diversity and altered ecosystem functions, such as soil nutrient levels and forest fire response (Pyšek et al., 2012). Invasive species can spread on boots, clothing, construction equipment, and transportation vehicles (NPS, n.d.), establishing on site (particularly in cleared areas) and spreading to surrounding habitats. Disturbances such as those on the Project Site create favourable environmental conditions for invasive species to establish and spread, such as open canopies, exposed soil, and altered hydrology, which reduce competition with native plants, allowing invasive species to establish on site and spread to surrounding habitats (Dix et al., 2010). Nine invasive species were identified on site: coltsfoot, common St. John's-wort (*Hypericum perforatum*), common tansy (*Tanacetum vulgare*), creeping buttercup, multiflora rose, scotch pine (*Pinus sylvestris*), smooth bedstraw (*Galium mollugo*), Virginia creeper (*Parthenocissus quinquefolia*), and woodland angelica (*Angelica sylvestris*). To prevent the further spread of these species, the mitigation measures detailed below will be implemented.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on flora during the Project:

- SAR and SOCI flora species will be avoided during vegetation clearing activities wherever feasible. Appropriate buffers will be established around SOCI species where practical. Where avoidance or buffers are not possible, transplantation may be considered, particularly for pinebarren golden heather, and potentially for American beech, depending on plant size; white elm is unlikely to require mitigation.
- Dust suppression techniques, including the application of lignin-based solutions and chloride mixtures, will be used on haul roads, stockpiles, and processing areas.
- Speed limits for vehicles on-site will be implemented to reduce dust emissions.

- Stockpiles and disturbed areas will be minimized to the extent possible and progressively reclaimed to reduce the potential for dust generation.
- Enclosed or covered trucks will be used for material transport to minimize dust generation.
- Dust-generating activities will be timed to avoid periods of excessive wind, and activities will be paused when wind speeds are high.
- Storage areas and material stockpiles will be designed with prevailing wind directions in mind to reduce the potential for dust dispersion.
- Loose site materials and products will be tied down, covered, and/or stored prior to inclement weather or wind events to prevent them from becoming airborne.
- An Erosion and Sediment Control Plan will be developed and implemented.
- Vehicles and machinery will be restricted to designated access roads and paths to reduce soil compaction and damage to surrounding vegetation.
- Vehicles will be routinely cleaned and inspected to reduce the spread of invasive species.
- Buffers of 30 m from the bank or ordinary high water mark of any watercourse will be implemented, which also encompasses adjacent wetlands.
- After final extraction, the pit walls will be rehabilitated to a 3:1 side slope. The pit wall slopes and pit floor will be covered with topsoil and seeded with a native grass mix. Over time, the area will return to forest through natural regeneration.

MONITORING

No monitoring is recommended for this VEC.

CONCLUSION

After mitigation measures, the residual effects on flora are anticipated to be:

- **Magnitude** - Low, as minor loss of supporting habitat may occur (e.g., pinebarren golden heather), but no net SOCI loss is anticipated following mitigation measures.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site.
- **Duration** - Medium-term, as effects will last throughout the operational and reclamation phases but are expected to diminish once operations conclude and the site is fully reclaimed.
- **Frequency** - Intermittent, as disturbances to flora may occur periodically during project activities.
- **Reversibility** - Reversible, as effects are expected to diminish over time with proper reclamation and mitigation measures.
- **Significance** - Not significant, as the residual effects are low in magnitude, localized, and temporary, with effective mitigation measures in place.

8.1.4 EFFECTS ON FAUNA

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for fauna includes the Project Site.
- **Regional Assessment Area:** The RAA for fauna includes the Project Site and a portion of the Annapolis Valley Ecodistrict, from Middleton to Berwick.

PROJECT INTERACTIONS

The following project activities may interact with fauna:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on fauna. The VEC-specific definition for magnitude is:

- **Negligible** - No anticipated loss of fauna. Habitat loss or behavioural impact is insignificant. No loss of SAR habitat.
- **Low** - Minor loss of fauna habitat, no loss of SAR habitat, and low risk of direct mortality.
- **Moderate** - Minor to moderate loss of fauna habitat, including SAR habitat, and/or risk of direct mortality; however, these impacts are localized and are not expected to affect populations..
- **High** - Significant loss of fauna habitat, including SAR habitat, and/or risk of mortality that may impact species at a population level.

PRIORITY SPECIES : METHODOLOGY

To determine which fauna species warranted further consideration in this effects assessment, a conservative multi-step screening approach was applied:

- **Initial species pool:** The assessment considered:
    - All SAR and SOCI fauna species observed during field surveys conducted on the Project Site; and

    - SAR fauna species reported by ACCDC to occur on or within 5 km of the Project Site.

- **Evaluation of potential occurrence:** Species identified from these sources were reviewed for either direct observation on the Project Site or the presence of suitable supporting habitat.

- **Priority species determination:** Species were identified as priority species if they are legally listed SAR and were either observed on the Project Site or considered likely to occur based on the presence of suitable habitat. This approach aligns with the definition provided in Chapter 5.

Fauna SOCI that did not meet the criteria for priority species are still described below to acknowledge their presence and inform general mitigation planning.

SPECIES DESCRIPTIONS

The following SAR and SOCI fauna species were identified during field surveys or through ACCDC data. SAR are shown in bold:

Avifauna

- **Bank Swallow (*Riparia riparia*)**
- **Barn Swallow (*Hirundo rustica*)**
- **Bobolink (*Dolichonyx oryzivorus*)**
- **Common Nighthawk (*Chordeiles minor*)**
- **Eastern Wood-pewee (*Contopus virens*)**
- **Evening Grosbeak (*Coccothraustes vespertinus*)**
- **Olive-sided Flycatcher (*Contopus cooperi*)**
- **Peregrine Falcon - anatum/tundrius (*Falco peregrinus pop. 1*)**
- Purple Finch (*Haemorhous purpureus*)
- Rose-breasted Grosbeak (*Pheucticus ludovicianus*)
- **Rusty Blackbird (*Euphagus carolinus*)**

Bats

- Eastern red bat (*Lasiurus borealis*)
- Hoary bat (*Lasiurus cinereus*)
- **Little brown myotis (*Myotis lucifugus*)**
- **Northern myotis (*Myotis septentrionalis*)**
- Silver-haired bat (*Lasionycteris noctivagans*)

Herpetofauna

- Eastern painted turtle (*Chrysemys picta picta*)
- Snapping turtle (*Chelydra serpentina*)
- Wood turtle (*Glyptemys insculpta*)

Invertebrates

- Monarch (*Danaus plexippus*)
- Yellow-banded bumble bee (*Bombus terricola*)

Each of these species is described in more detail below, including habitat requirements and observed or potential site interactions.

Avifauna

Bank Swallow

The Bank Swallow, a small migratory songbird, is experiencing significant population declines across its North American breeding range, including in Nova Scotia. Once widespread and relatively common, the species is now listed as 'Threatened' under SARA and 'Endangered' under the ESA due to rapid declines largely driven by habitat loss and degradation (COSEWIC, 2013a; NSNRR, 2021b).

Bank Swallows are colonial nesters that rely on exposed, vertical soil faces to excavate nesting burrows. In Nova Scotia, they typically breed in eroding riverbanks, coastal bluffs, gravel pits, and sand or soil stockpiles associated with construction or resource extraction (NSLF, 2020c). The species shows a strong preference for fine-textured soils (silt, sand, or loam) that are soft enough to dig but stable enough to support a burrow structure (Garrison, 1999). In addition to nesting habitat, Bank Swallows require nearby open areas such as wetlands, agricultural fields, or water bodies to forage for flying insects, which make up the bulk of their diet (COSEWIC, 2013a).

The Bank Swallow was identified by ACCDC within 5 km of the Project Site, and it was observed during field surveys. Additionally, Bank Swallows were found breeding on site in exposed vertical sand faces in a test pit on the expansion area, leading to their identification as a priority species in this assessment.

To mitigate potential impacts on Bank Swallow habitat within the project footprint, existing sand faces in the test pit will be managed to discourage nesting prior to construction. Alternate nesting habitat will be created elsewhere on site by excavating and re-contouring sand banks in consultation with qualified biologists and in accordance with provincial and federal guidelines. The alternate habitat will be established in a suitable area nearby that mimics the slope, substrate, and orientation of the original nesting site, ensuring minimal disruption to the breeding ecology of the species. All activities will be timed to avoid the breeding season.

Barn Swallow

The Barn Swallow is experiencing significant population declines across North America, including Nova Scotia. Listed as 'Endangered' under the ESA and 'Threatened' under SARA, this species' decline is attributed to factors such as habitat loss, reduced insect prey availability, and changes in agricultural practices (NSLF, 2020d).

Historically, Barn Swallows nested in natural structures like caves and cliff faces. However, they have largely adapted to human-made structures, building their mud nests on barns, sheds, bridges, and other buildings. These nests are often reused annually, and the presence of suitable nesting sites is crucial for their breeding success. Barn Swallows forage over open habitats, including grasslands, agricultural fields, wetlands, and shorelines. They feed on flying insects, making the availability of insect prey in these areas vital for their sustenance (COSEWIC, 2011).

The Barn Swallow was identified by ACCDC within 5 km of the Project Site and also recorded within Atlas Square 20LQ58 of the MBBA. Although it was not observed during field surveys, the presence of suitable habitat on site supports the potential for occurrence. As such, it was identified as a priority species in this assessment.

Species-specific mitigation is not anticipated to be required beyond the application of general bird protection measures.

Bobolink

The Bobolink is a migratory grassland songbird that breeds across southern Canada, including Nova Scotia, and winters in South America. In Nova Scotia, the species is listed as 'Vulnerable' under the ESA, reflecting concerns over its declining population and habitat threats. Nationally, the Bobolink is designated as 'Special Concern' under SARA, following a reassessment by COSEWIC in 2022 (COSEWIC, 2022).

Bobolinks are obligate grassland specialists, relying on open habitats for breeding and feeding. In Nova Scotia, they primarily nest in hayfields and pastures (these agricultural lands provide the tall grasses necessary for nesting and foraging) and abandoned fields/wet meadows (areas with dense herbaceous vegetation offer suitable nesting sites).

The Bobolink was identified by ACCDC within 5 km of the Project Site and also recorded within Atlas Square 20LQ58 of the MBBA. Although it was not observed during field surveys, marginally suitable habitat exists on site in some regrowing, grubbed areas, supporting the potential for occasional occurrence. As such, it was identified as a priority species in this assessment.

Species-specific mitigation is not anticipated to be required beyond the application of general bird protection measures.

Common Nighthawk

The Common Nighthawk has experienced widespread population declines across Canada, including Nova Scotia. In Nova Scotia, the species is listed as 'Threatened' under the ESA, reflecting concern over continued population losses and habitat pressures (NSLF, 2021b). Nationally, the Common Nighthawk is designated as 'Special Concern' under SARA. This designation, downgraded from 'Threatened' in 2007 to 'Special Concern' in 2018 by COSEWIC, acknowledges ongoing threats while recognizing some recovery potential. The primary factors contributing to its decline include habitat loss, reduced availability of insect prey due to pesticide use, urban development, and the increasing frequency of extreme weather events, which can disrupt nesting success and food availability (COSEWIC, 2007a).

In Nova Scotia, the Common Nighthawk breeds in a variety of open habitats that offer sparse vegetation and flat, exposed ground suitable for ground nesting. These habitats include natural environments such as coastal sand dunes, rock barrens, peat bogs, and burned or logged forest areas, as well as human-altered landscapes like pastures, gravel rooftops, and clearings created through forestry activities. The species lays its eggs directly on bare ground, sand, or gravel without building a traditional nest. Successful nesting depends on the availability of open, undisturbed sites with good visibility and proximity to areas where insects are abundant, as the Common Nighthawk feeds almost exclusively on flying insects captured in flight during dawn and dusk foraging periods.

The Common Nighthawk was identified by ACCDC within 5 km of the Project Site. Although it was not observed during field surveys, the presence of suitable habitat on site (open, sparsely vegetated areas) supports the potential for occurrence. As such, it was identified as a priority species in this assessment.

Species-specific mitigation is not anticipated to be required beyond the application of general bird protection measures.

Eastern Wood-pewee

In Nova Scotia, the Eastern Wood-pewee has been classified as 'Vulnerable' under the ESA since 2013. Nationally, it is listed as 'Special Concern' under SARA, following a 2012 assessment by COSEWIC. These designations reflect ongoing declines in population, attributed to factors such as habitat loss, changes in forest structure, and reductions in insect prey availability (ECCC, 2023; NSNRR, 2022a).

The Eastern Wood-pewee favours mature deciduous and mixed forests with open understories, which facilitate its foraging strategy of sallying from perches to catch flying insects. In Nova Scotia, important breeding habitats include mature upland forests and treed swamps. The species tends to avoid regenerating forests and areas with dense understory vegetation, likely due to reduced foraging efficiency in such environments (NSNRR, 2022a).

The Eastern Wood-pewee was identified by ACCDC within 5 km of the Project Site and was also detected during field surveys, where it was heard calling off-site, suggesting it is likely breeding nearby. Although no individuals were observed within the Project Site, the presence of suitable foraging habitat and tall treed areas to the south supports the potential for occurrence. As such, it was identified as a priority species in this assessment.

Species-specific mitigation is not anticipated to be required beyond the application of general bird protection measures.

Evening Grosbeak

In Nova Scotia, the Evening Grosbeak is listed as 'Vulnerable' under the ESA and nationally as 'Special Concern' under SARA, following a recommendation by COSEWIC in 2016 (COSEWIC, 2016). These designations reflect a substantial long-term decline, with population reductions estimated between 77% and 90% since 1970. In eastern Canada, including Nova Scotia, the species has experienced some of the steepest regional losses, with declines of up to 97% observed in parts of Ontario, Quebec, and the Maritimes.

In Nova Scotia, the Evening Grosbeak inhabits mature mixed and softwood boreal forests, where it forages in treetops and branches for insects, seeds, and berries. Breeding typically occurs in coniferous and mixed forests, with nests built on horizontal branches or in tree forks. Some mature forest that may provide nesting habitat for this species is present on the Project site, although in very limited amounts.

The Evening Grosbeak was identified by ACCDC within 5 km of the Project Site; however, it was not identified during field surveys. While some foraging habitat is present on site, it is unlikely to support breeding due to limited habitat availability. As a result, this species was not identified as a priority species for this assessment. This species will be addressed through the implementation of general mitigation measures intended to minimize disturbance to wildlife and habitat, including birds.

Olive-sided Flycatcher

The Olive-sided Flycatcher is a migratory songbird experiencing significant population declines across North America. In Nova Scotia, it is classified as 'Threatened' under the ESA. Nationally, it is listed as 'Threatened' under SARA. In Nova Scotia, it breeds in open coniferous or mixedwood forests, typically near wetlands or waterbodies where tall snags and forest edges provide elevated foraging perches (COSEWIC, 2018b; NSLF, 2021c).

National Breeding Bird Survey data indicate a long-term population decline of approximately 72% in Canada since 1970, with an estimated annual rate of decline of 3.4%. Contributing factors to these declines may include reduced insect prey availability, forest harvesting, fire suppression, habitat loss on both breeding and wintering

grounds, and broader landscape changes from development and resource extraction (COSEWIC, 2018b; NSLF, 2021c).

The Olive-sided Flycatcher was identified by ACCDC within 5 km of the Project Site; however, it was not identified during field surveys. The Project Site may provide some suitable foraging habitat near the wetland area, supporting the potential for occasional use. As such, it has been identified as a priority species in this assessment.

Species-specific mitigation is not anticipated to be required beyond the application of general bird protection measures.

Peregrine Falcon - anatum/tundrius

The Peregrine Falcon has made a remarkable recovery across North America since the 1970s. Once nearly extirpated from eastern Canada due to the widespread use of organochlorine pesticides like DDT, populations have rebounded significantly following the ban of these chemicals and concerted reintroduction efforts (Environment Canada, 2015). In Nova Scotia, the species has reestablished breeding populations, particularly along the Bay of Fundy, with nesting numbers potentially exceeding historical levels. Although COSEWIC assessed the Peregrine Falcon (anatum/tundrius) as 'Not at Risk' in 2017, the species is listed as 'Vulnerable' under the provincial ESA.

The Peregrine Falcon exhibits remarkable adaptability in its foraging habits, utilizing a diverse range of habitats across North America. Primarily, these raptors favour open landscapes that facilitate their high-speed hunting techniques. In Nova Scotia, coastal cliffs, estuaries, and tidal flats, such as those along the Bay of Fundy, provide ideal foraging grounds, supporting abundant populations of shorebirds and waterfowl (COSEWIC, 2017).

The Peregrine Falcon was observed once on a trail camera and once incidentally during a site visit. While nesting habitat is likely limited, the species may use the surrounding area for foraging, including within McGee Brook. Given its conservation status in Nova Scotia and confirmed presence on site, it was identified as a priority species in this assessment.

Species-specific mitigation is not anticipated to be required beyond the application of general avifauna protection measures, which will be included in the WMP.

Purple Finch

The Purple Finch is a widespread species of coniferous and mixed forests, with a breeding range that includes much of Nova Scotia. In the Maritimes, it nests in various forest types, particularly younger or thinned stands, and is also associated with settled areas in Nova Scotia (Stewart et al., 2015). The population has declined since

the 1970s but appears to have stabilized since the mid-1990s, with periodic fluctuations driven by cone crop availability (Government of Canada, 2015c).

The Purple Finch was identified during field surveys; however, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment. This species will be addressed through the implementation of general mitigation measures intended to minimize disturbance to wildlife and habitat, including birds.

Rose-breasted Grosbeak

The Rose-breasted Grosbeak breeds in a range of deciduous and mixed woodlands across southern Canada, including Nova Scotia. In the Maritimes, it is mainly associated with mature and sapling hardwood stands, forested wetlands, and partially cut areas, showing limited use of conifer-dominated habitats (Stewart et al., 2015). While still relatively widespread, the population has declined moderately since the 1970s (Government of Canada, 2015c), possibly due to reductions in mature hardwood forest availability.

The Rose-breasted Grosbeak was identified by ACCDC within 5 km of the Project Site, and it was also identified during field surveys. However, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment. This species will be addressed through the implementation of general mitigation measures intended to minimize disturbance to wildlife and habitat, including birds.

Rusty Blackbird

The Rusty Blackbird is listed as 'Special Concern' by COSEWIC and SARA, and 'Endangered' under the provincial ESA, having experienced significant population declines across its range. This decline has been attributed to habitat loss, particularly the conversion of wetland areas to agricultural land and urban development, as well as potential impacts from mercury contamination and blackbird control programs in the southeastern U.S. Nationally, the species has seen a decline of over 80% since the 1960s (COSEWIC, 2006; Government of Canada, 2015d).

In Nova Scotia, the Rusty Blackbird is primarily found in forested wetlands, beaver ponds, and regenerating coniferous forests, particularly in areas like the Cape Breton Highlands and Taiga, which provide the necessary habitat for breeding and foraging (Stewart et al., 2015). The species' distribution is patchy in the province, and observation rates have notably decreased in recent years. Habitat pressures, such as forest clearing for development, logging, and wetland degradation, are likely contributing to these declines. Due to its significant role in Canada's boreal ecosystems, the Rusty Blackbird remains a priority species for conservation efforts in the Maritimes.

The Rusty Blackbird was identified by ACCDC within 5 km of the Project Site; however, it was not identified during field surveys. The tall pines bordering the Project Site may provide suitable nesting habitat for blackbirds, including the Rusty Blackbird, supporting the potential for occasional use. As such, it has been identified as a priority species in this assessment.

Species-specific mitigation is not anticipated to be required beyond the application of general bird protection measures.

Bats

Eastern red bat

The Eastern red bat is listed as 'Endangered' by COSEWIC and is found across much of eastern North America, including Canada, the U.S., and parts of northeastern Mexico. These migratory bats can travel thousands of kilometres between their wintering and summering grounds. In summer, they typically roost in foliage, often choosing large, mature trees that reach or exceed the surrounding canopy height. They roost alone or with dependent young (COSEWIC, 2023).

This species forages in a range of habitats, including forest edges, open woodlands, and over clearings. However, they are generally less active in heavily disturbed environments such as urban areas, major roads, or active mining sites. Migration is thought to occur along coastlines or across large open areas (COSEWIC, 2023).

The Eastern red bat was detected during acoustic surveys; however, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment. This species will be addressed through the implementation of general mitigation measures intended to minimize disturbance to wildlife and habitat, including bats.

Hoary bat

The Hoary bat is listed as 'Endangered' by COSEWIC and is one of the most widespread bat species in North America, with a range extending across Canada, the U.S., and into Central America. As a long-distance migrant, this species overwinters in warmer coastal areas of the U.S. and Mexico, migrating north each spring to breed. In Nova Scotia, Hoary Bats are typically observed during the summer months (COSEWIC, 2023).

During the breeding season, they roost in foliage, often selecting mature coniferous or deciduous trees that provide dense canopy cover and open flight space beneath. Foraging typically occurs in semi-open habitats such as forest edges, wetlands, and clearings. Although adaptable in terms of roosting and foraging habitat, Hoary Bats generally avoid areas that are heavily disturbed, including major roads, developed landscapes, and industrial sites. Migration is believed to follow coastal routes or large open landscapes (COSEWIC, 2023).

The Hoary bat was detected during acoustic surveys; however, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment. This species will be addressed through the implementation of general mitigation measures intended to minimize disturbance to wildlife and habitat, including bats.

Little brown myotis

The Little brown myotis is listed as 'Endangered' by COSEWIC, SARA, and the ESA and was once the most widespread and familiar bat species in Canada. Found in all provinces and territories except Nunavut, it commonly roosts in buildings, attics, and barns during summer, making it more likely to be observed by people than other species (COSEWIC, 2013b; NSLF, 2020a).

This species forages primarily over lakes, ponds, and along forest edges, and is often seen hunting insects near streetlights and open water. It overwinters in humid, underground hibernacula such as caves and abandoned mines, sometimes migrating hundreds of kilometres between summer and winter sites (COSEWIC, 2013b). Populations in eastern Canada have experienced catastrophic declines due to White-nose syndrome (WNS), a fungal disease that affects hibernating bats. Although once abundant, the species is now rare in many areas. Additional threats include the loss of roosting sites, chemical exposure, and disturbance during hibernation (COSEWIC, 2013b).

The Little brown myotis was detected during acoustic surveys. The wetland area within the Project Site likely provides good foraging habitat, supporting the potential for regular use. Given its legal status and the presence of suitable habitat, the Little brown myotis was identified as a priority species in this assessment.

Mitigation measures will be incorporated into the Wildlife Management Plan (WMP) and will include avoiding disturbance to wetland habitat and limiting project activities to daytime hours to reduce potential impacts on bat foraging behaviour.

Northern myotis

The Northern myotis is listed as 'Endangered' by COSEWIC, SARA, and the ESA and occurs across most of Canada, excluding Nunavut. Its range spans from Newfoundland to British Columbia and includes much of the boreal forest, with breeding confirmed as far north as the Yukon and Northwest Territories (COSEWIC, 2013b; NSLF, 2020b). This forest-dependent species typically roosts in large-diameter trees during the summer, often forming small maternity colonies. It forages along forest edges, streams, and in canopy gaps, avoiding large open areas such as clearcuts and fields. In autumn, individuals migrate—sometimes over long distances—to overwinter in cold, humid caves or abandoned mines (NSLF, 2020b).

WNS, a fungal disease introduced to Canada around 2010, has caused severe population declines. Like the Little brown myotis, the Northern myotis was once common in eastern Canada but has experienced steep declines in WNS-affected areas. Other threats include habitat loss, disturbance, and potentially climate change (COSEWIC, 2013b; NSLF, 2020b).

The Northern myotis was detected during acoustic surveys. The wetland area within the Project Site likely provides good foraging habitat, supporting the potential for regular use. Given its legal status and the presence of suitable habitat, the Northern myotis was identified as a priority species in this assessment.

Mitigation measures will be incorporated into the WMP and will include avoiding disturbance to wetland habitat and limiting project activities to daytime hours to reduce potential impacts on bat foraging behaviour.

Silver-haired bat

The Silver-haired bat is listed as 'Endangered' by COSEWIC and ranges widely across North America, from British Columbia and the southern Northwest Territories to the Atlantic provinces, including Nova Scotia. It is also a long-distance migrant, wintering in the southern U.S. and Mexico and returning northward in spring to breed (COSEWIC, 2023).

This species commonly roosts under loose bark or in cavities of large dead or decaying trees. In some cases, buildings may also provide roosting opportunities. Maternity roosts are typically small and found in decaying deciduous trees. Silver-haired bats are forest-adapted and usually forage along forest edges, over water, or in small clearings. While specific migratory pathways are not well understood, movements are presumed to occur over broad, forested landscapes and potentially along coastlines (COSEWIC, 2023).

The Silver-haired bat was detected during acoustic surveys; however, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment. This species will be addressed through the implementation of general mitigation measures intended to minimize disturbance to wildlife and habitat, including bats.

Herpetofauna

Eastern painted turtle

The Eastern painted turtle is a freshwater species native to eastern Canada and the northeastern U.S. and is listed as 'Special Concern' by COSEWIC and SARA. Recognized for its striking shell coloration and semi-aquatic lifestyle, this turtle plays a vital role in freshwater ecosystems, aiding in nutrient cycling and seed dispersal. It is also of cultural significance to Indigenous peoples of Canada. The Eastern Painted Turtle is well-adapted to colder climates and is found in various aquatic habitats such as marshes, ponds, and slow-moving rivers across

its range. It is commonly associated with areas that provide abundant basking sites and aquatic plants for cover and feeding (COSEWIC, 2018a).

In Canada, the species is found in the eastern provinces, including New Brunswick and Nova Scotia, where it occupies shallow, well-vegetated wetlands. Suitable nesting sites are typically found in open, often south-facing areas with sandy-loamy or gravelly substrates near aquatic habitats. The Eastern painted turtle faces several threats, including road mortality, habitat loss, climate change, and predation, which can destabilize populations. Although the species is generally secure across North America, localized declines in population have been observed, highlighting the need for ongoing conservation efforts to protect this iconic species (COSEWIC, 2018a).

The Eastern painted turtle was identified by ACCDC within 5 km of the Project Site. Although it was not observed during field surveys, the presence of suitable habitat on site (in McGee Brook) supports the potential for occurrence. As such, it was identified as a priority species in this assessment.

A wildlife nesting monitoring program will be developed as part of the WMP to monitor potential Eastern painted turtle activity and help avoid disturbance during sensitive periods.

Snapping turtle

The Snapping turtle is listed as 'Special Concern' by COSEWIC and SARA, and 'Vulnerable' under the provincial ESA. They are Canada's largest freshwater turtle, found across eastern Canada, including Nova Scotia, New Brunswick, and southern Ontario. They inhabit slow-moving waters like ponds and river edges with soft mud bottoms and dense vegetation. Snapping Turtles face threats from habitat loss, road mortality, and pollution, which impact their reproductive success. They are slow to mature and have a long lifespan, making them vulnerable to increases in adult mortality (COSEWIC, 2008).

The Snapping turtle was identified by ACCDC within 5 km of the Project Site. Although it was not observed during field surveys, the presence of suitable habitat (in McGee Brook) on site supports the potential for occurrence. As such, it was identified as a priority species in this assessment.

A wildlife nesting monitoring program will be developed as part of the WMP to monitor potential Snapping turtle activity and help avoid disturbance during sensitive periods.

Wood turtle

The Wood turtle is listed as 'Threatened' by COSEWIC, SARA, and the ESA. Native to eastern North America, it occurs in small, isolated populations across parts of Ontario, Quebec, New Brunswick, and Nova Scotia, typically inhabiting clear, meandering streams and adjacent riparian areas (COSEWIC, 2007b; NSLF, 2020e).

Unlike most freshwater turtles, the Wood Turtle is highly terrestrial during the active season, often venturing far from water into forests, fields, and wetlands. It overwinters in streams and rivers and returns to known nesting areas, such as sandy streambanks and gravel pits, year after year. Long-lived and slow to mature, the species is highly sensitive to increases in adult mortality (NSLF, 2020e). Populations are declining across much of their range due to road mortality, nest predation, habitat degradation, and illegal collection for the pet trade. Its vulnerability is closely linked to increased human access to remote areas, particularly via roads and trails (COSEWIC, 2007b; NSLF, 2020e).

The Wood turtle was identified by ACCDC within 5 km of the Project Site. Although it was not observed during field surveys, the presence of suitable habitat on site (in McGee Brook and its surrounding riparian zone) supports the potential for occurrence. As such, it was identified as a priority species in this assessment.

A wildlife nesting monitoring program will be developed as part of the WMP to monitor potential Wood turtle activity and help avoid disturbance during sensitive periods.

Invertebrates

Monarch

The monarch butterfly is listed as 'Endangered' under COSEWIC, SARA, and the provincial ESA. It is a large butterfly known for its long migration from North America to Mexico. In Nova Scotia, the Monarch is at the edge of its range, and while its population has declined across North America, available data suggests that its numbers in the province have remained relatively stable. Monarchs depend on milkweed, particularly Common and Swamp milkweed, for breeding (COSEWIC, 2010; NSNRR, 2021a).

While threats like habitat loss in Mexico, pesticide use, and storms affect Monarchs, the main threats in Nova Scotia are the loss of breeding habitat to development and insecticide use. Despite this, the overall threat level in the province is considered low. Conservation efforts in Nova Scotia focus on maintaining milkweed populations, as the province hosts less than 1% of the eastern North American population (COSEWIC, 2010; NSNRR, 2021a).

Although this species is listed under SARA and the ESA and was identified by ACCDC within 5 km of the Project Site, it was not observed during field surveys. Common milkweed (*Asclepias syriaca*), which is critical for Monarch breeding, was encountered on site but only in very limited amounts. No other habitat features critical to its life cycle were documented. As a result, the likelihood of interaction with the Project is considered low, and it was not identified as a priority species in this assessment.

Yellow-banded bumble bee

The yellow-banded bumble bee is listed as 'Special Concern' under COSEWIC and SARA, and 'Vulnerable' under the provincial ESA. It is a medium-sized bumble bee with a distinctive golden yellow band across its abdomen and is an important pollinator of various crops and native plants (COSEWIC, 2015). Found across eastern North America, it is primarily located in woodlands, farmlands, and urban areas. The species nests underground in pre-existing cavities, such as abandoned rodent burrows or rotten logs (NSNRR, 2024).

Populations of the yellow-banded bumble bee have declined, particularly in southern Canada, with significant reductions in its abundance at multiple sites. The decline is likely due to a combination of factors, including pesticide use, disease transmission from managed bumble bees, climate change, and habitat loss. Despite this, the species has not disappeared from Nova Scotia, although its population has been affected. In 2017, it was assessed as 'Vulnerable' in Nova Scotia due to the observed decline in abundance (COSEWIC 2015; NSNRR, 2024).

Although this species is listed under SARA and the ESA and was identified by ACCDC within 5 km of the Project Site, it was not observed during field surveys. Additionally, no specific habitat features critical to its life cycle were documented on the Project Site. As a result, the likelihood of interaction with the Project is considered low, and it was not identified as a priority species in this assessment.

PRIORITY SPECIES : RESULTS

Based on the screening criteria and the definition of priority species used in this EA, the following fauna species have been identified as priority species:

Avifauna

- Bank Swallow
- Barn Swallow
- Bobolink
- Common Nighthawk
- Eastern Wood-pewee
- Olive-sided Flycatcher
- Peregrine Falcon
- Rusty Blackbird

Bats

- Little brown myotis
- Northern myotis

Herpetofauna

- Eastern painted turtle
- Snapping turtle
- Wood turtle

All identified priority species will be addressed through a WMP to avoid or reduce adverse effects during all phases of the Project. The WMP will include targeted measures for priority species, as appropriate. Species not identified as priority will still be considered through the application of general mitigation measures intended to minimize disturbance to wildlife and habitat.

DESCRIPTION OF EFFECTS

Activities that will impact fauna include removing and altering habitats during site preparation, creating sensory disturbance (noise, vibrations, and light) during extraction operations/processing/stockpiling/transportation, and direct mortality and injuries from wildlife-vehicle collisions. Priority species were identified based on SAR and SOCI determined through desktop analysis and field surveys, considering their presence, or potential presence, within the Project Site and the effects of the Project on the species.

- **Habitat Alteration:** Clearing vegetation during site preparation will remove habitat used by fauna species and could result in habitat fragmentation effects. Habitat fragmentation occurs when continuous habitats are broken up into smaller, isolated patches, reducing wildlife species' access to food, mates, and shelter, and increasing their exposure to predation and competition for resources (Fahrig, 2003; Haddad et al., 2015). These effects are most pronounced in smaller species such as small mammals and amphibians. Additionally, breeding bird species are also at risk of direct mortality and/or nest destruction during vegetation clearing activities if the clearing occurs during the breeding season (approximately May 1st to August 31st). However, the expansion area is relatively small (1.46 ha), and with the below mitigation measures, significant habitat loss, direct mortality and fragmentation effects are not anticipated. Of special concern is the Bank Swallow habitat that has been identified on site. Plans for the relocation of the Bank Swallow habitat are detailed in the mitigation section below.

- **Sensory Disturbance and Dust:** The sounds and vibrations made by heavy equipment during the extraction, processing, and transportation of the sand may result in altered behaviour and movement of local wildlife species currently using and surrounding the Project Site. Bats and birds are particularly sensitive to the effects of sound. Sound can result in altered bat activity and behaviour by resulting in adjusted echolocation or altered echolocation behaviour, which could result in impacts on navigation and foraging (Bunkley et al., 2015). Anthropogenic sound can also be particularly impactful to avian species as they use it extensively for communication (mating, warning of predators, etc.). Anthropogenic sound has been found to alter breeding song timing of nearby bird populations (de

Framond & Brumm, 2022) and induce altered hormonal levels in a quail bird study (Amjad et al., 2024). Sound and vibrations may repel certain species, increasing habitat fragmentation effects, and may also attract others, potentially leading to an increase in deleterious human-wildlife conflicts. However, provincial guidelines and municipal by-laws protecting human health will be followed, which, coupled with the mitigation measures listed below, will help prevent significant effects of noise and vibrations on fauna. Dust can also impact wildlife species' ability to forage and breathe. Dust has been found to reduce the foraging quality for herbivores (Watkinson et al., 2021), and a study exposing rats to dust storm fine particulate matter caused inflammation and injury to the rats' respiratory, cardiovascular, endocrine, hematological, and digestive systems (Cao et al., 2018). Dust mitigation measures will also be implemented and are detailed below.

- **Vehicle Collisions:** The sand pit development could increase the risk of wildlife-vehicle collisions due to heightened traffic from heavy machinery, transport trucks, and support vehicles. As the natural habitats within the planned Project Site expansion area are disturbed, wildlife may be forced to cross access roads and active pit areas more frequently in search of food, shelter, or mates. Species that are attracted to roads but lack the ability to avoid traffic, such as reptiles (e.g., nesting in roadside gravel), amphibians (e.g., breeding in road ruts), and large mammals (e.g., deer using roads as paths of least resistance), are particularly at risk of experiencing negative effects of roads and vehicular traffic (Fahrig & Rytwinski, 2009). Additionally, certain avian species, particularly ground-nesting birds or those foraging near open sand and gravel surfaces, may be exposed to collisions or disturbance from passing vehicles. Mitigations for species are detailed below.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on fauna during the Project:

- Vegetation clearing will be avoided during peak breeding season for birds (April to September). If vegetation clearing must occur during this time, pre-disturbance nest searches will be conducted, and appropriate nest buffers will be applied and avoided.
- A WMP will be developed and incorporated into the Environmental Protection Plan (EPP). This Plan will include measures to avoid or reduce adverse effects on priority fauna species during all phases of the Project. Included in this plan will be contingencies for managing Bank Swallow activity on the Project Site.
- Existing sand faces in the test pit will be managed to discourage Bank Swallow nesting prior to construction. Alternate nesting habitat will be created nearby in consultation with qualified biologists, mimicking the slope, substrate, and orientation of the original site. All activities will be timed to avoid the breeding season.

- To minimize noise- and vibration-related effects on wildlife, pit operations will comply with relevant municipal and provincial guidelines, including *By-Law # 84 - Noise Control By-Law* (MoCK, 2001), the *Pit and Quarry Guidelines* (NSEL, 2003), and the *Guidelines for Environmental Noise Measurement and Assessment* (NSECC, 2023).
- Wildlife awareness training will be provided to workers.
- A Waste Management Plan will be implemented to ensure waste will be properly disposed of and secured on the Project Site.
- Dust suppression techniques, including the application of lignin-based solutions and chloride mixtures, will be used on haul roads, stockpiles, and processing areas.
- Speed limits for vehicles on-site will be implemented to reduce dust emissions and limit the potential for wildlife collisions.
- Stockpiles and disturbed areas will be minimized to the extent possible and progressively reclaimed to reduce the potential for dust generation.
- Stockpiles and areas of exposed soil, as well as other project infrastructure, will be routinely inspected to rule out the possibility of nesting wildlife. Contingencies for nest management will be included in the EPP.
- Enclosed or covered trucks will be used for material transport to minimize dust generation.
- Dust-generating activities will be timed to avoid periods of excessive wind, and activities will be paused when wind speeds are high.
- Storage areas and material stockpiles will be designed with prevailing wind directions in mind to reduce the potential for dust dispersion.
- Loose site materials and products will be tied down, covered, and/or stored prior to inclement weather or wind events to prevent them from becoming airborne.
- An emergency response spill kit will be kept on site for spill cleanup.
- A 30 m buffer from the bank or ordinary high water mark of any watercourse will be implemented, which also encompasses the adjacent wetland.
- After final extraction, the pit walls will be rehabilitated to a 3:1 side slope. The pit wall slopes and pit floor will be covered with 100 mm and 500 mm of topsoil, respectively, and seeded with a native grass mix. Over time, the area will return to forest through natural regeneration.
- Project activities will be limited to daytime hours to reduce potential impacts on bat foraging behaviour.

MONITORING

A Wildlife Management Plan will be developed, through consultation with NSECC and NSNRR, to guide monitoring activities and help ensure ongoing protection of the identified priority species in this assessment. As part of this plan, a wildlife nesting monitoring program will be implemented to monitor the Project Site for turtle

activity (including Wood turtle) and prescribe management plans for encounters with turtles, including managing turtle nests.

CONCLUSION

After mitigation measures, the residual effects on fauna are anticipated to be:

- **Magnitude** - Low, as the habitat loss will be minimal, given that the existing sand pit is already in operation and additional habitat loss is expected to be insignificant within the broader RAA following the implementation of mitigation measures.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site.
- **Duration** - Medium-term, as while some habitat loss will have long-term effects, other impacts will persist throughout the operational and reclamation phases, but are expected to diminish once operations conclude and the site is fully reclaimed.
- **Frequency** - Intermittent, as disturbances to fauna may occur periodically during project activities, but may differ seasonally depending on species needs.
- **Reversibility** - Reversible, as effects are expected to diminish over time with proper reclamation and mitigation measures.
- **Significance** - Not significant, as the residual effects are low in magnitude, localized, and temporary, with effective mitigation measures in place.

8.1.5 EFFECTS ON TERRESTRIAL HABITAT

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for terrestrial habitat includes the Project Site.
- **Regional Assessment Area:** The RAA for terrestrial habitat includes a portion of the Annapolis Valley Ecodistrict, from Middleton to Berwick.

PROJECT INTERACTIONS

The following project activities may interact with the terrestrial habitat:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on terrestrial habitat. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable change to habitat quality, extent, or function.
- **Low** - Minor loss or alteration of terrestrial habitat, with no change to key habitat functions.
- **Moderate** - Minor to moderate loss of terrestrial habitat or loss of key habitat functions.
- **High** - Significant loss or degradation of terrestrial habitat and its ecological functions.

DESCRIPTION OF EFFECTS

- **Habitat Loss and Fragmentation:** Vegetation clearing within the proposed expansion area will result in the direct loss of approximately 1.46 ha of terrestrial habitat. This may reduce available cover, foraging resources, and movement corridors for wildlife within the LAA. Some minor fragmentation may also occur where previously continuous habitat patches are further subdivided. However, much of the habitat to be removed is already disturbed from previous sand pit activities, and no rare or sensitive terrestrial habitat types were identified within the proposed expansion footprint. The surrounding landscape remains largely forested and vegetated, unless used for agriculture, and there are no designated or pending conservation lands, significant old-growth forest stands, or other priority ecological features within the LAA aside from the wetland area in the eastern extent of the Project Site. Wetlands and riparian buffers associated with McGee Brook will remain undisturbed, in accordance with applicable provincial setback requirements. These surrounding natural features will continue to support ecological functions and provide connectivity for wildlife. Habitat loss will be minimized through adherence to defined clearing limits and the maintenance of vegetated buffers, ensuring that overall habitat function, such as cover, forage, and movement, remains largely intact.

- **Habitat Creation and Use of Disturbed Areas:** While the Project will result in a small amount of habitat loss, certain species may utilize the disturbed or early successional areas created by pit expansion. For example, deer, small mammals, and ground-nesting birds may forage or seek cover along pit margins, and some herpetofauna species are known to use gravel or sandy substrates for nesting or basking. Bank Swallow nesting habitat was observed in the edges of an existing exploratory pit, illustrating how adaptable species may opportunistically colonize disturbed areas. While such nesting in active pits is not encouraged due to safety and conservation concerns, this observation illustrates how some wildlife species can adapt to or even benefit from disturbed conditions in certain cases.

- **Indirect Effects:** Vegetation removal may cause localized edge effects, including changes in light availability, moisture conditions, or microclimate at the forest-pit boundary. These changes may temporarily alter plant community composition or facilitate the establishment of opportunistic or

invasive plant species. However, due to the limited footprint and the continued presence of vegetated buffers and adjacent forest, indirect effects on terrestrial habitat structure and function are expected to be minor and localized. Ongoing site management and reclamation measures will further reduce the likelihood of lasting indirect effects.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on terrestrial habitat during the Project:

- SOCI flora species will be avoided during vegetation clearing activities. Appropriate buffers will be implemented around identified SOCI species.
- Vegetation clearing will be limited to the minimum area required. Existing disturbed areas will be prioritized for expansion to reduce habitat fragmentation.
- Buffers of at least 30 m will be maintained from watercourses to protect habitat functions and connectivity, which also encompasses adjacent wetlands.
- Dust suppression techniques, such as lignin-based solutions and chloride mixtures, will be used on haul roads, stockpiles, and disturbed areas. An Erosion and Sediment Control Plan will be implemented to prevent sedimentation in surrounding habitats.
- After extraction, pit slopes will be graded to a 3:1 ratio and seeded with a native grass mix to promote natural regeneration.
- Equipment will be regularly cleaned to prevent the spread of invasive species. Only native species will be used in restoration activities.
- Vehicles and machinery will remain on designated access roads and trails to reduce habitat disturbance and soil compaction.
- A state of good housekeeping will be maintained on the Project Site to avoid attracting nuisance wildlife.
- Vegetation removal and maintenance will be conducted outside of the nesting bird season.
- Creation and removal of nesting areas within sand pits and piles for Bank Swallows and other wildlife will be conducted outside of the nesting bird season, in accordance with relevant Acts and regulations.

MONITORING

No monitoring is recommended for this VEC.

CONCLUSION

After mitigation measures, the residual effects on terrestrial habitat are anticipated to be:

- **Magnitude** - Low to moderate, as the expansion area is relatively small (1.46 ha), and habitat loss is limited and partially offset through reclamation and the use of buffers.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site. Habitat change within the RAA will be insignificant.
- **Duration** - Long-term, as habitat loss will persist beyond the life of the Project.
- **Frequency** - Intermittent, as habitat disturbance will occur periodically during active phases of site development and operation.
- **Reversibility** - Partially reversible, as some disturbed habitat will be reclaimed post-closure, but some changes will not return to baseline conditions in the short- or medium-term.
- **Significance** - Not significant, as the residual effects are low to moderate in magnitude, localized, and effective mitigations such as buffers, minimized clearing, and site rehabilitation are in place to reduce long-term effects.

8.1.6 EFFECTS ON FISH AND AQUATIC HABITAT

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for fish and aquatic habitat includes the Project Site, specifically McGee Brook along the eastern boundary of the Project Site.
- **Regional Assessment Area:** The RAA for fish and aquatic habitat includes the broader McGee Brook Watershed.

PROJECT INTERACTIONS

The following project activities may interact with fish and aquatic habitat:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on fish and aquatic habitat. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable change in fish health or behaviour. No loss of fish or aquatic habitat. No change in stream hydrology.

- **Low** - A minor, temporary alteration to aquatic habitat on or directly adjacent to the Project Site, resulting in no measurable impacts to fish health and a low likelihood of changes to local hydrology or fish behaviour.
- **Moderate** - Measurable changes to portions of aquatic and fish habitat are expected, including moderate habitat loss and localized behavioural effects on individual fish, not extending to the population level. Anticipated hydrological changes can be managed with standard mitigation measures. Temporary impacts to fish and fish habitat are expected to recover to pre-project conditions.
- **High** - Significant loss of fish and aquatic habitat is anticipated, with major impacts to regional populations that may affect long-term resource sustainability. Hydrological changes will be difficult to manage with standard practices. Population-level behavioural and life cycle impacts are expected.

PRIORITY SPECIES : METHODOLOGY

To determine which aquatic species warranted further consideration in this effects assessment, a conservative multi-step screening approach was applied:

- **Initial species pool:** The assessment considered:
    - All SAR and SOCI aquatic species observed during field surveys conducted on the Project Site; and
    - SAR aquatic species (or their habitat) reported by ACCDC and/or DFO to occur on or within 5 km of the Project Site.
- **Evaluation of potential occurrence:** Species identified from these sources were reviewed for either direct observation on the Project Site or the presence of suitable supporting habitat.
- **Priority species determination:** Species were identified as priority species if they are legally listed SAR and were either observed on the Project Site or considered likely to occur based on the presence of suitable habitat. This approach aligns with the definition provided in Chapter 5.

Aquatic SOCI that did not meet the criteria for priority species are still described below to acknowledge their presence and inform general mitigation planning.

SPECIES DESCRIPTIONS

The following SAR and SOCI aquatic species, or potential habitats, were identified through ACCDC/DFO data. SAR are shown in bold:

- **Brook floater (*Alasmidonta varicosa*)**
- Eastern pearlshell (*Margaritifera margaritifera*)

Both species are described in more detail below, including habitat requirements and observed or potential site interactions.

Brook floater

The Brook floater is listed as 'Special Concern' under COSEWIC and SARA, and 'Threatened' under the ESA. It is a freshwater mussel native to eastern North America, with the Canadian population restricted to Nova Scotia and New Brunswick. In Nova Scotia, Brook floater is known from a small number of disjunct watersheds, including the Annapolis, LaHave, St. Marys, and Salmon River systems. It typically occurs in low numbers, often fewer than five individuals observed at any one site, with the exception of the East St. Marys River, which supports the largest known population. Brook Floater prefers clean, well-oxygenated rivers and streams with moderate flow and sandy or gravel substrates. Key threats in Nova Scotia include water pollution, habitat degradation from land use (e.g., forestry, agriculture, development), and increased sedimentation from the loss of riparian vegetation (NSNRR, 2022b; COSEWIC, 2009).

The DFO Aquatic Species at Risk Map identified the Annapolis River as containing, or potentially containing, Brook floater. However, McGee Brook was not identified as containing this species, and, as such, the Brook floater was not considered a priority species for this assessment.

Eastern pearlshell

The Eastern pearlshell is a long-lived freshwater mussel with a holarctic distribution, and is one of the few North American unionids also found in Europe and Russia. In Canada, it occurs across the Atlantic region, including Nova Scotia, New Brunswick, Newfoundland, Labrador, and parts of southern Quebec. Within the Atlantic Maritime Ecozone, the species inhabits small to medium-sized cold-water streams and rivers, often far upstream in permanent, fast-flowing waters bordered by intact riparian zones. It prefers well-oxygenated, low-calcium environments and is typically associated with clean, shallow sandy or gravelly substrates. The species relies on salmonid hosts, particularly Atlantic Salmon and Brook Trout, for part of its life cycle. Key threats include habitat degradation from land use activities, sedimentation, declining water quality, and declines in host fish populations (Martel et al., 2010).

Eastern pearlshell was identified by ACCDC to be within 5 km of the Project Site and observed during field surveys. However, as it is not listed under SARA or the ESA, it was not identified as a priority species for this assessment.

PRIORITY SPECIES : RESULTS

Based on the screening criteria and the definition of priority species used in this EA, no priority aquatic species were identified. While DFO recorded one SAR in the Annapolis River (brook floater), no SAR were identified within McGee Brook.

Unidentified mussels and fish were observed in McGee Brook during field surveys; however, general mitigation measures to protect fish and other aquatic species and to minimize disturbance to habitat will be applied during all phases of the Project.

DESCRIPTION OF EFFECTS

- **Hydrological Alterations:** Plants facilitate the evaporation of precipitation through transpiration. Additionally, soil and vegetation store and slow water movement across land. Removing vegetation and soil during the clearing and grubbing activities involved in site preparation may result in increased surface water runoff from the Project Site. This increased runoff may lead to higher rates of sediment erosion and the transport of sediment, minerals, and ions into McGee Brook, particularly during heavy rainfall or snowmelt events. This runoff could negatively impact the water quality of McGee Brook, leading to negative effects on fish health and behaviour. Similar effects could also be caused by altered drainage patterns due to site grading and access road development. However, mitigation measures will be implemented as described below, and significant effects are not anticipated.

- **Dust:** Loose particles will be disturbed and become airborne, especially in dry conditions, during different project activities. Site preparation and excavation will generate dust during topsoil and vegetation removal; processing and stockpiling will produce dust when screening, stacking of sand; vehicle and machinery movement on site will produce dust when disturbing exposed surfaces such as those found on access roads and open pit surfaces; and wind will blow dust from the exposed surfaces on site into the surrounding area. If this dust is not suppressed, it could land in McGee Brook. Dust deposition in aquatic environments can adversely affect fish and aquatic habitats by increasing turbidity, thereby reducing light penetration and limiting photosynthetic activity in primary producers such as periphyton and macrophytes. Fine particulate matter can physically irritate or occlude fish gill surfaces, impairing respiratory efficiency and elevating physiological stress. Accumulation of dust on the benthic substrate may result in the smothering of fish eggs and invertebrate communities, leading to habitat degradation. These physical and biological disturbances can also alter fish behaviour, potentially causing habitat avoidance and interference with critical life history processes such as spawning and migration.

- **Water Contamination:** There will be fuel and other substances on site that, if introduced into McGee Brook (e.g. via spill and subsequent runoff), would negatively affect fish health, behaviour and surface water quality. The mitigation measures below will address this potential.

MITIGATIONS

There is no anticipated need to cross or work on the one watercourse identified on site (McGee Brook). It will not be crossed, culverts are not being installed, and no in-stream work is necessary. The following mitigation measures will be implemented to minimize potential impacts on fish and aquatic habitat during the Project.

- Stormwater management practices will be implemented to direct runoff toward infiltration areas and reduce sediment transport into a wetland, water resource, or beyond the property boundary.
- Roads, pits, and other disturbed areas will be graded in ways that limit slope and direct runoff and drainage away from watercourses and wetlands.
- Dust suppression techniques, including the application of lignin-based solutions and chloride mixtures, will be used on haul roads, stockpiles, and processing areas.
- Speed limits for vehicles on-site will be implemented to reduce dust emissions.
- Stockpiles and disturbed areas will be minimized to the extent possible and progressively reclaimed to reduce the potential for dust generation.
- Enclosed or covered trucks will be used for material transport to minimize dust generation.
- Dust-generating activities will be timed to avoid periods of excessive wind, and activities will be paused when wind speeds are high.
- Storage areas and material stockpiles will be designed with prevailing wind directions in mind to reduce the potential for dust dispersion.
- Loose site materials and products will be tied down, covered, and/or stored prior to inclement weather or wind events to prevent them from becoming airborne.
- An Erosion and Sediment Control Plan will be developed and implemented.
- Project activities, including fuelling, vegetation clearing, stockpiling, etc., will not occur within 30 m of any watercourse (i.e., McGee Brook), which also encompasses adjacent wetlands.
- An emergency response spill kit will be kept on site for spill cleanup.

MONITORING

Monitoring will be conducted to ensure the effectiveness of mitigation measures and to detect any unforeseen impacts to fish and aquatic habitat:

- Erosion and sediment controls will be inspected regularly, including quarterly and after severe precipitation events.
- Compliance checks will be conducted to ensure that mitigation measures remain effective.

CONCLUSION

After mitigation measures, residual effects on fish and aquatic habitat are anticipated to be:

- **Magnitude** - Negligible, as no direct impacts to fish or aquatic habitat are expected, and measurable effects to fish health and behaviour, and watercourse hydrology and surface water quality are not anticipated with the listed mitigation measures.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site and the immediate surrounding areas.
- **Duration** - Medium-term, as effects will last throughout the operational and reclamation phases but are expected to diminish once operations conclude and the site is fully reclaimed.
- **Frequency** - Intermittent, as runoff from precipitation, dust, etc., may occur periodically during the site preparation, extraction, and reclamation phases.
- **Reversibility** - Reversible, as the effects are expected to be measurable or lasting.
- **Significance** - Not significant, as the residual effects are negligible to low in magnitude, localized, and temporary, with effective mitigation measures in place

8.1.7 EFFECTS ON CLIMATE CHANGE

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for climate change includes the Project Site and immediate surroundings.
- **Regional Assessment Area:** The RAA for climate change is the province of Nova Scotia.

PROJECT INTERACTIONS

The following project activities may interact with climate change:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on climate change. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable change or a net reduction in Nova Scotia's annual GHG emissions.
- **Low** - A minor increase (i.e., <1%) in Nova Scotia's annual GHG emissions.
- **Moderate** - A moderate increase (i.e., 1% to 5%) in Nova Scotia's annual GHG emissions.
- **High** - A substantial increase (i.e., >5%) in Nova Scotia's annual GHG emissions.

DESCRIPTION OF EFFECTS

The Project will contribute to climate change through GHG emissions from machinery, transportation, and site operations. These emissions will primarily consist of CO_2, CH_4, N_2O, and VOCs. These emissions are estimated to be approximately 936.6 tonnes of CO_2e annually, which is negligible compared to the provincial average of 14.8 Mt CO_2e annually.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on climate change during the Project:

- Energy-efficient equipment and vehicles will be used when possible to minimize fuel consumption and GHG emissions.
- Sustainable construction practices and operational techniques will be used to reduce emissions.
- Speed limits for vehicles on-site will be implemented to reduce excess emissions.
- Heavy equipment will be maintained in accordance with manufacturer specifications, and emissions control technologies (e.g., diesel particulate filters and catalytic converters) will be used to reduce exhaust emissions.
- The idling of equipment will be minimized, and low-emission engines will be prioritized.

MONITORING

No monitoring is recommended for this VEC.

CONCLUSION

After mitigation measures, residual effects on climate change are anticipated to be:

- **Magnitude** - Negligible, as annual GHG emissions from the Project will be minor compared to provincial totals. While these emissions will persist in the atmosphere, their contribution is minimal and will not result in measurable climate effects.
- **Geographic Extent** - Global, as GHG emissions accumulate in the atmosphere and contribute to climate change on a global scale.

- **Duration** - Medium-term, as effects are expected to occur throughout the operational phase but are anticipated to diminish once operations conclude.
- **Frequency** - Intermittent, as the effects may occur sporadically throughout the various project phases.
- **Reversibility** - Irreversible, as GHG emissions will contribute to cumulative global concentrations.
- **Significance** - Not significant. Although GHG emissions are irreversible, the quantity generated by the project is expected to have a negligible effect on climate change and will not result in a measurable increase in Nova Scotia's total GHG emissions.

8.1.8 EFFECTS ON AIR QUALITY AND ATMOSPHERIC CONDITIONS

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for air quality and atmospheric conditions includes the Project Site and immediate surroundings, where local air quality could be impacted by dust and emissions.
- **Regional Assessment Area:** The RAA for air quality and atmospheric conditions is not applicable.

PROJECT INTERACTIONS

The following project activities may interact with air quality and atmospheric conditions:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on air quality and atmospheric conditions. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable changes in air quality or atmospheric conditions (i.e., no observable impacts on air quality or local atmospheric conditions).
- **Low** - Minor changes to air quality or atmospheric conditions, with no significant or lasting impact (e.g., small increase in dust levels or pollutants that remain within acceptable limits).
- **Moderate** - Noticeable but manageable changes to air quality or atmospheric conditions, potentially requiring mitigation to reduce impacts (e.g., measurable changes in local air quality).
- **High** - Significant and lasting changes to air quality or atmospheric conditions that are difficult to mitigate (e.g., significant air quality degradation or major alteration to local atmospheric conditions).

DESCRIPTION OF EFFECTS

- **Air Quality:** Air quality could be temporarily degraded during construction and operations due to the generation of dust and particulate matter from excavation, material hauling, and site preparation activities. Diesel-powered machinery will also release pollutants such as NO_x, SO_2, and CO. These emissions may cause localized air quality degradation, especially under dry or windy conditions. Further, smog from emissions can lead to the formation of acidic deposits (acid rain), which can leach aluminum from soils and strip essential nutrients needed by plants and trees. Acidic deposition may therefore contribute to vegetation stress and reduced forest health, and can also harm wildlife through soil and water quality degradation (US EPA, 2025b).

- **Atmospheric Conditions:** The removal of vegetation, though minor, and the disturbance of land surfaces may result in localized changes to atmospheric conditions, including variations in wind speed and direction, as well as minor changes in temperature and humidity (Sleeter et al., 2018). These effects are expected to be temporary and localized, but could affect microclimates in the immediate vicinity of the Project Site.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on climate change, air quality, and atmospheric conditions during the Project:

- Energy-efficient equipment and vehicles will be used when possible to minimize fuel consumption and emissions.
- Sustainable construction practices and operational techniques will be used to reduce emissions.
- Dust suppression techniques, including the application of lignin-based solutions and chloride mixtures, will be used on haul roads, stockpiles, and processing areas.
- Speed limits for vehicles on-site will be implemented to reduce dust emissions.
- Stockpiles and disturbed areas will be minimized to the extent possible and progressively reclaimed to reduce the potential for dust generation.
- Enclosed or covered trucks will be used for material transport to minimize dust generation.
- Dust-generating activities will be timed to avoid periods of excessive wind, and activities will be paused when wind speeds are high.
- Heavy equipment will be maintained in accordance with manufacturer specifications, and emissions control technologies (e.g., diesel particulate filters and catalytic converters) will be used to reduce exhaust emissions.
- Storage areas and material stockpiles will be designed with prevailing wind directions in mind to reduce the potential for dust dispersion.

- Loose site materials and products will be tied down, covered, and/or stored prior to inclement weather or wind events to prevent them from becoming airborne.
- The idling of equipment will be minimized, and low-emission engines will be prioritized.

MONITORING

No monitoring is recommended for this VEC.

CONCLUSION

After mitigation measures, residual effects on air quality and atmospheric conditions are anticipated to be:

- **Magnitude** - Low, as the impacts on air quality and atmospheric conditions are localized with minor changes that can be managed through mitigation (e.g., localized changes in dust levels and air quality).
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site and the immediate surrounding areas.
- **Duration** - Medium-term, as effects are expected to occur throughout the operational phase but are anticipated to diminish once operations conclude.
- **Frequency** - Intermittent, as the effects may occur sporadically throughout the various project phases.
- **Reversibility** - Partially reversible, as localized air quality and atmospheric conditions are expected to return to baseline conditions after operations cease.
- **Significance** - Not significant, as the residual effects on air quality and atmospheric conditions are low in magnitude, localized, and expected to return to baseline conditions in the medium term.

8.1.9 EFFECTS ON SOIL AND GEOLOGY

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for soil and geology includes the Project Site and immediate surroundings, where direct soil disturbance and geological interactions may occur.
- **Regional Assessment Area:** The RAA for soil and geology is not applicable as the Project's impacts on soil and geology are anticipated to be localized and do not extend beyond the immediate Project Site.

PROJECT INTERACTIONS

The following project activities may interact with soil and geology:

- Site Preparation
- Extraction Operations
- Stockpiling
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on soil and geology. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable changes to soil stability, composition, or geological integrity.
- **Low** - Minor soil disturbance or erosion risk, with no significant changes to site geology.
- **Moderate** - Noticeable alteration to soil structure or composition, but effects can be managed with mitigation (e.g., localized erosion, changes in soil texture).
- **High** - Significant geological disruption, such as subsidence, instability, or major erosion.

DESCRIPTION OF EFFECTS

- **Soil Disturbance:** Excavation activities will disturb the existing soil layers, including topsoil and underlying sand deposits. This could result in changes to the local topography and impact soil structure.

- **Erosion and Sedimentation:** Due to the nature of the operations, erosion and sedimentation could occur, particularly in disturbed areas. The movement of surface water, especially during periods of heavy rain, could lead to sediment runoff that may affect adjacent areas.

- **Geological Stability and Hazards:** The Project Site is underlain by the Wolfville Formation, primarily composed of fluvial sandstone and conglomerate, which poses a low risk for acid rock drainage. The area is not within a high-risk zone for karst topography or subsidence. Given the nature of extraction (sand removal without deep excavation into bedrock), no significant geological stability issues are expected.

- **Potential Contaminant Risks:** There is a medium risk for radon and arsenic in the region, though the Project will not disturb deeper bedrock formations where these elements are typically concentrated. Standard mitigation, such as monitoring and immediate reporting if sulfide-bearing material is encountered, will be followed.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on soil and geology during the Project:

- An Erosion and Sediment Control Plan will be developed and implemented.
- Progressive reclamation and the use of sediment barriers will be employed to limit soil loss.
- All stockpiled materials, such as topsoil and grubbing, will be stored in designated areas with proper erosion and sediment control measures to prevent the mobilization of sediment-laden surface water.

- Ditches and other erosion and sediment control infrastructure will be regularly inspected and maintained to minimize sediment build-up, particularly during and after periods of heavy rainfall.
- Existing drainage patterns will be maintained, and unnecessary land disturbance will be avoided.
- Immediate assessment and reporting to NSECC if unexpected geological risks (e.g., sulfide-bearing materials) are encountered.

MONITORING

Monitoring will be conducted to ensure the effectiveness of mitigation measures and to detect any unforeseen impacts to soil and geology:

- Routine inspections of soil stability and erosion and sediment control measures will be conducted.
- Monitoring for the presence of sulfide-bearing material during excavation, as well as any unforeseen geological hazards (e.g., karst features or other unexpected contaminants), will be carried out.
- Compliance checks will be conducted to ensure that mitigation measures remain effective.

CONCLUSION

After mitigation measures, residual effects on soil and geology are anticipated to be:

- **Magnitude** - Negligible to low, as effects are limited to minor soil disturbance, localized erosion, and manageable changes in soil texture.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site and the immediate surrounding areas.
- **Duration** - Medium-term, as effects will last throughout the operational and reclamation phases but are expected to diminish once operations conclude and the site is fully reclaimed.
- **Frequency** - Intermittent, as disturbances to soil and geology may occur periodically during the site preparation, extraction, and reclamation phases.
- **Reversibility** - Reversible, as the effects are expected to diminish over time with proper reclamation and mitigation measures.
- **Significance** - Not significant, as the residual effects are negligible to low in magnitude, localized, and temporary, with effective mitigation measures in place.

8.2 EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT

8.2.1 EFFECTS ON LOCAL ECONOMY, LABOUR FORCE, AND EMPLOYMENT

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for the local economy, labour force, and employment includes the Municipality of the County of Kings.
- **Regional Assessment Area:** The RAA for the local economy, labour force, and employment includes the entire province.

PROJECT INTERACTIONS

All project activities have the potential to interact with the local economy, labour force, and employment:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Aggregate Quantification
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on the local economy, labour force, and employment. The VEC-specific definition for magnitude is:

- **Positive** - The Project is expected to have a positive impact on the economy, labour force, and employment by maintaining existing jobs and supporting local businesses.
- **Negative** - The Project is expected to have a negative impact on the economy, labour force, and employment if it causes a loss of jobs or business activity.

DESCRIPTION OF EFFECTS

The impacts of the proposed sand pit expansion on the local economy, labour force, and employment are expected to be positive but minimal due to the small scale of the Project. The expansion will extend the operational life of the pit, thereby maintaining existing jobs that would otherwise be lost if the pit were decommissioned.

Since the Project is a continuation of an existing operation, no significant changes to local or regional employment trends are anticipated. The Project will positively contribute by maintaining local employment and supporting businesses, with limited broader economic effects.

MITIGATIONS

No mitigation measures are recommended for this VEC, as the expected impacts are positive and minimal.

MONITORING

No monitoring is recommended, as the potential effects are expected to be positive and minimal.

CONCLUSION

The impacts of the proposed sand pit expansion on the local economy, labour force, and employment are expected to be positive. The Project will sustain existing jobs and support local businesses, with minimal impacts on the broader economy or regional employment trends. No significant negative residual effects are anticipated:

- **Magnitude** - Positive, as the Project will maintain local employment and support the local economy.
- **Geographic Extent** - Localized to the LAA but may extend to the entire province (RAA).
- **Duration** - Medium-term, as positive effects are expected to last only during the operational life of the project.
- **Frequency** - Ongoing, as positive effects will continue consistently throughout operations.
- **Reversibility** - Partially reversible, as economic benefits are tied to the Project's operation, but some positive effects may remain in the local business environment.
- **Significance** - Not significant, as positive effects are anticipated.

8.2.2 EFFECTS ON LAND USE AND PROPERTY VALUES

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for land use and property values is defined as the Project Site and the surrounding area, including nearby residential properties.
- **Regional Assessment Area:** The RAA for land use and property values is not applicable.

PROJECT INTERACTIONS

All project activities have the potential to interact with land use and property values:

- Site Preparation
- Extraction Operations

- Processing
- Stockpiling
- Aggregate Quantification
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on land use and property values. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable changes in property values and/or land use.
- **Low** - Minor changes in property values and/or minor restrictions to surrounding land use.
- **Moderate** - Noticeable changes in property values and/or moderate restrictions to surrounding land use.
- **High** - Significant changes in property values and/or significant restrictions to surrounding land use.

DESCRIPTION OF EFFECTS

The sand pit expansion will occur primarily within the A2 - Rural Mixed Use Zone, an area that supports agricultural, residential, and resource-based land uses. Additionally, a portion of the Project is within the O1 - Environmental Constraints Zone, and the inclusion of a 30 m setback from watercourses, which also encompasses adjacent wetlands, will protect sensitive environments, ensuring that sand pit operations do not encroach on these features. Given that the existing sand pit operations are compatible with these zones, the proposed expansion is not expected to create significant conflicts with existing land uses.

As the sand pit is already an established operation, and no substantial changes to local land uses are anticipated, it is expected that property values will remain stable or see minimal changes as a result of the expansion.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on land use and property values during the Project:

- A 30 m setback from watercourses will be maintained, which also encompasses adjacent wetlands.
- Clear signage will be put up indicating project contact information to address any concerns or complaints from surrounding landowners.

MONITORING

No monitoring is recommended for this VEC.

CONCLUSION

After mitigation measures, residual effects on land use and property values are anticipated to be:

- **Magnitude** - Negligible, as there are no measurable changes expected to property values and/or land use.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site and the immediate surrounding areas.
- **Duration** - Medium-term, as effects will last throughout the operational phase.
- **Frequency** - Ongoing, as effects will continue throughout the operational phase.
- **Reversibility** - Reversible, as the effects are expected to revert once the operation concludes.
- **Significance** - Not significant, given the minor nature of the effects on land use and property values.

8.2.3 EFFECTS ON TRANSPORTATION AND INFRASTRUCTURE

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for transportation and infrastructure includes the Project Site, existing access roads, and any transportation routes directly affected by increased traffic from material hauling. This includes Morden Road, Highway 1, Victoria Road, and other nearby roads leading to the site, along with any infrastructure within the immediate vicinity of the Project.
- **Regional Assessment Area:** The RAA for transportation and infrastructure includes the broader transportation network, including major highways like Highway 101 and Highway 103, and other infrastructure that may experience indirect effects from the Project. It extends to regional routes leading to areas like Halifax and Yarmouth, depending on transportation impacts and material transport routes.

PROJECT INTERACTIONS

The following project activities may interact with transportation and infrastructure:

- Transportation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on transportation and infrastructure. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable impact on transportation networks or infrastructure.
- **Low** - Minor, localized changes to transportation flow or infrastructure use, with no disruption to existing services.

- **Moderate** - Noticeable changes to transportation flow or infrastructure use, with some temporary or localized disruptions.
- **High** - Significant changes to transportation networks or infrastructure, potentially requiring major modifications or causing widespread disruptions.

DESCRIPTION OF EFFECTS

- **Traffic and Road Use:** No new access roads will be built as part of the expansion. The expansion of the sand pit is not expected to increase traffic volumes, road use, or road wear and tear beyond existing levels associated with current pit operations. Therefore, increased traffic and associated impacts on Morden Road, Highway 1, and other surrounding roads are not anticipated.

- **Road Wear and Tear:** No additional road wear and tear beyond current conditions is expected due to traffic levels remaining consistent with existing operations.

- **Spring Weight Restrictions:** The Project may be subject to spring weight restrictions on non-major roads, which could affect the timing of hauling activities. However, since major highways (Highway 1, Highway 101, and Highway 103) are exempt from these restrictions, hauling routes along these corridors will not be impacted. This may lead to temporary delays or schedule adjustments during the spring thaw, but this is expected to have minimal impact on the broader transportation network.

- **Infrastructure:** No impacts on infrastructure are anticipated as the expansion does not require significant changes to existing infrastructure.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on transportation and infrastructure during the Project:

- Access roads will be monitored and maintained to ensure they remain in good condition throughout the Project.
- Haul routes will be well-marked, and any temporary changes to signage will be addressed promptly.
- Hauling during high-traffic hours will be avoided if it could cause significant disruption (e.g., during peak commuting times).
- Vehicles will operate within speed limits.
- Spring weight restrictions will be adhered to where applicable.
- The need for appropriate signage, such as truck entrance signs, will be assessed to warn drivers and nearby residents about increased truck traffic.

MONITORING

A complaint response protocol, with a focus on transportation-related concerns, will be developed.

CONCLUSION

After mitigation measures, the residual effects on transportation and infrastructure are anticipated to be:

- **Magnitude** - Low, as effects are minor and localized, with no disruption to existing transportation flow or infrastructure services.
- **Geographic Extent** - Primarily within the LAA, covering the Project Site, access roads, and the immediate surrounding area. However, the RAA may experience minor indirect effects due to transportation activities.
- **Duration** - Medium-term, as effects will last throughout the operational phase of the project but are expected to diminish after the site is fully reclaimed and transport activities cease.
- **Frequency** - Ongoing, as transportation activities will occur regularly throughout project operations, with periodic variations depending on hauling schedules and material transport.
- **Reversibility** - Reversible, as the effects are expected to diminish once operations end.
- **Significance** - Not significant, as the residual effects are low in magnitude and localized, with minimal impact expected after operations conclude.

8.2.4 EFFECTS ON RECREATION AND TOURISM

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for recreation and tourism is the Municipality of the County of Kings.
- **Regional Assessment Area:** The RAA for recreation and tourism is not applicable.

PROJECT INTERACTIONS

All project activities have the potential to interact with recreation and tourism:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Aggregate Quantification
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on recreation and tourism. The VEC-specific definition for magnitude is:

- **Negligible** - No discernible impact on recreation and tourism activities.
- **Low** - Minor, localized changes to tourism and recreation opportunities, with minimal effect on overall use.
- **Moderate** - Noticeable changes to tourism and/or some limitations on recreation activities, but not affecting overall access or use significantly.
- **High** - Significant disruptions or limitations to tourism and recreation activities, with widespread effects on availability or enjoyment.

DESCRIPTION OF EFFECTS

The Project is not expected to interfere with recreation or tourism. While some recreational trails and scenic areas exist in the region, they are located at a sufficient distance from the Project Site to avoid any direct effects. Temporary increases in traffic and noise during operations will be minor and are unlikely to impact visitor experiences. The broader availability of recreation and tourism opportunities in the region ensures that the Project will not result in any meaningful change to these activities.

MITIGATIONS

No mitigations are recommended for this VEC.

MONITORING

No monitoring is recommended for this VEC.

CONCLUSION

No significant negative residual effects are anticipated:

- **Magnitude** - Negligible, as no changes to recreation or tourism are expected.
- **Geographic Extent** - Within the LAA.
- **Duration** - Medium-term, as the Project will operate for several years, but no lasting effects on recreation or tourism are expected.
- **Frequency** - Ongoing, as potential effects could occur throughout the Project.
- **Reversibility** - Reversible, as no permanent changes to recreation or tourism will occur.
- **Significance** - Not significant, as no measurable effects on recreation or tourism are expected.

8.3 EFFECTS ON CULTURAL AND HERITAGE RESOURCES

8.3.1 EFFECTS ON ARCHAEOLOGICAL RESOURCES AND HISTORICAL SITES

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for archaeological resources and historical sites includes the Project Site and an appropriate buffer around areas where ground disturbance may occur.
- **Regional Assessment Area:** The RAA for archaeological resources and historical sites is not applicable.

PROJECT INTERACTIONS

The following project activities may interact with archaeological resources and historical sites:

- Site Preparation
- Extraction Operations
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on archaeological resources and historical sites. The VEC-specific definition for magnitude is:

- **Low** - Low potential for encountering archaeological resources, with little to no disruption expected from project activities.
- **Moderate** - Moderate to high potential for encountering archaeological resources, but any effects can be effectively mitigated through established procedures.
- **High** - Moderate to high potential for encountering archaeological resources, with a risk that some artifacts or sites may be disturbed despite mitigation efforts.

DESCRIPTION OF EFFECTS

The potential for impacts on archaeological resources and historical sites is expected to be low, given that the Project is a small expansion of an existing operation. The area has been previously disturbed by sand extraction and other activities, reducing the likelihood of intact archaeological resources. However, CRM Group identified an area of high potential for Pre-contact Mi'kmaq archaeological resources. Despite the previous disturbance, there remains a small chance that previously undocumented artifacts or historical remnants could be encountered. Should archaeological resources be uncovered, standard protocols under the *Special Places Protection Act*, R.S.N.S. 1989, c. 438 will be followed, including reporting findings to NSCCTH.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on archaeological resources and historical sites during the Project:

- Work will stop immediately, and the NSCCTH Special Places Coordinator will be contacted for further guidance if any archaeological resources or historical sites are encountered during operations.
- The area identified as having high archaeological potential will be marked on the ground and avoided during project activities.

MONITORING

No monitoring is recommended for this VEC.

CONCLUSION

After mitigation measures, residual effects on archaeological resources and historical sites are anticipated to be:

- **Magnitude** - Low, as the potential for encountering archaeological resources is minimal due to prior land disturbance.
- **Geographic Extent** - Within the LAA.
- **Duration** - Medium-term, as effects could occur throughout the operational phase but will cease once operations conclude.
- **Frequency** - Rarely, as archaeological discoveries are unlikely.
- **Reversibility** - Irreversible, as any disturbance to archaeological resources would be permanent if artifacts are uncovered and removed.
- **Significance** - Not significant, as any potential effects would be limited to the operational phase, with a low likelihood of encountering archaeological resources and established measures in place to address any discoveries.

8.3.2 EFFECTS ON MI'KMAQ CULTURAL RESOURCES

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for Mi'kmaq cultural resources includes the Project Site and adjacent areas where project activities may cause disturbance or affect culturally significant resources.
- **Regional Assessment Area:** The RAA for Mi'kmaq cultural resources is not applicable.

PROJECT INTERACTIONS

The following project activities may interact with Mi'kmaq cultural resources:

- Site Preparation
- Extraction Operations
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate potential effects on Mi'kmaq cultural resources. The VEC-specific definition for magnitude is:

- **Low** - Low potential for impact; areas with high potential for Mi'kmaq cultural resources will be avoided.
- **Moderate** - Moderate potential for impact; areas with high potential for Mi'kmaq cultural resources cannot be fully avoided, and additional mitigation measures may be required.
- **High** - High potential for impact, with a risk that significant Mi'kmaq cultural resources may be disturbed despite mitigation measures.

DESCRIPTION OF EFFECTS

The ARIA report identified an area of high potential for Pre-contact Mi'kmaq archaeological resources within the LAA. While the Project is a minor expansion of an existing operation and much of the area has been previously disturbed, there remains potential for encountering culturally significant sites or materials associated with the Mi'kmaq. Should cultural resources be uncovered, standard protocols under the *Special Places Protection Act*, R.S.N.S. 1989, c. 438 will be followed, including reporting findings to NSCCTH.

The Proponent is committed to ongoing engagement with the Mi'kmaq of Nova Scotia to identify and mitigate impacts to cultural resources throughout the Project's lifespan.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on Mi'kmaq cultural resources during the Project:

- The Proponent will continue to take opportunities to engage with Mi'kmaq communities and organizations to ensure culturally appropriate management of resources.
- Work will stop immediately, and the NSCCTH Special Places Coordinator will be contacted for further guidance if any archaeological resources or historical sites are encountered during operations.
- The area identified as having high archaeological potential will be marked on the ground and avoided during project activities.

MONITORING

No monitoring is recommended for this VEC.

CONCLUSION

After mitigation measures, residual effects on Mi'kmaq cultural resources are anticipated to be:

- **Magnitude** - Low, due to prior disturbance and mitigation commitments.
- **Geographic Extent** - Within the LAA.
- **Duration** - Medium-term, as effects could occur throughout the operational phase but will cease once operations conclude.
- **Frequency** - Rarely, as encountering cultural resources is unlikely.
- **Reversibility** - Irreversible, as any disturbance to cultural resources would be permanent if artifacts are uncovered and removed.
- **Significance** - Not significant, as any potential effects would be limited to the operational phase, with a low likelihood of encountering cultural resources and established measures in place to address any discoveries.

8.4 EFFECTS ON HUMAN HEALTH AND WELL-BEING

8.4.1 EFFECTS OF NOISE LEVELS

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for noise levels includes the Project Site and a buffer zone extending 500 m from the operational footprint.
- **Regional Assessment Area:** The RAA for noise levels is not applicable.

PROJECT INTERACTIONS

All project activities have the potential to interact with noise levels:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Aggregate Quantification
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate the potential effects of noise levels. The VEC-specific definition for magnitude is applied based on thresholds established in the *Pit and Quarry Guidelines* (NSEL, 2003) and the *Guidelines for Environmental Noise Measurement and Assessment* (NSECC, 2023):

- **Negligible** - Noise levels from project-related activities remain below the established thresholds (55 dBA at night, 60 dBA in the evening, or 65 dBA during the day) at residential and sensitive receptor locations.
- **Low** - Noise levels from project-related activities may approach or temporarily exceed thresholds at residential and sensitive receptor locations during peak activities but remain intermittent and limited in duration.
- **Moderate** - Noise levels from high-impact project-related activities regularly exceed thresholds at residential and sensitive receptor locations but occur only during active operations and are not prolonged throughout the day.
- **High** - Noise levels from multiple project-related activities frequently exceed thresholds at residential and sensitive receptor locations for extended periods, occurring continuously or on a regular basis.

DESCRIPTION OF EFFECTS

Noise generated by the sand pit operation, including the movement of trucks, heavy equipment, and other machinery, may impact human health and community well-being. Prolonged exposure to elevated noise levels can cause annoyance, sleep disturbance, and reduced quality of life for residents living near the site.

The Project is located in a mixed-use rural area where noise from highways and agricultural activities already contributes to the ambient acoustic environment. The area's acoustic landscape is influenced by various anthropogenic noise sources, varying from day to night. Sensitive receptors, such as residential properties, may experience heightened awareness of noise during active site operations.

Noise levels associated with the expansion are not expected to increase beyond those generated by existing pit operations. While some noise from construction and material hauling activities, including trucks and front-end loaders, may occur, these are expected to be minimal and consistent with current operational levels. The expansion area is situated in a less densely populated portion of the site, with fewer nearby residences, which further limits potential noise impacts. Additionally, natural features such as quarry walls, berms, and forested areas will help attenuate noise and reduce its effects on surrounding properties.

The noise effects are expected to be temporary and localized, primarily affecting residents in proximity to the site. Long-term adverse health effects are unlikely. The distance to residential areas and natural vegetative buffers provides some level of protection, further reducing the potential for significant disturbance.

It is anticipated that the noise generated by the sand pit operation will remain within the acceptable noise limits set out by regulatory guidelines. The operational schedule will restrict activity during nighttime hours, which will help mitigate any disturbances during sensitive nighttime periods. The Proponent is committed to ongoing communication with neighbouring properties. A complaint resolution framework will be included in the EPP for the documentation and management of any noise complaints.

MITIGATIONS

The following mitigation measures will be implemented to minimize the potential impacts of noise levels on human health and well-being during the Project:

- All construction and extraction equipment will be maintained according to manufacturer specifications to reduce mechanical noise.
- Site activities will be restricted to daylight hours (7:00 AM to 7:00 PM) to avoid nighttime disturbances.
- Speed limits will be established on-site and on haul roads to minimize traffic-related noise.
- Noise barriers and/or berms will be used around the extraction area to block sound from travelling to nearby receptors.
- Idling of equipment will be minimized, and low-noise equipment will be prioritized for operations.
- Existing vegetation buffers around the sand pit will be maintained to help reduce noise transmission.
- Equipment will be relocated further from properties or residences if necessary to reduce noise exposure to sensitive receptors.

MONITORING

A complaint response protocol, with a focus on noise-related concerns, will be developed.

CONCLUSION

After mitigation measures, the residual effects of noise levels are anticipated to be:

- **Magnitude** - Low, as noise exposure to nearby receptors may occur occasionally during operation, but is not expected to exceed established thresholds at sensitive receptors, and the noise will remain intermittent and limited in duration.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site and the immediate surrounding areas.
- **Duration** - Medium-term, as effects are expected to occur throughout the operational phase but are anticipated to diminish once operations conclude.
- **Frequency** - Ongoing, as noise will consistently occur during operational hours.
- **Reversibility** - Reversible, as the effects will subside after project closure.

- **Significance** - Not significant, as the residual effects are low in magnitude and localized, with effective mitigation measures in place.

8.4.2 EFFECTS OF DUST AND EMISSIONS

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for dust and emissions includes the Project Site and the immediate surrounding area, where dust and emissions from Project activities may be directly noticeable and potentially affect human health. This area includes nearby residential properties and roads that may be impacted by airborne dust and emissions.
- **Regional Assessment Area:** The RAA for dust and emissions is not applicable.

PROJECT INTERACTIONS

The following project activities may contribute to dust and emissions:

- Site Preparation
- Extraction Operations
- Processing
- Stockpiling
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate the potential effects of dust and emissions. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable impact on human health.
- **Low** - Minor, localized health effects with no long-term consequences.
- **Moderate** - Noticeable health effects such as irritation or exacerbation of pre-existing conditions.
- **High** - Significant deterioration in human health, including respiratory issues or other long-term health impacts.

DESCRIPTION OF EFFECTS

Dust and emissions can have various impacts on human health and overall well-being.

DUST

- **Respiratory Issues:** Fine particulate matter can penetrate deep into the lungs, aggravating conditions like asthma, bronchitis, and other respiratory ailments (Health Canada, 2021). Coarse particulate matter (PM_{10}), which refers to particles smaller than 10 µm in diameter, can irritate the throat, nose, and eyes, which can be especially troublesome for nearby residents or workers at the site (CDC, 2024).

- **Nuisance and Visibility Impairment:** While not directly harmful, dust deposition on properties may be a nuisance, requiring increased cleaning and maintenance. Dust can also reduce visibility, which may create traffic hazards, especially near the site entrance or along haul routes.

EMISSIONS

- **Respiratory Issues:** Emissions, including NO_x, SO_2, CO, $PM_{2.5}$, PM_{10}, and VOCs, can cause significant respiratory problems. Long-term exposure to fine particulate matter can exacerbate asthma, bronchitis, and other lung diseases (Health Canada, 2021).

- **Cardiovascular Risks:** Particulate matter is linked to an increased risk of cardiovascular diseases. Prolonged exposure can lead to higher rates of stroke, heart attacks, and other cardiovascular issues (US EPA, 2025a).

- **Carcinogenic Effects:** Several VOCs emitted during operations, such as benzene and formaldehyde, are known carcinogens (Xiong et al., 2024). Long-term exposure to these compounds can significantly increase the risk of cancer, particularly for those in close proximity to the Project Site.

MITIGATIONS

The following mitigation measures will be implemented to minimize the potential impacts of dust and emissions on human health and well-being during the Project:

- Dust suppression techniques, including the application of lignin-based solutions and chloride mixtures, will be used on haul roads, stockpiles, and processing areas.
- Speed limits for vehicles on-site will be implemented to reduce dust emissions.
- Stockpiles and disturbed areas will be minimized to the extent possible and progressively reclaimed to reduce the potential for dust generation.
- Enclosed or covered trucks will be used for material transport to minimize dust generation.
- Dust-generating activities will be timed to avoid periods of excessive wind, and activities will be paused when wind speeds are high.
- Heavy equipment will be maintained in accordance with manufacturer specifications, and emissions control technologies (e.g., diesel particulate filters and catalytic converters) will be used to reduce exhaust emissions.

- Storage areas and material stockpiles will be designed with prevailing wind directions in mind to reduce the potential for dust dispersion.
- Loose site materials and products will be tied down, covered, and/or stored prior to inclement weather or wind events to prevent them from becoming airborne.
- The idling of equipment will be minimized, and low-emission engines will be prioritized.
- Health and safety training on minimizing exposure to both dust and emissions will be provided.

MONITORING

A complaint response protocol, with a focus on dust- and emissions-related concerns, will be developed.

CONCLUSION

After mitigation measures, the residual effects of dust and emissions are anticipated to be:

- **Magnitude** - Low, as dust and emission effects are expected to be minor and localized.
- **Geographic Extent** - Within the LAA, as any effects are confined to the Project Site and the immediate surrounding areas.
- **Duration** - Medium-term, as effects are expected to occur throughout the operational phase but are anticipated to diminish once operations conclude.
- **Frequency** - Intermittent, as dust and emission levels will vary depending on weather conditions and project activities.
- **Reversibility** - Reversible, as the effects will subside after project closure.
- **Significance** - Not significant, as the residual effects are low in magnitude, localized, and temporary, with effective mitigation measures in place.

8.4.3 EFFECTS ON SAFETY AND COMMUNITY WELL-BEING

ASSESSMENT BOUNDARIES

- **Local Assessment Area:** The LAA for safety and community well-being includes the Project Site, access roads, and nearby areas where potential safety risks may arise due to project activities, including transportation of materials.
- **Regional Assessment Area:** The RAA for safety and community well-being is not applicable.

PROJECT INTERACTIONS

All project activities have the potential to interact with safety and community well-being:

- Site Preparation
- Extraction Operations

- Processing
- Stockpiling
- Aggregate Quantification
- Transportation
- Site Reclamation

EFFECTS ASSESSMENT CRITERIA

The assessment criteria outlined in Table 8.1 will be used to evaluate the potential effects on safety and community well-being. The VEC-specific definition for magnitude is:

- **Negligible** - No measurable impact on safety or well-being.
- **Low** - Minor, localized safety risks, with standard safety measures in place.
- **Moderate** - Noticeable safety concerns requiring additional mitigation or monitoring.
- **High** - Significant safety risks with the potential for serious injury, requiring major intervention.

DESCRIPTION OF EFFECTS

The Project has the potential to affect worker and public safety, as well as community well-being, through:

- **Workplace Hazards:** The operation of heavy machinery, vehicle movements, and material extraction could pose safety risks to workers.
- **Public Safety Risks:** Unauthorized site access could pose risks to individuals entering active work areas.
- **Transportation:** Increased truck traffic on public roads may temporarily increase risks of vehicle collisions, particularly in areas where transport routes pass through residential or high-traffic zones.
- **Water Resources:** Accidental spills of fuel or lubricants during equipment operation and maintenance could introduce contaminants to groundwater or surface water if not properly managed.
- **Community Complaints:** Concerns related to safety, noise, or traffic could arise from community members, requiring responsive communication and mitigation.

MITIGATIONS

The following mitigation measures will be implemented to minimize potential impacts on safety and community well-being during the Project:

- Worker safety procedures will comply with the *Occupational Health and Safety Act*, S.N.S. 1996, c. 7 and industry standards.

- The site will remain secured with fencing, gated access, and safety signage to prevent unauthorized entry.
- Stability measures (e.g., berms, controlled slope angles) will be maintained to reduce terrain hazards.
- Traffic safety measures will include adherence to weight and speed limits and vehicle maintenance requirements.
- Spill prevention measures will include proper fuel storage, secondary containment, and controlled refueling procedures.
- Community concerns will be addressed through an established complaint resolution process to ensure timely responses to safety-related issues.

MONITORING

Monitoring will be conducted to ensure the effectiveness of mitigation measures and to detect any unforeseen impacts on safety and community well-being:

- Routine safety inspections will be conducted at the Project Site to ensure compliance with OHS requirements.
- Transportation-related safety measures will be reviewed regularly, including vehicle inspections and speed compliance.
- The effectiveness of site security measures will be assessed periodically to ensure public safety.
- A complaint response protocol will be implemented.

CONCLUSION

After mitigation measures, the residual effects on safety and community well-being are anticipated to be:

- **Magnitude** - Low, as the Project does not introduce new hazards beyond standard resource extraction risks.
- **Geographic Extent** - Within the LAA, as safety risks are limited to the Project Site and access routes.
- **Duration** - Medium-term, as effects will last throughout the operational phase of the project, but are expected to diminish after reclamation.
- **Frequency** - Intermittent, as safety risks may vary depending on specific project activities.
- **Reversibility** - Reversible, as the effects are expected to diminish once operations end.
- **Significance** - Not significant, as the residual effects are low in magnitude, localized, and temporary, with minimal impact expected after operations conclude.

8.5 SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT RESULTS

Table 8.3 below provides a summary of the anticipated environmental effects of the Project on each VEC, based on the results of the effects assessment. This includes information on the magnitude, geographic extent, duration, frequency, reversibility, and significance of residual effects.

Table 8.3: Summary of Effects Assessment Results

VEC	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Significance	Mitigation Measures Recommended	Monitoring Recommended
Biophysical Environment								
Surface Water and Groundwater	**Low** - Minor changes to quality, quantity or hydrology expected	LAA	Medium-term	Intermittent	Reversible	Not Significant	Yes	Yes
Wetlands	**Negligible** - No direct impacts to wetland area or function; no anticipated indirect wetland losses of area or function due to hydrological changes	LAA	Medium-term	Intermittent	Reversible	Not Significant	Yes	No
Flora	**Low** - Minor loss of supporting habitat (e.g., pinebarren golden heather); no net SOCI loss anticipated with mitigation	LAA	Medium-term	Intermittent	Reversible	Not Significant	Yes	No
Fauna	**Low** - Minor habitat loss expected	LAA	Medium-term	Intermittent	Reversible	Not Significant	Yes	Yes
Terrestrial Habitat	**Low to Moderate** - Limited habitat loss partially offset by buffer and reclamation	LAA	Long-term	Intermittent	Partially Reversible	Not Significant	Yes	No
Fish and Aquatic Habitat	**Negligible** - No direct impacts to fish and aquatic habitat; no measurable effects on fish health, behaviour, or hydrology anticipated	LAA	Medium-term	Intermittent	Reversible	Not Significant	Yes	Yes
Climate Change	**Negligible** - Minor GHG emissions; no measurable climate effects anticipated	Global	Medium-term	Intermittent	Irreversible	Not Significant	Yes	No

VEC	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Significance	Mitigation Measures Recommended	Monitoring Recommended
Air Quality and Atmospheric Conditions	**Low** - Minor and localized changes expected	LAA	Medium-term	Intermittent	Partially Reversible	Not Significant	Yes	No
Soil and Geology	**Negligible to Low** - Minor soil disturbance, localized erosion, and manageable soil texture changes expected	LAA	Medium-term	Intermittent	Reversible	Not Significant	Yes	Yes
Socioeconomic Environment								
Local Economy, Labour Force, and Employment	**Positive** - Maintains local employment and supports the local economy	LAA, potential for extension into RAA	Medium-term	Ongoing	Partially Reversible	Not Significant	No	No
Land Use and Property Values	**Negligible** - No measurable changes expected	LAA	Medium-term	Ongoing	Reversible	Not SIgnificant	Yes	No
Transportation and Infrastructure	**Low** - Minor, localized effects with no disruption to transportation flow or infrastructure services	LAA, potential minor effects in RAA	Medium-term	Ongoing	Reversible	Not Significant	Yes	Yes
Recreation and Tourism	**Negligible** - No changes expected	LAA	Medium-term	Ongoing	Reversible	Not Significant	No	No
Cultural and Heritage Resources								
Archaeological Resources and Historical Sites	**Low** - Minimal potential to encounter archaeological resources due to prior disturbance	LAA	Medium-term	Rarely	Irreversible	Not Significant	Yes	No
Mi'kmaq Cultural Resources	**Low** - Minimal potential for effects due to prior disturbance and	LAA	Medium-term	Rarely	Irreversible	Not Significant	Yes	No

VEC	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Significance	Mitigation Measures Recommended	Monitoring Recommended
	mitigation commitments							
Human Health and Well-Being								
Noise Levels	**Low** - Occasional noise exposure at nearby receptors; not expected to exceed established thresholds	LAA	Medium-term	Ongoing	Reversible	Not Significant	Yes	Yes
Dust and Emissions	**Low** - Minor and localized effects expected	LAA	Medium-term	Intermittent	Reversible	Not Significant	Yes	Yes
Safety and Community Well-Being	**Low** - No new hazards expected beyond standard resource extraction risks	LAA	Medium-term	Intermittent	Reversible	Not Significant	Yes	Yes

8.6 SUMMARY OF RESIDUAL EFFECTS, MITIGATIONS, AND MONITORING COMMITMENTS

Table 8.4 below provides a summary of the residual environmental effects, along with the associated mitigation measures and monitoring commitments for the Project, as identified through the effects assessment.

Table 8.4: Summary of Residual Effects, Mitigations, Monitoring, and Significance

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
Biophysical Environment					
Surface Water and Groundwater	Site Preparation Extraction Operations Stockpiling Site Reclamation	• Surface water sedimentation • Surface water and groundwater quality and quantity changes • Localized erosion and runoff • Minor changes to surface drainage • Potential contamination from spills	• Implement an Erosion and Sediment Control Plan and Groundwater Management Plan • Install erosion control measures where needed • Apply progressive reclamation to reduce exposed soils • Avoid new ditches or diversions • Direct stormwater to infiltration areas • Maintain a 30 m buffer from McGee Brook, which also encompasses adjacent wetlands • Develop a Surface Water Management Plan • Follow a Spill Response and Contingency Plan • Inspect and maintain equipment regularly • Monitor TSS if effluent leaves the site • Contact NSECC if sulfide-bearing material is found • Avoid dewatering or pumping activities • Avoid excavation within 1 m of the maximum annual water table and conduct groundwater monitoring to ensure excavations do not extend lower than 1 m above the water table. • Stop excavation if groundwater is encountered	• Inspect erosion and sediment controls (e.g., silt fences) quarterly and after heavy rain • Monitor sediment levels in runoff during major precipitation events • Check site drainage regularly for changes post-rainfall • Implement a Groundwater Monitoring Plan to track levels and recharge over time and ensure compliance with the excavation buffer	Not Significant
Wetlands	Site Preparation Extraction Operations Processing Stockpiling	• Fugitive dust accumulation • Invasive species spread • Runoff into wetlands	• Use dust suppression techniques • Set restrictions on dust-generating activities (e.g. speed limits, wind-avoidance timing, etc.) • Use enclosed or covered trucks for material	• Inspect erosion and sediment controls (e.g., silt fences) quarterly and after heavy rain	Not Significant

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
	Site Reclamation		transport • Minimize disturbed areas and apply progressive reclamation • Secure loose materials before storms or wind events • Design stockpiles considering prevailing wind direction • Clean and inspect vehicles to prevent invasive species spread • Maintain a 30 m buffer from McGee Brook, which also encompasses adjacent wetlands • Grade roads and pits to direct runoff away from wetlands • Implement stormwater controls to promote infiltration • Develop and follow an Erosion and Sediment Control Plan		
Flora	Site Preparation Extraction Operations Processing Stockpiling Transportation Site Reclamation	• Dust deposition reducing photosynthesis • Direct vegetation removal from clearing • Potential growth reduction and increased plant stress or mortality due to dust • Spread and introduction of invasive species • Minor impacts on adjacent vegetation edges	• Avoid SAR and SOCI flora during clearing where feasible; use buffers where practical; consider transplantation for pinebarren golden heather and, if needed, American beech. • Use dust suppression techniques • Set restrictions on dust-generating activities (e.g. speed limits, wind-avoidance timing, etc.) • Minimize disturbed areas and apply progressive reclamation • Use enclosed or covered trucks for material transport • Design stockpiles considering prevailing wind direction	No monitoring proposed	Not Significant

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
			• Secure loose materials before storms or wind events • Develop and implement an Erosion and Sediment Control Plan • Restrict vehicles to designated roads and paths • Clean and inspect vehicles to prevent invasive species spread • Maintain a 30 m buffer from McGee Brook, which also encompasses adjacent wetlands • Rehabilitate pit walls with 3:1 slope, seed with native grasses		
Fauna	Site Preparation Extraction Operations Processing Stockpiling Transportation Site Reclamation	• Habitat alteration and fragmentation from vegetation clearing • Direct mortality or nest destruction during breeding season • Sensory disturbance (noise, vibrations, light) altering behaviour • Dust impacting wildlife foraging and respiratory health • Increased risk of wildlife-vehicle collisions • Potential disruption of species-specific behaviours	• Avoid vegetation clearing during bird breeding season; conduct nest searches and apply buffer if clearing is needed • Develop a WMP within the EPP, including Bank Swallow contingencies • Manage sand faces in the test pit to discourage Bank Swallow nesting; create alternate habitat nearby with biologist consultation, timed to avoid the breeding season • Follow municipal/provincial noise and vibration guidelines • Provide wildlife awareness training to workers • Implement a Waste Management Plan to secure and dispose of waste properly • Use dust suppression techniques • Set restrictions on dust-generating activities (e.g. speed limits, wind-avoidance timing, etc.)	• Develop a WMP to guide monitoring activities • Implement a wildlife nesting monitoring program • Monitor nesting activity during sensitive periods to avoid disturbance.	Not Significant

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
			• Set speed limits on-site to reduce wildlife collisions • Minimize disturbance and apply progressive reclamation • Inspect stockpiles and exposed soils for nests • Use enclosed or covered trucks for material transport • Design stockpiles considering prevailing winds • Secure loose materials before storms or wind events • Keep emergency spill kits on site • Maintain a 30 m buffer from watercourses, which also encompasses adjacent wetlands • Rehabilitate pit walls to 3:1 slopes, cover with topsoil, and seed with native grasses • Limit activities to daytime to reduce bat disturbance		
Terrestrial Habitat	Site Preparation Extraction Operations Processing Stockpiling Transportation Site Reclamation	• Habitat loss and fragmentation from clearing • Reduction in cover, forage, and movement corridors for wildlife • Localized edge effects altering light, moisture, and microclimate • Potential facilitation of invasive species establishment • Creation of disturbed or early successional habitat used by some species	• Avoid SOCI flora during clearing; apply appropriate buffers • Limit vegetation clearing to minimum area; prioritize disturbed areas for expansion • Maintain a 30 m buffer from watercourses, which also encompasses adjacent wetlands, to protect habitat connectivity • Use dust suppression techniques • Set restrictions on dust-generating activities (e.g. speed limits, wind-avoidance timing, etc.) • Implement an Erosion and Sediment Control Plan	No monitoring proposed	Not Significant

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
			• Grade pit slopes to 3:1 and seed with native grasses after extraction • Clean equipment regularly to prevent invasive species spread • Use only native species for restoration activities • Restrict vehicles/machinery to designated roads and trails to minimize disturbance • Maintain good housekeeping to avoid attracting nuisance wildlife • Conduct vegetation removal outside of nesting bird season • Create/remove nesting areas for Bank Swallows and other species outside nesting season		
Fish and Aquatic Habitat	Site Preparation Extraction Operations Processing Stockpiling Transportation Site Reclamation	• Hydrological alterations • Dust accumulation in McGee Brook leading to fish behaviour and health impacts, turbidity increase, and other water quality changes • Water contamination	• Maintain a 30 m buffer from McGee Brook, which also encompasses adjacent wetlands • Implement stormwater controls to reduce runoff and sediment transport • Grade disturbed areas to direct flow away from watercourses and wetlands • Develop and follow an Erosion and Sediment Control Plan • Use dust suppression techniques • Set restrictions on dust-generating activities (e.g. speed limits, wind-avoidance timing, etc.) • Use covered/enclosed trucks to transport materials • Secure loose materials before storms or wind events	• Inspect erosion and sediment controls (e.g., silt fences) quarterly and after heavy rain • Compliance checks	Not Significant

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
			• Design stockpiles with wind direction in mind • Store fuel and conduct site work outside 30 m buffer zones • Keep emergency spill kits on site and ready for use		
Climate Change	Site Preparation Extraction Operations Processing Stockpiling Transportation Site Reclamation	• GHG emissions from site machinery, transportation, and operations (CO_2, CH_4, N_2O, VOCs)	• Use energy-efficient equipment where possible • Apply sustainable construction and operational practices • Set on-site speed limits to reduce unnecessary fuel use • Maintain heavy equipment per manufacturer specs and use emissions control technologies • Minimize equipment idling	No monitoring proposed	Not Significant
Air Quality and Atmospheric Conditions	Site Preparation Extraction Operations Processing Stockpiling Transportation Site Reclamation	• Dust and particulate matter from excavation, hauling, and site prep • Emissions from diesel equipment may degrade local air quality • Localized microclimate changes	• Use energy-efficient equipment where possible • Set restrictions on dust-generating activities (e.g. speed limits, wind-avoidance timing, etc.) • Use dust suppression techniques • Follow sustainable construction and operational practices • Minimize disturbed areas and reclaim progressively • Set on-site speed limits • Use enclosed/covered trucks for material transport • Secure loose materials before wind or rain events • Maintain equipment and use emissions controls	No monitoring proposed	Not Significant

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
			• Minimize equipment idling		
Soil and Geology	Site Preparation Extraction Operations Stockpiling Site Reclamation	• Changes to local topography impacting soil structure • Erosion and sedimentation • Contamination from ground disturbance (e.g., arsenic, radon)	• Develop and implement an Erosion and Sediment Control Plan • Use progressive reclamation and sediment barriers to reduce soil loss • Store stockpiles in designated areas with erosion controls • Maintain ditches and erosion control structures, especially after heavy rain • Avoid unnecessary land disturbance and preserve natural drainage patterns • Report any unexpected geological risks (e.g., sulfide rock) to NSECC	• Routine inspections of soil stability and erosion controls • Monitor for sulfide-bearing material and unexpected hazards • Conduct compliance checks to ensure mitigation effectiveness	Not Significant
Socioeconomic Environment					
Local Economy, Labour Force, and Employment	Site Preparation Extraction Operations Processing Stockpiling Aggregate Quantification Transportation Site Reclamation	• Maintain existing jobs • Support local businesses	No mitigation proposed	No monitoring proposed	Not Significant
Land Use and Property Values	Site Preparation Extraction Operations Processing Stockpiling Aggregate Quantification Transportation Site Reclamation	• Changes to property values • Restrictions on surrounding land use	• Maintain a 30 m setback from watercourses, which also encompasses adjacent wetlands • Install clear signage with project contact information for landowner concerns	No monitoring proposed	Not Significant

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
Transportation and Infrastructure	Transportation	• Increased traffic • Road deterioration	• Maintain and monitor access roads throughout the Project • Mark haul routes clearly; update signage as needed • Avoid hauling during peak traffic hours if disruptive • Ensure vehicles follow speed limits • Comply with spring weight restrictions • Assess and install appropriate signage (e.g., truck entrance signs)	• Develop and implement a complaint response protocol	Not Significant
Recreation and Tourism	Site Preparation Extraction Operations Processing Stockpiling Aggregate Quantification Transportation Site Reclamation	None expected	No mitigation proposed	No monitoring proposed	Not Significant
Cultural and Heritage Resources					
Archaeological Resources and Historical Sites	Site Preparation Extraction Operations Site Reclamation	• Disturbance of archaeological resources	• Stop work and notify NSCCTH if archaeological resources are found • Avoid the area of high archaeological potential	No monitoring proposed	Not Significant
Mi'kmaq Cultural Resources	Site Preparation Extraction Operations Site Reclamation	• Disturbance of Mi'kmaq archaeological resources	• Stop work and notify NSCCTH if archaeological resources are found • Avoid the area of high archaeological potential • Continue engagement with Mi'kmaq representatives and organizations	No monitoring proposed	Not Significant
Human Health and Well-Being					

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
Noise Levels	Site Preparation Extraction Operations Processing Stockpiling Aggregate Quantification Transportation Site Reclamation	• Elevated noise from trucks, heavy equipment, and machinery during operations • Potential annoyance, sleep disturbance, and reduced quality of life for nearby residents	• Maintain equipment per manufacturer specifications to reduce noise • Restrict site activities to daylight hours • Enforce on-site and haul road speed limits • Install noise barriers or berms near extraction areas • Minimize equipment idling and use low-noise machinery • Preserve existing vegetation buffers • Relocate equipment farther from sensitive receptors if necessary	• Implement complaint response protocol for noise-related concerns	Not Significant
Dust and Emissions	Site Preparation Extraction Operations Processing Stockpiling Transportation Site Reclamation	• Dust, particulate matter, and emissions may aggravate respiratory conditions • Coarse dust may irritate eyes, nose, and throat of workers and nearby residents • Dust deposition on nearby properties may cause nuisance and increase maintenance needs • Reduced visibility from dust may pose traffic safety risks near the site and along haul routes • Prolonged exposure to fine particulates may increase cardiovascular risks • VOCs in emissions may elevate cancer risk	• Use dust suppression techniques • Set restrictions on dust-generating activities (e.g. speed limits, wind-avoidance timing, etc.) • Minimize disturbed areas and progressively reclaim to limit dust sources • Use enclosed/covered trucks for material transport • Maintain equipment per manufacturer specs and use emissions controls • Store materials with wind direction in mind; secure loose materials • Minimize idling and prioritize low-emission engines • Provide health and safety training	• Implement complaint response protocol for dust- and emissions-related concerns	Not Significant

VEC	Project Activities	Potential Effects	Mitigations	Monitoring	Significance After Mitigations
Safety and Community Well-Being	Site Preparation Extraction Operations Processing Stockpiling Aggregate Quantification Transportation Site Reclamation	• Safety risks to workers from heavy machinery and on-site activities • Public safety risks from unauthorized site access • Increased truck traffic may raise collision risks on public roads • Accidental fuel or lubricant spills may contaminate water	• Follow the *Occupational Health and Safety Act*, S.N.S. 1996, c. 7 and industry standards • Secure site with fencing, gates, and safety signage • Enforce speed and weight limits; maintain vehicles • Use proper fuel storage, secondary containment, and safe refueling procedures	• Implement complaint response protocol • Conduct routine safety inspections and ensure OHS compliance • Periodically assess site security measures • Review transportation safety measures and vehicle inspection records	Not Significant

8.7 ADAPTIVE MANAGEMENT

To ensure that the potential effects of the Project are effectively managed throughout its lifecycle, adaptive management will be implemented. This approach will involve regularly monitoring the environmental effects of the Project, as outlined in the monitoring programs for each VEC, and adjusting mitigation measures as necessary to address any emerging issues or unanticipated changes. Monitoring results will inform the ongoing implementation of mitigation strategies and will be used to revise approaches where needed, ensuring the Project's environmental impact remains within acceptable thresholds.

CHAPTER 9: CUMULATIVE ENVIRONMENTAL EFFECTS

9.1 OVERVIEW

As defined by the Government of Canada (2025), cumulative effects generally refer to the combined effects from past, present, and reasonably foreseeable future activities and natural processes. Cumulative effects can occur when multiple activities or processes overlap in time and space, leading to effects that may accumulate or intensify beyond what would be expected from each activity or process individually.

The purpose of this cumulative effects assessment (CEA) is to evaluate the combined environmental effects of the proposed Project and other existing or foreseeable activities within the region. This assessment will help identify whether the residual effects of the Project, in combination with other regional activities, could lead to significant cumulative impacts on the VECs.

9.2 METHODOLOGY

9.2.1 SELECTION OF BOUNDARIES

SPATIAL BOUNDARIES

The spatial boundary for this CEA is defined as a 5 km buffer surrounding the Project Site, including the site itself and the surrounding areas potentially affected by Project activities, such as surface water, groundwater, and terrestrial ecosystems.

TEMPORAL BOUNDARIES

The temporal boundary spans the entire anticipated life of the Project, approximately 15-20 years. This includes the land preparation phase, the operational phase, and the decommissioning and reclamation phase.

9.2.2 SELECTION OF VECS

The following VECs were selected based on their relevance to the Project and other regional activities:

- Surface Water and Groundwater
- Wetlands
- Flora, Fauna, and Terrestrial Habitat
- Fish and Aquatic Habitat
- Air Quality
- Transportation
- Noise Levels
- Dust and Emissions

For VECs where cumulative effects are not reasonably expected, such as property values, recreation, cultural resources, and others, no detailed CEA is provided.

9.2.3 OTHER PROJECTS AND ACTIVITIES IN THE AREA

There are several other projects within the Project Region, including pits and quarries; however, none are located within 5 km of the Project. Agricultural activities are prevalent in the surrounding area, and this is the primary land use within the 5 km buffer. Given the limited number of nearby industrial or commercial developments, the Project's activities are not expected to have significant cumulative effects from other regional undertakings.

9.3 CUMULATIVE EFFECTS ASSESSMENT

9.3.1 SURFACE WATER AND GROUNDWATER

The Project's activities have the potential to influence surface water and groundwater through changes to flow patterns, sedimentation, and water quality. However, significant cumulative effects are not expected given the well-drained sandy soils at the site, stormwater infiltration, and the presence of a natural vegetated buffer around McGee Brook. A 30 m vegetated buffer is maintained between the Project footprint and McGee Brook in accordance with regulatory requirements, further reducing the risk of contamination and sedimentation of the watercourse. While agricultural activities in the surrounding area may contribute to sedimentation and runoff in nearby water bodies, the Project's stormwater management practices and vegetated buffers will minimize its contribution to these effects. Additionally, the Project's operations will not disrupt groundwater recharge, as excavation will occur at least one metre above the water table and no dewatering is planned. Further, groundwater monitoring will be conducted to ensure excavations do not extend lower than one metre above the water table. Regional activities such as nearby highway projects and quarries, while present, are not expected to result in significant cumulative effects due to their distance from the site and the Project's effective mitigation measures.

9.3.2 WETLANDS

The Project's activities have the potential to affect wetlands primarily through dust, invasive species, and runoff. However, given the implementation of mitigation measures such as dust suppression, erosion controls, and buffers around wetlands, significant cumulative effects are not expected. Agricultural activities in the surrounding area may contribute to sedimentation and nutrient loading, but the Project's stormwater management practices will help mitigate these impacts. Regional activities, including nearby agricultural and minor industrial developments, are not expected to result in significant cumulative effects due to the Project's effective mitigation measures and the distance from these activities.

9.3.3 FLORA, FAUNA, AND TERRESTRIAL HABITAT

The Project's activities have the potential to affect local flora, fauna, and terrestrial habitat through habitat alteration, sensory disturbances (such as noise and dust), and minor landscape fragmentation. However, given the small scale of the expansion, the site's current land use, and the mitigation measures in place, significant cumulative effects are not expected.

The expansion will minimize additional habitat loss and be contained to an area of high anthropogenic activity. The expansion of the existing pit would require significantly less clearing than the development of a new sand pit location. Agricultural activities and other regional developments may contribute to habitat disturbance, but the Project's buffers and land management strategies will help minimize any combined effects. Nearby agricultural activities may also contribute to localized disturbances, such as increased predation pressure from domestic animals, but the Project is not expected to exacerbate these effects. Sensory disturbances, such as noise and dust, may overlap slightly with nearby activities, but with dust suppression, noise reduction, and habitat protection measures, cumulative impacts are not anticipated to be significant.

9.3.4 FISH AND AQUATIC HABITAT

The Project's activities have the potential to affect fish and aquatic habitat through changes to surface water runoff, dust deposition, and potential water contamination. However, with mitigation measures such as stormwater management, maintenance of a 30 m vegetated buffer between the Project footprint and McGee Brook, dust suppression, and spill prevention practices, significant cumulative effects are not expected.

Agricultural activities and other regional developments may contribute to sedimentation and water quality issues in the watershed, but the Project's effective site controls will minimize its own contribution. While regional dust generation may occur, the Project's dust suppression measures will reduce the potential for cumulative impacts on aquatic environments. Overall, the Project is not expected to contribute substantially to cumulative effects on fish and aquatic habitat.

9.3.5 AIR QUALITY

The Project may contribute to cumulative effects on air quality through dust generation and emissions from excavation, material hauling, and diesel-powered machinery. These emissions, including NO_x, SO_2, CO, and particulate matter, could degrade local air quality, especially during dry or windy conditions. Additionally, smog from these emissions may lead to acid rain, which can harm vegetation, soil, and wildlife by leaching essential nutrients and degrading water quality.

Regional activities, such as construction, agriculture, and transportation, could also release similar pollutants, potentially exacerbating localized air quality degradation. However, with mitigation measures like dust suppression, low-emission equipment, and proper site management, significant cumulative impacts on regional air quality are not expected.

9.3.6 TRANSPORTATION

The Project's increased truck traffic along Morden Road, Highway 1, and other surrounding roads will likely result in localized, incremental effects, such as additional wear on road infrastructure. While these effects are expected to be minor and limited to the immediate haul routes, regional activities, including other small-scale industrial operations and local traffic patterns, may contribute to cumulative effects on road wear and traffic congestion. However, the Project's mitigation measures, including road maintenance, traffic management, and adherence to spring weight restrictions, will minimize these cumulative impacts. Overall, the Project is expected to make a minor contribution to regional transportation infrastructure or traffic levels in the broader area.

9.3.7 NOISE LEVELS

The Project will introduce additional noise from the use of trucks, heavy equipment, and material hauling activities. Cumulatively, noise from the Project could interact with existing sources of anthropogenic noise in the area, such as highway traffic and agricultural operations. However, the Project's contribution to overall ambient noise levels is expected to be marginal compared to these existing sources. Noise effects will be temporary, localized, and largely confined to daytime hours. Existing topographical features, natural vegetation buffers, and setback distances from sensitive receptors will help attenuate cumulative noise impacts. Therefore, no substantial cumulative noise effects are anticipated.

9.3.8 DUST AND EMISSIONS

The Project will contribute minor additional dust and emissions to the existing environment, where local sources such as vehicle traffic and agricultural activities already generate particulate matter and exhaust. Given the localized nature of Project activities and the implementation of mitigation measures (e.g., dust suppression, equipment maintenance, speed limits), the Project's incremental contribution to cumulative dust and emissions levels is expected to be low. No major cumulative effects on human health or well-being are anticipated.

9.4 CONCLUSION

The CEA determined that the Project, in combination with other existing and reasonably foreseeable activities in the region, is not expected to result in significant cumulative impacts on the selected VECs.

The Project's residual environmental effects, including those on surface water and groundwater, wetlands, terrestrial habitat, fish and aquatic habitat, air quality, transportation, noise levels, and dust and emissions, are predicted to be localized, minor, and effectively mitigated through the proposed environmental protection measures.

Regional activities, such as agriculture, transportation, and small-scale industrial operations, were considered in the cumulative assessment; however, given the Project's distance from other extractive operations, the

dominance of agricultural land use within the assessment boundary, and the implementation of standard mitigation and management practices, cumulative effects are anticipated to be minimal.

Overall, the Project is not expected to contribute substantially to cumulative environmental effects in the region.

CHAPTER 10: EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The environment surrounding the Project Site can influence sand pit operations, particularly through climate change, extreme weather, and natural hazards. Recognizing these factors is essential for understanding potential vulnerabilities and implementing necessary mitigation measures.

10.1 CLIMATE CHANGE AND EXTREME WEATHER

Climate change is projected to impact Nova Scotia through increased temperatures, shifting precipitation patterns, and more frequent and severe extreme weather events. Average annual temperatures in Nova Scotia are expected to rise by 2.6°C by mid-century and by up to 4.5°C by the end of the century under high-emission scenarios (NSECC, 2022b). These changes may contribute to heavier rainfall, stronger storms, and increased risk of flooding and erosion.

At the Project Site, these climate trends may occasionally disrupt operations through localized erosion or storm-related impacts. Warmer temperatures and fluctuating freeze-thaw cycles may also influence soil stability, particularly in erosion-prone or steep areas of the site. Short-duration rain or snow events may pause operations, while heavier storms could cause surface runoff, localized erosion, or sediment movement. However, the well-drained sandy soils and internal grading of the pit are expected to direct water to the pit floor, limiting the potential for off-site impacts. High winds may generate fugitive dust; however, this risk will be mitigated through the use of dust control measures to reduce the potential for off-site transport.

10.2 FLOODING AND HYDROLOGICAL HAZARDS

Heavy rainfall and snowmelt can cause inland flooding in Nova Scotia, particularly in low-lying areas (Bush & Lemmen, 2019). McGee Brook and its associated floodplain are located within the Project Site but are situated outside of the active Project footprint where sand pit operations will occur. The Project will maintain at least a 30 m buffer from this feature in accordance with provincial guidelines, minimizing flood vulnerability and hydrological impacts within the operational area.

While the Project footprint itself is not located within a floodplain, localized ponding and surface runoff during intense storm events may still occur. This could result in short-term disruptions to site access or equipment. These impacts are expected to be short-term and manageable through general stormwater management practices and erosion control measures implemented as part of the Project's environmental protection planning.

The wetlands on the Project site, as well as McGee Brook itself, would likely see changes in hydrology. Increased frequency and intensity of precipitation, coupled with prolonged dry spells, will likely lead to more extreme hydrological conditions. This could manifest as more severe swings between drought and flood conditions in both the wetlands and the watercourse. While McGee Brook, as a perennial watercourse, may offer some

drought resilience to the contiguous wetlands by maintaining a baseline water supply, the wetlands are simultaneously crucial for the brook's flood resilience, providing stormwater attenuation and erosion resistance.

10.3 MITIGATIONS

The following measures will help minimize potential environmental effects from extreme weather events, flooding, and wind:

- Erosion control measures (e.g., silt fences) will be used where necessary to reduce runoff and sedimentation risks.
- A minimum 30 m setback from McGee Brook, which also encompasses the adjacent wetland, will be maintained to reduce hydrological and ecological impacts.
- Runoff will be directed toward infiltration areas where feasible, and existing drainage patterns will be preserved. Stormwater management practices will help reduce erosion and localized flooding.
- Site activities may temporarily pause during extreme weather events (e.g., heavy rainfall, high winds) to protect workers and equipment. Operations will resume once conditions stabilize.
- During high winds, dust will be managed using lignin-based solutions or chloride mixtures to minimize off-site transport.
- Severe weather forecasts will be monitored, and site-specific response measures will be implemented as needed.

10.4 CONCLUSION

The Project is designed to minimize the potential impacts of climate change, extreme weather events, and hydrological hazards. By implementing the outlined mitigation measures, including erosion control, stormwater management, and dust suppression, the Project is prepared to manage these environmental challenges. These strategies will help ensure that any residual risks are effectively managed, maintaining operations throughout all phases of the Project while protecting the surrounding environment.

CHAPTER 11: EMERGENCY AND RISK MANAGEMENT

The Project will involve low-risk activities typically associated with sand pit operations, including excavation, stockpiling, and hauling of aggregate material. However, potential risks will be addressed through a combination of mitigation measures, emergency response planning, and adherence to applicable regulatory frameworks.

11.1 IDENTIFIED RISKS

Several potential risks are associated with the operation of the sand pit, including:

Fires

Fires may occur due to equipment malfunction, dry conditions, or human error during operation or refueling activities. Risk is higher during dry periods, and fire may be exacerbated by the presence of combustible materials on-site (e.g., fuel, lubricants).

Sedimentation and Soil Erosion

Disturbance of soil during excavation activities may lead to sediment runoff, particularly during rainfall events, potentially affecting nearby watercourses.

Fuel and Hazardous Substance Leaks

Fuel or oil leaks from machinery or during refueling present a risk of contaminating soil and surface water. Incidents may also involve unintended discharge of hydraulic fluids or lubricants during equipment malfunctions.

Surface Water Contamination

Spills of hazardous substances or poor management of stormwater runoff can lead to contamination of local water bodies, including nearby streams or groundwater sources.

Vehicle Accidents

Accidents involving transport vehicles, such as trucks carrying sand, can pose risks to workers and nearby road users, especially if they occur on local or regional roads.

11.2 MITIGATIONS

To manage the identified risks, the following mitigation measures will be implemented:

Fire Prevention and Control

- Fire extinguishers will be available at key locations, particularly near fuel storage and refueling areas.
- Workers will be trained in fire prevention and basic response procedures.

Erosion and Sediment Control

- Measures such as silt fences will be installed to prevent sediment from reaching nearby watercourses.
- Disturbed areas will be stabilized as soon as practicable, especially ahead of rainfall events.

Spill Prevention and Containment

- Fuel and oil storage will include secondary containment (e.g., spill trays or berms).
- Equipment will be regularly maintained and inspected for leaks.
- Spill kits (e.g., absorbent pads, booms) will be available on-site to contain and clean up minor spills. Larger spills will be managed with support from an external environmental response contractor.

Surface Water Contamination

- Equipment will be refueled away from waterbodies and runoff paths.
- Stormwater management practices will be in place to divert clean water away from work areas and to manage runoff from disturbed areas.

Vehicle Safety

- Drivers will follow site speed limits and haul route protocols.
- Signage warning of truck traffic will be installed at the site entrance.
- Regular maintenance and inspections of vehicles will be conducted to reduce mechanical failure risks.

11.3 EMERGENCY PLANNING, CONTINGENCY MEASURES, AND COMMUNICATION

An Emergency Response Plan and Contingency Plan will be updated prior to operations. These plans will outline roles and responsibilities, emergency procedures, and communication protocols to ensure a rapid and coordinated response in the event of a fire, hazardous substance spill, vehicle accident, or other incidents. Plans will align with provincial requirements and industry best practices and will be developed in consultation with the appropriate regulatory authorities.

In the event of an emergency, the site supervisor or designated on-site lead will coordinate communication with local emergency services, regulators, and nearby residents as appropriate. Updates may be shared via direct outreach or local communication channels, depending on the nature and severity of the event.

These plans will be reviewed and updated as needed throughout the life of the Project to reflect operational changes or evolving best practices.

CHAPTER 12: ADDITIONAL APPROVALS, AUTHORIZATIONS, AND FUNDING SOURCES

The following additional approvals and authorizations will be required prior to proceeding with the Project:

- **Industrial Approval:** The Project will require an amendment to the existing Industrial Approval (No. 2019-2616742-00) under the *Environment Act,* S.N.S. 1994-94, c. 1, to reflect the proposed expansion of the sand pit.
- **Municipal Requirements:** No municipal development or building permits are required for this type of operation, as no new structures are anticipated. The Proponent will continue to comply with all applicable municipal bylaws and land use regulations.
- **Other Permitting Requirements:** No wetland, watercourse alteration, or water withdrawal approvals are anticipated for the Project.

No public funding or government grants will be sought for this Project. The Project will be fully funded through private investment by the Proponent.

CHAPTER 13: CONCLUSION

The objective of the Project is to expand the existing sand pit to allow continued extraction of sand in support of regional infrastructure and development needs. The Project will help meet local and regional demand for aggregate while maintaining compliance with environmental regulations and implementing best practices in pit operations and reclamation.

This EA considered the potential effects of the Project on a range of biophysical, socioeconomic, cultural, and human health VECs. No significant adverse residual environmental effects are anticipated. While some minor residual effects may occur, these are expected to be localized and either reversible or manageable over time through the implementation of appropriate mitigation and monitoring measures.

Engagement with adjacent landowners and local stakeholders informed Project planning. Permissions were secured for reduced setbacks from neighbouring property lines, and information was shared with local organizations. No concerns have been raised to date.

The CEA concluded that the Project, in combination with other existing and reasonably foreseeable activities in the region, is not expected to result in significant cumulative impacts on the selected VECs. Residual effects are predicted to be localized and minor, and standard mitigation measures will be sufficient to manage potential interactions with other land uses.

Environmental factors such as extreme weather or seasonal conditions are not expected to pose a substantial risk to Project operations. Emergency and risk management procedures will be in place to respond to unforeseen events.

In summary, with the implementation of proposed mitigation and monitoring measures, the Project is not expected to cause significant adverse environmental effects.

CHAPTER 14: CLOSURE

This Report has been prepared by the Consultant, Fraxinus Environmental and Geomatics Limited, for the Proponent, Kenneth Lutz Trucks Limited, solely for the purpose of supporting the environmental assessment applications for the Project, the Morden Road Sand Pit Expansion Project. It reflects the Consultant's professional judgment, exercised in accordance with guidance provided by the Government of Nova Scotia and the Government of Canada, and reflects the standard of care ordinarily practiced by environmental professionals in Nova Scotia under similar circumstances, at the time the services were performed and the observations were made. The findings, opinions, and recommendations are based on observed site conditions and information provided by others, which have not been independently verified unless expressly stated. The Consultant makes no warranty, express or implied, and has no obligation to update this Report if conditions, regulations, or available information change after the date of issue. The Consultant is not liable for errors, omissions, or discrepancies arising from changed, concealed, or different environmental conditions or from reliance on information provided by others.

In preparing this Report, the Consultant has relied in part on data sets, research projects, models, and other information cited herein and/or provided by third parties (including the Proponent, regulators, and public databases), which the Consultant has not independently verified except where expressly stated. The Consultant's analyses, findings, and conclusions are contingent upon the accuracy, completeness, and currency of such information and assumptions. To the fullest extent permitted by law, the Consultant disclaims responsibility for, and shall have no liability arising from or related to, errors, omissions, or discrepancies resulting from false, incomplete, outdated, or otherwise inaccurate information supplied by others.

The Consultant's role is limited to providing environmental science services and advisory support. The Proponent is solely responsible for obtaining and maintaining approvals, implementing mitigation and monitoring measures, and ensuring the Project's compliance with all applicable laws, permits, and conditions. The Consultant does not control and is not responsible or liable for the Proponent's decisions, construction means and methods, site operations, or compliance performance, and nothing in this Report creates any duty on the Consultant to monitor, direct, or enforce compliance on behalf of the Proponent or any regulator.

A list of Project Team members and their roles is provided below. Curricula vitae for contributing team members are included in Appendix H.

- **Ian Bryson, MSc** – President & Senior Scientist

- **Scott Dickey, MREM** – Senior Scientist
- **Cuun Niesink, MREM** – EA & Permitting Specialist
- **Zacharye Simai, BSc** – Environmental Scientist

CHAPTER 15: REFERENCES

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