APPENDIX A
BIOPHYSICAL ASSESSMENT REPORT
(Envirosphere Consultants Limited, 2024)

Environmental Assessment Registration Document:
Hartville Quarry Expansion
Ellershouse, Windsor West Hants Regional Municipality
Nova Scotia

Biophysical Assessment:
Hartville Quarry Expansion
783 Ellershouse Rd #769, Ellershouse, West Hants Regional Municipality—
PIDs 45407111, 45007903, 45407905

March 2024

Prepared for:

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1 INTRODUCTION

Alva Construction Limited, Antigonish, Nova Scotia, is proposing to expand its existing 3.988 hectare (ha) quarry (Hartville Quarry) located in the vicinity of Ellershouse, Windsor-West Hants Regional Municipality (WWHRM), to the south and east, to occupy a maximum area of 10.118 ha. The quarry is presently operating under an industrial approval for a quarry less than 4 ha in size. An approval to expand the quarry beyond the current size is required under the Environmental Assessment Regulations of the Nova Scotia Environment Act. Alva Construction Limited contracted Envirosphere Consultants Limited of Windsor, Nova Scotia, to prepare a biophysical and socio-economic overview and assessment of the proposed quarry expansion in support of the Environmental Assessment Registration application. This report contains the results of the overview and assessment. It presents a description of the methodology and scope, existing environment, environmental effects, cumulative effects, discussion, and conclusions. The assessment provides a sufficient level of detail to ensure that all information necessary to allow adequate review of the project is provided; to demonstrate how the assessment was conducted; and to document the information on which the conclusions were based.

2 INFORMATION SOURCES

Information for the biophysical and socio-economic overview and assessment was collected from various sources, including interviews with representatives of the Nova Scotia Department of Natural Resources and Renewables (NSNRR); contacts with organizations, businesses, and individuals in the area; review of published information including soil surveys, reports on geology, archaeology, and natural history (e.g. *Natural History of Nova Scotia*); use of relevant websites and databases (e.g. Nova Scotia Open Data Portal; NSNRR Significant Habitat and Wetland Databases, Atlantic Canada Conservation Data Centre, and Nova Scotia Museum of Natural History); and use of maps, digital data on land use, property ownership, aerial photos, and 1:50,000 topographic maps. An Archaeological Resource Impact Assessment (ARIA) was conducted by Davis-McIntyre and Associates, Dartmouth, Nova Scotia, under Heritage Research Permit A2023NS159. Site visits and walkovers by project personnel were carried out on July 7, July 14, and September 11, 2023 (site reconnaissance); June 21, 2023, and September 8, 2023 (spring and fall botany survey); May 14-15, 2023, and June 9, 2023 (owls and breeding birds); July 7, 2023 (wildlife survey); and August 8, 2023 (lichen survey). Key project personnel included Patrick Stewart (M.Sc.), Heather Levy (B.Sc. Hons. Environmental Science), and Kyra Scott (B.Sc. Biology) (background review, site reconnaissance, wetlands, water quality & fish habitat assessment); Ruth Newell, M.Sc. (botany survey); Mark Pulsifer, M.Sc. (wildlife); Chris Pepper (lichens); and Mr. Fulton Lavender and Mr. Richard Hatch (breeding bird and owl surveys).

3 SITE LOCATION AND STUDY AREA

The Hartville Quarry is located in Ellershouse, Windsor-West Hants Regional Municipality (WWHRM), , Nova Scotia, approximately 1.6 kilometers east of St. Croix, and 3.3 kilometers west of Newport Corner, Hants County, Nova Scotia at approximately UTM Zone 20, NAD83, Easting 0377947 and Northing 4914805 and PIDs 45407111, 45407905, and 45007903. The quarry is accessed by an unnamed gravel road leading off Ellershouse Road. The study area for the assessment is shown in Figure 1. The proposed quarry expansion area will be located entirely within the EA study area of 10.1 ha (Figures 2 to 6).

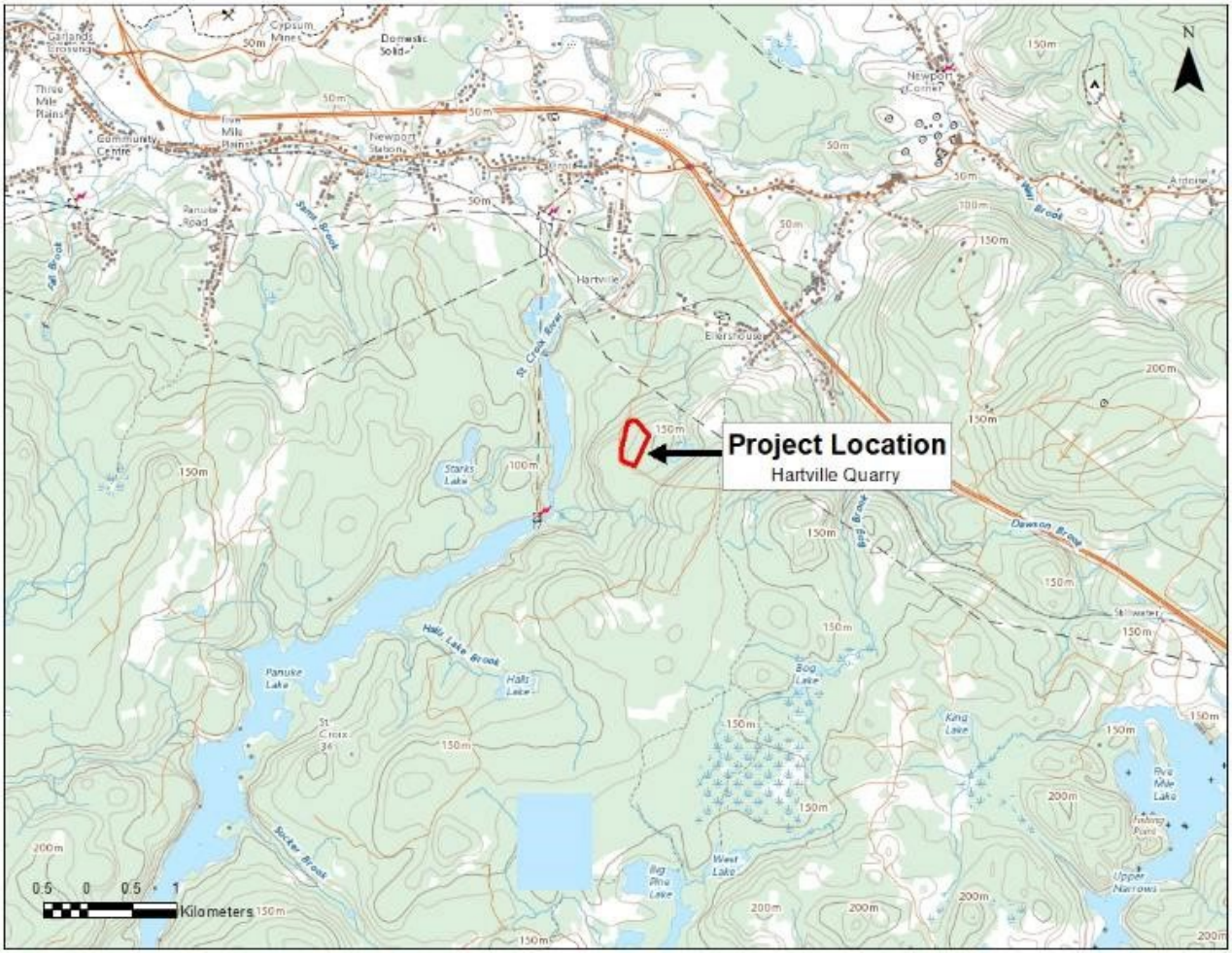

Figure 1. Project location shown on NTS 1:50,000 mapping (21A16).

Figure 2. View of Alva's Hartville Quarry, facing west, July 14, 2023.

Figure 3. View of Alva's Hartville Quarry, facing east, July 14, 2023.

Figure 4. View of Alva's Hartville Quarry and surrounding landscape, facing north, July 14, 2023.

Figure 5. View of Alva's Hartville Quarry, facing south, July 14, 2023.

Figure 6. Stockpile areas on the north (left), northwest (centre), and west end (right) of the quarry, July 14, 2023.

4 EXISTING ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

4.1.1 CLIMATE AND WINDS

The Alva Hartville Quarry is located inland from both the Atlantic and Bay of Fundy coasts, approximately 11 kilometers from the head of Minas Basin, at an elevation of 135 - 145 meters above sea level. The site is located at the western end of the Rawdon Wittenburg Hills Ecodistrict 410 near the transition into the St. Margaret's Bay Ecodistrict 780 to the south; and to the South Mountain Ecodistrict 720 to the west (Neily *et al.* 2017. Consequently the site shares a mixed climate, with occasionally both high rainfall and cooler temperatures (Rawdon Wittenburg Hills); and to the south the cooler, moist climate with rain and fog and high soil moisture levels due to the influence of the Atlantic Ocean (St. Margaret's Bay Ecodistrict) (Neily *et al.* 2017). The South Mountain Ecodistrict has warm, early springs and warm, dry summers, and mild winters with snow accumulations at higher elevations (Neily et al., 2017).

Average daily temperatures in the study area are moderate, ranging from a low of 5.5 °C in January to 19.9 °C in July and an annual average of 7.2 °C (Canadian Climate Normals 2023) (Figure 7). Average annual precipitation of 1,309.1 mm (measured at Windsor/Martock) is high, with 11% coming as snow, mainly in January (Canadian Climate Normals 2023). Temperatures are less moderate (hotter in the summer and cooler in the winter) because of the separation of the site from the moderating influence of the Atlantic Ocean. Most precipitation arrives in September-December and secondarily in March-April. Extreme daily precipitation events have recently occurred, influenced by changes in climate patterns as a result of global climate warming. Wind speeds are generally highest in the winter, predominantly from the west to northwest (December-February), shifting to the west in the spring (March-May). Predominantly southwest winds occur in June to August, shifting back to the west for the fall (September-November) (Environment and Climate Change Canada 2016).

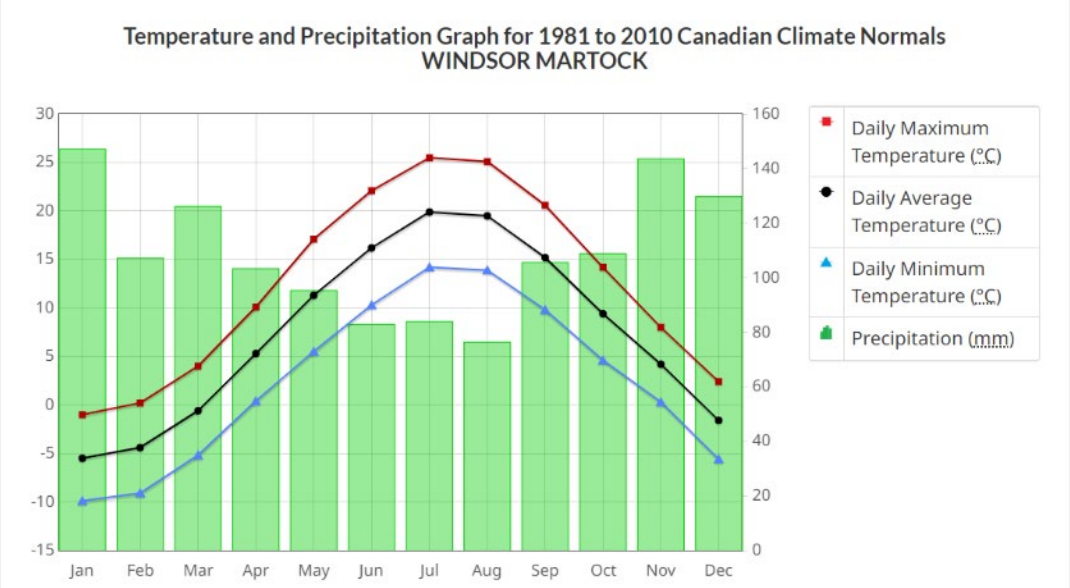

Figure 7. Annual precipitation and temperature cycle, Windsor Martock (1981-2010) (Canadian Climate Normals 2023).

4.1.2 TOPOGRAPHY AND GEOLOGY

4.1.2.1 Landscape

Landscape at the site is formed by a combination of factors including bedrock and surficial geology, topography (elevation variation), soils, predominant vegetation, and surface water features. The site is located at an elevation of 110 to 145 meters above sea level, near the crest of the north-facing upslope leading into the Rawdon Wittenburg Hills Ecodistrict from a lowland formed at the upper tidal extent of the St. Croix River at St. Croix, Landscape is typical of the Rawdon Hills which extends from approximately Kennetcook to Windsor (Neily et al., 2017). Topography is moderately to steeply rolling; soils are gravely sandy loams to loams with moderately well to imperfect drainage; and the area is largely (over 99%) forested in tolerant mixed-wood forests covering hills, hummocks, and slopes. Wetlands occupy about 0.3% of the land surface, consisting of bogs, fens, swamps, and poorly drained areas (NSDLF 2019). The vicinity of the site includes a mixed woodland (immediately south, west, and east of the existing quarry); coniferous forests (south and east of the quarry); and cutover areas (e.g. the south end of the proposed expansion area) (Figure 8). Panuke Lake, which serves as a reservoir for hydro generating facilities in St. Croix is situated approximately 1 km east of the Alva Hartville Quarry.

Figure 8. Forested landscape at Hartville Quarry, July 14, 2023.

4.1.2.2 Bedrock Geology

The Hartville Quarry lies over bedrock of the Cambro-Ordovician Goldenville Group, which is composed of quartzites, meta-greywackes, and lesser amounts of slate; and is near the contact with Halifax Group slates immediately to the southeast of the quarry (Figure 9)[1]. The Goldenville and Halifax groups were derived from seafloor sediments that were metamorphosed during the Appalachian-Caledonide orogeny (Waldron *et al.* 2009). The quartzites of the Goldenville Group are a source of high-quality aggregate due to the durability, hardness, and resistance to weathering of the crushed stone (Prime and White, 2009). The Goldenville Group is also typically low in pyrite and other sulfides and has low acid-generating potential (White and Goodwin, 2011). In contrast, the Halifax Group slates, especially the Cunard Formation which is the one potentially occurring in the vicinity, are pyrite-rich and have high acid-generating potential.

To the south, granites of the South Mountain Batholith are found. To the north, Horton Group sedimentary rocks (siltstone, sandstone, and conglomerate) occur (Figure 9) on top of the Goldenville formation. The Horton Group is in turn overlain further to the north by the marine sedimentary rocks and evaporates of the Windsor Group (limestone, dolostone, gypsum, and anhydrite).

1 Halifax Formation bedrock potentially occurs in parts of the expansion area for the Quarry (Figure 10). Rocks in this formation are potentially acid-generating. Prior to expansion, the characteristics of sub-surface bedrock should be assessed, such as by a drilling program, to avoid exposing these rocks during site development.

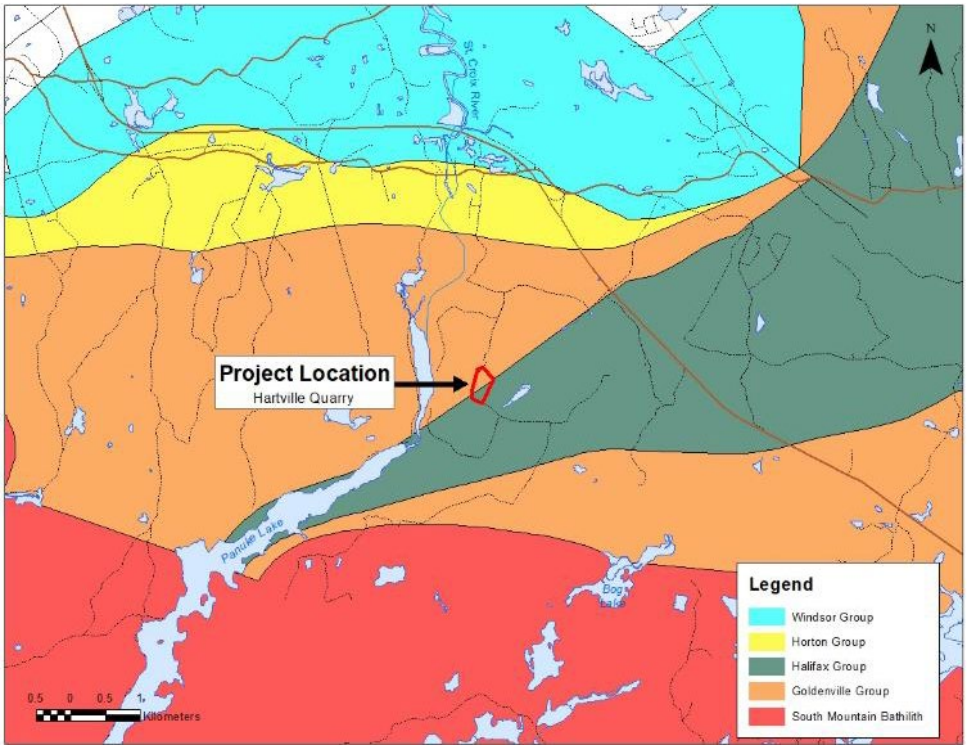

Figure 9. Bedrock formations in the vicinity of the Hartville Quarry (Keppie 2000).

4.1.3 SURFICIAL GEOLOGY

Materials which form the surface layer of the ground are largely derived from weathering of bedrock, and deposition during the last glaciation, modified by erosion and fluvial (flowing water) processes. The immediate area around the quarry is covered in a shallow layer of stony till derived largely from glacial till and reworking of local bedrock (Figure 10). Large exposures of bedrock are common, with smaller areas of organic deposits (peat and clay) in depressions. This combination of thin, nutrient-poor, stony soil, steep slopes, and poor drainage has resulted in land that has limited use for either agriculture or construction (Stea et al. 1992). In contrast, north of the site, surficial deposits are dominated by a thicker layer of silty till (Figure 10) that is suitable for construction and which leads to the formation of soil that is more fertile. The till is incised by numerous subglacial fluvial deposits (eskers and kame terraces) and glaciofluvial deposits (outwash fans and deltas). Along the boundaries of rivers, these glacial sediments have been reworked to form more modern fluvial and estuarine sediments.

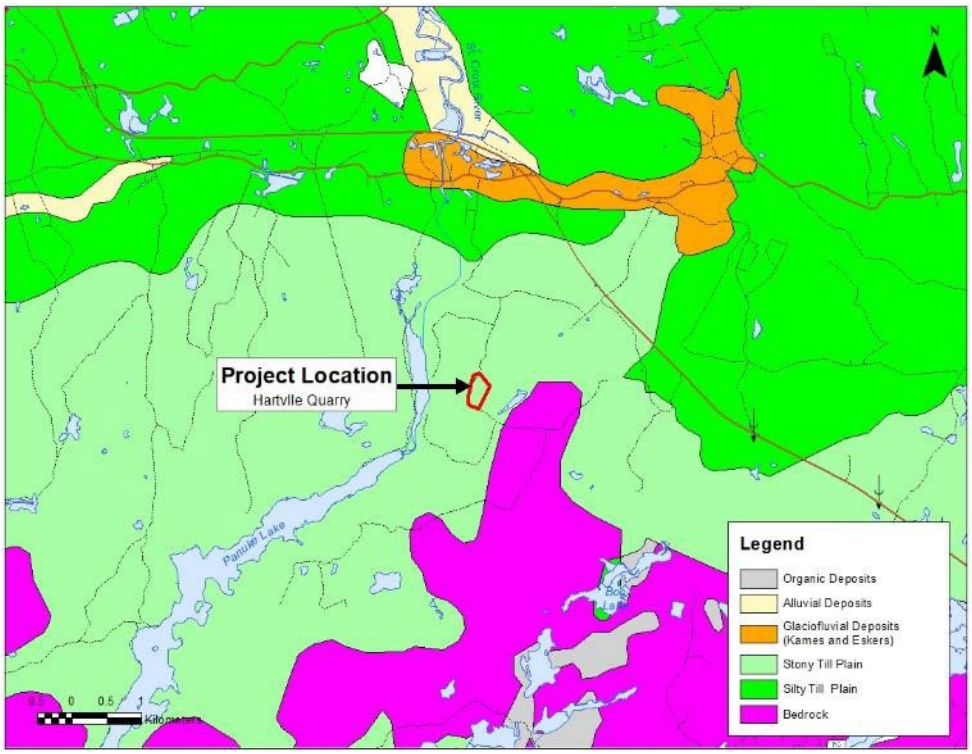

Figure 10. Surficial geology of the study area (Stea et al., 1992).

4.1.4 AIR QUALITY, NOISE & LIGHT

The Hartville area experiences moderate levels of artificial light, ambient noise, and has high air quality. No large urban centers occur in the area which could be a source for artificial light. Ambient noise levels at the quarry reflect traffic and operational noise from the quarry, as well as noise from traffic along Highway 101 and Highway 1. Air quality is expected to be good due to the remote rural location and predominantly natural setting.

Light levels are expected to be low due to the low residential density and surrounding largely undeveloped forested areas, with main sources being vehicle lights from nearby Highway 101; fixed lighting for the Highway 101-Highway 1 interchange (3 km); sky shine from Windsor which is visible from the site; seasonal lighting for the St. Croix Recreation Park baseball fields (3.5 km from the site); lighting for the nearby wind farm transformer station; and obstruction lighting for the Wind Turbine Towers. If lighting was used at the quarry for nighttime operations, 'skyshine' from operations when low clouds occur, might be seen from adjacent communities of Hartville, St. Croix and Ellershouse.

Quarry operations including blasting, crushing and screening, and associated truck and equipment operations are a source of noise. Operation of a portable crusher and other heavy equipment (e.g. motors, generators, back-up signals, etc.) may take place periodically, as well as use of heavy equipment such as loaders, excavators, and trucks to transport product and move the portable equipment as required. Operations at the quarry are periodic in response to the demand for product, usually from approximately April to November, and likely can be heard from the adjacent communities of Ellershouse, Hartville and St. Croix. Blasting occurs infrequently, typically once to several times a year, in response to demand for product during years in which the quarry is active. Some operational noise is expected to be heard in Hartville and

Ellershouse. The scope of operations, including annual production and activity levels, for the quarry is not expected to change as the result of expansion, and ambient noise levels thus are not expected to change. All trucks leaving the site are required to follow Alva's best operating practices, as well as those established by the Truckers Association of Nova Scotia (TANS) and the Nova Scotia Road Builders Association (NSRBA), to minimize noise. Noise levels arising from the quarry in the future will continue to meet the limits established in the Nova Scotia Pit and Quarry Guidelines and are expected to be consistent with those produced by the existing quarry operations at the site. Other sources of noise are wind turbines surrounding the site generate variable amounts of noise depending on wind conditions and operational status. The activities at the quarry are not expected to interact with noise arising from other sources.

The vicinity of the Quarry is expected to have relatively high natural baseline air quality typical of areas with a high proportion of natural landscapes such as neighboring forested wilderness areas, and largely undeveloped surrounding areas. Low levels of human activity, including vehicle traffic along Hartville and Ellershouse Road, as well as that associated with quarry activities, have little impact on overall air quality at the site. Periodic dust and vehicle exhaust emissions from quarry activities as well as regular residential vehicle traffic are the main contributors to particulates and exhaust emissions, which are expected to be at low levels. Based on the results of a water balance assessment conducted for the project (HERAA 2023), the small catchment area affected it is anticipated that the proposed pit expansion will have a negligible impact on the local hydrological regime. The assessment determined that during development the surface runoff from the site would decrease from 1.8 to 7.8% but after reclamation would be similar (0.8% increase) to that occurring in undeveloped conditions (HERAA 2023). Surface water management and monitoring plans will be implemented as part of the expected requirements of the amended Industrial Approval and are expected to validate the findings of the water balance assessment (HERAA 2023).

4.1.5 HYDROLOGY

The Hartville Quarry lies in the St. Croix River Watershed, sub-tertiary watershed (1DE-1-B13). The catchment area of the proposed expansion drains north and northwest into the immediate watershed of the St. Croix River (Figure 11). The overall catchment area of the quarry and proposed expansion area is 70 hectares (0.7 km^2) (HERAA 2023) or 0.1% of the 74,670 ha (746.7 km^2) the St. Croix River watershed as a whole, and therefore is a negligible contributor. The upland area on which the quarry occurs has shallow to non-existent overburden and occasional bedrock exposures, leading to rapid runoff after precipitation events through intermittent flowages, into wetlands, or existing watercourses. The study area has an overall slope to the northwest and drainage that mirrors the topography (HERAA 2023).

Part of the catchment is due to a low ridge running southwest to northeast across the middle of the expansion area, which channels surface water there in a northeast direction, leading to an accumulation which favours the occurrence of a chain of wetlands. The wetlands supply a small intermittent stream which originates about 150 m east of the expansion area and flows northeast and then north (Figures 11 and 26). The quarry expansion will remove the western part of the catchment for the wetlands and the stream, an area of 4.2 ha or about 14.5% of the total catchment of the stream of 29.6 ha. The catchment is a minor part (about 42%) of the overall quarry catchment of 70 ha (HERAA 2023). No direct connection of the intermittent stream with another watercourse could be identified although the swamp below the access road into which the watercourse flows is in close proximity to the unnamed watercourse which flows from Taylor Lake (Figure 11) which eventually reaches the St. Croix River.

Both the operating Alva Quarry and the adjacent Brycon Quarry to the north have negligible to minimal flows typically leaving the quarry footprints, although higher flows are expected during large rainfall events. Discharge from the Alva Quarry passes under the main site access road through a culvert adjacent to the entrance and disperses into the woods with no visible channels present. The Brycon Quarry discharges into the road ditch at the weigh scale, and flows downhill along the ditch to meet a small intermittent flowage, where the combined flows cross the access road via a culvert, and the combined flow disperses into the woods with no visible permanent channel. A second culvert from the Brycon Quarry crossing the access road at the entrance was dry during a March site visit. Both these areas (Alva Quarry and Brycon Quarry), have outwash gravel in downstream areas—evidence of transport by flashy flows.

In a separate catchment further east of the study area, an unnamed watercourse arises at Taylor Lake, flows across the quarry access road (Figure 11), and then flows north to cross Ellershouse Road, flowing north on the east side of the Hartville Road, eventually discharging into the St. Croix River at the St. Croix Recreation Park (Figure 11) (Map A-1).

Two artificial ponds less than 100 m^2 occur at the site, one of which is the detention pond near the weigh scale (Figure 12, WL 5) and drains through a culvert under the access road to the west; and, a shallow surface water pond which has developed in the grubbed margin of the existing quarry and is connected to WL2 (Figure 12).

Watercourses in the vicinity of the site are expected to have highest flows in the fall (October-November), reduced flows in winter, peaking after snow melt in spring (April) and dropping to low flows or to dry up, or in summer (July-September). Much of the St. Croix River watershed is forested and flows are expected to be moderate in response to sudden precipitation events. Impermeable surfaces such as access roads in the area

Figure 11. Surface waters in the vicinity of the Hartville Quarry.

would channel some of the flow into ditches which will be dissipated passing downslope towards the surrounding watercourses. Although increased flashiness of flows leaving the quarry may be expected, the Hartville Quarry study area (10.1 ha) occupies only 0.0075% of the 1DE-1 secondary watershed (134,558 ha; 1345.58 km^2) and therefore the expansion is not expected to impact flows to a significant degree.

Figure 12. Shallow surface water pond in the grubbed margin of the existing quarry (*left*). Cattail pond/marsh in detention pond (WL5; *right*) at the Quarry entrance. Photos by H. Levy (*left)* July 14, 2023 and S. Timpa *(right*) September 11, 2023.

4.1.6 HYDROGEOLOGY

The site is underlain predominantly by quartzite and metamorphosed greywacke bedrock, but may include Halifax Group slates immediately to the southeast of the quarry. Surface material is expected to be a thin veneer of stony glacial till and surface soil. Groundwater develops mainly in cracks and fractures, on horizontal surfaces between strata in bedrock, as well as in shallow till at the site. The water table at the site is below the floor of the quarry based on the current understanding of drainage characteristics of the study area. The actual depth of the bedrock water table at the quarry site is not known, but it has not been encountered during previous quarry operations, and it is not anticipated that the quarry expansion will reach the bedrock water table. Surficial and shallow groundwater flow is anticipated to mirror the topographic slope that flows predominantly north and west.

Precipitation reaching the quarry is expected to infiltrate the quarry floor or to leave via ditches and outflows into the surrounding forest, while some is expected to enter groundwater as seepage through cracks and fractures. Occasionally, retained surface water may accumulate on exposed bedrock, although it is not an expression of the groundwater table.

4.1.7 SOILS

The soil at the site is a well-drained light brown sandy loam over yellowish brown sandy loam (Halifax Sandy Loam), derived from olive gray sandy loam till. The soils are stony, dominated by quartzite rock, and are usually thin yet firm over the bedrock below resulting in negligible capability for agriculture. Drainage is variable, but in areas of sufficient slope for the water to run off, the soils are well drained and the internal drainage is usually rapid since the soils are open and porous (Cann and Hilchey 1959). Wetlands and larger depressions in lower elevations frequently form swamps that have developed peat deposits, and are not commercially extracted from this location (Anderson and Broughm 1988).

4.2 BIOLOGICAL RESOURCES AND HABITAT

4.2.1 TERRESTRIAL ENVIRONMENT

The site is in the Rawdon Wittenburg Hills Ecodistrict and vegetation is expected to reflect characteristics found throughout the ecodistrict, but which has been logged to a significant degree at various times. Much of the area north and west of the existing quarry has been clear-cut and is regenerating. The eastern slopes towards Taylor Lake are predominantly intolerant hardwoods with softwoods including predominantly balsam fir, and a small area of forest on the west side the lake is relatively mature, dominated by red maple, yellow birch and red spruce. Uncut forest dominated by red maple, red spruce, red oak and eastern hemlock is found in a patch across the access road near the southwest corner of the expansion area.

Vegetated habitats surveyed in the study area include several logged or cutover areas of different ages at the southern end of the property; mixed woodland; coniferous woodland; and several wetlands. All plant species identified within the study area were non-invasive and consisted of both native species with secure populations in Nova Scotia, except for American Beech, which is ranked as S3S4 (vulnerable). Three exotic species were also identified: helleborine (*Epipactis helleborine*), tartarian honeysuckle (*Lonicera tartarica*), and common speedwell (*Veronica officinalis*). No species with the potential to harm the environment or known to interfere with the ecological balance of the area were identified during botany and site reconnaissance surveys. Plant species found at the site during spring and fall vascular plant surveys (conducted on June 21 and September 8, 2023) are presented in Appendix B.

At the southern end of the property, two cutovers occur. The southernmost cutover (adjacent to the road) is younger than the adjacent cutover to the north (Figure 13). Tree species present in these two cutover areas include American beech (*Fagus grandifolia*), moose maple (*Acer pensylvanicum*), sugar maple (*Acer saccharum*), trembling aspen (*Populus tremuloides*), large-toothed aspen (*Populus grandidentata*), northern red oak (*Quercus rubra*), paper birch (*Betula papyrifera*), wire birch (*Betula populifoia*), Balsam Fir (*Abies balsamea*), and White Spruce (*Picea glauca*). Shrub and herbaceous species present include beaked hazelnut (*Corylus cornuta*), Bebb's willow (*Salix bebbiana*), speckled alder (*Alnus incana* ssp. *rugosa*), bush honeysuckle (*Diervilla lonicera*), sweet fern (*Comptonia peregrina*), bracken fern (*Pteridium aquilinum*), hay-scented fern (*Dennstaedtia punctilobula*), wild sarsaparilla (*Aralia nudicaulis*), yellow bluebead lily (*Clintonia borealis*), Canada goldenrod (*Solidago canadensis*), rough goldenrod (*Solidago rugosa*), woolly bulrush (*Scirpus cyperinus*), tall white aster (*Doellingeria umbellata*), and calico aster (*Symphyotrichum lateriflorum*) (Appendix B).

Figure 13. One of two adjacent, relatively recent cutover areas at the south end of the property. Photo by R. Newell, June 21, 2023.

Mixed woodland (Figure 14) occurs immediately south and southwest of the quarry pit. Tree species present within this habitat, include balsam fir (*Abies balsamea*), red spruce (*Picea rubens*), white spruce (*Picea glauca*), white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), pin cherry (*Prunus pensylvanica*), northern red oak (*Quercus rubra*), wire birch (*Betula populifolia*), white birch (*Betula papyrifera*), trembling aspen (*Populus tremuloides*), large-toothed aspen (*Populus grandidentata*), and red maple (*Acer rubrum*). Shrub and herbaceous species present include hobblebush (*Viburnum lantanoides*), sheep laurel (*Kalmia angustifolia*), late lowbush blueberry (*Vaccinium angustifolium*), velvet-leaved blueberry (*Vaccinium mytilloides*), blackberry (*Rubus* sp.), bunchberry (*Cornus canadensis*), northern starflower (*Lysimachia borealis*), wild lily-of-the-valley (*Maianthemum canadense*), bracken fern (*Pteridium aquilinum*), pink lady's-slipper (*Cypripedium acaule*), whorled wood aster (*Oclemena acuminata*), painted trillium (*Trillium undulatum*), sweet fern (*Comptonia peregrina*), beaked hazelnut (*Corylus cornuta*), goldthread (*Coptis trifolia*), northern bush honeysuckle (*Diervilla lonicera*), mountain holly (*Ilex mucronata*), and cucumber root (*Medeola virginiana*) (Appendix B).

Figure 14. Mixed woodland occurring southwest (left) and mixed woodland occurring east (right) of the active quarry. Photos by R. Newell, June 21, 2023.

There are scattered small stands of primarily coniferous trees present south and east of the open quarry area (Figure 15). Herbaceous vegetation on the forest floor is scant in these areas. Trees present include white pine (*Pinus strobus*), red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*) (Appendix B).

Figure 15. Coniferous woodland occurring south and east of the quarry. Photo by R. Newell, June 21, 2023.

Several wetlands also occur within the study area, predominantly occurring east and southeast of the existing quarry. Wetlands include four treed drainageway swamps, one high shrub sphagnum bog, and one cattail pond/marsh. A narrow, elongate treed drainageway swamp (Figure 16) occurs south of the active quarry within mixed woodland and runs roughly parallel to the south end of the quarry. A small intermittent stream and scattered, small boggy pools are present within the treed swamp areas. A high shrub sphagnum bog (Figure 17) occurs near the eastern extent of the proposed expansion area. Refer to Section 4.3.4 for detailed descriptions of wetlands within the Hartville Quarry study area.

Figure 16. Swamp occurring south of the existing quarry within mixed woodland. Photos by R. Newell, June 21, 2023.

Figure 17. A high shrub sphagnum bog occurs east of the active quarry. Photo by R. Newell, June 21, 2023.

4.2.2 AQUATIC ENVIRONMENT

The Hartville Quarry is located in the lower reaches of the St. Croix River (1DE-1) secondary watershed as well as within the St. Croix River (1DE-1-B) tertiary watershed. There are no permanent, first-order streams in or near the immediate vicinity of the study site. Taylor Lake, which is a prominent surface water feature east of the site, is in a different sub-watershed and is not influenced by the quarry. Drainage from the Hartville Quarry and the adjacent Brycon Quarry to the north enters ditches along the access road and crosses the access road through culverts. The flow from the quarries is intermittent, and low or negligible flow was observed during site visits, and no permanent surface water features occur downslope of the culverts. Patchy open water was observed in natural flowages associated with wetlands (Figures 16 and 19); and occasional sub-surface flows were presumed between wetlands. Surface water draining from wetlands at the southeastern end of the quarry (see Figure 26) supplies a small intermittent stream which flows northeast and then north of the site (Figure 11 and Figure 18). Surface water is not retained within the active pit area, and precipitation reaching the quarry floor either percolates through fractures below ground or drains into a small detention pond which has developed into a graminoid marsh wetland (Wetland 5 in Figure 26 and Figure 24) located at the quarry entrance alongside the access road.

Figure 18. Left: Shrub swamp at eastern end of wetland complex southeast of the expansion area, March 9, 2024. Right: Intermittent stream leaving wetland complex, March 9, 2024.

4.2.3 WATER QUALITY

There were few locations containing adequate surface water for sampling, and water quality measurements were taken at three locations from open water pools in wetlands during the July survey (Figure 20). Temperatures were warm and characteristic of the time of year (16.3 - 17.8°C). Dissolved oxygen levels were low at all sites reflecting the warm water temperatures and stagnant or slowly flowing water. Specific conductivity at all sites was low and ranged from 36.4 – 48.5 µS/cm. Water was clear and Total Suspended Solids (TSS) was low at site SW-1 (3.5 mg/L); the other sites had high levels of natural organic particulate matter present which was not suitable for TSS analysis (Table 1). pH values were low and ranged from 5.7 to 6.2 with the most acid conditions occurring in wetland or wetland-influenced areas, as is typical for such areas. Water quality measurements are presented below in Table 1. Bolded values indicate where the CCME Guidelines for Protection of Freshwater Aquatic Life were exceeded. Locations for water quality measurements are shown in Figure 20.

Table 1. Water quality measurements in surface waters at or near the Hartville Quarry Expansion area, July 14, 2023.

Bolded values exceeded the Freshwater Aquatic Life Guidelines.

Site Location & Date	July 14, 2023			Freshwater Aquatic Life Guidelines
	Hartville Quarry			
	W1S1	**W1S2**	**SW1**	
Site Description	Wetland	Wetland Channel (No Flow)	Wetland Channel (Flowing Water)	
Temperature °C	17.8	17.2	16.3	<20[1]
Dissolved Oxygen (mg/L)	**0.63**	**2.85**	**2.87**	>6.5, >9.5[2]
Dissolved Oxygen (% saturation)	6.8	26.0	31.9	--
Conductivity (µS/cm)	41.4	30.8	33.0	--
Specific Conductivity (25°) (µS/cm)	48.5	36.4	39.1	--
pH	**5.7**	**6.2**	**5.9**	6.5 to 9.0[3]
TSS (mg/L)	--	--	3.5	>25 mg/L[4]

Appearance	Clear, Organic Particles Present	Clear, Organic Particles Present	Clear	--

Note: TSS = Total Suspended Solids.

1. **Thresholds of 20° C are used as indicators of stress to aquatic species, particularly salmonids (DFO 2012).**
2. **CCME, Canadian Council of Ministers of the Environment. 1999. >9.5 mg/L early life stages; >6.5 mg/L other, cold water ecosystems.**
3. **CCME, Canadian Council of Ministers of the Environment. 1999.**
4. **Exceedance of normal level.**

Figure 19. Water quality sampling locations (Table 1 and Figure 20). SW1 (left) - Open water in wetland with flowing water; W1S1 (right) – Open water in wetland basin further downslope.

Figure 20. Field survey locations for water quality, breeding bird and owl surveys. Also shown are locations for Species of Conservation Concern identified during surveys (July 2023).

4.2.4 WETLANDS

Wetlands are areas of land that are periodically or permanently flooded, have characteristic soils, and support particular types of vegetation that are adapted to life in such environments. The quarry property and proposed expansion area are moderately sloped and moderately well-drained; however, parts are poorly drained and support wetlands. Wetlands at the site include four swamps, a high shrub bog, and a small cattail marsh pond (Figure 26; Table 2).

A treed drainageway swamp wetland complex (WL1, WL2, WL3, and WL4) (Figure 26)is present in a broad depression, south of the existing quarry (Figures 21 to 23). All wetlands within this complex are similar in character, having a negligible to gentle slope, patchy distribution of vegetation, sphagnum hummocks, sedge, occasional presence of wetland-associated grasses, and open exposed substrate suggesting periodic flooding. Both July surveys took place after a rainfall event following a long dry spell, and standing surface water was present within wetlands. An eastward flow was observed in WL2 and WL4, but these areas likely have periods when no water is retained. Vegetation is similar overall with a substrate primarily composed of sphagnum moss. Ferns are particularly abundant, especially sensitive fern (*Onoclea sensibilis*) and cinnamon fern (*Osmundastrum cinnamomeum*). Other ferns of varying occurrence are also present including interrupted fern (*Claytosmunda claytoniana*), lady fern (*Athyrium filix-femina*), beech fern (*Phegopteris connectilis*), crested wood fern (*Dryopteris cristata*), common oak fern (*Gymnocarpium dryopteris*) and New York fern (*Parathelypteris noveboracensis*). Tree and shrub species present within the swamp habitat include White Ash (*Fraxinus americana*), Red Maple (*Acer rubrum*), Black Spruce (*Picea mariana*), Yellow Birch

(*Betula alleghaniensis*), Balsam Fir (*Abies balsamea*), Common Winterberry, (*Ilex verticillata*), Speckled Alder (*Alnus incana* ssp. *rugosa*) and Beaked Hazelnut (*Corylus cornuta*). Additional herbaceous species present include Whorled Wood Aster (*Oclemena acuminata*), Wild Sarsaparilla (*Aralia nudicaulis*), Northern Starflower (*Lysimachia borealis*), Bladder Sedge (*Carex intumescens*), Three-seeded Sedge (*Carex trisperma),* Brownish Sedge (*C. brunnescens*), Fowl Manna Grass (*Glyceria striata*), American Golden Saxifrage (*Chrysoplenium americanum*), Northern Water Horehound (*Lycopus uniflorus*) and Calico Aster (*Symphyotrichum lateriflorum*) (Appendix B). Occasional, small, somewhat isolated, wet peaty, or swampy patches were also observed away from the main swamp area (Appendix B).

A high shrub sphagnum bog occurs near the eastern corner of the study site (WL6; Figures 25 and 26) associated with a low ridge. Vascular plant species present within this wetland include red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), black spruce (*Picea mariana*), speckled alder (*Alnus incana* ssp. *rugosa*), yellow birch (*Betula alleghaniensis*), white birch (*Betula papyrifera*), common winterberry (*Ilex verticillata*), velvet-leaved blueberry (*Vaccinium myrtilloides*), woodland horsetail (*Equisetum sylvaticum*), cinnamon fern (*Osmundastrum cinnamomeum*), sensitive fern (*Onoclea sensibilis*), bunchberry (*Cornus canadensis*), wild lily-of-the-valley (*Maianthemum canadense*), three-seeded sedge (*Carex trisperma*), fringed sedge (*Carex crinita*), northern starflower (*Lysimachia borealis*), goldthread (*Coptis trifolia*), hobblebush (*Viburnum lantanoides*), and bristly dewberry (*Rubus hispidus*) (Appendix B).

A small Graminoid Marsh occurs on the west side of the quarry property located at the entrance to the quarry alongside the access road (WL5; Figure 24). Vascular plant species that are present in this wetland area are broadleaf cattail (*Typha latifolia*), paper birch (*Betula papyrifera*), coltsfoot (*Tussilago farfara*), early goldenrod (*Solidago juncea*), woolgrass bulrush (*Scirpus cyperinus*), and common blackberry *(Rubus alleghenienis)* (Appendix B).

Figure 21. A treed drainageway swamp occurs at the southern property boundary of the study area within mixed woodland (WL1). July 7, 2023.

Figure 22. . A narrow, elongated treed drainageway swamp (WL2) occurs southern property boundary of the study area within mixed woodland. July 7, 2023.

Figure 23. Treed drainageway swamp (WL4; left) with open water visible channel (right) located near the southern property boundary of the study area. July 7, 2023.

Figure 24. Wetland 5 (WL5) Graminoid Marsh located to the north at quarry entrance. Photo by S. Timpa, September 11, 2023.

Figure 25. High Shrub Bog (WL6) southeast of existing quarry. Photo by R. Newell.

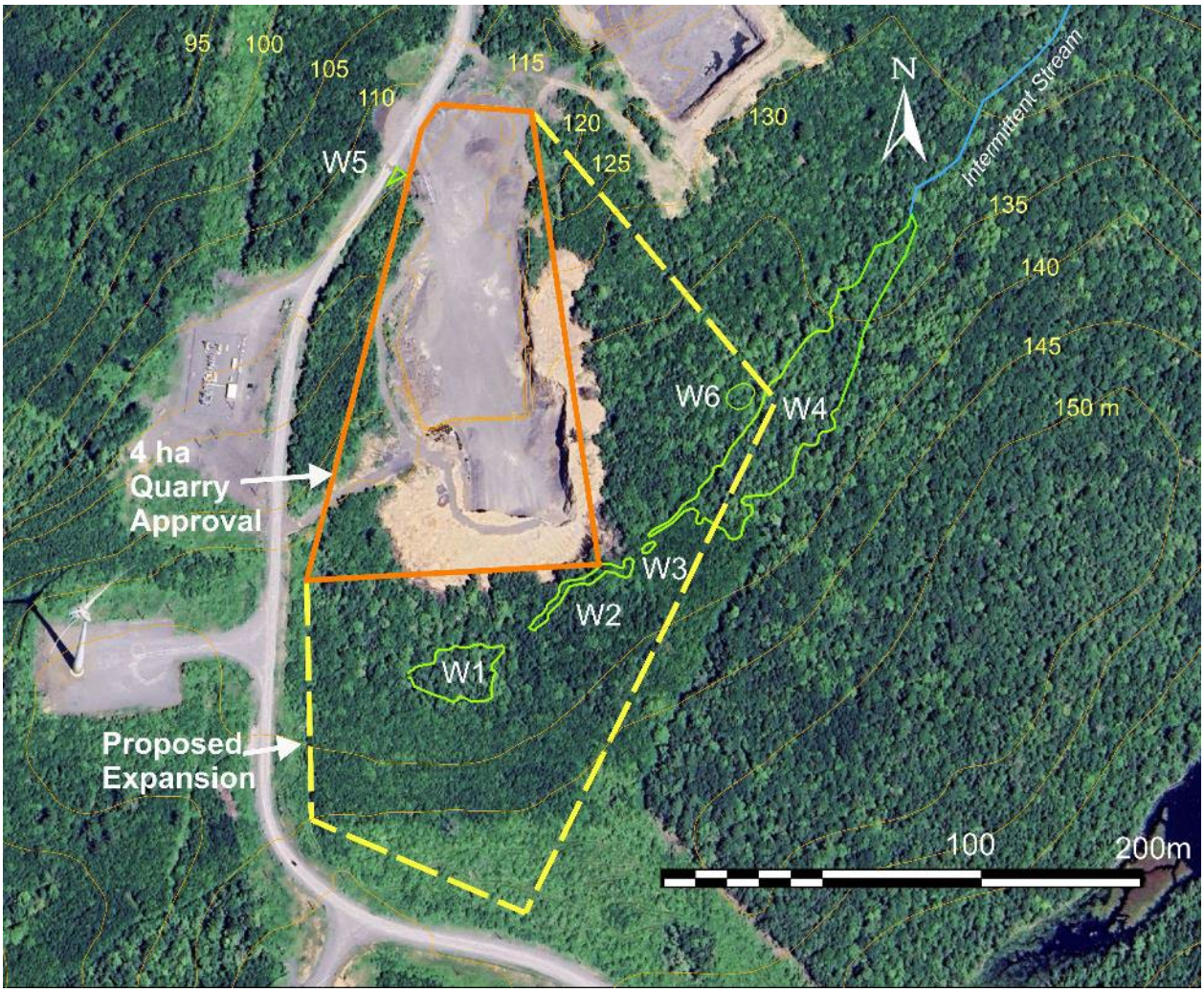

Figure 26. Wetlands at Hartville Quarry.

Table 2. Wetlands, Hartville Quarry Expansion. Locations shown in Figure 25. Areas presented are for the wetlands only found within the study area.

Identification	Area (ha)	Wetland Type and Comments
WL1	0.16	Treed basin/drainageway swamp
WL2	0.04	Treed drainageway swamp
WL3	<0.01	Treed drainageway swamp
WL4	0.15	Treed drainageway swamp
WL5	<0.01	Graminoid Marsh
WL6	0.017	High shrub sphagnum bog

4.2.5 FISH AND FISH HABITAT

There is no fish habitat at the quarry or in the immediate vicinity. The intermittent stream which drains wetlands at the site (Figures 11 and 26) was followed in its entirety to a point below where it crosses the quarry access road and a short distance below where it spreads out as it enters a swamp (see report, Appendix G). Average width was approximately 1 m and the flow was low to moderate during early March, a time when moderate flows were expected. The stream was often braided as it passed through swamps; had numerous barriers to fish passage such as waterfalls up to 2 m; and no pools were identified along the entire length which could serve as refugia for fish during dry periods. No direct connection of the stream with another watercourse could be identified although the swamp below the access road into which the watercourse flows is in close proximity to the unnamed watercourse which flows from Taylor Lake (Figure 11) to the St. Croix River. The expansion will only affect a portion of the catchment area of the stream at the site, entirely due to removal of wetlands in the upper reaches of the watershed. The catchment of the stream is 29.6 ha and the portion proposed to be removed is 4.2 ha or 14.5%. Productivity associated with the woods in the surroundings of the watercourse provide a source of nutrients and organic productivity which may reach areas downstream.

There are no other watercourses arising from the site. Surface drainage from the quarry exits under the access road to the west with no evident stream channels, with a relatively steep slope and likely not containing fish habitat (Figure 11). Taylor Lake, which is to the east of the site and may contain fish, is in a separate catchment area and drains through an unnamed watercourse to the north but crosses under the Quarry access road, and eventually connects with the St. Croix River at St. Croix (Figure 11).

4.2.6 BIRDS

Birds are one of many animal groups which live in the natural environments at the site and which contribute to the functioning of the terrestrial and wetland ecosystems in the vicinity of the Hartville Quarry. Occurrence of birds was assessed by means of reviews of available literature; as well as standard surveys for owls and breeding birds. An owl survey was conducted from 2215 – 0155 hrs on May 14 - 15, 2023[2]; and a breeding bird survey (June 9, 2023) from 0510 to 00720 hrs by birders Fulton Lavender and Richard Hatch[3].

Observation points for the owl and breeding survey had been allocated to one of two dominant forest types which had been identified in the area (mature mixed woods and regenerating mixed wood sites). The number of points was sufficient to cover the proposed quarry expansion area. Conditions were good for observations. Air temperature for both the owl and breeding bird surveys were 8°C. Winds were light to calm under clear

2 Owls were surveyed by a combination of both taped playback and silent listening at the quarry in the late evening to early morning hours. The Birds Canada Nocturnal Owl Survey Protocol for Atlantic Canada [https://www.birdscanada.org/atlantic_owls] was employed from 2215 hours to 2345 hrs at six points including four on roads near the quarry; one above the quarry; and one on the south shore of the lake east of the quarry, in the evening of May 14, 2023.This protocol involves playing a standard tape recording containing calls of Barred Owl, followed by Boreal Owl. A listening period is included following the taped calls. The survey is conducted until approximately midnight. After the call survey, the observers stood at several locations near the quarry and listened until about 0155 hrs, for any additional owls which might be present.

3 Surveys were consistent with protocols for point-count surveys in Ralph et al. (1993) and Huff et al (2000).

skies for the owl survey; and light to calm winds and overcast were experienced for the breeding bird survey. Wind turbine noise was noted for both surveys but didn't interfere with observations.

A single Barred Owl was heard using the Birds Canada Nocturnal Owl Survey Protocol (i.e. with tapes played through the evening until before midnight), calling twice ~200 m south of Point 5 (Figure 20). Outside the survey period (i.e. from 2335 hrs to 0153 hrs), a Long-Eared Owl was heard 100 m into the woods west of the south end of Taylor Lake. Five Barred Owl were heard northwest of Point 2—two between 300 and 500 m; and three beyond 500 m.

No species of conservation concern were found in either the owl survey or breeding bird survey. The songbird community in mature mixed woods areas at the quarry (Sites 1 – 3, Figure 20)[4] was dominated by Common Yellowthroat, American Robin, Hermit Thrush, Song Sparrow, and Red-Eyed Vireo, each of which occurred at all three sites and in moderate abundance. Ovenbird, American Redstart, Chestnut-Sided Warbler, Mourning Dove, Black and White Warbler, and Black-Capped Chickadee were also observed (Table 3). Low numbers overall can be attributed to the sampling date which was early in the migration period, and also to the cool temperatures encountered, although most of the species expected for the area are represented.

Regenerated mixed woods (Sites 4 and 5, Figure 20) were occupied by predominantly American Robin, Common Yellowthroat, Chestnut-sided Warbler, and Alder Flycatcher, occurring in low abundance at both sites (Table 3. Minor species were Red-Eyed Vireo, Hermit Thrush, Black and White Warbler, Song Sparrow, White-throated Sparrow, Mourning Dove, Ovenbird, American Goldfinch, Dark-eyed Junco, Magnolia Warbler, and Nashville Warbler, all of which occurred at both observation points.

Total number of species (Species Richness) at the quarry was moderate, with between 13 and 20 species observed at individual sites—and 33 species overall. The regenerated mixed woods sites were higher in total abundance, overall species per habitat, and average species per site (Table 3).

Other birds identified at or in the general area of the site during site visits included Common Raven, Red-tailed Hawk, American Woodcock, Purple Finch and Black-Throated Green Warbler.

Table 3. Bird species heard or observed during dawn bird surveys conducted June 9, 2023, between 0510 and 0720 hrs at the Hartville Quarry study site. For locations of observation points, see Figure 20.

	Mature Mixed Woods (Sites 1 – 3)		Regen Mixed Woods (Sites 4 and 5)	
	No. of sites	Average/ 10 mins	No. of sites	Average/ 10 mins
PASSERIFORMES				
Alder Flycatcher	0	0	2	7.50
American Crow	1	0.33	0	0
American Goldfinch	0	0	2	1.50

4 All birds heard in a 10-minute period, and approximate distance (0-50, 50-100 and > 100m) and direction, were noted. Weather conditions for the survey were calm with air temperatures around 8°C.

Table 3. Bird species heard or observed during dawn bird surveys conducted June 9, 2023, between 0510 and 0720 hrs at the Hartville Quarry study site. For locations of observation points, see Figure 20.

	Mature Mixed Woods (Sites 1 – 3)		Regen Mixed Woods (Sites 4 and 5)	
	No. of sites	Average/ 10 mins	No. of sites	Average/ 10 mins
American Redstart	2	3.33	1	0.50
American Robin	3	3.67	2	9.50
Black and White Warbler	2	1.00	2	5.50
Black-capped Chickadee	2	0.67	0	0
Blue-headed Vireo	1	0.33	0	0
Blue Jay	1	0.67	1	0.50
Cedar Waxwing	0	0	1	1.00
Chestnut-sided Warbler	2	2.33	2	9.50
Common Goldeneye	1	0.33	0	0
Common Yellowthroat	3	4.33	2	9.50
Dark-eyed Junco	1	0.33	2	1.00
Hermit Thrush	3	4.00	2	6.50
Magnolia Warbler	1	0.33	2	1.00
Mourning Dove	2	1.33	2	2.00
Nashville Warbler	0	0	2	1.00
Northern Parula	1	0.67	1	0.50
Northern Waterthrush	1	0.67	0	0
Ovenbird	3	1.67	2	2.5
Red-breasted Nuthatch	1	0.33	1	0.50
Red-eyed Vireo	3	3.00	2	6.50
Song Sparrow	3	3.00	2	5.00
Swainson's Thrush	1	0.67	1	0.50
Veery	1	0.33	0	0
White-throated Sparrow	1	0.33	2	5.00
Yellow Warbler	0	0	1	0.50
Yellow-rumped Warbler	0	0	1	0.50
GALLIFORMES				
Ruffed Grouse	0	0	1	0.50
PICIFORMES				
Hairy Woodpecker	1	0.33	0	0
Northern Flicker	1	0.33	1	0.50
Yellow-bellied Sapsucker	1	0.67	0	0
SUMMARY				
Average Abundance (Number per 10 min)	**35.0**		**79.0**	
Total Species per Habitat	**26**		**25**	
Average Species/Site	**14.33**		**20.00**	

Table 4. Birds potentially breeding in the St. Croix Area of Hants County (Maritime Breeding Bird Atlas-Online 2023). Map 20MQ17.	
SWANS, GEESE & DUCKS (ANSERIFORMES: ANATIDAE)	
Canada Goose	Ring-necked Duck
American Black Duck	Common Merganser
PHEASANTS, GROUSE, TURKEYS & LOONS (GALLIFORMES, PHASIANIDAE)	
Ring-necked Pheasant	Common Loon
Ruffed Grouse	
GREBES (PODICIPEDIFORMES)	
Pied-billed Grebe‡	
RAILS, GALLINULES & COOTS (GRUIFORMES, RALLIDAE)	
Sora ‡	
BITTERNS, EGRETS & HERONS (PELECANIFORMES)	
American Bittern‡	Great Blue Heron §
HAWKS & FALCONS (FALCONIFORMES: ACCIPITRIDAE, FALCONIDAE)	
Osprey	Northern Goshawk ‡
Bald Eagle ‡¤	Red-tailed Hawk
Northern Harrier	Merlin ‡
SHOREBIRDS PLOVERS, SANDPIPERS, SNIPES & GULLS (CHARADRIIFORMES, SCOLOPACIDAE)	
Killdeer	Spotted Sandpiper
PIGEONS, DOVES & CUCKOOS (COLUMBIFORMES: COLUMBIDAE, CUCULIFORMES)	
Rock Pigeon	Mourning Dove
SWIFTS (APODIFORMES, APODIDAE) AND HUMMINGBIRDS (APODIFORMES, TROCHILIDAE)	
Ruby-throated Hummingbird	
KINGFISHERS (CORACIIFORMES, ALCEDINIDAE)	
Belted Kingfisher	
WOODPECKERS (ORDER PICIFORMES, PICIDAE)	
Yellow-bellied Sapsucker	Black-back Woodpecker ‡
Downy Woodpecker	Northern Flicker
Pileated Woodpecker	
SONGBIRDS (PASSERIFORMES)	
Olive-sided Flycatcher †	Golden-crown Kinglet
Eastern Wood-Pewee	Ruby-crown Kinglet
Least Flycatcher	Eastern Bluebird †
Eastern Phoebe ‡	Veery
Eastern Kingbird	Bicknell's Thrush †
Blue-headed Vireo	Swainson's Thrush
Red-eyed Vireo	Hermit Thrush
Gray Jay	American Robin
Blue Jay	Gray Catbird
American Crow	European Starling
Common Raven	Cedar Waxwing
Tree Swallow	Ovenbird
Bank Swallow §	Black-and-white Warbler
Barn Swallow	Common Yellowthroat
Black-cap Chickadee	Northern Parula
Boreal Chickadee	Magnolia Warbler
Red-breast Nuthatch	Yellow Warbler

White Breast Nuthatch ‡	Chestnut-sided Warbler
Winter Wren	Yellow-rumped Warbler
Black-throated Green Warbler	Clay-colored Sparrow‡
Chipping Sparrow	Savannah Sparrow
Song Sparrow	White-throated Sparrow
Dark-eyed Junco	Bobolink
Red-winged Blackbird	Common Grackle
Purple Finch	Red Crossbill
American Goldfinch	
This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #16(Annopolis Valley- Digby Neck). Rare/Colonial Species Report Forms should be completed for species marked: § (Colonial), ‡ (regionally rare), † (rare in the Maritimes) or ¤ (rare in the Maritimes, documentation only required for confirmed records). Current as of 23/10/202302/02/2024. 20MQ17.	

Most bird species common to the area can be observed from March to September in open, forested and wetland habitats (Figures 27 and 28). The site is near the dykelands and estuary of the St. Croix River which forms a diverse habitat, which support raptors such as Red-tailed Hawk, and Bald Eagle, which nest along the gypsum cliffs which line the river in the area, and range into the study area. Rocks Road by the gypsum cliffs is an occasional birding location.

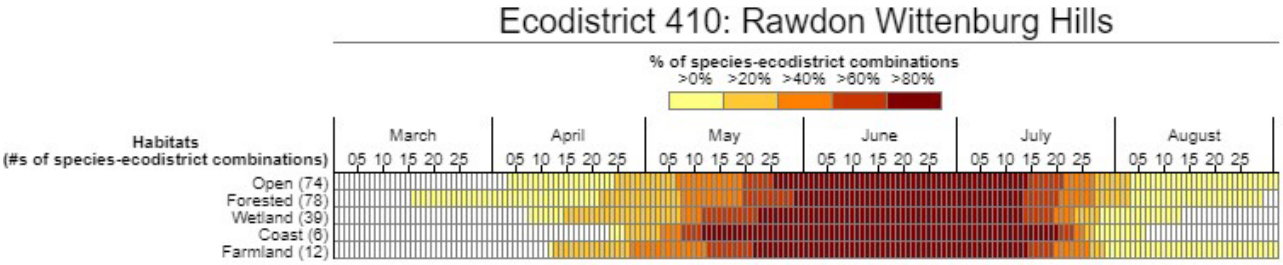

Figure 27. Nesting periods for various habitats in the Rawdon Wittenburg Hills Ecodistrict (410), formerly known as the Beaver Bank Ecodistrict (520) (Rousseu and Drolet 2015; Webb and Marshall 1999).

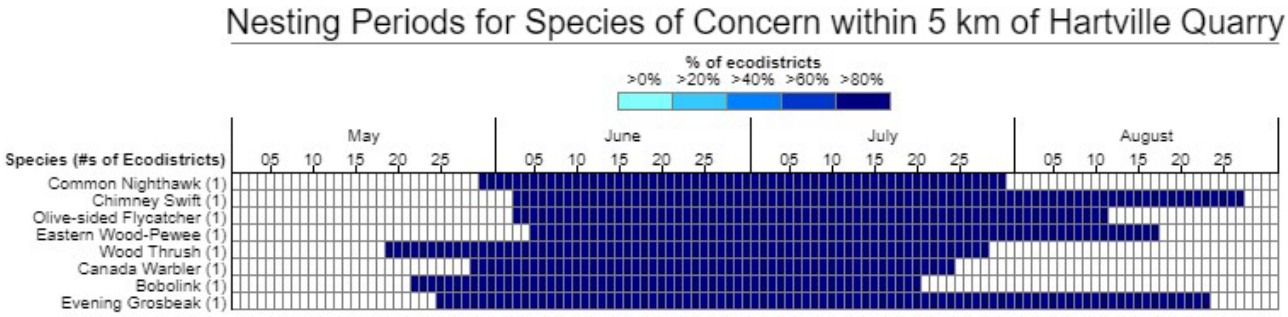

Figure 28. Nesting periods for bird Species of Concern found within five kilometers of Hartville Quarry Source (Rousseu and Drolet 2015).

4.2.7 MAMMALS

Various mammal species, both large and small, including game and furbearing species, are found in Hants County and may occur periodically at the quarry site. Mammals expected to occur regularly or occasionally reflect the dominant terrestrial habitat in the surrounding area, which includes coniferous and mixed woodland forest, cutovers of different ages, wetlands of various types, and open water (e.g. Taylor Lake). Species such as white-tail deer (*Odocoileus virginianus*), and snowshoe hare (*Lepus americanus*) frequent the quarry site based on repeated sightings (weigh scale operators, personal communication, 2023). Red squirrel (*Tamiascuirus hudsonicus)*, bobcat (*Lynx rufus*), and groundhog (*Marmota monax*) are also known to occur at the site, based on signs and observations during the designated wildlife survey (Appendix C). These species and others may utilize the study area seasonally or as part of their home range. Moose (*Alces alces*) have been reported in the general area of the study site—the closest record at a distance of 19 kilometers from the study area. The project site, however, is not a part of mainland moose concentration area although it is close to the mapped core habitat identified in the recovery plan for the mainland moose (NSNRR 2021) and suitable habitat conditions is present for moose (Appendix C). Other mammals which are likely occur in the general area include: eastern coyote (*Canis latrans*), Red fox (Vulpes vulpes) and black bear (*Ursus americanus).* Fisher (*Pekania pennanti)* and American marten (*Martes americana)* can be widespread in distribution and could also occur in the area, but they generally prefer mature and late seral forests with large diameter trees and abundant coarse woody material, which was not present within the study area.

The absence of larger open-water wetlands, waterbodies, and watercourses suggests that aquatic furbearers such as beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), and river otter (*Lontra canadensis*) are not resident within the project area (Appendix C). Although there was no evidence of aquatic furbearers within the study site, wet drainages would provide suitable habitat for raccoons (*Procyon lotor*), and forested upland habitats could also provide suitable habitat for short-tailed weasel (*Mustela erminae*).

Bat surveys were not conducted for this assessment; however, the lack of mature and old stands, with abundant standing deadwood structures (e.g., snag and cavity trees) would suggest that bats are not present or common in the project area (Appendix C). ACCDC records indicate, however, that bat hibernaculum and bat species occurrence have been reported within a 5 km radius of the site and therefore they may be present occasionally foraging and roosting where suitable (Appendix C). Distributions of bats are typically centred in areas where there are overwintering sites (hibernacula-where bats overwinter and raise young). Hibernacula are commonly located in abandoned mine shafts, caves and old buildings. There is one abandoned mine opening located 1 kilometer east of the quarry, as well as 7 known mine openings to the east within 7 to 9 kilometers from the site (Nova Scotia 2021). Further, there are four caves in the general area known to formerly harbour bats within a 2-25 km range of the study site (Frenchman's Cave I & II, Miller's Creek Cave (no longer in existence), Woodville Ice Cave, and Center Rawdon Gold Mine) (Moseley 2007). No caves or mine shafts were observed as part of our surveys.

Rodents and other small mammals potentially utilizing various habitats in the study area include snowshoe hare (*Lepus americanus*) and red squirrel (*Tamiascuirus hudsonicus)* (as noted above) as well as deer mouse

(*Peromyscus maniculatus*), white-footed deer mouse (*Peromyscus leucopus*), and meadow vole (*Microtus pennsylvanicus*). Red-backed vole (*Myodes gapperi*) and woodland jumping mouse (*Napaeozapus insignis*) could occur but are not likely present in any significant numbers, due to the lack of late seral mature forest present and meadow habitat. Insectivores such as shrews (*Blarina* sp., *Sorex* spp.) could occur where there is complex ground cover and coarse woody material present. Habitat for the long-tailed shrews, an uncommon to rare species in Nova Scotia, is not present at or adjacent to the quarry and therefore they are not expected to occur at the site (Appendix C).

4.2.8 Reptiles and Amphibians

Several snakes and other reptile as well as amphibians are known to occur in cutover areas, along roadsides, and in abandoned gravel pits, like the study site. Maritime garter snake (*Thamnophis sirtalis*), northern redbelly snake (*Storeria occipitomaculata*), and eastern smooth green snake *(Opheodrys vernalis*) potentially occur in sand, gravel, and waste areas, or deciduous forest adjacent to the quarry, basking or foraging for food (Gilhen, 1984 in Appendix C). A snapping turtle (*Chelydra serpentina*) and a wood frog (*Lithobates sylvaticus*) were observed near wetland 1 (WL1) on the northwest side (Figure 20) on July 7, 2023; and Green Frogs (*Rana clamitans*) were observed in a shallow pond located in the grubbed margin of the existing quarry (July 14, 2023). The turtle was near the grubbed margin of the quarry and was heading towards Wetland 1 which would be consistent with having laid eggs and heading back towards the normal habitat, for example Taylor Lake, for the rest of the year. Yellow-spotted salamanders (*Ambystoma maculatum*) were also present as indicated by the multiple egg masses found in flooded vehicle tracks during the wildlife survey. Red-backed salamanders (*Plethodon cinereus*) and American toads (*Bufo americanus*) are common in deciduous and mixed woodland forests similar to those located in the project area and therefore are likely to occur on the study site. Wood frogs (*Lithobates sylvaticus*), northern spring peepers (*Pseudacris crucifer*), green frogs (*Rana clamitans*), and northern leopard frogs (*Lithobates pipiens*) are likely present in the study area where there is at least temporary standing water for breeding. ACCDC records indicate occurrences of wood turtle (*Glyptemys insculpta*), snapping turtle (*Chelydra serpentina*), and eastern painted turtle (*Chrysemys picta picta*) within 6 kilometers of the study area (Appendix D). Suitable habitat for these species would be Panuke Lake Reservoir and Taylor Lake, as well as slow/moderately flowing streams in the area. These may occasionally occur at the quarry site enroute to and from these areas, particularly in search of coarse sand to gravel deposits, including those often found around quarries and along roads, for nesting.

4.2.9 Species at Risk

Background: Species at Risk are plants or animals whose existence is threatened, or which are in danger of being threatened, by human activities or natural events. The Canadian Committee on the Status of Endangered Wildlife in Canada (COSEWIC) presently recommends species to be listed for legal federal protection under the federal *Species at Risk Act* (SARA). At the provincial level, the Nova Scotia Species at Risk Working Group completes assessments and recommendations for a species' status. Nova Scotia maintains a list of legally protected species under the *Nova Scotia Endangered Species Act* (ESA). A third status list is the *sub-national ranks* (S-ranks), which is a provincial system used for ranking species rarity or conservation status as a tool for identifying gaps in knowledge for species for which occurrence data are maintained. S-ranks are specific to a province and consider a variety of factors including number of

occurrences, distribution, population size, abundance trends, and threats. Species listed as "S1" (any species known to be, or believed to be critically imperiled due to extreme rarity or steep declines), and "S2" (any species known to be, or believed to be, imperiled due to restricted ranges, few populations, or steep declines) are considered priority species[5]. Species that may be at risk of extirpation or extinction are candidates for a detailed risk assessment by COSEWIC, or provincial or territorial equivalents. The Nova Scotia *Biodiversity Act* sets guidelines for activities in the vicinity of species at risk on Crown Land and also provides guidance for private landowners for working near these species.

Survey Results: The Atlantic Canada Conservation Data Centre (ACCDC) maintains a database of records of species of conservation concern listed under federal or provincial legislation as well as with general status. Species of conservation concern in the database that occur within five kilometres of the Hartville Quarry site include both animals and plants (Table 5). One flora species of conservation concern, the American beech (*Fagus grandifolia*)(S3/S4), was identified during the spring and fall botany surveys of the site. The tree is a late –successional and shade tolerant native tree species, and was found as small individuals in a cutover area near the south end of the proposed expansion area. Once more common, the populations of American Beech have become reduced by Beech Bark disease, introduced from Europe in the late 19th century, and trees rarely reach maturity. There were no other rare plant species observed during the surveys conducted on June 21 and September 8, 2023.

No federally or provincially listed bird species of conservation concern were observed during dedicated surveys at the study site. The various habitats within the study site potentially support many bird species of conservation concern, however, from time to time, based on available habitat. Federally listed bird species of conservation concern occurring within five kilometers of the study site include barn swallows and bank swallows, Canada warbler, olive-sided flycatcher, bobolink, evening grosbeak, and eastern wood-pewee. Of the species listed, olive-sided flycatcher and Canada warbler typically are found in wetland habitats such as treed (black spruce) sphagnum bogs, shrubby grassy swamps, and bog/fen wetlands. Canada warbler prefers bogs/fens habitat while olive-sided flycatcher can be found in treed (black spruce) sphagnum bogs, both habitats which can be found at the site. Open fields, marshes, swamps, etc. are typical habitat for barn swallow and bobolink, and therefore they may occasionally occur at the site. Evening grosbeak and eastern wood pewee prefer open, mature, mixed woodland forests where fir species or white spruce are dominant, and thus are unlikely to occur as such habitat is not present within the proposed expansion area. Bank swallow habitat (i.e. eroding banks along rivers, streams and ocean coasts) was also not present within the study area. Common nighthawk, chimney swift and wood thrush have been observed within 10 km of the site (Table 7). Common nighthawk may be found nesting in open areas such as the fringe areas of quarry developments; while chimney swift and wood thrush favour mature forests, which are not found on the Hartville Quarry site.

Other animals of conservation concern in this part of Nova Scotia includes moose (the mainland population is listed provincially as endangered) which have been observed as close as 19 kilometers. No sign of moose were observed within the study area during surveys but suitable habitat in the general vicinity could provide

[5] Definitions of all S-Ranks are presented in Table 5.

foraging and cover opportunities over the short term (Appendix C). Important moose habitats such as wetlands, waterbodies, and mature forest stands can be found, however, within 1 kilometer of the center of the study site. NSDNRR mapping indicates that the study site is not a part of mainland moose concentration area although it is close to the mapped core habitat identified in the recovery plan for mainland moose (NSNRR 2021; Appendix C).

A Snapping turtle (listed as special concern by *COSEWIC* and *SARA*, and vulnerable by the *ESA*) was found at the study site and habitat occurs nearby, although no suitable habitat occurs on the study site. Wood turtle (listed as threatened by COSEWIC, SARA and by ESA) and eastern painted turtle (listed as special concern by *COSEWIC* and *SARA*) have been documented as occurring within 6 and 3.2 kilometers, respectively, of the study area; and suitable habitat can be found within 1 kilometer of the quarry (ACCDC 2023 and Appendix C). The provincially endangered monarch butterfly has been recorded within 3.5 kilometers of the study site (ACCDC 2023). The preferred habitat for this insect includes open fields and meadows with abundant wildflower growth that supports common milkweed *(Asclepias syriaca),* asters (Asteraciae sp.), and goldenrods (*Solidago* sp.). Open habitat in the study area is small but present, and can be found in cutovers and along roadsides. Nova Scotia is a part of the breeding range for monarch butterflies, and individuals can be found throughout the province from May to October (Maritime Butterfly Atlas 2016).

The little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), and tri-colored bat (*Perimyotis subflavus*) (all federally and provincially listed as endangered) are Species of Concern that have been reported within a 5 km radius of the study site (ACCDC, 2023 and Appendix C). The distinctive gypsum deposits and cliffs associated with St. Croix about 5 km from the site have sink holes and caves which bats could occupy. The presence at the quarry site of mature trees and snags for roosting cover, as well as open water and bog wetland types for a source of aerial insects suggests the species could use surrounding areas of the study site, but the lack of mature and old stands within the study area suggests that bats are not present or common (Appendix C). Bats are known to overwinter in abandoned mine shafts, natural caves, and old buildings and could be present in adjacent areas where these occur. Numbers of bats are exceedingly low in most areas of Nova Scotia due to the White-Nose Syndrome, a fungus disease which affects most bats in the Province, and occurrences are extremely unlikely at the quarry site due to the low overall numbers. Three other nationally endangered bat species (Hoary Bat, *Lasiurus cinerius*; Eastern Red Bat, *Lasiurus borealis*; Silver-haired Bat, *Lasionycteris noctivagans*) have been reported within 50 km of the study area.

A list of plants and animals of concern within 5 and 100 kilometer radii of the study site is included in Appendix C.

Table 5. Conservation status of Species of Concern observed during site surveys of Hartville Quarry, 2023. An explanation of the rankings is presented in Table 7.

Family/Scientific Name	Common Name	Status/Rank				
		SARA	COSEWIC (NPROT[1])	NS ESA (SPROT[2])	SUB-NATIONAL RARITY RANK (SRANK)[3]	GLOBAL RARITY RANKING OF SPECIES (GRANK)[4]
FLORA						

Table 5. Conservation status of Species of Concern observed during site surveys of Hartville Quarry, 2023. An explanation of the rankings is presented in Table 7.

Fagaceae	*Fagus grandifolia*	American Beech	-	-	-	S3S4	G5
ANIMALS							
Chelydridae	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	G5

Table 5. Records of Species of Concern within a five kilometer radius of Hartville Quarry, Hants County, Atlantic Canada Conservation Data Centre (ACCDC) Database, 2023.

Family/Scientific Name		Common Name	Status/Rank				
			SARA	COSEWIC (NPROT[1])	NS ESA (SPROT[2])	SUB-NATIONAL RARITY RANK (SRANK)[3]	GLOBAL RARITY RANKING OF SPECIES (GRANK)[4]
FLORA							
Asteraceae	*Symphyotrichum undulatum*	Wavy-leaved Aster	-	-	-	S3	G5
	Antennaria parlinii ssp. fallax	Parlin's Pussytoes	-	-	-	S2	G5
	Rudbeckia laciniata	Cut-Leaved Coneflower	-	-	-	S2	T5
	Erigeron hyssopifolius	Hyssop-leaved Fleabane	-	-	-	S3S4	G5
	Packera paupercula	Balsam Groundsel	-	-	-	S3S4	G5
Aulacomniaceae	*Arrhenopterum heterostichum*	One-sided Groove Moss	-	-	-	S1S2	G5
Bryaceae	*Ptychostomum pendulum*	Drooping Bryum	-	-	-	S2?	G5
Caprifoliaceae	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed	-	-	-	S3	G5
Collemataceae	*Collema leptaleum*	Crumpled Bat's Wing Lichen	-	-	-	S2S3	GNR
	Scytinium teretiusculum	Curly Jellyskin Lichen	-	-	-	S3S4	G4
	Leptogium acadiense	Acadian Jellyskin Lichen	-	-	-	S3S4	GNR
	Scytinium subtile	Appressed Jellyskin Lichen	-	-	-	S3S4	GNR
	Leptogium corticola	Blistered Jellyskin Lichen	-	-	-	S3S4	G4

Table 5. Records of Species of Concern within a five kilometer radius of Hartville Quarry, Hants County, Atlantic Canada Conservation Data Centre (ACCDC) Database, 2023.

Cupressaceae	*Thuja occidentalis*	Eastern White Cedar	-	-	-	S2S3	G5
Cyperaceae	*Eleocharis ovata*	Ovate Spikerush	-	-	-	S2S3	G5
	Carex rosea	Rosy Sedge	-	-	-	S3	G5
Elaeagnaceae	*Shepherdia canadensis*	Soapberry	-	-	-	S3S4	G5
Fagaceae	*Fagus grandifolia*	American Beech	-	-	-	S3S4	G5
Fissidentaceae	*Fissidens taxifolius*	Yew-leaved Pocket Moss	-	-	-	S3	G5
Helodiaceae	*Elodium blandowii*	Blandow's Bog Moss	-	-	-	S3?	G5
Jubulaceae	*Jubula pennsylvanica*	A liverwort	-	-	-	S1?	G5
Liliaceae	*Lilium canadense*	Canada Lily	-	-	-	S2	G5
Mniaceae	*Mnium stellare*	Star Leafy Moss	-	-	-	S3?	G5
Onagraceae	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose	-	-	-	S2S3	G5
Orchidaceae	*Cypripedium arietinum*	Ram's-head Lady's-Slipper	-	-	Endangered	S1S2	G3
	Cypripedium parviflorum var. pubescens	Yellow Lady's-slipper	-	-	Vulnerable	S2	G5
	Goodyera pubescens	Downy Rattlesnake-plantain	-	-	-	S2S3	G5
	Cypripedium parviflorum	Yellow Lady's-slipper	-	-	-	S3	G5
Pannariaceae	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	GNR
Parmeliaceae	*Evernia prunastri*	Valley Oakmoss Lichen	-	-	-	S3S4	G5
Poaceae	*Koeleria spicata*	Narrow False Oats	-	-	-	S3S4	G5
Polygonaceae	*Rumex triangulivalvis*	Triangular-valve Dock	-	-	-	S2S3	G5
Pottiaceae	*Aloina brevirostris*	Short-beaked Rigid Screw Moss	-	-	-	S1	G4
	Aloina rigida	Aloe-like Rigid Screw Moss	-	-	-	S1?	G4
Pteridaceae	*Adiantum pedatum*	Northern Maidenhair Fern	-	-	-	S1	G5

Table 5. Records of Species of Concern within a five kilometer radius of Hartville Quarry, Hants County, Atlantic Canada Conservation Data Centre (ACCDC) Database, 2023.

Ranunculaceae	*Hepatica americana*	Round-lobed Hepatica	-	-	-	S2	G5
Rosaceae	*Amelanchier spicata*	Running Serviceberry	-	-	-	S3S4	G5
Thymelaeaceae	*Dirca palustris*	Eastern Leatherwood	-	-	-	S2	G4
Ulmaceae	*Ulmus americana*	White Elm	-	-	-	S3S4	G4
Violaceae	*Viola sagittata var. ovata*	Arrow-leaved Violet	-	-	-	S3S4	T5
ANIMALS-BIRDS							
Ardeidae	*Botaurus lentiginosus*	American Bittern	-	-	-	S3S4B,S4S5M	G5
Accipitridae	*Accipiter gentilis*	Northern Goshawk	-	Not At Risk	-	S3S4	G5
Cardinalidae	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	-	-	-	S3B	G5
Charadriidae	*Charadrius vociferus*	Killdeer	-	-	-	S3B	G5
Corvidae	*Perisoreus canadensis*	Canada Jay	-	-	-	S3	G5
Fringillidae	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	G5
	Loxia curvirostra	Red Crossbill	-	-	-	S3S4	G5
Hirundinidae	*Riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	G5
	Hirundo rustica	Barn Swallow	Threatened	Special Concern	Endangered	S3B	G5
Icteridae	*Dolichonyx oryzivorus*	Bobolink	Threatened	Special Concern	Vulnerable	S3B	G5
Paridae	*Poecile hudsonicus*	Boreal Chickadee	-	-	-	S3	G5
Parulidae	*Cardellina canadensis*	Canada Warbler	Threatened	Special Concern	Endangered	S3B	G5
Parulidae	*Leiothlypis peregrina*	Tennessee Warbler	-	-	-	S3S4B,S5M	G5
Picidae	*Picoides arcticus*	Black-backed Woodpecker	-	-	-	S3S4	G5
Scolopacidae	*Actitis macularius*	Spotted Sandpiper	-	-	-	S3S4B,S5M	G5
Tyrannidae	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	G4
	Contopus virens	Eastern Wood-pewee	Special Concern	Special Concern	Vulnerable	S3S4B	G5

Table 5. Records of Species of Concern within a five kilometer radius of Hartville Quarry, Hants County, Atlantic Canada Conservation Data Centre (ACCDC) Database, 2023.

	Tyrannus	Eastern Kingbird	-	-	-	S3B	G5
ANIMALS-OTHER							
Chelydridae	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	G5
Emydidae	*Chrysemys picta*	Eastern Painted Turtle	Special Concern	Special Concern	-	S4	G5
Nymphalidae	*Danaus plexippus*	Monarch	Special Concern	Endangered	Endangered	S2?B,S3M	G4
Plethodontidae	*Hemidactylium scutatum*	Four-toed Salamander	-	Not At Risk	-	S2?B,S3M	G5
Salmonidae	*Salvelinus fontinalis*	Brook Trout	-	-	-	S3	G5

[1] NPROT, National conservation status of species, as designated by COSEWIC.
Extinct (X) - A wildlife species that no longer exists.
Extirpated (XT) - A wildlife species that no longer exists in the wild in Canada but exists elsewhere.
Endangered (E) - A wildlife species facing imminent extirpation or extinction.
Threatened (T) - A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient (DD)- A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not at Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
[2] SPROT=Provincial Rank/Status of Taxon.
[3] SRANK, Sub-National (Provincial) Rarity Ranks
S1 Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2 Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3 Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations (21 to 100 occurrences).
S4 Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g. watch list). (100+ occurrences).
S5 Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions.
S#S# Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).
SH Historical: Element occurred historically throughout its range in the province (with expectation that it may be rediscovered), perhaps having not been verified in the past 20 - 70 years (depending on the species) and suspected to be still extant.
SU Unrankable: Possibly in peril throughout its range in the province, but status uncertain; need more information.
SX Extinct/Extirpated: Element is believed to be extirpated within the province.
S? Unranked: Element is not yet ranked.
SA Accidental: Accidental or casual in the province (i.e., infrequent and far outside usual range). Includes species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded.
SE Exotic: An exotic established in the province (e.g., Purple Loosestrife or Coltsfoot); may be native in nearby regions.
SE# Exotic numeric: An exotic established in the province that has been assigned a numeric rank.
SP Potential: Potential that Element occurs in the province, but no occurrences reported.
[4] GRANK, Global rarity rank of species, using CDC/NatureServe methods
G1 **Critically Imperiled**—At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.

Table 5. Records of Species of Concern within a five kilometer radius of Hartville Quarry, Hants County, Atlantic Canada Conservation Data Centre (ACCDC) Database, 2023.

G2	**Imperiled**—At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
G3	**Vulnerable**—At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
G4	**Apparently Secure**—At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5	**Secure**—At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
GU	**Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible (when the range of uncertainty is three consecutive ranks or less), a range rank (e.g., G2G3) should be used to delineate the limits (range) of uncertainty.
GNR	**Unranked**—Global rank not yet assessed.
G#G#	**Range Rank**—A numeric range rank (e.g., G2G3, G1G3) is used to indicate the range of uncertainty about the exact status of a taxon or ecosystem type. Ranges cannot skip more than two ranks (e.g., GU should be used rather than G1G4).
Q	**Questionable taxonomy that may reduce conservation priority**—Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. The "Q" modifier is only used at a global level and not at a national or subnational level.
C	**Captive or Cultivated Only**—Taxon or ecosystem at present is presumed or possibly extinct or eliminated in the wild across their entire native range but is extant in cultivation, in captivity, as a naturalized population (or populations) outside their native range, or as a reintroduced population or ecosystem restoration, not yet established. The "C" modifier is only used at a global level and not at a national or subnational level. Possible ranks are GXC or GHC. This is equivalent to "Extinct" in the Wild (EW) in IUCN's Red List terminology (IUCN 2001).
T	**Infraspecific Taxon** (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species. For example, a G1T2 subrank should not occur. A vertebrate animal population, (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an infraspecific taxon and given a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.
SR	Reported: Element reported in the province but without persuasive documentation, which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.
SRF	Reported falsely: Element erroneously reported in the province and the error has persisted in the literature.
SZ	Zero occurrences: Not of practical conservation concern in the province, because there are no definable occurrences, although the species is native and appears regularly. An NZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations) or transitory. In other words, the migrant regularly passes through the province, but enduring, mappable Element Occurrences cannot be defined.

Table 6. Provincially listed Species of Concern with potential to occur in the vicinity of the project site (~10 kilometers). Nova Scotia Museum records (Nova Scotia Communities, Culture and Heritage 2023).

Scientific Name	Common Name	SARA	COSEWIC (NPROT[1])	NS ESA (SPROT[2])	SUB-NATIONAL RARITY RANK (SRANK)[3]	GLOBAL RARITY RANKING OF SPECIES (GRANK)[4]
ANIMALS- BIRDS						
Dolichonyx oryzivorus	Bobolink	Threatened	Special Concern	Vulnerable	S3B	G5
Cardellina canadensis	Canada Warbler	Threatened	Special Concern	Endangered	S3B	G5
Chaetura pelagica	Chimney Swift	Threatened	Threatened	Endangered	S4	G4

Table 6. Provincially listed Species of Concern with potential to occur in the vicinity of the project site (~10 kilometers). Nova Scotia Museum records (Nova Scotia Communities, Culture and Heritage 2023).

Scientific Name	Common Name	SARA	COSEWIC (NPROT[1])	NS ESA (SPROT[2])	SUB-NATIONAL RARITY RANK (SRANK)[3]	GLOBAL RARITY RANKING OF SPECIES (GRANK)[4]
Chordeiles minor	Common Nighthawk	Special Concern	Special Concern	Vulnerable	S2S3B,S1M	G5
Contopus virens	Eastern Wood-pewee	Special Concern	Special Concern	Vulnerable	S3S4B	G5
Coccothraustes vespertinus	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	G5
Contopus cooperi	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	G4
Hylocichla mustelina	Wood Thrush	Threatened	Threatened	-	SUB	G4
ANIMALS-OTHER						
Myotis lucifugus	The Little Brown Bat	Endangered	Endangered	Endangered	S1	G3G4
Myotis septentrionalis	The Northern Myotis	Endangered	Endangered	Endangered	S1	G1G2
Perimyotis subflavus	The Tri-coloured Bat	Endangered	Endangered	Endangered	S1	G3G4
Danaus plexippus	Monarch Butterfly	Endangered	Special Concern	Endangered	S2?B,S3M	G4
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	G5

[1] NPROT, National conservation status of species, as designated by COSEWIC.
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Extirpated (XT) - A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.
Endangered (E) - A wildlife species facing imminent extirpation or extinction.
Threatened (T) - A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient (DD)- A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not At Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
[2] SPROT=Provincial Rank/status of taxon & Provincial GS Rank.
[3] SRANK, Sub-National (Provincial) Rarity Rank.
[4] GRANK, Global rarity rank of species, using CDC/Nature Serve methods

4.2.10 NATURAL AREAS & WILDERNESS

The Quarry is situated in the Hartville area which is a relatively remote location in Nova Scotia. Located inland from the coast along the South Mountain, the area is comparatively undeveloped and has a relatively high proportion of wilderness and natural areas. Although settlement and consequent expansion and logging activities in the past changed the character of the landscape, much of the land has returned to forest. A proportion of Crown Land in the area is devoted to protecting and managing wildlife areas, resulting in many natural and untouched areas, including St. Croix River IBP, Newport Corner SES, Smiley's Provincial Park, St. Croix Conservation Lands, and Eagles Nest Wilderness Area (Figure 29). Wild land allows for preservation and

conservation of wildlife as well as places for outdoor activities (i.e., hunting and recreational based), which are important to both residents and visitors of the area. Residents are exposed to the natural environment on a daily basis and appreciate the presence of, and access to, undeveloped land and natural spaces, while accepting that industry for garnering resources (e.g. aggregate quarries, forestry operations) need to be present, many of which individuals depend on for their livelihood. The nearby Bowater Mersey Multiuse Trails are used by residents and non-residents for activities such as ATV use, and the quarry access road is used as a stopping point to admire the view of the St. Croix River Valley (see Figure 5) (K. Scott, personal communication, 2023). As well, the Spence Managed Forest Inc. located in Ellershouse is a 2000 acre managed forest system that has logging trails used by the local residents for outdoor recreation activities such as walking trails and ATV trails and has access to some of the local water falls such as Dawson Brook Falls.

4.3 HUMAN USES OF THE ENVIRONMENT

4.3.1 MI'KMAQ

The Mi'kmaq maintain aboriginal claim to all of the landmass of Nova Scotia, and the Province of Nova Scotia maintains a policy that proponents of industrial development projects engage with the Mi'kmaq concerning their activities. The nearest Mi'kmaq reserves are (IR 34 St. Croix, Annapolis Valley First Nation, Cambridge), a 126.2 ha forest stand 4 km SW (Map A-1). Several First Nations are located within approximately 35 km of the site: Glooscap (IR 35, 31 km north near Hantsport); and New Ross (IR 20, 31 km SW), Pennal (IR 19, 35 km SW), Wallace Hills (IR 14A, 29 km SE, in the Hammonds Plains area, Bedford, and Shubenacadie (IR 13, 33 km E) near Shubenacadie, all of which are part of Sipekne'katik First Nation. Among various community activities and pastimes at each of these communities are hunting and fishing, and harvesting wild foods for sustenance and traditional ceremonial activities.

The Alva Hartville Quarry is located within the Mi'kmaw territory known as Sipekne'katik meaning "wild potato area" or "place of groundnuts". Sipekne'katik encompasses parts of what today are Hants, Lunenburg, Kings, Colchester, Halifax, and Cumberland Counties. Although the study area bears no known Mi'kmaw name, the greater regions of Pisiquid or Pesiktik, meaning "to flow splitwise" contains many Mi'kmaw toponyms. To the north, Miluamkitk or Meander River meaning "meandering river", can be found, and to the northeast Apsamkuk, or Little River, meaning "a little sand gully". Large rivers flow west of the study area including the Amaqapskiket, or Avon River, which means "flowing over rocks" and the Maqmekwitk/Kanataktuk or the St. Croix River, meaning "a larger wide portion of the river". The St. Croix River branches off into Panuke Lake near Hartville. The St. Croix River system, which is now predominantly taken up by the dammed Panuke Lake, represents a significant waterway in that it would have allowed navigation across a very large part of the province by canoe. To the southwest of the study area, St. Croix Reserve IR 34 is located, also known as Panuk, meaning "at the opening". To the east is Paqasimkwajk or Five Mile Lake meaning "at the boggy place". These traditional Mi'kmaw place names reflect resources available and landscape features in the area. River systems and connected lakes were particularly key features in traditional Mi'kmaw land use as they offered a multitude of food resources as well as access to inland terrestrial habitats and their resources (Davis Macintyre and Associates 2024).

There are no registered Mi'kmaq archaeological sites within the study area, however two registered archaeological sites have been identified within 5 kilometer radius of the study site: BfDa-01 and BfDa-11.

BfDa-01 is a large habitation site with components dating to the Mu Awsami Kejikawe'k L'nuk/Archaic and Kejikawe'k L'nuk/Woodland periods and, BfDa-11, consists of an artifact concentration identified on a submerged river shore. Artifacts recovered included quartz and quartzite flakes, cores, as well as 4 sherds of grit-tempered pottery dating to the Kejikawe'k L'nuk/Woodland period. Presently, no significant Mi'kmaq cultural activities occur in or around the study area, although traditional fishing and hunting likely continues in the general area (Davis Macintyre and Associates 2024).

In current times, two tribal councils exist in Nova Scotia: The Confederacy of Mainland Mi'kmaq (CMM) and Union of Nova Scotia Indians (UNSI). CMM is a not-for-profit organization incorporated in 1986, whose mission is to promote and assist Mi'kmaq communities. The UNSI, created in 1969, was formed *to provide a cohesive political voice for Mi'kmaq people.* The Native Council of Nova Scotia (NCNS) represents Mi'kmaq living off reserve. The NCNS is a self-governing agency located in Truro. The Office of N'Lu Affairs (formerly Office of Aboriginal Affairs) in Nova Scotia estimates that approximately 35% of Mi'kmaq live off reserve. The goal of NCNS is "to operate and administer a strong and effective Aboriginal Peoples Representative Organization that serves, advocates and represents our community."

The Mi'kmaq Rights Initiative (Kwilmu'kw Maw-klusuaqn; KMK) also represents a number of the First Nations in Nova Scotia. The mission of KMK—whose name means, "we are seeking consensus"— is "to address the historic and current imbalances in the relationship between Mi'kmaq and non-Mi'kmaq people in Nova Scotia and to secure the basis for an improved quality of Mi'kmaq life." KMK's objective is to negotiate between the Mi'kmaq of Nova Scotia whom it represents, the Province, and the Government of Canada, and operates from its main office in Millbrook. The Atlantic First Nations Environmental Network (AFNEN) is an environmental organization of Mi'kmaq communities and organizations. The CMM and UNSI are members of the AFNEN, with the Mi'kmaq Confederacy of PEI in Charlottetown currently the acting coordinator. The AFNEN includes a representative from each Mi'kmaq organization and community interested in environmental issues. The Network meets regularly during the year through meetings, conferences, and the Internet to discuss environmental matters or concerns. Two First Nations—Millbrook First Nation, and Sipekne'katik operate independently of these organizations. Millbrook is situated outside Truro and includes activities in Cole Harbour, Sheet Harbour, and Beaver Dam. Sipekne'katik First Nation is one of 13 First Nations and is the second largest Mi'kmaq band in Nova Scotia. Sipekne'katik First Nation includes the communities of Indian Brook, New Ross, Pennal, Dodd's Lot, Wallace Hills and Grand Lake.

4.3.2 POPULATION AND ECONOMY

The Quarry is within the West Hants Regional Municipality (WHRM). WHRM had a population of approximately 19,509 in 2021, one that has been steadily increasing—overall a 2.6 % population growth occurred from 2016-2021. One First Nations Reserve occupies the remaining census subdivisions within West Hants, St Croix 34, which has no permanent residents and is administered by the Annapolis Valley First Nation (Statistics Canada 2022). Local economies in WHRM are tied primarily to health care, social assistance, education, construction, manufacturing, and to retail trade. Although agriculture, forestry, and fishing have historically been important economic sectors in WHRM they currently account for less than 4% of employment. Quarries are important sources of revenue and employment in the area. A gypsum industry was also an important sector in the area and three gypsum mines are currently present but none of them are currently in operation. The annual median household income of residents in WHRM is $69,500, slightly

lower than the median household income of Nova Scotia ($71, 500) (Statistics Canada 2022). Tourism is also an important industry in the area, with scenic attractions (i.e., a number of historical landmarks and artisan shops) and recreational activities (i.e., organized trail system, Irishman's Road Recreation Site, camping at Smileys Provincial Park, skiing at Ski Martock etc.).

4.3.3 WATER SUPPLY AND RESIDENTIAL WELLS

In WWHRM, over one-third of residents receive water through municipal infrastructure, while the remainder depend on private wells (West Hants Regional Municipality, 2023). There are three municipal water supply areas within the municipality: French Mill Brook which supplies the community of Falmouth; Mill Lake which supplies the area of Windsor and Three Mile Plains; and Davidson Lake which serves the community of Hantsport and surrounding areas. Both drilled and dug wells are used as drinking water sources in WHRM and drilled wells the primary drinking water source for the Hartville-Ellershouse area. There are 28 wells within a 2 kilometer radius of the quarry entrance and only one within 800 m of the Hartville Quarry, located 360 meters west (Nova Scotia Environment 2021).

There are two wastewater treatment facilities and one sewer collection system located within WHRM: the Falmouth and Windsor wastewater treatment plants, and the Three Mile Plain sewer collection system. For those who are not on a public wastewater treatment system, WHRM operates a septage disposal and treatment facility for the use of licensed septic tank waste haulers at the West Hants Waste Management Facility (West Hants Regional Municipality, 2023).

4.3.4 LAND USE

Land in the vicinity of the quarry is predominantly undeveloped forest with no residential development in the immediate vicinity of the study site. There is a forestry presence in the area, both commercial and private with the immediate surrounding parcels of land being owned by a commercial logging company, Atlantic Star Forestry Ltd. The road used for quarry access, and accessory roads, have been used, and are currently used for logging. The Ellershouse Wind Farm is located adjacent to the study site on the south and a second privately owned quarry is located 60 meters north of the Hartville Quarry. The Bowater Mersey Trail system and the Spence managed Forest Inc trails can be accessed at the end of the quarry access road, and is used by many locals year-round for activities such as ATVing, snowmobiling, hiking, and general walking (K. Scott, , personal communications, 2023).The Bowater Mersey Trail follows old logging roads extending towards the south shore (southern coast of the province) and ends in the Hubbard's area, While the Spence Managed Forest Inc trails follow the currently used logging trails around the Ellershouse area and connect with the Bowater Mersey Trails. There are several parks and protected areas in the general vicinity of the study site, the closest of which being the St. Croix Conservation Lands, held by the Nova Scotia Nature Trust, approximately 3.2 kilometers from the study site (Figure 29).

4.3.5 AQUACULTURE AND SHELLFISH HARVESTING

Aquaculture has a limited presence in Hants County. A land-based Atlantic Salmon producer (Sustainable Blue) is located on the Kennetcook River in Centre Burlington, approximately 30 kilometers northwest of the quarry. Annapolis Valley First Nation has held a lease for American oyster since 2022 off the coast of Cheverie on Minas Basin at Cheverie (NSDFA 2023). Commercial shellfish harvesting is prohibited in the Bay of Fundy and the Minas Basin.

4.3.6 HUNTING AND TRAPPING

Lands in the vicinity of the Hartville Quarry site support many of the common game and fur-bearing species found elsewhere in Nova Scotia. Hunting or trapping activity may take place in the general vicinity of the site, although trapping statistics indicate that Hants County has an intermediate harvest of most species (NSDLF 2023). White-tailed deer are common in the general vicinity, and the county typically ranks among the highest for deer harvest in Nova Scotia; and bear are also hunted in the area. The main fur-bearers trapped in the five-year period (2018 to 2023) were muskrat, coyote, raccoon and beaver. No American marten were trapped within the county in the last five years, while two Canada lynx were trapped, incidentally. Snowshoe hare is the most commonly hunted upland game in Hants County (Table 8). Ruffed Grouse and Ring-Necked Pheasant are important upland game bird species.

Table 7. Five-year summary of wildlife harvested in Hants County and Nova Scotia (NSDLF 2023).

Animal	Hants County Reported Harvest	Provincial Reported Harvest	Percent (%) of total for province
LARGE MAMMALS			
Deer (Zone 103)	5,035	38,006	13.25%
Bear	111	1,734	6.40%
UPLAND GAME			
Snowshoe Hare	6,973	149,712	4.66%
Ruffed Grouse	6,529	100,678	6.49%
Ring-necked Pheasant	1,367	10,553	12.98%
FUR HARVEST			
Beaver	401	8,123	4.94%
Muskrat	774	16,625	4.66%
Otter	55	1,266	4.34%
Mink	87	1,608	5.41%
Bobcat	273	3,659	7.46%
Fox	82	1,426	5.75%
Racoon	531	4,045	13.13%
Skunk	29	121	23.97%
Squirrel	249	1,786	13.94%
Weasel	77	588	13.10%
Coyote	720	10,588	6.80%
Canadian Lynx*	2	8	25%
American Marten*	0	6	0.00%
Fisher	34	447	7.61%
Total Furbearers	**23,389**	**350,979**	**6.66%**

*Trapped incidentally. Trappers Association of Nova Scotia prepares incidental pelts for auction and all proceeds go to the NS Species at Risk Conservation Fund.

4.3.7 FORESTRY & AGRICULTURE

Forestry and agriculture contribute to the economy of Windsor West Hants Regional Municipality (WWHRM), but the influence is relatively small compared with other sectors of the economy. The forest industry has been historically important in WWHRM, due to the availability of accessible forested land. Forest and wood production today employs locals in various segments of the industry, including resource harvesting and trucking. Logging of both natural stands and plantations are found in the general vicinity of the quarry.

Agriculture is not a prominent activity in the immediate vicinity of the quarry and no agricultural lands are currently being used for production near the study site. Dykelands along the St. Croix River in the vicinity of St. Croix were recently (2006 to 2012) converted to saltmarsh in projects sponsored by Nova Scotia Department of Public Works (Bowron *et al.* 2008). Elsewhere in WWHRM agriculture is an important contributor the economy, with various crops and often hay production as an important activity. A wide range of agricultural operations take place in these area such as livestock, dairy, orchards, greenhouse and market garden operations, and egg producers. In addition to the primary agricultural producers, there are value-added enterprises including baked products, jams and jellies, honey, processed meat, breweries, vineyards, non-timber forest products (such as mushrooms, berries, and wreaths), and agro-tourism, within the County. The Station Food Hub, located in Newport Station, is an industrial complex supporting agrifood businesses in the Windsor area (The Station Food Hub Company 2022). Windsor hosts the annual Hants County Exhibition, which is the oldest ongoing agricultural fair in North America. Farming is a small but significant activity in relation to other sectors of the economy. In 2011, there were 342 farms in the Hants County. A large proportion of these farms are involved in livestock (51.1%), and crop farming (27.8 %). Hants County farms reported receipts of $65.6 million in 2010, making up 11% of the provincial total, with farms in the county operating at a surplus of $12.4 million (NSFA 2017). Interest in agriculture in the area benefits from geographical advantages due to the nutrient-rich, silty soil, largely in northern portions of the county.

4.3.8 RECREATIONAL, COMMERCIAL, AND MI'KMAQ FISHING

Streams in the general vicinity support recreational fishing for salmonids such as Speckled Trout and Brook Trout and marine / estuarine species may be fished in the St. Croix River and its tributaries (Communications Nova Scotia 2023) Recreational fishing provides an important resource and pastime for residents and visitors to WWHRM. Mi'kmaq similarly access suitable fish in food and ceremonial fisheries. The study area itself is not particularly important for freshwater recreational fishing but rivers and lakes in the area including Panuke Lake, St. Croix River, Dawson Brook, Weir Brook, and Thumb Hill Creek have resident fish populations, some of which are fished recreationally.

The study area is within Provincial Recreational Fishing Area 5 comprised of Annapolis, Hants, and Kings Counties. Recreational fishing opportunities for several species include: dip netting for smelt in the St. Croix River from April 1 to June 15; shad and gaspereau are fished in tidal waters including St. Croix River and tributaries; striped bass may occur in estuarine waters and coastal areas of Minas Basin including the St. Croix River; and there is an important Smallmouth Bass population in Panuke Lake, which also supports brook trout. (Nova Scotia 2023). In particular, Panuke Lake is a special Provincial smallmouth bass management area, with fishing allowed from April 1 to December 31; and the Lake is often used for smallmouth bass tournaments and has a brook trout population (Fish Nova Scotia 2024). Meadow Pond located along Hwy 101 near Windsor, is owned by the Windsor West Hants Regional Municipality, and is stocked by the Province

with both Speckled and Rainbow Trout. Anglers have seen sturgeon in tidal portions of the St. Croix River, and Grilse (Atlantic Salmon) have been accidentally caught in estuarine portions of the St. Croix River (Nova Scotia Fishing Forum 2011).

4.3.9 HISTORICAL, ARCHAEOLOGICAL AND PALAEONTOLOGICAL RESOURCES

There are no known recorded archaeological sites in the vicinity of or within the study area and no significant watercourses in the immediate area which would have supported Mi'kmaq use (Department of Communities, Culture, Tourism and Heritage NS 2023; Appendix E). The site is near, however the St. Croix River and Taylor Lake on the east which may have promoted use by Mi'kmaq. Ellershouse is named after the Baron Franz von Ellershausen, who was prominent in Nova Scotia gold mining in the 1860s. The elegant residence is still maintained and occupied in the community.

The bedrock geology for the study area is Cambrian Goldenville Formation and the likelihood of significant fossils found in this area is low (CCTCH-Appendix E). If any are observed during quarry operations, the Nova Scotia Museum of Natural History may be consulted.

4.3.10 PARKS AND PROTECTED AREAS

Both the Province of Nova Scotia and the Government of Canada, as well as private conservation organizations, actively protect natural environments in the general vicinity of the site, and there are a number of parks and protected areas in the general vicinity the Hartville Quarry (Table 8, Figure 29). These include: Eagles Nest Nature Reserve); Newport Corner Significant Ecological area (SES); Smiley's Provincial Park, approximately 9.5 km northeast; Nova Scotia Nature Trust St. Croix Conservation Lands; and International Biological Program (IBP) site (Table 8 and Figure 29). The St. Croix Conservation Lands owned and managed by the Nova Scotia Nature Trust is the closest, located above the gypsum cliffs on the St. Croix River, approximately 3.3 kilometers north of the quarry. Types of parks and protected areas including those listed above include:

Wilderness Areas are provincially-significant areas that protect representative examples of natural landscapes, native biological diversity, and outstanding natural features of Nova Scotia. They are used for scientific research, education and a variety of recreation and nature-tourism related activities such as hiking, canoeing, sea-kayaking, sport-fishing and hunting. These areas are designated under Nova Scotia's *Wilderness Areas Protection Act*.

Nova Scotia Nature Trust's Conservation Lands are protected areas that are safeguarded and stewarded for the purposes of nature conservation. The properties have come under the care of the Nature Trust through donation, part-donation, purchase, or conservation easement, and protect Nova Scotia's rare, outstanding and unique natural areas while fulfilling landowner wishes to permanently protect the natural legacy that so many of them have proudly stewarded for generations.

Nova Scotia Nature Reserves are established to preserve and protect areas representative of natural ecosystems and associated plant and animal species. Scientific research and education are the primary uses of nature reserves and recreation is generally restricted. These areas are protected under the *Special Places Protection Act*.

Provincial Parks protect provincially or regionally significant natural heritage values such as coastlines and beaches, scenic views, diverse landscapes, forests, and lakes and rivers, for recreational use and general enjoyment by residents and tourists. Provincial Parks are important in conserving biodiversity as well as contributing to a high quality nature experience for users of the parks and economic development for nearby communities. Provincial Parks are established under the *Provincial Parks Act*.

National Parks are protected areas that are used to protect nationally significant heritage values, including forests, lakes, rivers, scenic views, etc. National parks are used for recreational purposes, provide opportunity for economic development for communities, and are important to the conservation of biodiversity. National Parks are protected under the *Canada National Parks Act.*

Important Birdlife and Biodiversity Areas Program Canada (IBA's) are discrete sites that support specific groups of birds: threatened birds, large groups of birds, and birds restricted by range or by habitat. IBA is a joint project of Bird Studies Canada and Nature Canada coordinated by Bird Life International.

Migratory Bird Sanctuaries (MBSs) support significant abundances or key species of migratory birds, and are designated under regulations under the federal *Migratory Birds Convention Act.*

Significant Habitat in Nova Scotia includes sites where species at risk or other species of conservation concern can be found, sites where usually large concentrations of wildlife occur and habitats that are rare in the province of Nova Scotia. The Department of Natural Resources and Renewables collects information and data supplied by department staff, government departments and members of the public to create a database to help make people aware of these habitats to ensure the conservation of vulnerable wildlife species.

International Biological Program (IBP) is an international program of biological studies which took place in the 1970s and which identified the productivity of biological resources, human adaptability to environmental change, changes in the natural environment, and on the conservation and growth of natural resources for human benefit.

Table 8. Parks and protected areas within a 20 kilometer radius of Hartville Quarry in Hants County. Province of Nova Scotia, Nova Scotia Environment Database, 2023. See Figure 29.

Name of Site	Primary Type of Protection	Protection Status	Area (ha)
Eagles Nest Nature Reserve	Nature Reserve	Designated (1981)	188
Newport Corner SES	Significant Ecological Area	--	137
Smileys Provincial Park	Provincial Park	Designated (1989)	43
St. Croix Conservation Lands	Land Trust Property	NS Nature trust— Considered Protected	127
St. Croix River IBP Site	International Biological Program	--	8

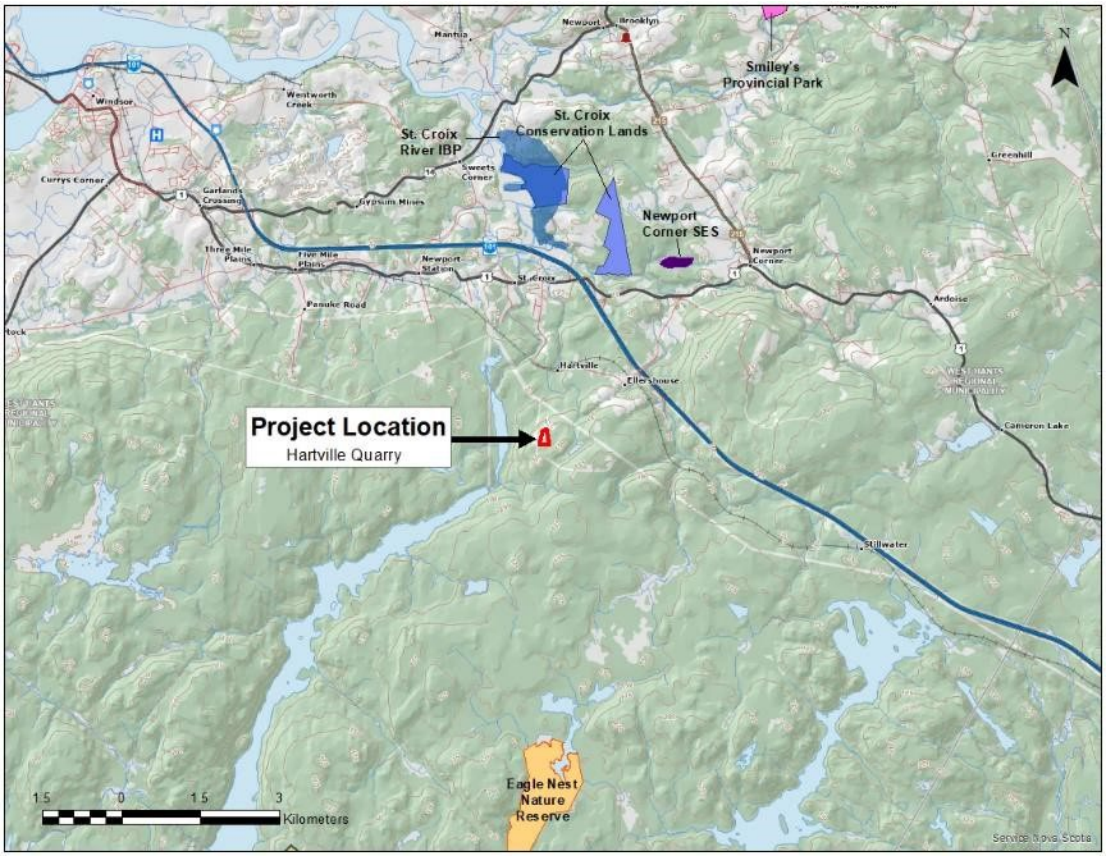

Figure 29. Parks and protected areas in the general vicinity of the Hartville Quarry.

4.3.11 RECREATIONAL/CULTURAL FEATURES

Residents and visitors to Hants County access natural areas for a wide range of outdoor recreation activities. In the Ellershouse and St. Croix areas, which border the quarry site, the predominant outdoor recreational activities are sightseeing, walking/hiking, birding, camping, boating (i.e., kayaking and canoeing), skiing, hunting, ATVing and snowmobiling, and angling. Dawson Brook Trail which leads from Ellershouse to Dawson Brook Falls is used for birding, hiking, and walking (All Trails 2024). The Bowater Mersey Multi-Use Trail is an ATV trail on the old forestry and logging land previously owned by the Bowater Mersey logging company and can be accessed from the Hartville Quarry access road. The trails, which runs south of the Hartville Quarry towards the community of Hubbard's, on the Nova Scotia South Shore, is maintained by the Department of Natural Resources and Renewables and is used for a wide range of recreational activities such as ATVing and snowmobiling, biking, cross-country skiing, walking and horseback riding (Government of Nova Scotia, 2012). The St. Croix Recreation Site operated by WWHRM has two lit regulation softball fields which host major tournaments; and a large freshwater pond is stocked and used by locals as well as by Learn2Fish programs, as well as for ice skating. The St. Croix Conservation Lands located above the gypsum cliffs along the St. Croix River north of the quarry protects natural plant communities associated with karst topography (Figure 29). The Eagles Nest Nature Reserve located to the south of the quarry offers fens and forest slopes used for hiking, biking, ATV use, and bird watching. Smiley's Provincial Park is the nearest provincial park, located 10 km northeast of the quarry, is a popular camping and swimming area, as well as being popular for dog walking

and hiking. Cemeteries that occur in nearby communities include St. Croix Cemetery, St. Croix United Church Cemetery, and Oak Hill Cemetery in Ellershouse. Ellershouse is named after the Baron Franz von Ellershausen, who was prominent in Nova Scotia gold mining in the 1860s, built a pulp and paper mill on the St. Croix River, and owned 60,000 acres including Stillwater and Panuke Lakes. His elegant residence still stands in the community and is presently occupied (Mining Association of Nova Scotia 2019).

4.3.12 RESIDENTIAL USE

The communities of St. Croix, Hartville and Ellershouse are in a largely rural setting, typically spread out along adjacent highways, with large lots, and in small subdivisions. There are no residences in the immediate vicinity of the Hartville Quarry, with the nearest residence 1.3 kilometers from the quarry and accessed from Ellershouse/Hartville Road. There are residences on most lots on the south side along Ellershouse/Hartville Road between the access road and the community, including a new residence under construction on the property adjacent to the quarry road. Residents in the area are mostly permanent and work locally or travel to work in nearby communities; some individuals occupy the area seasonally. Residents use the area for a variety of purposes including farming, logging, hiking, hunting and fishing, as well as for ATV and snowmobile travel year round. Lot sizes in the area are large and may include surrounding tracts of forested land. Lifestyles of the residents of the general area tend towards retirees maintaining their homes and properties, residents working locally, seasonal cottage homes and younger individuals engaged in economic activities such as logging. As in other forested parts of rural Nova, residents use the area and backcountry for recreation such as walking or hiking, canoeing or kayaking, and use ATVs and snowmobiles, and resource uses such as firewood, berry picking etc. The quarry is 7.8 kilometers from Windsor where residents can access various local services as well as recreational amenities such as walking trails and local businesses.

4.3.13 COMMERCIAL/INDUSTRIAL DEVELOPMENT

The Hartville Quarry and a windfarm project (Ellershouse Wind Farm) are the only industrial activities at the site. Minas Energy owns and manages the St. Croix Hydro facility, a 5 MW generation system built in the 1930s on the St. Croix River whose dams created Panuke Lake Reservoir. The main dam and auxiliary dam are about 1.5 km SSW and 1.3 km NW of the Hantsport Quarry. Logging continues to be an important activity on private property and Crown Land in the vicinity. Small enterprises that operate in nearby communities include: the Ellershouse Community Hall, the Ellershouse General Store, Handyman Bran, Starrett Electric, and Canada Post approximately two kilometers east of the study area; Hound Tales Inn, Dale Young's Auto Repair, and Saltmarsh Poodles, approximately 3.5 kilometers east of the study area; and Minas Basin Pulp and Power and Spence Aggregates Quarry, about 3.2 kilometers to the west.

Windsor is the largest population centre in the Windsor West Hants Regional Municipality, and supports three malls, numerous convenience stores, banking, fast food businesses and other outlets (i.e., Makers Studio and Art Market, West Hants Historical Society, Windsor Regional Library, Fort Edward National Historical Site, etc.) which are patronized by locals from the St. Croix to Ellershouse area. Various amenities including a hardware store, feed store, liquor store, bakery and fast food outlets are also available to Ellershouse residents in Brooklyn, about 9.5 km north.

4.3.14 TOURISM AND VIEWSCAPE

Highway 101 which passes the study area to the north is the major 100-series highway on the Provincial Highway System is the main point of introduction of visitors from the Halifax Area to the eastern end of the Annapolis Valley. As motorists pass Ellershouse, the landscape changes in a short stretch from an elevated plateau of rolling bedrock dominated forest, to farmland and views of former dykelands, freshwater marshes, gypsum cliffs, and the estuary of the St. Croix River. Travel routes in the vicinity of Hartville Quarry offer visitors a chance to experience both nature and a pleasing rural landscape, enroute to the Bay of Fundy, and to prominent agricultural and urban areas of the Annapolis Valley and popular recreational destinations such as Ski Martock, Avon Valley Golf Course, Haliburton House museum. Tourists can find bed and breakfasts or rent cabins and participate in outdoor recreational activities, including angling, birding, camping, hiking, skiing, paddling, boating, and ATVing and snowmobiling. The area has a number of protected areas of interest to visitors including St. Croix River IBP site behind the St. Croix gypsum cliffs, Smileys Provincial Park, St. Croix Conservation Lands, and the Eagles Nest Nature Reserve which offer opportunities for camping, hiking, bird watching, and sight-seeing. A public trail in the area, The Bowater Mersey Multi-use Trail, runs from the communities of Ellershouse to Hubbard's, used for hiking, mountain bicycling, and ATV riding. The Hartville Quarry is not visible from Ellershouse Road or not readily seen from other vantage points in Windsor West Hants Regional Municipality. It also cannot be detected in several scenic views available to tourists such as along the St. Croix gypsum cliffs and dykelands towards St. Croix.

4.3.15 TRANSPORTATION

Hartville Road, which runs past the quarry site, is a local residential paved highway connecting Ellershouse and Hartville to Highway 1. It is mainly used by local traffic, as well as traffic from the quarry. Highway 1 is a collector highway that connects with the main 100-series Highway 101, and supports a combination of local and cross-province traffic linking the Annapolis Valley and the Halifax Regional Municipality. It has a moderate to high traffic volume compared with other highways in the province, with an annual average daily traffic (AADT) of 7,559 per day east and west combined in the years 2015-2021 (Nova Scotia Open Data Portal, 2023). Highway 101 has comparatively high levels of both local and regional residential, commercial, and tourist traffic. It has a high traffic volume compared to other highways in the province, with an annual average daily traffic (AADT) of 18,129 per day on east and west combined in the years 2015-2021 (Nova Scotia Open Data Portal. 2023). Average daily traffic (ADT) in the same spring-summer period of the same years is similar and a comparable relative pattern and traffic volumes is observed on Highway 1 and on Highway 101 (Nova Scotia Open Data Portal, 2023).

The access road intersection with Ellershouse Road has good sightlines and is well maintained (Figure 30). When operating, the quarry will contribute to truck traffic and some heavy equipment traffic (e.g. crushers, asphalt trucks, etc.) in the vicinity of the site, typically in the summer/fall construction season. Access to the quarry from Highway 1 at both the Ellershouse and Hartville ends is unobstructed with good sight lines, and neither are expected to be hazardous. Trucks hauling aggregate sometimes lose some of the load during transit, which can be hazardous to local road users. One Ellershouse resident interviewed had knowledge of cracked windshields due to trucks losing material which can then be projected by other vehicles.

The Windsor to Windsor Junction branch of the Windsor and Hantsport Railway Company runs immediately north of the Ellershouse Road. It hasn't been operated since the early 2000s. Its current U.S. owners acquired

the branch when it was put up for disposal by CN Rail in 2013, and plans for future operation are unknown at present (Palmeter 2020).

Figure 30. Entrance to the access road for Hartville Quarry and Ellershouse wind turbine development along Ellershouse Road, facing east, March 9, 2024.

5 Environmental Impacts, Significance, and Mitigation

5.1 Assessment Approach and Methods

Information for the assessment was obtained from consultants' personal knowledge, from reviews of available information, and knowledge of the purpose and proposed design of the project. The environmental assessment follows *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (NSE September 2009) and uses assessment methodology typical for environmental assessment screenings of this kind. For this assessment a list of valued environmental components (VECs)[6] (also known

[6] Valued Environmental Components (VECs) are features or things in the environment, which are particularly important either ecologically, socially, economically, or culturally. The environmental assessment addresses potential interactions of the project with each VEC identified and assesses potential impacts. The process followed involves identifying all the activities or outcomes of the project, which interact with each VEC, and then determining and rating the magnitude of the impact in a standard way, in this case in a manner guided by standard approaches that have been developed for environmental assessments.

as VCs)[7], and project activities and outcomes for the proposed expansion of the existing quarry were developed, and the potential for interactions of these activities with VECs was identified. Where interactions were identified, and there was potential for significant impacts if mitigation was not undertaken, mitigating actions or activities have been suggested that will avoid the impact or reduce it to acceptable levels before the project proceeds. The process ensures that potentially significant impacts on VECs are identified, potential impacts on them have been considered, and sufficient mitigation planned.

5.2 VALUED ENVIRONMENTAL COMPONENTS

The list of Valued Environmental Components considered for the assessment, and interactions with project components, are presented in Table 10. The environmental effects and potential impacts of the project along with their significance and suggested mitigations are outlined in the following and are summarized in Tables 11 and 12.

Table 9. Valued Environmental Components (VECs) for Hartville Quarry Expansion.

Biophysical	Socio-economic
Air Quality, Noise and Light	Mi'kmaq
Groundwater	Recreation, Tourism & Viewscape
Hydrology	Recreational, Commercial & Mi'kmaq Fishing
Water Quality	Archaeological, Cultural and Historical
Freshwater Aquatic Environments and Wetlands	Economy, Land Use and Value
Terrestrial Environments	Transportation
Fish & Fish Habitat	Residential Use
Flora & Fauna & Habitat	Commercial /Industrial Use
Species at Risk	Water Supplies & Residential Wells
Natural Areas & Wilderness	Parks & Protected Areas
	Forestry, Hunting & Trapping

5.3 SOCIOECONOMIC IMPACTS

5.3.1 MI'KMAQ

The Mi'kmaq maintain a general interest in all lands in Nova Scotia which they claim to have never surrendered, ceded, or sold the Aboriginal title. As co-owners of the land and its resources, they expect that any potential impacts to rights and title be addressed. Mi'kmaq occupied much of Nova Scotia prior to European contact, and lands were used to varying degrees for habitation, hunting and fishing, as noted in Sections 4.3.1 and 4.3.8. In more recent times, treaties made with the British and continued through Canadian law have maintained their rights. Lake Panuke and associated lake and river systems were used by the Mi'kmaq to transit cross-Province in the general vicinity; however, there is low potential for occurrence

[7] Valued Environmental Components (VECs) and Valued Components (VCs) are equivalent. Use of the acronym VC was used in environmental assessments carried out under the federal environmental assessment process under the Canadian Environmental Assessment Act (2012) and is recommended to be used in assessments carried out under its replacement, the federal Impact Assessment Act (IAA) (2019).

of Mi'kmaq archaeological resources at the quarry site (Nova Scotia Communities, Culture and Heritage 2023; Davis McIntyre and Associates 2024).

Although the quarry is near the St. Croix Mi'kmaq Reserve, no First Nation activities which might be associated with the reserve such as general use, hunting and trapping, or ceremonial, recreational of subsistence use of natural resources in the area are expected to be directly affected by the Hartville Quarry. Best management practices used at the site will prevent potential impacts quarry activities may have on water and forest quality and quantity; the overall small footprint of the quarry in relation to the adjacent undeveloped land largely in a natural state will have negligible impacts on wildlife; and there will be no net increase in activity or type of activity in future. The road leading to the quarry is maintained by users including the quarry, and provides access for both aboriginal and non-aboriginal users alike, which is a positive benefit of the project. The seasonality of activities at the quarry would not interfere with popular uses such as hunting, trapping, fishing and snowmobile and recreational vehicle use in the winter and spring. Consequently the quarry operations are expected to have a negligible impact on Mi'kmaq use of the area.

5.3.2 Recreational Activities

Lands in the immediate vicinity of the Hartville Quarry are used by locals for various nature- and outdoors-based activities, but not particularly by the general public. Managed recreation resources such as nature trails (e.g. Dawson Brook Falls Trail), sports and outdoor facilities such as the St. Croix Recreation Site, which are provided and managed by government, conservation organizations, and local initiatives to protect environments, associated wildlife, species of conservation concern, are used by locals and the general public but they are some distance from the quarry. Residents of the area also have the opportunity to live in a relatively untouched natural environment with a low population density leading to local uses such as hunting, fishing, walking, hiking, and home-based recreation (e.g., gardening) concentrated around roads and population centres in the area, for which the vicinity of the quarry is a small fraction. The principal interactions would be from vehicle traffic and noise associated with quarry but the effects are likely to be small, and a small part of overall uses of roads including logging, and local commercial as well as public vehicle use. Noise from routine operations at the Quarry and occasional blasting has the potential to be heard by the in the nearby communities of Ellershouse, St. Croix, and Newport Corner; noise from blasting is likely to be heard over a wide area, one to two times a year, but would not interfere with recreational activities. The scope of quarry activities is not expected to increase from past use, and so the level of impact, and therefore the impact of the continued quarry operations is expected to be negligible.

5.3.3 Tourism and Viewscape

Continued operation of Hartville Quarry is not expected to have a significant impact on tourism. The road through the nearby communities of Hartville and Ellershouse is not a major travel route for tourists which would include travel by car and cyclists, and the communities do not have tourist attractions. The principal interactions with tourists in vehicles would be noise, and truck traffic transporting aggregate to job sites. Some operations at the quarry may be heard nearby but are not likely noticeable by tourists in vehicles passing by, and if heard would be against a background of truck noise on Highway 101, and Highway 1. Blasting, which may be heard at greater distances, is of short duration and occurs infrequently—one to two times a year, and overall activity levels will not change as the result of expansion . The quarry can only be seen from a distance and then only as a small point on the horizon and so likely would not be noticeable and

would not disrupt any scenic views available to tourists in the area. Overall, the impacts on viewscape and tourism are expected to be negligible.

5.3.4 RECREATIONAL, COMMERCIAL & MI'KMAQ FISHING

The Hartville Quarry is not near any surface waters which support recreational, commercial or Mi'kmaq fishing. The closest site supporting fishing is the Panuke Lake Reservoir, for which the quarry is in the upper watershed, but forms a small part of it; and further the quarry isn't a source of any contamination which could interfere with fishing activities there. The amount of runoff from the quarry is small and high quality, and will have a negligible impact on overland runoff and groundwater. Overall, no significant effect of the Hartville Quarry on recreational, commercial, and Mi'kmaq fishing is expected.

5.3.5 ARCHAEOLOGICAL/CULTURAL/HISTORICAL

The land proposed for the quarry expansion has low potential for pre-contact and/or early historic First Nations or European archaeological resources (Nova Scotia Communities, Culture and Heritage 2023; Davis-McIntyre 2024). The site is not expected to have been a prime area used by Mi'kmaq pre-contact. If an archaeological feature of significance is encountered during quarry activities, particularly evidence of Mi'kmaq occupation, operations will be stopped, and experts including Nova Scotia Department of Communities, Culture, Tourism and Heritage will be consulted to ensure the artifact or feature is not disturbed and is adequately documented and preserved.

5.3.6 ECONOMY, LAND USE AND VALUE

Activities at the Hartville Quarry do not restrict forestry in the area and in fact, support those operations by helping to maintain the access road to the site which is also used by logging trucks and equipment. Aggregate from the quarry is used in projects in the area at a competitive cost due to the proximity of the quarry. Employees working at the quarry use local services which generates tax revenue. The existing quarry has been operating at the site with little to no impact for many years, while providing economic development and a source of aggregate for local construction projects. Continued use of the quarry will maintain the property value of the area. As no change is likely in activities at the quarry, no negative effects are foreseen.

5.3.7 TRANSPORTATION

The Hartville Quarry currently generates a comparatively low level of truck traffic on highways in the area, and activity levels are not expected to increase. Consequently, the quarry is not expected to change existing traffic volumes. The project will not interfere with use of the access road by other operations such as logging and maintenance of the Ellershouse Wind Farm. The intersection of the Quarry access road with Ellershouse Road has good sightlines but may lead to hazardous encounters due to sharp corners and blind hills along Ellershouse Road. These hazards can be mitigated by applicable warning signs placed far in advance of the access road to indicate the likely presence of heavy equipment and trucks turning. Safe use of the road and avoidance of accidents is essential, both for human impacts and the potential impacts of vehicle accidents and spills on the local watercourses and environments. Equipment and truck operators for the quarry will be given instruction on safe and environmentally acceptable procedures. With suitable foresight and care, the impact of the project on transportation and safety is expected to be minimal, will little or no change from previous operations at the quarry.

5.3.8 RESIDENTIAL USE

Although all residences along the Ellershouse Road are further than 1.3 Km of the quarry, residences will experience effects of the quarry, principally noise from heavy equipment operation such as loaders and trucks; operation of crushers; and effects such as shocks from periodic blasting, as well as dust and noise from truck traffic to some degree. The distance from residences reduces the shock received in these areas, and consequently the effects on groundwater wells or impacts of blasting on building structure are likely to be small and likely negligible. To assess any impacts, Alva currently monitors for blast concussion and ground vibration within seven meters of the nearest structures, and if required in its Industrial Approval, may be required to conduct a well monitoring program. Sky-shine from the quarry, on rare occasions when the quarry may be operated at night, might be seen by local residents, but would be controlled by proper environmental management practices such as use of downward directional lighting at the site. The effects of the quarry would occur principally when the quarry is operating in the April to November period and so not year-round. Operations at the quarry would be cyclic, likely occupying several weeks to months during the construction season during the years in which the site is active, and the site is regulated and monitored through an Industrial Approval issued by the Province. Truck traffic generates noise, and creates the potential for vehicle accidents, and accidental loss of product (e.g. gravel, rock) from trucks during transport can be hazardous. Proper loading and covering of the load in trucks to avoid spillage can mitigate the release of these materials. Although quarry operations could likely be heard near the quarry and residents would experience truck traffic and other effects of quarry operations, the frequency and scope of activities at the quarry is not expected to increase from past use, and any impact on normal activities of residents as a result of the proposed quarry expansion are expected to be negligible.

Blasting could be heard by residents of distant communities, but would be brief and infrequent (e.g., one to two times per year during years in which the quarry is active). All blasting events will continue to be monitored for concussion and ground vibration to ensure blasting limits are achieved. Most operations at the site occur during daylight hours. On rare circumstances when they are undertaken at night, activities will involve minimal lighting, which likely will not be visible to residents of St. Croix or Newport Corner and are unlikely to be a significant disturbance to residents. The quarry includes signage with phone numbers and contact persons should any members of the community have inquiries. A complaint resolution procedure will be put in place by Alva to address complaints and concerns.

5.3.9 COMMERCIAL/INDUSTRIAL USE

The nearest commercial operations / businesses are the adjacent Brycon Construction quarry and the Ellershouse Wind Farm Project, the Minas Energy Hydro generation system, and several businesses in the Ellershouse area. The quarry does not impact existing Ellershouse Wind Farm either through occasional blasting, for which a waiver has been obtained by Alva for wind turbines adjacent to the project (Map A4) or significantly impact traffic along the access road for both the Quarry and the wind project. Occasional blasting at the quarry will not impact dams or generation facilities of the Minas Energy Hydro system, the former which are located from 1.3 to 1.5 km from the Quarry and the generation facilities in St. Croix. There are no businesses in the vicinity of the Quarry which could be affected. The quarry contributes to net economic benefit in the community through supporting local trucking operations and providing access to aggregate and other quarry products.

5.3.10 Water Supplies and Residential Wells

Surface water and drilled wells associated with the nearest residences and businesses in Ellershouse, St. Croix and Newport Corner are too far from the quarry to be significantly affected by blasting at the quarry. Groundwater recharge generated by the quarry is likely to be of high quality (low conductivity and dissolved solids and neutral in pH). Best management practices surrounding blasting will be followed, established operational procedures for fueling will be followed, and a contingency plan will be maintained to mitigate impacts on aquifers at the site.

5.3.11 Parks and Protected Areas

The quarry site is sufficiently distant (at least 3.3 km) from any parks and protected areas and does not interfere with access; and intensity or frequency of activity at the site is not expected to change, and therefore the degree of any interactions with the managed conservation and protected areas in the general vicinity is not expected change. The quarry and its expanded area will not be visible to tourists traveling by road. With no expected change in the scope or frequency of quarry activity due to the expansion, road traffic activity from the quarry is not expected to change, or be high enough in volume to disrupt tourist traffic. Occasional blasting may be heard in the Provincial Parks, Nature Reserves, IBPs, SESs, or Conservation Lands in the area, but noise levels generated from routine operations at the quarry are not expected to be heard. Occurrences of blasting are brief and infrequent, and not likely to be a significant concern to visitors/users of those areas. The quarry will be reclaimed at the end of its useful life. Expansion of the quarry will not affect the integrity of any nearby protected areas. Overall, the change due to the expansion of the quarry will be negligible to the surrounding parks and protected areas.

5.3.12 Resource Use—Forestry, Hunting & Trapping

Use of the land in the expansion area will remove the potential for future forestry use of the site, at least until after the quarry is closed and rehabilitated in future; however, the area occupied by the quarry is relatively small in relation to the available forest resources in the area, and the overall impact on economic return is expected to be small. The quarry will occupy a relatively small area of habitat for furbearing and game species, and will not have a significant impact on hunting and trapping.

5.3.13 Human Health

Many aspects of modern industrial society have the potential for impacting human health. Effects range from direct toxic impacts of contaminants in the food supply, trace metals and organic pollutants in water, pesticides in the working environment and on food, atmospheric emissions of smoke and volatile organic compounds, wood preservatives in everyday use, fuels, flame retardants—the list goes on. Industrial operations including quarries generate low-level releases to the environment including vehicle and equipment exhaust, dust, emissions arising from associated products such as asphalt, although at typically extremely low levels, and comparable to effects of equipment use elsewhere, and which have been acknowledged and managed.

Operations of Hartville Quarry are not expected to result in impacts on human health. Dust, which is derived both from the source rock, aggregate and activities at the quarry, does not contain toxic components and exposure to residents along Ellershouse Road will be low. Residual dust associated with the quarry after control measures, will be largely localized in the immediate vicinity of the quarry. Operations of an asphalt

plant which may take place from time to time at the site is closely regulated under provincial approvals and levels of volatile emissions will be below those which could be harmful. Activity levels of the quarry may include periodic operations at night which potentially would disturb the sleep of residents, which could if prolonged could be considered a health concern. However this effect was not noted as a concern in conversations conducted with locals. Other air-borne emissions such as vehicle exhaust are not unique to quarry activities and would also be derived from other traffic along roads in the area.

5.4 Biophysical Impacts—Impacts of the Project on the Environment

5.4.1 Air Quality, Noise, and Light

The intensity, frequency, and scope of quarry activities are not expected to change from present levels, which is governed by the amount of local demand for aggregate. This demand does not change appreciably from year to year, and in a rural area such as Windsor West Hants Regional Municipality, is not typically high. Operation of a quarry has the potential to generate dust, combustion emissions, noise, and light. In particular, operation of heavy equipment (e.g., earth movers, crushers), rock drilling and blasting, as well as onsite routine operations contribute to increased dust and particulate levels. Dust management will be undertaken, including use of water spray and covering working and laydown areas with blasted rock, dust suppression systems on crushing equipment, reducing vehicle speeds, and using tarpaulins on truck boxes. Airborne particulate emissions are monitored in accordance with the site Industrial Approval, the Pit and Quarry Guidelines, and the Nova Scotia Air Quality Regulations. Industry standards and best practices will be followed during all phases of operations.

Exhaust emissions are generated by the operation of vehicles and equipment. Vehicles and heavy equipment are expected to follow efficient operating procedures such as not idling unnecessarily when not in use. Given the relatively small size of the quarry and the scope of the planned operations, these emissions will be minimal (i.e., restricted to several pieces of heavy equipment, earth movers, trucks etc. as well as operation of crushers and asphalt plant) and will be localized and similar in type and amount to those produced during previous operations. Ambient air quality monitoring will be conducted at the request of NSECC, in accordance with the terms and conditions of the Industrial Approval.

With no anticipated change in scope or frequency of operation, noise levels from the expanded quarry are expected to be similar to those already produced at the site. Noise mitigation will include maintaining vehicles and heavy equipment in proper working order; planning traffic flow patterns around the site to reduce the need for heavy equipment to back up (thus reducing the frequency of backup signals); and ensuring that parts of equipment capable of causing noise (e.g., dump doors on truck boxes) are secured. Alva will ensure that heavy equipment does not exceed the noise limits specified in the Nova Scotia Pit and Quarry Guidelines. Blasting is expected to occur infrequently (1-2 times per year). All blasting events will be monitored for concussion and ground vibrations to confirm adherence to regulated levels. Noise monitoring will be conducted at the request of NSECC, in accordance with the terms and conditions of the Industrial Approval.

Nighttime operations will only occur if necessary, and will adhere to time of day conditions in the Industrial Approval from NSECC. Light during nighttime operations— particularly during times of low-hanging cloud and fog—can attract migrating birds traveling over water towards the rest of the mainland of Nova Scotia. If

nighttime operations are required then directional lighting will be used to minimize emanation of light upward and laterally over the horizon.

5.4.2 GROUNDWATER

Activities associated with the project including forest clearing, grubbing and removal of overburden, and blasting influence groundwater flow locally in the vicinity of the quarry, but are not expected to influence groundwater aquifers over a broader area. The amount of recharge area involved in project activities is small in relation to the overall size of the aquifers in the general vicinity; there is a high degree of infiltration of surface water through the floor of the quarry; and the water table in bedrock below the quarry floor will continue to recharge at approximately the same rate as at present. A contingency plan will be established to manage emergency response in the unlikely event of spills or releases of fuels or hazardous chemicals potentially impacting groundwater in the area. In the continued operation of the quarry, a groundwater monitoring program is expected to be developed as part of the Industrial Approval awarded by NSECC. The groundwater monitoring program will establish baseline groundwater quality and quantity prior to the quarry expansion, and will provide regular monitoring to ensure that any potential impacts associated with the quarry expansion are identified. Overall, the effect on overall groundwater distribution and flow are expected to be negligible.

5.4.3 HYDROLOGY

Due to the relatively small area of the expanded quarry, and its position in the local catchments, the quarry will have a negligible effect on surface waters in the immediate vicinity. This was shown by a Water Balance Assessment (HERAA 2023), conducted for the environmental assessment. A small sub-catchment southeast of the quarry which is part of the overall catchment area for the quarry, will be affected to a negligible degree, amounting to a reduction in sub-catchment area of only 15% due to the proposed expansion. The proposed expansion area is small and consequently the effect on supply to surface waters in the vicinity is not expected to be disrupted significantly. Surface water runoff from the quarry is inherently intermittent due to the dominance of precipitation in water balance, and most is expected to enter the water table directly through percolation through cracks and fissures in the bedrock. Surface flows will be moderated by the surface water management system and will ensure that flow characteristics in downstream areas are not affected significantly. Runoff will be managed to ensure that it meets acceptable environmental standards.

5.4.4 WATER QUALITY

Water quality leaving the quarry via surface or groundwater is high, and surface waters outside the expansion area are not expected to be impacted significantly, as there are no watercourses in the vicinity into which runoff from the quarry will be directed. Surface runoff currently supplying the wetlands to be removed will be captured within by the expanded quarry footprint and ditches associated with the quarry drainage and access road, neither of which connect directly with a surface watercourse. Management measures to reduce erosion and sedimentation on the quarry floor will help increase water quality, and the low-contaminant characteristics of the bedrock and location of the site high in the local catchment area will also lead to high water quality. Quarry rock is within acceptable limits for sulphur and acid-generating potential. Blasting is not expected to result in groundwater quality changes. Forest clearing and grubbing activities can lead to releases of fines from the soil, resulting locally in elevated suspended sediment levels but little surface water flow from grubbed areas is expected off the site in part due to the small area involved, the high potential for

infiltration, and trapping of residual sediments during flow through the adjacent landscapes. Both normal and accidental release of other contaminants, such as oils and lubricants, from operating equipment is expected to be mitigated by normal precautions on equipment operations and fuelling locations. Contaminants arising from operations of the quarry are expected to be exceedingly low. All activities will conform to the Nova Scotia Erosion and Sedimentation Control Handbook (NSE 1988) and the Nova Scotia Pit & Quarry Guidelines (NSE 1999). Runoff from road surfaces potentially can lead to temporarily elevated suspended sediment levels in flows in ditches adjacent to them, although effects would be short term. Impact of the quarry on water quality in adjacent streams and other waters is expected to be negligible. A surface water management and monitoring program will be established through the subsequent Industrial Approval Amendment process following the Environmental Assessment Approval.

5.4.5 Freshwater Aquatic Environments and Wetlands

One permanent stream is located 150 m east of the project and is fed by runoff in a small sub-catchment of the quarry which is found in the southern section of the proposed expansion area. Removal of the wetlands in the catchment will reduce the surface water supply to the watercourse by about 15%, which is not considered to be a significant amount. Runoff from the quarry floor discharges into a ditch and disperses In the forest, eventually contributing to the St. Croix River which is not expected to be impacted. Quantities of runoff arising from the site in future from the outer slopes of berms, product storage piles, and grubbing's piles will be approximately the same as at present and will remain in the same watershed. The quarry is unlikely to generate significant quantities of contaminants or suspended sediments that could impact any freshwater habitat. Wetlands which may be disturbed together occupy less than 0.4 ha, may be fully or partially removed as a result of the quarry expansion. These wetlands are not "significant" wetlands" as defined in provincial wetland regulations, and appropriate approvals (e.g. Wetland Alteration Approval from NSECC) will be obtained, including appropriate wetland compensation for the impacted area.

5.4.6 Terrestrial Environments

Proposed expansion will utilize areas which are mainly recently cut over areas and mixed woodland forest—types which are common in the general vicinity, and in particular locally at the site—and the quarry will not remove a large proportion of either type. No unique habitats were identified at the site. Dust from operations may affect adjacent forest communities although the impacts are likely to be negligible.

5.4.7 Fish and Fish Habitat

Proposed project activities will have a negligible impact on potentially fish bearing streams. There is no fish habitat on site. A small intermittent watercourse arising about 150 m east of the study area and which has its source in an area proposed to be removed by the quarry expansion, was walked in its entirety and determined not to have potential for fish habitat, and in any event would see a reduction in flow of only approximately 15% as the result of the project. The access road to the Quarry crosses an unnamed watercourse that flows from Taylor Lake to the St. Croix River and so would be subjected to dust from vehicle traffic and the unlikely occurrence of vehicle accidents. Surface runoff from the active quarry floor enters ditches and disperses downslope, and so does not have a direct connection with surface watercourses. The Water Balance Assessment for the project indicates that the expansion will not affect the supply of water to adjacent areas significantly. Water quality typically found in runoff from the quarry will be monitored and is expected to meet NSECC guidelines and limits stipulated in the Industrial Approval. The closest watercourse

is more distant than 150 meters which is considered a safe separation from blasting activities. Safe use of vehicles traveling to and from the Quarry will minimize the potential for accidental spills into the unnamed watercourse crossing the access road north of the Quarry. All guidelines for activities and timing of blasting in the quarry will be followed. Overall, the effects of the quarry construction and operations on fish and fish habitat are expected to be negligible.

5.4.8 Flora and Fauna and Habitat

Expanding the Alva Hartville Quarry will remove existing terrestrial ecosystem (plants and animals) in the footprint of the quarry. With time, areas no longer suitable for quarry operations will be remediated, through a site reclamation plan which has been established as a condition of quarry Industrial approval. Plant and animal communities that arise in remediated areas will likely differ to some degree from those at present; however, a goal of remediation will be to ensure that conditions (e.g., soil types and topography) are reasonably restored to pre-existing conditions, to allow natural communities to re-establish, and to avoid development and expansion of communities of invasive species. During recovery and revegetation of abandoned areas, the seeding in and succession of forest species will provide habitat for a moderate diversity of species which will change with time. Removal of forest cover is a feature that quarry development shares with logging activities, which affects local ecosystems to a moderate degree, and is allowed in Nova Scotia. Normal management practices regarding forest clearing, such as avoidance of cutting or major clearing activities during critical breeding periods of songbirds from mid-April to mid-September, will reduce harm to nesting birds in forest areas.

Expansion of the Hartville Quarry will result in only a comparatively small loss of 6.1 ha in the coverage of natural and mature forest stands in the area and is expected to have a small impact on forest birds and wildlife. During normal operations, modified areas of the quarry offer potential nesting sites for certain species of birds and other wildlife, including hunting spaces for species such as owls and nesting for ground nesting birds such as nighthawks. Quarry employees should be educated on the need to check areas for activity and nests including both ground- and tree-nesting birds, before undertaking activities which would disturb established surfaces. Night operations and use of lights have various effects, including attracting insects which otherwise would need darkness to mate and reproduce; light pollution is considered to be an important factor globally in decline of songbird populations, through declines in populations of some insects. Many migrating birds follow the Bay of Fundy coast on their southward migration; if night-time operations are required, in particular during fall migration periods (August-September) when lights have the potential to attract migrating birds, downward directional lighting will be used which focuses downward and below the normal horizon, to limit visibility by birds and insects from a distance. The potential for use of the margins of the quarry site for nesting by Snapping Turtles (an S3S4 species) will be noted, and measures put in place to manage interactions and avoid harming the species.

5.4.9 Species at Risk

No federally or provincially-listed species at risk, or species more sensitive than S3 ranking (vulnerable), were found in the study area. No American Marten or Canada Lynx (both provincially listed as Endangered and which can occur in Hants County) have been recorded within 25 kilometers of the site. No American Marten have been trapped recently in the area, while two Canadian Lynx have been trapped in the last 5 years. The quarry will not have a significant potential for impacting them or their habitat. Common Nighthawk, a

ground-nesting species, potentially could nest in grubbed and marginal but open areas of the quarry; employees should be made aware of the need to check areas for activity and nests before undertaking activities which would disturb established surfaces. Activities such as logging and site clearing should be scheduled outside the April to mid-September nesting period for breeding birds. Lights used during night operations during nesting and migration periods would attract various bird species and insects, which could include species at risk. Lighting used at the site should focus downward and below the normal horizon, to limit visibility from a distance.

5.4.10 NATURAL AREAS & WILDERNESS

Natural areas in the vicinity of the site such as the Eagle Nest Nature Reserve, St. Croix Conservation Lands, St. Croix Indian Reserve, Newport Corner Significant Ecological sites, and St. Croix International Biological Program site (Figure 29) are not near the Quarry and will not be impacted. The proposed expansion will affect a small proportion of the natural landscape at the site, in an area that has already been extensively logged, and is not in any protected areas. Alva is committed to minimizing potential effects of the quarry, in particular to minimize traffic, noise, dust and light from operations to the extent possible. The quarry expansion is not expected to change the frequency, intensity, or scope of operations, and consequently the already negligible impact on natural areas and wilderness is expected to continue to be low. Site restoration will also consider values important in conservation of biological communities and ecosystems, as well as changes in physical conditions that could affect those communities. Normal procedures such as dust control and light management will help to minimize impacts on natural and wilderness values at the site.

6 CUMULATIVE EFFECTS

Expansion of the Hartville Quarry will have minimal cumulative effects, in part because of the small size of the expansion relative to other similar uses of the area involving development of sites for aggregate production, mining, and other industrial development; and because the pit is expected to be reclaimed at the end of its useful life. Cumulative effects are effects of a project that are likely to result in combination with other physical activities that have been or will be carried out (IAA 2023). Relative importance of particular cumulative effects is determined using similar criteria to those of individual impacts of projects, which are often socially-perceived limits, such as acceptable geographic extent of the effect relative to available land or habitat type in a particular area.

The Hartville Quarry's proposed expansion of 6 ha is comparatively small and only 0.5% of the current area developed for similar purposes within a 10 km radius of the site (1074.6 ha) (e.g. gravel pits, quarries, gypsum mines or other areas which involve modifying the landscape for industrial development) (NS Forest Classification 2013) and will not be a significant increase in relation to those uses. The expansion area would remove previously clear-cut forest, which will result in a reduction of about 0.3% of the approximately 2,042 ha of clearcut and natural forest types occurring within the same 10 km radius (NS Forest Classification 2013). Two open pit gypsum mines—Fundy Gypsum Wentworth Road and Miller Creek—are the largest contributors and alone occupy 361.9 and 457.3 ha respectively. A smaller but significant developed area is the Newport Corner DND site (68.8 ha); and there is a significant amount of permanent urban development associated with the outskirts of Windsor. The Brycon Construction Limited aggregate quarry located immediately adjacent and north of the Hartville Quarry occupies approximately 4 ha. The adjacent Ellershouse Wind Farm with 10 turbines occupies approximately 60 ha (turbine pads and infrastructure) most

of which was new permanent construction; and a further expansion to 12 additional turbines and a project area of 69 ha is currently proposed. The proposed quarry expansion area is 5% of these projects, occurring over the life of the quarry, and the land is expected to be rehabilitated. Combined with the adjacent quarry and the two wind projects, 138.8 ha is involved, or 6.8% of forested area within a 10 km radius. Apart from the increase in footprint of the quarry, site operations are not expected to increase in frequency or scope from past use. Therefore the cumulative effect of the quarry and other local activity is not expected to change and will be negligible.

Table 10. Potential interactions between project activities and operations and Valued Environmental Components (VECs) for Hartville Quarry expansion.

General Category of VEC	Biophysical										Socioeconomic									
Project Component (potential interactions shown by ✓)	Air Quality, Noise and Light	Groundwater & Hydrology	Water Quality	Freshwater Aquatic Environments and Wetlands	Terrestrial Environments	Natural Areas & Wilderness	Fish and Fish Habitat	Flora & Fauna Species & Habitat	Species at Risk	Mi'kmaq	Archaeological/Cultural/Historical	Recreation, Tourism & Viewscape	Residential Use	Recreational, Commercial & Mi'kmaq Fishing	Water Supplies/ Residential Wells	Economy, Land Use, and Value	Transportation	Commercial /Industrial Use	Parks & Protected Areas	Forestry Hunting /Trapping
CONSTRUCTION																				
Site Acquisition, Use/Removal of Resources	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓		✓
Site Clearing/Grubbing	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓				✓
Drilling	✓	✓	✓	✓		✓		✓	✓	✓		✓	✓			✓				
Blasting	✓	✓	✓	✓		✓		✓	✓	✓		✓	✓		✓	✓			✓	
Lights & Noise	✓					✓		✓		✓		✓	✓						✓	
OPERATION																				
Moving/Transporting Rock and Product	✓					✓		✓	✓	✓		✓	✓			✓	✓	✓	✓	✓
Crushing	✓				✓	✓		✓	✓	✓		✓	✓			✓				
Washing		✓	✓	✓						✓										
Lights & Noise	✓				✓	✓		✓	✓	✓		✓	✓						✓	
Site Runoff Management		✓	✓	✓			✓													
Portable Asphalt Plant	✓				✓	✓		✓		✓		✓	✓			✓	✓			
Onsite Materials Storage			✓															✓		
Accidents (Fires/Oil & Fuel Spills)	✓	✓	✓	✓		✓	✓	✓				✓	✓	✓	✓				✓	✓

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Hartville Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
BIOPHYSICAL COMPONENTS						
Air Quality, Noise & Light	Construction	Noise and dust from heavy equipment during site clearing and grubbing.	Significant	Negative	Take steps to reduce noise sources such as engine braking. Maintain vehicles and equipment to reduce noise and emissions generated from worn parts.	Not significant.
		Drilling and blasting.	Significant	Negative	Monitor noise levels and undertake to avoid exceedances of regulatory levels.	Not significant.
		Light from the quarry can be seen in neighboring areas.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry during night operations.	Not significant.
	Operation	Noise from drilling and blasting; crusher; heavy equipment operation; dust.	Significant	Negative	Monitor noise levels and undertake to avoid exceedances of regulatory levels. Institute measures for dust control.	Not significant.
		Noise from engine braking of trucks on access road interfering with residential enjoyment.	Significant	Negative	Instruct truck operators to avoid engine braking on access road and Ellershouse Road and in populated areas.	Not significant.
		Light from the quarry can be seen in neighboring areas.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry at night.	Not significant.
		Dust from crushing operations and site activities.	Significant	Negative	Water spray systems on crusher to reduce dust. Water spray or approved dust suppressant on access road and working areas to reduce the resuspension of dust.	Not significant
Groundwater/ Hydrology	Construction	Forest and soil removal changes surface and ground water flow levels and patterns.	Negligible	Negative	Use site runoff management to minimize impacts. Likely changes in groundwater and runoff patterns will be small.	Not significant.
	Operation	Blasting fractures bedrock, disturbs till, and changes groundwater flow patterns. Drilled wells in bedrock and surface wells can be disturbed.	Significant	Negative	Analyze groundwater quality and movement to determine changes. No residential wells near the site but water quality can be verified by testing on request.	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Hartville Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
	Operation	Quarry and work areas change surface water flows. Increased peak stormwater flows. Washing product creates silt-laden surface flows.	Significant	Negative	Onsite water management to moderate extreme surface water runoff and suspended sediment levels. Aggregate washing arranged in closed loop system to retain all wash water onsite.	Not significant.
	Operation	Accidental hydrocarbon spills and blasting residues contaminate groundwater.	Significant	Negative	Measures to minimize danger of spills; monitor and control nitrates from blasting; proper fuel handling strategies, onsite emergency numbers, spill kits etc.	Not significant.
Water Quality	Construction	Possible presence of Halifax Formation bedrock generates acid runoff	Significant	Negative	Prior to expansion, assess sub-surface bedrock composition and avoid unsuitable geology.	Not Significant
		Altered surface water flows and turbidity in ditches leaving the site.	Negligible	Negative	Erosion and sedimentation controls in work areas. Onsite water management to moderate surface water runoff and suspended sediment levels.	Not significant.
	Operation	Dust & suspended sediment from operations potentially enters local watershed. Chemicals (e.g., nitrates) from explosives entering runoff.	Significant	Negative	Onsite dust control and water management to moderate surface water runoff and suspended sediment levels. Erosion & sedimentation controls. Closely monitor chemical residues after blasting.	Not significant.
	Operation	Water chemistry changes in runoff from stockpiles stored on site.	Negligible	Negative	Best management practice allows leaving piles exposed to the environment. Monitor settling ponds; storm-water management.	Not significant.
Natural Areas & Wilderness	Construction & Operation	The presence of quarry, emissions, dust etc., detracts from public perception of wild quality of area. Site is not near popular wilderness areas.	Negligible	Negative	The area affected is small in relation to remaining natural areas, and previous development and logging has occurred in the area, diminishing value of natural areas and wilderness. Minimize footprint. Manage releases of dust and light, and control noise.	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Hartville Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
Freshwater Aquatic Environments	Construction	Minimal potential for disturbance of watercourses and other surface waters which are far removed from the quarry. Reduced source water supply to watercourse east of the site.	Negligible	Negative	Preserve wooded buffer areas for quarry. Avoid as much as possible disturbance of wetlands feeding the nearby watercourse. Onsite water management and sedimentation controls to moderate surface water runoff and suspended sediment levels.	Not significant.
	Operation	Surface runoff with dust, nutrients, and contaminants in local ditches. Residues from aggregate washing. Reduced water availability from evaporation from pit floor and exposed surfaces.	Negligible	Negative	Maintain forested buffers. Onsite water management. Use sedimentation ponds and store wash water during off peak season. Minimize unvegetated areas.	Not significant.
	Operation	Higher peak flows and suspended sediment during activities.	Significant	Negative	Onsite water management to store wash water. Preserve woodland in buffer areas of quarry.	Not significant.
	Operation	Releases of chemicals from blasting and runoff from materials stored on site.	Negligible	Negative	Isolate and treat runoff from work areas and stored materials piles.	Not significant.
	Construction & Operation	Accidental spills of hydrocarbons on site.	Significant	Negative	Provide pollution prevention and emergency measures.	Not significant.
Terrestrial Environments	Construction	Grubbing, road construction, pit preparation. Damage to natural forest ecosystem, and associated species.	Significant	Negative	Maintain forested buffers. Conduct species specific breeding bird surveys prior to development stages. Monitor species-at-risk birds and Snapping Turtle. Monitor for invasive and exotic plant species. Conduct forest removal in small stages corresponding to site development and not in breeding period for birds.	Not significant.
	Operation	Dust, nutrient inputs from runoff, changes to environment and	Negligible	Negative	Maintain buffers. Conduct species specific surveys prior to expansion into	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Hartville Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
		functioning of forest communities.			new areas. Be aware of critical times for rare species which might occur.	
Fish & Fish Habitat	Construction	No direct impact. Change runoff patterns at site in local and adjacent watersheds.	Negligible	Negative	Runoff management to maintain flow to natural watersheds and to avoid sudden runoff events.	Not significant.
	Operation	No direct impact. Site runoff management and water use affects hydrological and groundwater regime.	Negligible	Negative	Ensure the runoff from the site is managed to avoid sudden runoff events.	Not significant.
	Construction & Operation	No direct impact. Small releases of oils, hydraulic fluids etc. from operating equipment. Accidental spills of hydrocarbons on site and on roads passing surface waters.	Negligible	Negative	Maintain equipment to minimize loss of lubricants and fuels. Provide pollution prevention and emergency measures.	Not significant.
	Operation	No direct or indirect impact. Accidental spills into watercourses due to vehicle accidents on roads in area.	Negligible	Negative	Recommend safe driving practices for truckers and staff and reduce speed in vicinity of quarry key intersections. Provide pollution prevention and contingency measures for accidents.	Not significant.
Terrestrial Flora & Fauna & Habitat	Construction	Removal of Existing Forest Communities	Negligible	Negative	Restore damaged and unused parts of the site (e.g. grubbing's and waste rock piles) as soon as possible. Long-term site rehabilitation plan developed with NSECC. Cut forest short term only as needed to expand quarry. Conduct species specific breeding bird survey prior to development.	Not significant.
	Construction & Operation	Noise disturbs wildlife which avoid or can be driven out of nearby areas.	Significant	Negative	Consider placing noisy equipment such as crushers in parts of the quarry which direct noise away from the forested areas.	Not significant.
		Accidental contaminant releases,	Significant	Negative	Provide pollution prevention and emergency measures &	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Hartville Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
		contamination of habitat.			response capability. Remediate areas affected by spills.	
		Artificial light from operations influences movements of birds and insects.	Significant	Negative	Use directional lighting with downward focus to minimize light leaving the quarry.	Not significant.
		Removal of potential forest and wildlife resource (i.e., wildlife habitat)	Negligible	Negative	Small area affected relative to the total available. Minimize footprint of quarry. Restore and rehabilitate areas not used. Leave mature standing trees where possible as nest cavities.	Not significant.
		Quarry affects wildlife movement patterns and connectivity of habitats.	Negligible	Negative.	Restoration should include consideration for wildlife movement through the restored site.	Not significant.
Species at Risk	Construction	Removal of potential habitat for SAR occurring in the area.	Negligible	Negative	Small area affected relative to the total available. Minimize footprint of quarry.	Not significant.
	Operation	Sound from blasting can harm bats and birds.	Negligible	Negative	Minimize blasting activity and concentrate in summer (outside breeding and migratory periods for birds and bats).	Not significant.
		Light influences movements of species at risk birds migrating overland.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry.	Not significant.
		Open and revegetated areas and grubbing's piles may be occupied by nesting species such as nighthawks and Snapping Turtle,	Significant	Negative	Educate personnel to look for birds of concern prior to activities; periodically conduct nesting bird survey at site. Restrict quarry activities around margins where turtles may nest to the late fall to spring period (i.e. November to April).	Not significant.
SOCIOECONOMIC COMPONENTS						
Mi'kmaq	Construction and Operation	Any land use conflicts with Mi'kmaq Right to Use land	Significant	Neutral	Engage with Mi'kmaq in developing quarry.	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Hartville Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
		Expansion reduces the land base available for wildlife to a minor degree.	Negligible	Negative	Employ Best Management Practices for noise and activity quarries. Avoid accidental releases of contaminants. Avoid vehicle accidents.	Not significant.
Archaeological, Cultural and Historical Significance	Construction	Expansion may affect undiscovered artifacts.	Not significant	Negligible	Unlikely that artifacts occur at site. Stop work and report discoveries. Minimize project footprint.	Not significant.
Recreation	Construction & Operation	Quarry traffic uses same roads as both residents and tourists.	Not significant	Negative	Signage of truck use, dangers, and quarry activity. Use for safety program for responsible driving by truckers transporting product.	Not significant.
Tourism and Viewscape	Construction & Operation	Principal interaction of the quarry with tourists is through encounters with trucks and other vehicles. Quarry cannot be seen.	Negligible	Negative	Maintain entrance to quarry access road in natural condition. Safety program for vehicle operators transporting product.	Not significant.
Residential Use	Construction & Operation	Noise; light pollution perceived by local residents; operation of trucks and transportation of heavy equipment along highways used by locals.	Significant	Negative	Use best management practices. Provide community with safety information for truck traffic and quarry operations. Ensure protective measures such as tarps over loads are used to prevent release of product onto road surface.	Not significant.
Recreational and Mi'kmaq Hunting and Fishing	Construction & Operation	Accidental hydrocarbon spills and blasting residues contaminate surface runoff, but has negligible potential for reaching waters supporting fish.	Negligible	Negative	Not an important local activity. Provide pollution prevention, emergency measures & response capability. Identify and control contaminant releases.	Not significant.
	Construction	Loss of forested area under quarry footprint.	Not significant	Negative	Small area affected. Rehabilitate areas no longer needed for activity and future development. Minimize cutting outside quarry footprint.	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Hartville Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
Water Supplies & Residential Wells	Construction and Operation	Blasting potentially impacts local aquifers.	Negligible	Negative	No wells within 1 km and only one non-residential surface water well at 300 m. Develop groundwater-monitoring plan in consultation with NSECC.	Not significant.
Economy, Land Use and Value	Construction & Operation	Removal of potential forest and wildlife resource (e.g., forestry & trapping).	Not significant	Negative	Small area affected relative to total land available. Minimize footprint of quarry. Restore and rehabilitate areas not used.	Not significant.
Transportation	Operation	Wear on highway	Negligible	Negative	Current levels low and will not increase.	Not significant.
	Operation	Collisions with trucks and equipment on Ellershouse Road.	Not significant	No Change	Use good signage at entrance to access road, have speed policy in vicinity of quarry. Safety training for truck drivers.	Not significant
Industrial & Commercial Use	Operation	Use of access road for forestry and access to Wind Turbines.	Negligible	Neutral	Quarry will cooperate to maintain access road to support other industrial and Mi'kmaq users.	Not significant.
Resource Use Forestry, Hunting & Trapping	Construction & Operation	Removes woodland; game habitat.	Not significant	Negative	A relatively small area is used. Minimize footprint and rehabilitate areas no longer needed.	Not significant.
Parks and Protected areas	Construction & Operation	Noise and blasting likely can be heard parks in the general area, but is short term and infrequent.	Not significant	Neutral	Employ best management practices for all aspects of quarry operation, in particular control of noise, light, and dust.	Not significant.

7 IMPACTS OF THE ENVIRONMENT ON THE PROJECT

Hartville Quarry will not be impacted to a significant degree by weather, including high winds and rainfall, and effects can be managed by appropriate site design and surface water management features. Halifax Formation bedrock which is potentially acid-generating, may occur in parts of the proposed expansion area; this would affect the development trajectory of the quarry. Acid-generating potential of rock should be tested as the quarry expands.

8 MONITORING

As part of the subsequent Industrial Approval Amendment application (following successful EA approval) Alva is expected to be required to establish several management and monitoring programs to validate the environmental mitigation strategies that will be implemented at the site. Monitoring programs will include:

- Surface water monitoring plan to monitor water quality in local water resources which may be impacted by the quarry;
- Groundwater monitoring plan to monitor hydrogeological conditions and groundwater quality;
- Blast monitoring plan (noise and concussion) for all blasting events conducted at the site;
- Noise monitoring plan (at NSE request);
- Dust monitoring plan (at NSE request); and
- Additional monitoring for select species and/or other environmental features (as necessary).

9 PUBLIC CONSULTATION

Informing the public and Mi'kmaq about proposed industrial activities which potentially affect them is an important part of environmental and project management. Potential benefits include exposure to local knowledge, which may improve environmental performance, and overall operations of the project, and public involvement and support in subsequent operations. In addition to contacts already made in developing this assessment and in conducting operations in the area, Alva will be undertaking consultations with the local community through public notices, contacts with municipal and provincial government officials, and engagement with the Mi'kmaq about the project and its implications; as well as the plans for using the resources at the site in an environmentally acceptable manner.

10 PERSONAL COMMUNICATIONS

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12 LIMITING CONDITIONS

The American Society for Testing and Materials Standards of Practice and the Canadian Standards Association state that no environmental assessment can wholly eliminate uncertainty regarding the recognition of potential environmental liabilities. The intent of the assessment is to reduce, but not eliminate, uncertainty regarding projects, giving reasonable limits of time and costs.

The conclusions of this report are based in part on the information provided by others, which is assumed to be correct. The potential exists that unexpected environmental conditions may be encountered at the site and with the project, not specifically investigated. Should this occur, the proponent and regulatory authorities must be notified so that we may decide if modifications to our conclusions are necessary.

The findings of this investigation are based on research and investigations carried out in June 2023-January 2024 and the generally accepted assessment practices of our industry. No other warranty is made.

APPENDIX A

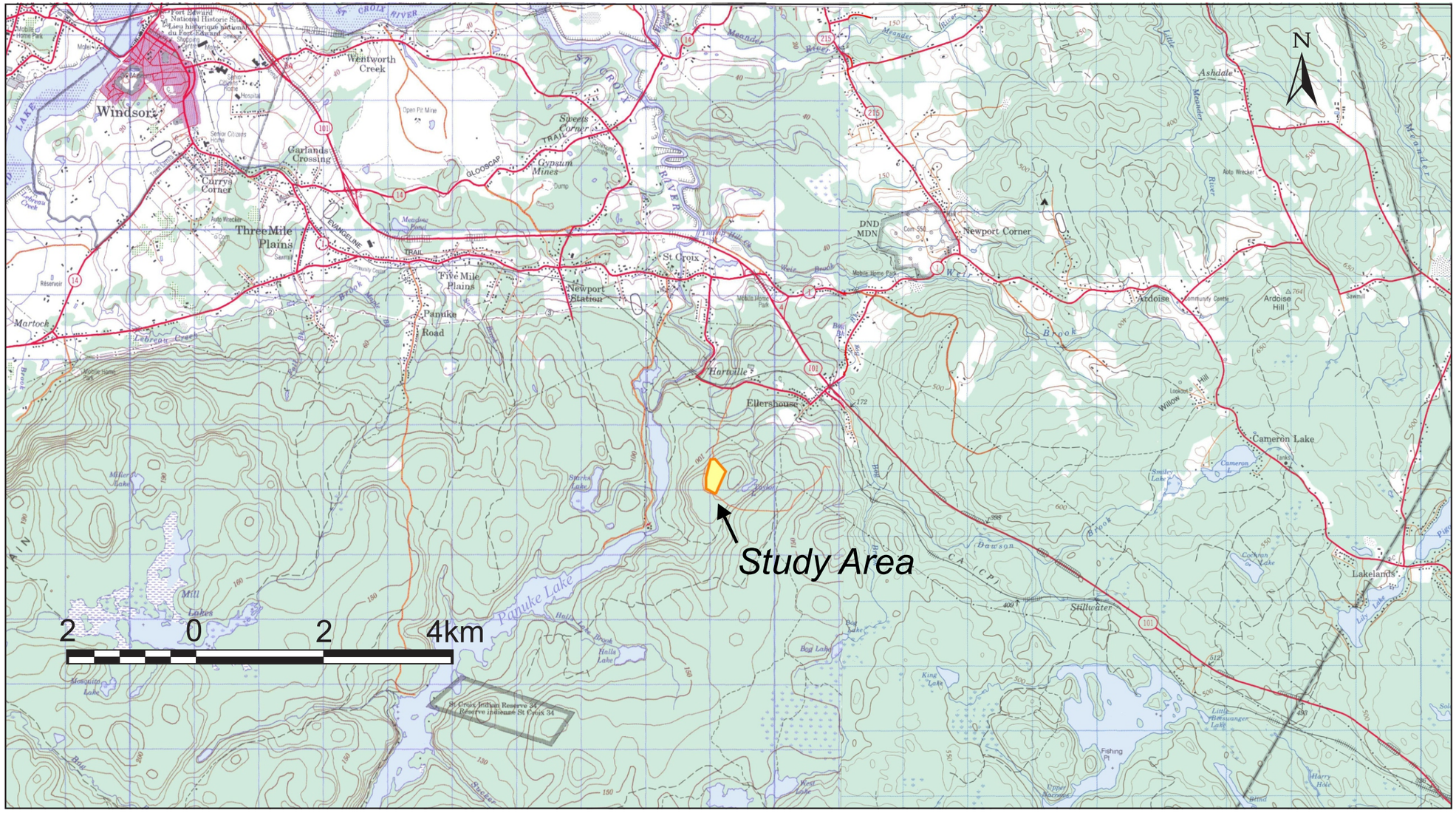
MAPS

ALVA CONSTRUCTION LIMITED

HARTVILLE QUARRY EXPANSION

Hartville, WWHRM, Nova Scotia

Location



Study Area

Elevation Contour (m)

Watercourse

Source:
NTS 1:50,000 11D3 and 21A6

Map By: Envirosphere Consultants Limited.
Windsor, Nova Scotia, January 2024

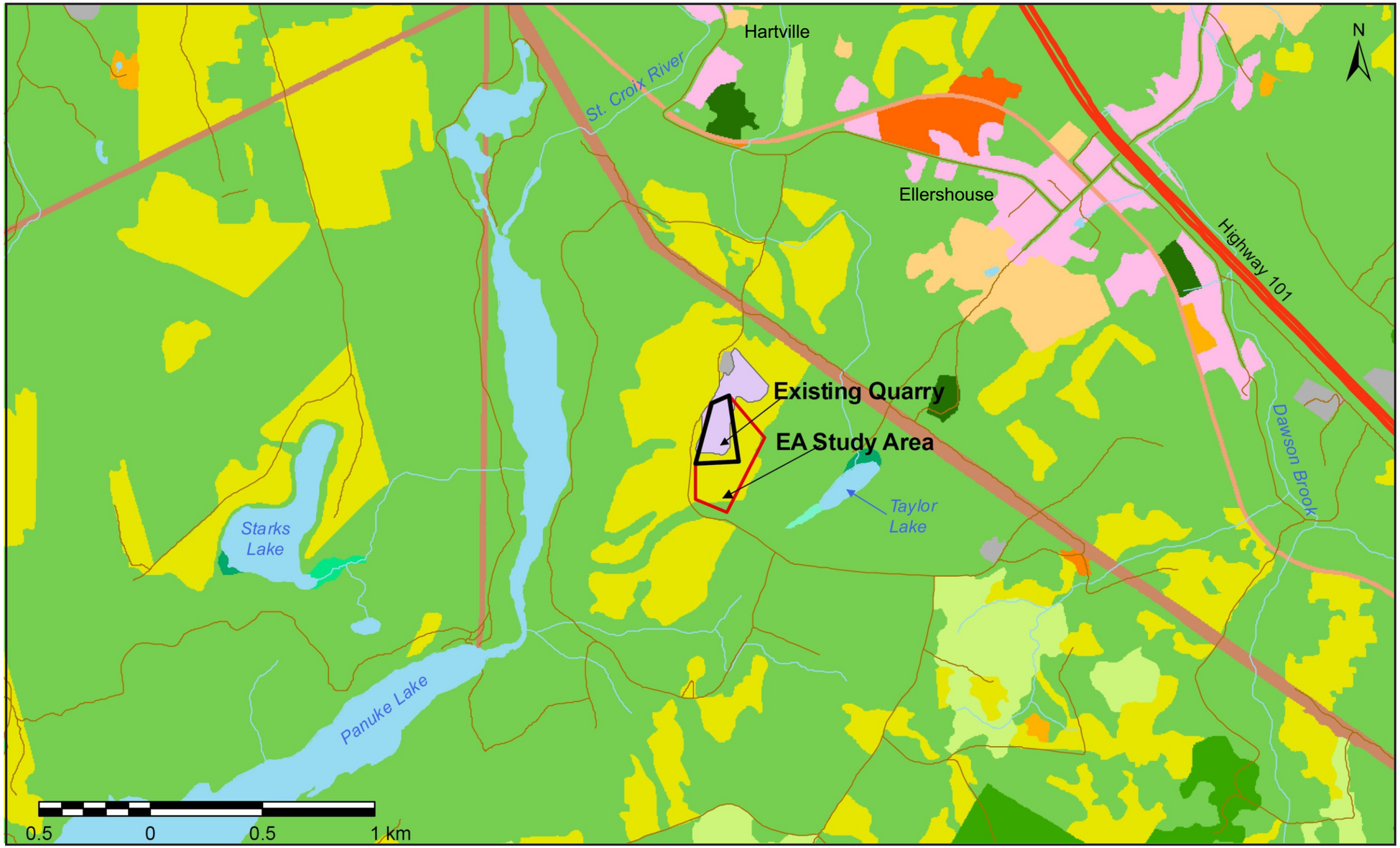
ALVA CONSTRUCTION LTD.

Map A-1

ALVA CONSTRUCTION LIMITED

HARTVILLE QUARRY EXPANSION

Hartville, WWHRM
Nova Scotia



Forest Classification

- Natural Stand
- Treated
- Christmas Trees
- Plantation
- Stand c/w Dead Trees
- Brush
- Alders
- Clear Cut/ Partial Cut
- Wetlands General
- Open Bogs
- Treed Bogs
- Agriculture
- Urban
- Quarry
- Powerline Corridor
- Rail Corridor
- Inland Water
- Watercourse
- Main Highway
- Secondary Roads & Trails

Map by:
Envirosphere Consultants Limited.
Windsor, Nova Scotia, September 2023
Based on Nova Scotia Forest Inventory Cycles 2 & 3 and Current Updates

https://novascotia.ca/natr/forestry/gis/forest-inventory.asp

May, 2023.

ALVA CONSTRUCTION LTD.

Map A-3