

APPENDIX D
BIOPHYSICAL ASSESSMENT REPORT
(Envirosphere Consultants Limited, 2016)

Environmental Assessment Registration Document:
Gabarus Quarry Expansion
Gabarus, Gabarus Lake, Cape Breton Regional Municipality
Nova Scotia



Biophysical Assessment:
Gabarus Quarry Expansion
605 Grand Mira Gabarus Road,
Gabarus Lake, CBRM, Nova Scotia –
PIDs 15852478 & 15351539

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Prepared for:

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1 INTRODUCTION

Dexter Construction Company Limited, Bedford, Nova Scotia (Dexter Construction), is proposing to expand an existing quarry in the Gabarus Lake community of the Cape Breton Regional Municipality (CBRM), Nova Scotia. The quarry is presently operating under an industrial approval (NSE Approval No. 2014-088454-01) for quarries less than four hectares 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. Dexter Construction contracted Envirosphere Consultants Limited of Windsor, Nova Scotia, to prepare a biophysical and socio-economic overview and assessment of the expansion in support of the approval 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 (NS DNR), Nova Scotia Department of Aquaculture and Fisheries (NS DAF), and Fisheries and Oceans Canada; contacts with organizations, businesses and individuals in the Gabarus Lake, Cape Breton area; review of published information including soil surveys, reports on geology, reports on archeology, First Nations groups consultations (e.g. Cultural Resource Management Group) and natural history (e.g. *Natural History of Nova Scotia*); use of relevant websites and databases (e.g. Nova Scotia Open Data Portal; DNR 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 and property ownership, aerial photos, and 1:50,000 topographic maps. Site visits and walkovers by project personnel were carried out on, October 22, 2018 and June 24 and 25, 2019 (fall and late spring/early summer botany surveys); June 23-25, 2019 (owls and breeding birds); June 10 – 12, 2019 (site reconnaissance); and August 7, 2019 (supplementary wetland survey). Key project personnel included Patrick Stewart (M.Sc.), Valerie Kendall (M.Env.Sc.), and Heather Levy (B.Sc. Hons. Environmental Science) (background review, site reconnaissance, wetlands, water quality & fish habitat assessment); Nick Hill, Ph.D. (botany and wetland survey), and Ruth Newell, M.Sc. (botany survey); and Mr. Fulton Lavender and Mr. Richard Hatch (bird surveys).

3 SITE LOCATION AND STUDY AREA

Gabarus Quarry in Cape Breton Regional Municipality is located on Grand Mira Gabarus Road, one kilometre west of the Community of Gabarus Lake, at approximately UTM Zone 20, NAD83, Easting 713940 and Northing 5077530. The site is shown in air photos 2008 306-251 & -252, July 7, 2008, and Google Earth satellite imagery from June 6, 2019. The focus area for the assessment is shown on Figure 1 and Map A-1, Appendix A. The quarry is shown in Figures 2 & 3. The proposed quarry expansion area will be located entirely within the EA study area.



Figure 1. Project location shown on NTS 1:50,000 mapping.



Figure 2. View of southwest section of Gabarus Quarry, facing west, June 11, 2019.



Figure 3. View of northeast corner of Gabarus Quarry facing north, June 11, 2019.



Figure 4. Stockpile area on east end, June 11, 2019.

4 EXISTING ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

4.1.1 CLIMATE AND WINDS

The Gabarus Quarry study site is a moderately exposed, low elevation location, approximately 7 km from the Atlantic Coast and therefore influenced strongly by onshore winds and sea temperatures. The marine influence leads to the occurrence of short cool summers and relatively mild, wet winters (Webb and Marshall 1999). Average daily temperatures are moderate¹, ranging from a low of -5.2 °C in February to 17.6 °C in August (Canadian Climate Normals 2019 (Figure 5)). The area has a high annual average precipitation of 1646 mm (measured at Louisbourg), about 15% coming as snow, mainly in January-February (Canadian Climate Normals 2019). Rain falls predominantly in April – May and secondarily in October-November. Extreme daily precipitation events can be expected, as in most parts of Nova Scotia, in particular due to a tendency for more extreme weather events to occur as a result of global climate change. A high daily rainfall of 112.8 mm was recorded in Louisbourg in October 2000. Fog is common, associated with southerly winds, and is a major problem in coastal areas, particularly in late spring and early summer (Environment Canada 2016), leading to visibilities of 0.3 km or less 10-20% of the time. Wind patterns are similar to other locations on the east coast of Nova Scotia—generally strongest in winter, predominantly from the west and south quadrants, occurring mainly from the west (November-February), shifting to north and northwest (February-April), and southwest (spring to late summer, May-August), and returning to the west in September-October (TDC Atlas 1991). In particular the site is potentially exposed to winds in strong north easterly gales which move along the Nova Scotia coast predominantly in winter. Southerly sea breezes are a feature of weather at the site (Environment Canada 2016).

¹ Climate conditions are measured at Louisbourg and summarized for 1981 to 2010 (Canadian Climate Normals 2019).

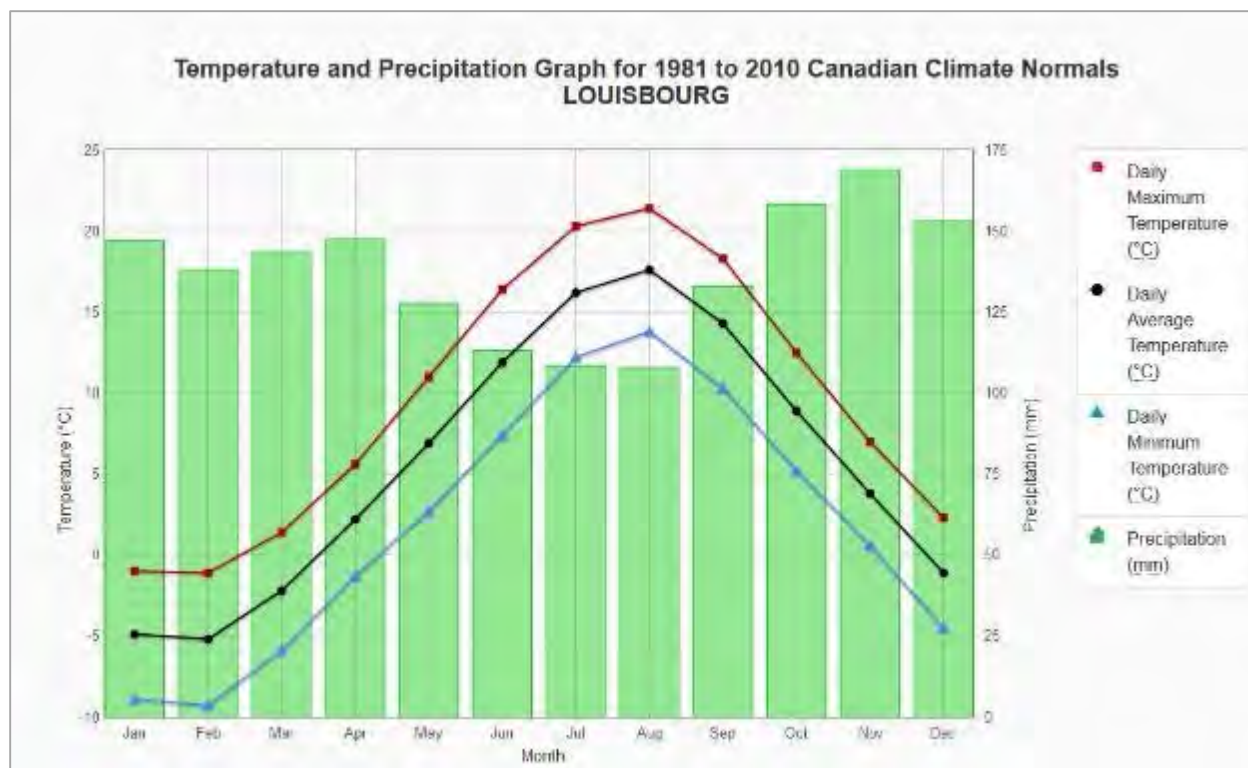


Figure 5. Annual precipitation and temperature cycle, Louisbourg (1981-2010) (Canadian Climate Normals 2019).

4.1.2 TOPOGRAPHY AND GEOLOGY

Landscape

Gabarus Quarry is located near the southeast coast of Cape Breton Island, on the level to gradually sloping Atlantic coastal plain which extends from Mira Bay to Point Michaud and Red Head near Isle Madame (Davis and Browne 1997). The landscape is gently rolling over varying depths of surficial glacial till deposits, covering the generally level bedrock strata in the area, punctuated by occasional higher elevations in drumlins which are scattered through the area (Figures 6 & 7). Elevations reach approximately 40 m above sea level at the quarry site. Low elevations near the Atlantic coast lead to the formation of irregular coastal lakes and shallow embayment's protected by coastal barrier beaches such as Gabarus Bay and Belfry Lake (Figures 8 & 9). Mixed forest dominated by softwoods form the predominant cover (Figures 6 & 7), and lately logging has created extensive areas of clear cut, while there are limited lands developed as agricultural fields and other open areas, largely restricted to the vicinity of occupied properties (Maps A-2 & A-3).



Figure 6. Forest landscape at Gabarus Quarry, June 2019.



Figure 7. Topography at Gabarus Quarry, June 2019.



Figure 8. Coastal barrier at Harris Beach along Gull Cove Hiking Trial, Gabarus Wilderness Area, located approximately 12 km east of Gabarus Quarry. June 11, 2019.



Figure 9. Cobble beach at MacGillivray's Cove, Gabarus Bay, Gabarus, located approximately 10 km east of Gabarus Quarry. June 11, 2019.

Bedrock Geology

Bedrock at the site is predominantly Fourchu Group, Main-a-Dieu and Stirling group volcanics (tuff, basalt, rhyolite) and metamorphosed sedimentary rocks (slate, quartzite and greywacke) (Barr et al. 1996). These formations are overlain by Carboniferous age rocks to the west in the vicinity of Mira River and immediately to the east towards Gabarus Lake (Figure 10) where conglomerate, limestone, shale and sandstone of the Grantmire Formation of the Windsor Group occur (Keppie 2000; Weeks 1954; Weeks and Cameron 1954).

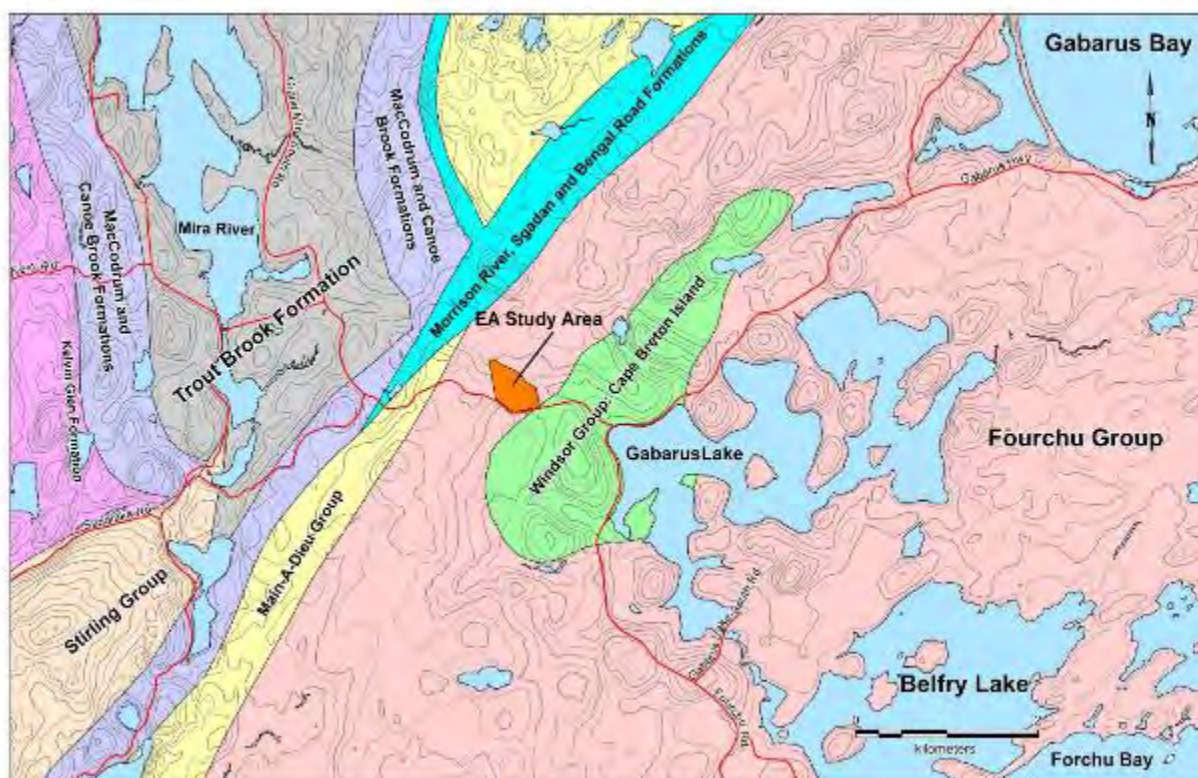


Figure 10. Bedrock formations in the vicinity of the Gabarus Quarry (Keppie 2000).

Surficial Geology

Landscape in the area is a gradually sloping to slightly rolling till plain incised by local watercourses and punctuated by locally prominent drumlin features. Surface material is shallow to moderately deep over bedrock depressions and in drumlins, and bedrock is often exposed (Figure 11). Surficial material is a mixed till derived from local bedrock and organic deposits (peat) through influence of wetlands and peatland features (Figure 11).



Figure 11. Surficial geology of the study area. From Stea et al. (1992) and digital version (2016).

4.1.3 AIR QUALITY, NOISE & LIGHT

The Gabarus Lake area experiences low levels of artificial light, low levels of ambient noise, and high air quality. There are few sources of artificial light in the area; ambient noise levels reflect local vehicle traffic and operations of the quarry; and air quality is expected to be good due to the rural location and predominantly forested setting.

House and yard lights as well as vehicle lights are the main sources of artificial light at the site. However due to the few residences near the site and the low traffic volumes, light from local residences and traffic traveling on the secondary Gabarus Grand Mira Road, are expected to be minor sources. Lights at the quarry, as well as ‘skyshine’ from operations when low cloud occurs, can probably be seen from a distance including offshore areas; however nearby residents of Gabarus Lake interviewed noted that light from the quarry was not noticeable while it was in operation.

The Gabarus Lake area is expected to have a relatively high natural baseline air quality typical of areas with high proportions of natural landscape such as neighbouring forested wilderness areas to the west. Low levels of human activity, including vehicle traffic along the Gabarus Grand Mira Road, as well as that associated with quarry activities, have little impact on overall air quality at the site. The Grand Mira Gabarus Road is the main road that passes by the site and vehicle use is relatively low along this route. As a gravel road, it is expected that dust will be generated by vehicles traveling along it. Fourchu Road, a paved highway joining the communities Fourchu and Gabarus along the eastern coast of Cape Breton,

passes approximately 1 km east of 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. A resident of Grand Mira Gabarus Road between the quarry and the Fourchu Road indicated that dust was not a significant issue.

The scope of operations, including annual usage, for the quarry are not expected to change and ambient noise levels in general are expected to be low due to the relatively isolated location of the quarry. Peak vehicle noise on the highway is expected to coincide with vehicle traffic patterns. Peak traffic and noise levels through the day, as well as seasonal (summer) peaks in traffic noise corresponding to tourist activities, are expected. Occasionally, operations at the quarry can be heard from nearby Gabarus (about 5 km northeast)(F. Carswell, local resident, pers. comm., July 2019). The quarry and associated movement of trucks and equipment would continue to provide a minor and periodic source of noise in the area and noise levels reaching the nearest residences are minor². Operations at the quarry are periodic in response to demand for product and are likely one of the main noise sources in the area. Blasting occurs typically one to two times per year; operation of a portable crusher and heavy equipment may take place periodically and add to noise levels when the quarry is in operation; a portable asphalt plant may operate at the site periodically; and trucks are used to transport the product and move the portable equipment as required. Typical noise includes blasting and sounds from crusher and other heavy equipment operations (e.g. motors, generators, back-up signals etc.). All trucks leaving the site are required to follow Company best operational practices, as well as those established by Truckers Association of Nova Scotia (TANS) and the Nova Scotia Road Builders Association (NSRBA), to minimize emissions. Noise levels arising from the quarry in the future will continue to meet the limits established in the Pit and Quarry Guidelines and are expected to be consistent with those produced by the existing quarry operations at the site.

4.1.4 HYDROLOGY

Gabarus Quarry is located in headwaters of a permanent, first order, unnamed stream in the 1FJ-SD12 secondary watershed which drains through Gabarus and Belfry Lakes into Fourchu Bay in the Atlantic Ocean (Figure 1, 12 & 13). Catchment area above the quarry is approximately 0.5 km², which is 1% of the watershed as a whole. Major contributors to flow are expected to be surface water runoff and groundwater flow. The unnamed stream is formed from two small tributaries located north and south of the quarry and joining northeast of it (Map A-2). The watershed of the two tributaries above the junction is approximately 1.1 km² in area (0.6 km² for the northern and 0.5 km² for the southern tributary) (Map A-5).

Slope and surface water runoff from the quarry site is predominantly northeast with a small component draining southeast and east (Map A-5). The quarry floor drains east, exiting at the northeast corner via a constructed subsurface French drain into several small wetlands and then into a wetland complex through which both northern and southern tributaries flow. Some runoff also originates from precipitation reaching the outer slopes of berms and grubblings piles which surround the quarry. In addition, some

² Residents interviewed did not indicate a problem with operational noise from the quarry. Noise from engine braking was not noted to be a problem at the intersection of Grand Mira Gabarus Road and Fourchu Road (J. Hancock, local resident, pers. comm. 2019).

precipitation is expected to continue to enter the water table by percolation through the quarry floor where it will contribute to groundwater flow towards the streams. The area proposed for expansion drains mainly northeast towards the northern tributary and the proposed expanded quarry footprint of 9.1 ha makes up approximately 15% of the watershed area of the northern tributary. Surface water drainage on the south between the quarry and the Grand Mira Gabarus Road is southeast to east and is blocked by the Grand Mira Gabarus Road and where it enters a ditch and flows east, eventually to join the south tributary. Precipitation and associated surface and groundwater flows are expected to be highest in spring (April-May) and fall (October-November).



Figure 12. Unnamed stream at northwest corner of study area, Gabarus Quarry, June 12, 2019.



Figure 13. Unnamed stream downstream of Gabarus Quarry, June 12, 2019.

4.1.5 HYDROGEOLOGY

Groundwater develops predominantly subsurface in cracks and fractures, on horizontal surfaces between strata in bedrock, and in till which can accumulate to significant depth at some locations in the area. The water table at the site is expected to be considerably below the floor of the quarry. Most precipitation reaching the quarry leaves via the quarry drainage system and a small proportion enters the groundwater as seepage through cracks and fractures. There is one confirmed drilled well within 800 m, but no wells listed in the NS Well Log database within approximately 1 km of the site.

The site is immediately underlain by unconsolidated surficial materials specifically glacial till with a stony, sandy matrix derived from local bedrock sources, and the depth to bedrock at the site is small. Where drumlins occur, the matrix is siltier due to erosion and incorporation of older till units by glaciers. The till plain is estimated to be between 2 and 20 meters thick, whereas the drumlin overlain areas may be between 4 and 30 meters thick (Stea et al 1992).

Bedrock in the general area consists of igneous and metamorphic rocks and subsurface flow is likely to be through fractures in the bedrock. Surficial and shallow groundwater flow is anticipated to mirror the topographic slope, which is towards the north and northeast. It is anticipated that the bedrock aquifer will exhibit fracture flow. Some precipitation is expected to percolate through cracks and spaces in the quarry floor.

Potable water wells in the general vicinity will utilize the deeper bedrock groundwater regime, although locally, dug wells potentially could support adequate flows. Both drilled and dug wells are variously used by residents in the Gabarus Lake area. A search of the NS well log database shows approximately 30 well

log records in the Gabarus Lake area—however none are within 1 km of the quarry. The property at 769 Grand Mira Road, which is within 800 m, has a drilled well (J. Hancock, resident, personal communication, July 2019) but it is not in the database, and the owner has a waiver with Dexter Construction concerning their operations at the quarry.

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.

4.1.6 SOILS

The site is located on Thom soils—well-drained, pale brown sandy loams developed from till derived from local metamorphosed volcanic and sedimentary bedrock. Topography is rolling with gradual slopes, and soils are typically stony, often forming a shallow layer over bedrock or coarse subsurface deposits (Cann et al 1963). Millbrook soils extend to near the study site from the vicinity of Gabarus Lake. In contrast to the Thom soils, these are imperfectly drained, dark reddish brown gravely clay loams which are moderately stony, occurring on rolling topography. Neither soil type is particularly suited to agriculture, and typically have been used for pasture.

4.2 BIOLOGICAL RESOURCES AND HABITAT

4.2.1 TERRESTRIAL ENVIRONMENT

The study site is located in the southeastern lowlands of Cape Breton near the Atlantic Coast where the damp and cool environment leads to the development of mixed and coniferous forests dominated by Balsam Fir, Larch, White Spruce, Red Maple and White Birch, which are common throughout much of coastal Nova Scotia. Much of the forest has been cut and is currently in stages of cutting. Low relief and gradual slopes over poorly drained soil lead to a patchwork of forest communities related to elevation and drainage, favouring development of wetlands in many areas (Davis and Browne 1997) (Map A-4).

Around the margins of the quarry, where forest cover has been removed and drainage has been affected by quarry activities, a disturbed vegetated community occurs. These modified areas either drop abruptly or are level to gently sloping down to the surrounding woodland and are usually mesic or moderately dry and vegetated with a mixture of graminoids (grasses), forbs and scattered shrubs and young trees (Figure 14). One of these modified areas on the east side of the quarry had a small area of wet open marsh habitat (Figure 15) with drainage occurring eastwards. Common species in the marshy area included Broad-leaved Cattail (*Typha latifolia*), Speckled Alder (*Alnus incana*, spp. *rugosa*), Purple-stemmed Aster (*Symphotrichum puniceum*), Balsam Willow (*Salix pyrifolia*) and Soft Rush (*Juncus effusus* s.l.).

In other parts of the disturbed area surrounding the quarry, remnants of wetlands which existed prior to development of the quarry were evidenced by the occurrence of Large Cranberry (*Vaccinium macrocarpon*) in a sphagnum-dominated area; and woodland areas apparently flooded due to diversion of surface flow by quarry berms (see Section 4.2.3) (Figures 16 & 33).



Figure 14. Mesic buffer zone between quarry (on left) and woodland.



Figure 15. Marshy buffer zone between quarry (on left) and woodland.

Much of the quarry expansion area is occupied by mixed and coniferous mesic woodland (woodland with a moderate amount of moisture present in the soil/substrate). Mesic woodland, both mixed (mixture of deciduous and coniferous species) (Figures 17 & 18) and coniferous (Figure 19), occurs primarily in the southeast corner of the survey area and on the lower west side of the property. Mixed woodlands had an overstorey of Balsam Fir (*Abies balsamea*), White Spruce (*Picea glauca*), Red Maple (*Acer rubrum*) and White Birch (*Betula papyrifera*) with occasional Larch (*Larix laricina*) present. Common shrubs included several blueberry species including Lowbush Blueberry (*Vaccinium angustifolium*) and Velvet-leaved Blueberry (*V. myrtilloides*), as well as Lambkill (*Kalmia angustifolia*) and Mountain Holly (*Ilex mucronata*). Common herbaceous species present included Bunchberry (*Cornus canadensis*), Twinflower (*Linnaea borealis*), Cinnamon Fern (*Osmundastrum cinnamomeum*), and Starflower (*Lysimachia borealis*). Common mosses in these woods included Schreber's Red-stemmed Feather Moss (*Pleurozium schreberi*) and Stair Step Moss (*Hylocomium splendens*). The coniferous woodland areas generally were occupied by Balsam Fir, White Spruce, and Larch with limited herbaceous ground cover and similar mosses present as in the mixed woodland. Both habitats described above have scattered to occasional damp pockets of sphagnum moss (*Sphagnum* spp.) (Figure 20). Regenerated coniferous forest (Balsam Fir) occurs on the western margin of the quarry expansion area (Figure 21).



Figure 16. Wet flooded mature woods on edge of disturbed area near northwest quarry berm, June 10, 2019.



Figure 17. Mixed, mesic woodland with both coniferous and deciduous trees present and a variety of herbaceous plant species. Dominant mosses in this habitat include Red-stemmed Feather Moss (*Pleurozium schreberi*) and Stairstep Moss (*Hylocomium splendens*) (R. Newell).



Figure 18. Mixed wood showing paper birch (*Betula papyrifera*) and balsam fir (*Abies balsamea*) with the wood fern *Dryopteris intermedia* (N. Hill).



Figure 19. Mesic coniferous woodland showing general scarcity of herbaceous species on the forest floor with mosses as dominant ground cover (R. Newell).



Figure 20. One of several damp woodland openings north of the current quarry footprint (R. Newell).



Figure 21. Coniferous forest on west side of study area, June 12, 2019.

Open woodland (woodland with scattered openings from which the overstorey has been removed, occurs in several small openings in the northwest section of the quarry expansion area (Figure 22). These openings have conditions ranging from mesic to somewhat boggy or damp. Forest openings may be the result of past disturbance such as localized cutting for hunting purposes to improve sightlines (CRM 2019) or for forest trails. These openings range from relatively dry (mesic) (Figure 22) to somewhat wet or damp (Figure 23 & 24). Common species in the dryer openings include Bracken Fern (*Pteridium aquilinum*), Meadowsweet (*Spiraea alba* var. *latifolia*), Rough Goldenrod (*Solidago rugosa*), Canada Goldenrod (*Solidago canadensis*), Pearly Everlasting (*Anaphalis margaritacea*), Wild Strawberry (*Fragaria virginiana*), Wild Raspberry (*Rubus idaeus*, *R. strigosus*) and patches of reindeer lichen (*Cladonia* spp.). Common species in the damper openings include Sphagnum mosses (*Sphagnum* spp.), Cinnamon Fern (*Osmundastrum cinnamomeum*), New York Fern (*Thelypteris noveboracensis*), Balsam Willow (*Salix pyrifolia*) and Beaked Willow (*Salix bebbiana*).



Figure 22. Mesic woodland opening in woods north of the current quarry (R. Newell).



Figure 23. Species in open wet areas, including the exotic *Ranunculus repens*, reflect disturbance history (N. Hill).

Wet woodlands occur in the vicinity of the unnamed stream, which forms the northeast boundary of the survey area, and scattered throughout the forested area northwest of the quarry (Figures 24 & 25). The woodland in this area showed signs of past disturbance (possibly cutting) as there are wide, heavy vehicle ruts present. Tree species include Red Maple (*Acer rubrum*), Black Spruce (*Picea mariana*), Balsam Fir (*Abies balsamea*), Larch (*Larix laricina*) and several birch species (*Betula* spp.). The substrate is dominated primarily by sphagnum mosses (*Sphagnum* spp.) and numerous ferns. Common herbaceous plants and shrub species present include Cinnamon Fern (*Osmundastrum cinnamomeum*), Interrupted Fern (*Claytonmunda claytoniana*), Sensitive Fern (*Onoclea sensibilis*), Beech Fern (*Phegopteris connectilis*), Lady Fern (*Athyrium filix-femina*), a variety of Wood ferns (*Dryopteris* spp.), Sheep Laurel (*Kalmia angustifolia*), Bunchberry (*Cornus canadensis*), Wood Aster (*Oclemena acuminata*), Wild Sarsaparilla (*Aralia nudicaulis*), sedges (*Carex* spp.), Mountain Holly (*Ilex mucronata*), Woodland Horsetail (*Equisetum sylvaticum*), and Small Enchanter's Nightshade (*Circaea alpina*).



Figure 24. Area of wet woodland occurring in northwest corner of proposed expansion area (R. Newell).



Figure 25. Alder swamp beside the unnamed stream along north side of study area (N. Hill).

4.2.1 AQUATIC ENVIRONMENT

The study area is in the headwaters of the watershed of Gabarus Lake and is bordered on the north by an unnamed first-order stream which flows into Gabarus Lake, about 1 km east (Figures 12 & 13, 26 to 28). The unnamed stream originates west to northwest of the study site (Map A-2) and flows along the northern boundary of the study area, converging east of the quarry site with a second unnamed stream arising in the south, and the combined flow discharges into Gabarus Lake. The stream supports bottom types ranging from gravel to cobble and organic peat and debris, with a high proportion of woody debris, and slow to fast flowing environments, and containing riffles to pools. It is restricted in places by culverted crossings (Figures 26 to 28).



Figure 26. Unnamed stream at WS2, June 11, 2019. For location see Map A-2.



Figure 27. Unnamed stream at Fourchu Road, June 11, 2019.



Figure 28. Unnamed stream upstream of forest road, June 12, 2019.

4.2.2 WATER QUALITY

Surface water quality measured in the unnamed stream (WS1; WS2; and WS3), which flows along the northeast perimeter of the quarry site, as well as in the south tributary (WS4), which joins the unnamed stream below the quarry site were typical of relatively undisturbed natural environments in upper watershed areas of northern Nova Scotia (Map A-2). Site WS4 is in a tributary that combines with the unnamed stream below the quarry site and empties into Gabarus Lake. Site WS4 is not associated with surface water runoff from quarry activities and is considered a reference site with which to compare water quality of the unnamed stream. On the floor of the quarry site is an area of temporary depressions, created by grubbing, which have accumulated surface water to form small ponds (WS5) (Map A-4). These are areas of exposed bedrock previously covered by till where fractures have been blocked by fine till constituents, and all are above the permanent water table. Water quality here also exhibited seasonal characteristics typical of standing shallow water bodies, including the presence of amphibian larvae (e.g. tadpoles).

Surface waters at the site showed moderate to high oxygen levels, slightly acidic conditions characteristic of headwaters, low conductivities, and generally low suspended sediment levels. The sampling on June 11 was conducted after a rainfall event, and all locations with the exception of the reference Site WS4 had TSS levels less than 10 mg/L (Table 1). The elevated suspended sediment of 84.5 mg/L at WS4 showed the influence of surface runoff from Grand Mira Gabarus Road which runs along the stream at the site and forest clearing in upstream areas nearby. WS4 is a reference site and is not influenced by the quarry (Map A-2). Water quality measurements for pH and dissolved oxygen levels were within guideline ranges for the protection of freshwater aquatic life for downstream sites WS2 and WS3 (CCME 1999)(Table 1).

**Table 1. Water quality measurements from streams in the vicinity of Gabarus Quarry.
Site locations shown in Map A-2.**

Site Location & Date	June 11, 2019				
	WS1	WS2	WS3	WS4	WS5
Site Description	Unnamed stream	Unnamed stream	Unnamed stream	Tributary Reference Site	Surface Water (grubbed area)
Temperature °C	9.9	8.0	7.9	8.6	16.6
Dissolved Oxygen (mg/L)	4.0	8.0	8.7	8.2	5.9
Dissolved Oxygen (% saturation)	35.9	67.2	73.6	81.8	61.2
Conductivity (µs/cm)	23.9	22.2	30.3	18.3	40.5
Specific Conductivity (25°) (µs/cm)	33.6	32.8	44.5	26.7	48.2
pH	6.1	6.1	6.6	6.2	7.0
TSS (mg/L)	2.0	4.5	9.5	84.5	12.0
Sample Time	11:50 AM	10:35 AM	10:10 AM	9:10 AM	9:38 AM

Note: TSS = Total Suspended Solids. WS4 is in a tributary of Unnamed stream. WS5 is a pond.

4.2.3 WETLANDS

The proposed expansion area for the Gabarus Quarry impinges on several wetlands, including several areas which are artificially 'wet' as a result of rutting from previous cutting in the area and impacts of the quarry on surface drainage patterns. Level to gradual slopes in places coupled with poor drainage, in particular in the extreme northwest section of the study area, have resulted in the occurrence of flat and slope swamps, which join wetlands occurring along the unnamed stream (Figure 29). In these areas the upper, flat swamps form where the topography is more level, with slope swamps forming on increasingly-sloping land surfaces. Wetlands are summarized in Figure 29 and Table 2. Land at the quarry is presumed, prior to construction, to have been level to gradually sloping with a shallow depth to bedrock, possibly supporting wetlands through imperfect surface drainage through the bedrock. Historic impacts to wetlands were caused by development of the quarry prior to Dexter Operations. Remnants of the earlier pre-construction wetlands take the form of small swamps and marshy areas in the cutover marginal areas of the quarry (e.g. Figure 15). Wetlands within the study area include fen (low stature vegetation on flowing peatland) and swamps (shrub- or tree-dominated) draining toward a northern boundary stream (WL1)(Figures 29 to 35)(Appendix B). Most of these wetlands have a layer of peat from *Sphagnum* moss species (e.g. *S. magellanicum*, *S. rubellum*, *S. girgensohnii*) and a clear demarcation from upland areas based on soil cores. The treed swamps were either yellow birch slope swamps with balsam fir understorey or were dominated by black spruce and tamarack (larch). In the riparian area next to the stream, treed swamps give way to alder shrub swamps dominated by *Alnus incana* but featured herbs including Meadow Rue (*Thalictrum pubescens*), Lady Fern (*Athyrium felix-femina*), Water Avens (*Geum rivale*), and Manna grasses (*Glyceria canadensis* and *G. striata*). Fens—open peatlands with water flowing through the surface layer—were *Sphagnum*-dominated and these supported small sedges (*Carex trisperma*, *C. echinata*, *C. magellanicum*, and *Eriophorum virginicum*), grasses (e.g. *Glyceria* spp.), and forbs (*Geum rivale*, *Rubus pubescens*, *Viola* spp., *Lycopus uniflorus*, *Maianthemum trifolium*, *Iris versicolor*, and *Galium* spp.) (Appendix B).

A remnant treed sphagnum swamp influenced by ground and/or surface water flows (WL2, Figure 29), occurs on the disturbed margin of north edge of the quarry with species including Large Cranberry (*Vaccinium macrocarpon*) as well as dominant *Sphagnum* species (Figures 29 & 30). WL3 near the northeast corner of the existing quarry, is a disturbed marsh and fen wetland supporting a diverse plant community that included species typical of disturbance (e.g. *Juncus effusus*, *Juncus brevicaudatus*, *Carex nigra*, *Equisetum arevense*, *Tussilago farfara*) but also native wetland species. The presence of *Carex flava* as well as the orchid *Platanthera aquilonis* indicates that these wetlands are calcium-rich.

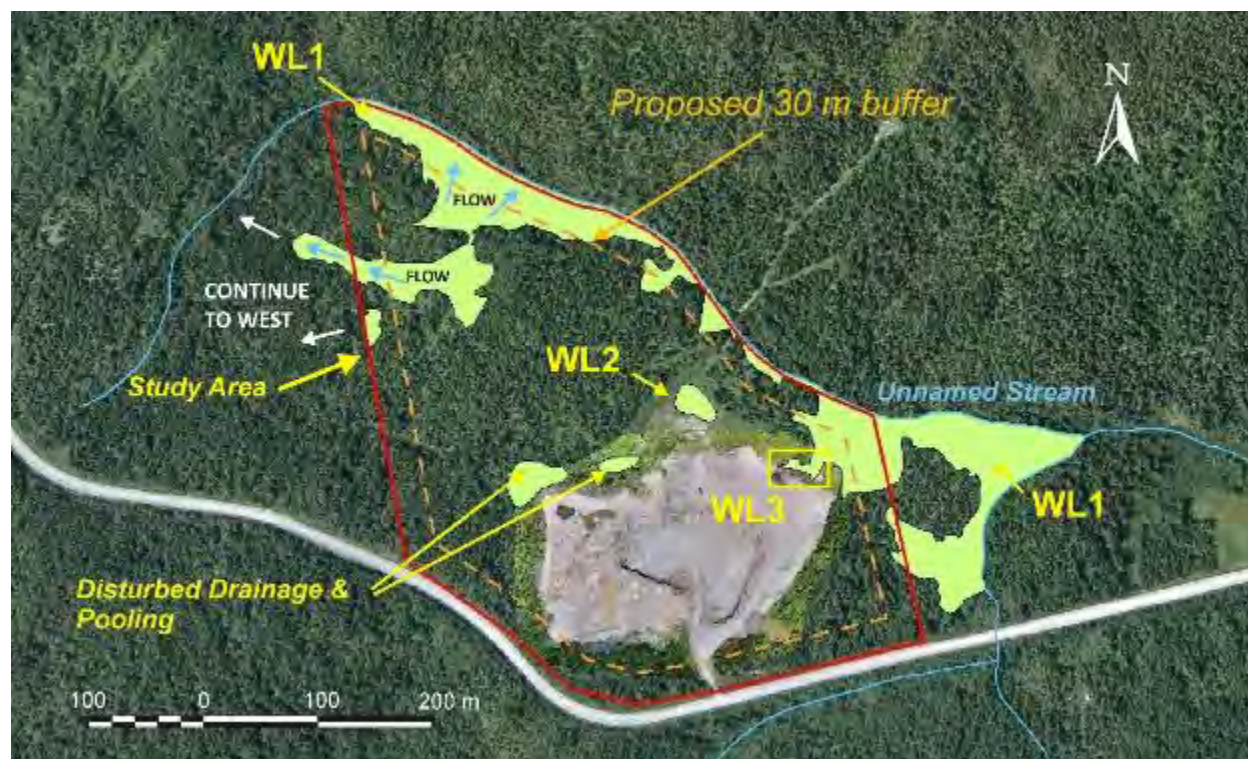


Figure 29. Wetlands (WL) in proposed expansion area, Gabarus Quarry.

Table 2. Wetlands, Gabarus Quarry Expansion. Locations shown in Figure 29. Approximate boundaries and surface area which occurs within the study area.

Identification	Area (ha)	Wetland Type and Comments
WL1	2.61	Fen / Riparian Swamp / Slope Swamp/ Flat Swamp Complex
WL2	0.09	Remnant Sphagnum Swamp
WL3	0.04	Disturbed Marsh / Open Marsh to Fen



Figure 30. Remnant treed sphagnum swamp on northeast edge of Gabarus Quarry, June 10, 2019.



Figure 31. Flat swamp/fen along unnamed stream at northwestern extent of study area, June 12, 2019.



Figure 32. Small intermittently wet *Sphagnum* patch in woods north of Gabarus Quarry, June 11, 2019.



Figure 33. (Left) Transition from dry woods to riparian swamp along north margin of study area. (Right) Temporary ponds arising from intermittent flooding in woods north of quarry, June 11, 2019.

4.2.4 FISH & FISH HABITAT

Streams or other surface waters which could support fish, occur along the northern boundary and southeast of the EA study area. Both surface and groundwater discharge originating from the quarry may contribute to flows in the unnamed stream north of the site and in a tributary that passes the quarry to the south, but there are no direct surface water connections from the quarry to these areas. Streams in the area form from a combination of groundwater and precipitation, and because they form in upper watershed areas can be seasonally intermittent. The unnamed stream passing along the northeastern margin of the study area potentially provides habitat for fish. Sampling during the current study found Brook Trout (*Salvelinus fontinalis*) at several locations (WS3 & WS4, Map A-2)³ and immediate upstream areas are passible by fish but there are no lakes or other surface waters upstream of the site which could be used by migratory species. The stream potentially provides acceptable nursery habitat for salmonids, and could contain juveniles of various species which occur in the Gabarus Lake area, including Brook Trout,

3 Two 8-10 cm and one 12- 14 cm brook trout were captured in the Unnamed stream after a 23-hr set of a minnow trap on June 11-12, 2019.

Rainbow Trout and Brown Trout; including Atlantic salmon (*Salmo salar*); Rainbow Smelt; Sticklebacks (Three-spine, Four-spine and Nine-spine); and American Eel. Gabarus Lake supports landlocked salmon also known as *ouananiche* (NS Anglers Handbook 2018). Occurrence of landlocked salmon is uncommon in Nova Scotia and in other Eastern Canadian provinces. Individuals never leave freshwater and are smaller than salmon which spend part of their lives at sea. Other species such as Alewife, Striped Bass and Atlantic Sturgeon have been observed in the general area (ACDC, 2018), but are more likely to occur in water bodies such as Gabarus Lake and Belfry Lake downstream and in the Mira River. Chain Pickerel, a widespread invasive in Nova Scotia, have not invaded the Gabarus Lake system, according to locals. The Mira River system (to the northwest of the quarry site and not connected with it), has recorded Lake Whitefish (*Coregonus clupeaformis*), and Atlantic salmon (COSEWIC listed as Endangered from the Eastern Cape Breton population), for both of which special restrictions (regarding water quality and habitat maintenance) would apply (S. Weseloh-McKeane, Nova Scotia Museum, 2018).

4.2.5 BIRDS

Birds are an important component of the ecosystem in the vicinity of the Gabarus Quarry. One hundred sixteen species of birds have been recorded as potentially breeding in the study area (Maritimes Breeding Bird Atlas 2019, Eastern Cape Breton Island Region 25, Table 4), but additional species may breed at the site from time to time. Olive-sided Flycatcher, a rare species in Nova Scotia (listed federally and provincially as *Threatened*) favours open swampy mature softwood and an individual was heard in woods northeast of the study area (see Map A-2, Site 7). Boreal Chickadee, which is also uncommon and whose numbers are regionally declining, was heard at all sites. Yellow-bellied Flycatcher and Black-backed Woodpecker, both species with sensitive status, were present during bird survey. Two Important Bird and Biodiversity (IBA) Areas (NS047 Rocks off Fourchu Island and NS049 Harbour Rocks (Gabarus Bay) occur approximately 10 km southeast and northeast respectively)⁴.

Habitat types in and around the study site include regenerated softwood (Balsam Fir, White Spruce and Larch) in the southwest corner; and mixed forest. Surveys at the site included: a site walkover on June 24, 2019; a night owl survey on June 23, 2019; and ten-minute dawn point count surveys at seven sites on June 25, 2017 (Map A-2). A single Long-eared Owl was heard at the site during the owl survey. Three Wilson's Snipe and an American Woodcock were also heard during the night observations. The June point-count survey documented 35 species (Table 3). Gabarus Lake currently supports nesting pairs of Common Loon and Canada Geese (A.M. MacLean, local resident, personal communication 2019).

The most common and abundant species at the site observed in the point-count survey were: Alder Flycatcher, Magnolia Warbler, American Robin, Red-eyed Vireo, Hermit Thrush, Common Yellowthroat, Yellow-bellied Flycatcher, and Boreal Chickadee which occurred in all habitat types (Table 3); while Swainson's Thrush, Black-capped Chickadee, Ruby-crowned Kinglet, American Redstart, and American Crow were also relatively abundant (Table 3). Most species (27-29) occurred in sites associated with mixed forest, where the dominant species (most common and abundant) included Alder Flycatcher, Magnolia

⁴ The *Important Birdlife and Biodiversity Areas Program Canada* (IBA) is a joint project of Bird Studies Canada and Nature Canada coordinated by BirdLife International.

Warbler, American Robin, Red-eyed Vireo, Dark-eyed Junco, Black-capped Chickadee, and Swainson's thrush (Table 3).

Relatively high abundances of several species, but lowest number of species overall were observed in the regenerated softwood area (14 species)(Table 4, and Site 4, Map A-2)), where important species included Alder Flycatcher, Magnolia Warbler, American Robin, Hermit Thrush, Mourning Warbler, White-throated Sparrow and Red-eyed Vireo (Table 4). All birds were expected based on the Maritimes Breeding Bird Atlas (2019) records for the area.

Table 3. Bird species heard or observed during dawn point count bird survey conducted June 25, 2019 between 0520 and 0725 hrs at the Gabarus Quarry study site. For locations, see Map A-2.						
Bird Species	Regenerated Softwood (Site 4)		Mixed Forest – South (Sites 5 & 10)		Mixed Forest – Northwest (Sites 1-3 & 7)	
	Number of sites	Average/10 mins	Number of sites	Average/10 mins	Number of sites	Average/ 10 mins
Passeriformes						
Alder Flycatcher	1	20.0	2	8.0	3	2.75
American Crow	0	0.0	1	2.0	3	1.25
American Goldfinch	0	0.0	1	1.0	1	0.25
American Redstart	0	0.0	2	8.0	2	1.75
American Robin	1	15.0	2	5.5	4	2.25
Bay-breasted Warbler	0	0.0	1	0.5	1	0.25
Black-capped Chickadee	0	0.0	2	4.0	2	3.00
Blue-headed Vireo	0	0.0	1	0.5	3	2.25
Blue-winged Warbler	0	0.0	2	1.5	0	0.00
Boreal Chickadee	1	1.0	1	1.0	3	2.75
Blue-throated Green Warbler	0	0.0	1	1.0	1	2.50
Cedar Waxwing	0	0.0	1	0.5	0	0.00
Common Loon	0	0.0	0	0.0	1	0.50
Common Yellowthroat	1	2.0	1	1.5	4	2.00
Dark-eyed Junco	0	0.0	2	5.0	0	0.00
Golden-crowned Kinglet	0	0.0	1	0.5	1	0.25
Hermit Thrush	1	10.0	1	2.0	4	3.00
Lincoln's Sparrow	0	0.0	0	0.0	2	0.75
Magnolia Warbler	1	20.0	2	5.5	4	7.75
Mourning Warbler	1	7.0	1	2.5	1	0.25
Northern Parula Warbler	0	0.0	2	1.5	0	0.00
Olive-Sided Flycatcher	0	0.0	0	0.0	1	0.25
Red-breasted Nuthatch	0	0.0	2	1.5	1	0.75
Red-eyed Vireo	1	5.0	2	2.0	4	3.50
Ruby-crowned Kinglet	0	0.0	1	2.0	3	3.00
Song Sparrow	1	1.0	0	0.0	1	0.25
Swainson's Thrush	0	0.0	2	3.5	3	6.75

Table 3. Bird species heard or observed during dawn point count bird survey conducted June 25, 2019 between 0520 and 0725 hrs at the Gabarus Quarry study site. For locations, see Map A-2.						
Bird Species	Regenerated Softwood (Site 4)		Mixed Forest – South (Sites 5 & 10)		Mixed Forest – Northwest (Sites 1-3 & 7)	
	Number of sites	Average/10 mins	Number of sites	Average/10 mins	Number of sites	Average/ 10 mins
White-throated Sparrow	1	6.0	0	0.0	3	0.75
Yellow-bellied Flycatcher	1	2.0	1	0.5	3	4.50
Yellow-rumped Warbler	1	1.0	0	0.0	3	1.00
Charadriiformes						
American Woodcock	1	1.0	0	0.0	0	0.00
Wilson's Snipe	1	1.0	1	0.5	2	0.75
Piciformes						
Hairy Woodpecker	0	0.0	1	0.5	0	0.00
Northern Flicker	0	0.0	1	1.0	1	0.50
Falconiformes						
Sharp-shinned Hawk	0	0.0	0	0.0	1	0.25
SUMMARY						
AVERAGE ABUNDANCE PER SITE	92.0		63.5		55.8	
TOTAL SPECIES IN HABITAT	14		27		29	
AVERAGE NUMBER OF SPECIES PER SITE	14		18.5		16.5	

Table 4. Birds potentially breeding in the Gabarus Lake Area of the Cape Breton Regional Municipality, Cape Breton Island (Maritime Breeding Bird Atlas-Online 2019).	
Swans, Geese & Ducks (Anseriformes: Anatidae)	
Canada Goose	Green-winged Teal
Wood Duck	Ring-necked Duck
American Wigeon ‡	Common Eider §
American Black Duck	Common Goldeneye ‡
Mallard	Hooded Merganser ‡
Mallard x Am. Black Duck	Common Merganser
Blue-winged Teal	Red-breast Merganser
Northern Pintail ‡	
Pheasants, Grouse and Turkeys (Galliformes, Phasianidae)	
Ruffed Grouse	Ring-necked Pheasant
Spruce Grouse	
Loons and Grebes (Gaviidae and Podicipedidae)	
Common Loon	Pied-billed Grebe ‡
Storm-Petrels, Cormorants, Wading Birds (Hydrobatidae, Phalacrocoracidae, Ardeidae)	
Leach's Storm-Petrel ‡§	American Bittern
Double-crest Cormorant §	Great Blue Heron §
Great Cormorant ‡§	
Hawks & Falcons (Falconiformes: Accipitridae, Falconidae)	
Osprey	Broad-winged Hawk
Bald Eagle ✕	Red-tailed Hawk
Northern Harrier	American Kestrel
Sharp-shinned Hawk	Merlin
Northern Goshawk	
Rails (Gruiformes, Rallidae)	
Sora	
Shorebirds	
Sandpipers & Snipes (Charadriiformes, Scolopacidae)	
Piping Plover †	Willet
Killdeer	Wilson's Snipe
Spotted Sandpiper	American Woodcock
Greater Yellowlegs †	
Gulls, Terns, Kittiwake (Charadriiformes, Laridae)	
Black-legged Kittiwake ‡§	Common Tern §
Herring Gull §	Arctic Tern ‡§
Great Black-backed Gull §	
Auks, Murres, Puffins (Charadriiformes, Alcidae)	
Razorbill ‡§	Atlantic Puffin ‡§
Black Guillemot §	
Pigeons & Doves (Columbiformes: Columbidae)	
Rock Pigeon	Mourning Dove
Owls (Strigiformes)	
Great Horned Owl	Boreal Owl †
Barred Owl	North Saw-whet Owl
Short-eared Owl †	
Swifts (Apodiformes, Apodidae) and Hummingbirds (Apodiformes, Trochilidae)	
Common Nighthawk †	Ruby-throated Hummingbird
Chimney Swift †	
Kingfishers (Coraciiformes, Alcedinidae)	
Belted Kingfisher	

Table 4. Birds potentially breeding in the Gabarus Lake Area of the Cape Breton Regional Municipality, Cape Breton Island (Maritime Breeding Bird Atlas-Online 2019).

Woodpeckers (Order Piciformes, Picidae)	
Yellow-bellied Sapsucker	Black-back Woodpecker
Downy Woodpecker	Northern Flicker
Hairy Woodpecker	Pileated Woodpecker
Songbirds (Passeriformes)	
Olive-sided Flycatcher †	Common Yellowthroat
Eastern Wood-Pewee	American Redstart
Yellow-bellied Flycatcher	Cape May Warbler ‡
Alder Flycatcher	Northern Parula
Least Flycatcher	Magnolia Warbler
Eastern Phoebe ‡	Bay-breasted Warbler
Eastern Kingbird	Blackburnian Warbler
Blue-headed Vireo	Yellow Warbler
Philadelphia Vireo ‡	Chestnut-sided Warbler
Red-eyed Vireo	Blackpoll Warbler
Gray Jay	Black-throated Blue Warbler
Blue Jay	Palm Warbler
American Crow	Yellow-rumped Warbler
Common Raven	Black-throated Green Warbler
Tree Swallow	Canada Warbler †
Bank Swallow §	Wilson's Warbler
Cliff Swallow §	Chipping Sparrow
Barn Swallow	Savannah Sparrow
Black-capped Chickadee	Nelson's Sh.-tail Sparrow
Boreal Chickadee	Fox Sparrow
Red-breast Nuthatch	Song Sparrow
White-breast Nuthatch	Lincoln's Sparrow
Brown Creeper	Swamp Sparrow
Winter Wren	White-throat Sparrow
Golden-crown Kinglet	Dark-eyed Junco
Ruby-crown Kinglet	Rose-breast Grosbeak
Eastern Bluebird †	Bobolink
Veery	Red-wing Blackbird
Bicknell's Thrush †	Rusty Blackbird †
Swainson's Thrush	Common Grackle
Hermit Thrush	Brown-head Cowbird ‡
American Robin	Pine Grosbeak
Gray Catbird	Purple Finch
Northern Mockingbird †	Red Crossbill †
European Starling	Pine Siskin
Cedar Waxwing	American Goldfinch
Ovenbird	Evening Grosbeak
North Waterthrush	House Sparrow
Black-white Warbler	White-winged Crossbill
Tennessee Warbler	American Goldfinch
Nashville Warbler	Evening Grosbeak
Mourning Warbler	House Sparrow

This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #25 (East Cape Breton Island).

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 2/07/2019. 20 QR17 & 20QR18

4.2.6 MAMMALS

Various large and small mammal species, including game and furbearing species, are found in Cape Breton Regional Municipality and may occur at the quarry site. Mammals expected to occur regularly or occasionally reflect the communities typical of the dominant terrestrial habitat in the surrounding area, which includes coniferous and mixed forest. White-tailed Deer, Snowshoe Hare, and Eastern Coyote occur in the general vicinity of the quarry, and occasional scat and sign were observed at the site on June 11 - 12, 2019. Moose and Canada Lynx (the latter provincially listed as Endangered) are known to occur in the general area of the study site. Other species likely to occur in the general area include carnivores such as American Fisher; as well as rodents and small mammals including lemmings (Southern Bog Lemming), voles (Rock Vole), shrews (Long-tailed Shrew, a species designated federally as Special Concern), and bats (Little Brown Myotis) (ACCDC, 2018). Of these species, Rock Vole occur in upland areas in western Cape Breton but are sparsely distributed elsewhere within Nova Scotia. Little Brown Myotis and Northern Myotis (both are federally and provincially listed as Endangered) occur in the area (S. Weseloh-McKeane, Nova Scotia Museum, 2019). Bat populations are diminished at present due to the White Nose Syndrome in North America.

4.2.7 REPTILES AND AMPHIBIANS

Some of the common Nova Scotian amphibians and reptiles are expected to occur at the site although there is little open water habitat present. The unnamed stream and adjacent riparian area that runs along the northern border of the study area is likely to support amphibian species such as Leopard Frog, Wood Frog, Green Frog, Pickerel Frog, American Toad, Spring Peeper and salamanders (e.g. Red-spotted newt, Eastern Redback Salamander, Yellow-spotted Salamander); and an uncommon species, Four-toed Salamander has been found on Cape Breton Island (Gilhen 1984)). Tadpoles were observed in pools on the upper north and northwest quarry site. Lands around the quarry will support snakes, including the Maritime Garter Snake, seen during June 11- 12, 2019 site visits. Northern Redbelly Snake, Northern Ringneck Snake, and Eastern Smooth Green Snake also may occur in the general area (Gilhen 1984); all have all been recorded elsewhere in Cape Breton (Parks Canada 2019). Habitat is not present at the site for species of conservation concern such as Wood Turtle or Snapping Turtle, although the latter, which is a federally and provincially listed species (Special Concern and Vulnerable, respectively), has been observed recently nesting in the Mira River watershed (S. Weseloh-McKeane, Nova Scotia Museum, 2019).

4.2.8 SPECIES AT RISK

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*. A third status list is the *Nova Scotia General Status of Wild Species*, which is a provincial system used as a "first-alert tool" for identifying and prioritizing species potentially at-risk and does not provide legal protection. General status rankings are assigned by a provincial General Status Species Assessment process based on expert scientific evaluation of a set of criteria. Species listed as "Red" (any species known to be, or believed to be, at risk),

and “Yellow” (any species known to be, or believed to be, particularly sensitive to human activities or natural events) are considered priority species. Species that may be at risk of extirpation or extinction are candidates for a detailed risk assessment by COSEWIC, or provincial or territorial equivalents.

Species of conservation concern listed under federal or provincial legislation as well as with general status that occur within five kilometres of the Gabarus Quarry study site include both animals and plants (Table 5). There are no animals *per se* of particular conservation concern in the study area, however, Canada Lynx and American Marten, which are currently listed as “Endangered” under the NS Endangered Species Act, are of concern due to low numbers and may occasionally occur. Bird species of particular conservation concern occurring within 5 km of the Quarry include: Canada Warbler and Barn Swallow (both listed under the federal *Species at Risk* and provincial *Endangered Species* acts as Threatened and Endangered, respectively); and Olive-sided Flycatcher (listed federally and provincially as Threatened) (ACCDC 2018). Potential breeding of Olive-sided Flycatcher was identified in the northeast part of the study site. Plant species of concern reported within five kilometers of the study area includes, the New Jersey Rush (*Juncus Caesariensis*), listed federally as Special Concern and provincially as Vulnerable (ACCDC 2018).

Suitable habitat for both Canada Warbler and Olive-Sided Flycatcher typically are found on the site. Canada Warbler prefers wetland habitats, including treed and shrubby grassy swamps around bog/fen wetlands; and Olive-Sided Flycatcher is found in treed (black spruce) sphagnum bogs. Olive-sided Flycatcher, in particular, was heard in woods northeast of the site during the spring bird survey on June 24 – 25, 2019. Canada Warbler was not observed during survey visits, but the habitat is suitable (F. Lavender, personal communication, 2019). Open areas such as fields and ponds are typical habitat for Barn Swallow, none of which occur at the site. There are records of nesting or potential nesting in the general area for Barn Swallow, Canada Warbler, Olive-sided Flycatcher, Bobolink, and Common Nighthawk (S. Weseloh-McKeane, Nova Scotia Museum, 2019).

Other animals of conservation concern potentially occurring at the site include Little Brown Myotis and Northern Myotis (both are federally and provincially listed as Endangered) (S. Weseloh-McKeane, Nova Scotia Museum, 2019). Neither of these animals are documented within a 5 km radius of the study site (ACCDC, 2018).

Botany surveys of the site did not detect any plant species of conservation concern. One federally- and provincially-listed plant species of concern—the New Jersey Rush—has been reported within five kilometres of the study area (ACCDC 2018). Two other plant species, Peppered Moon Lichen (*Sticta fuliginosa*) and Moor Rush (*Juncus stygius* spp. *americanus*), both with a general status within Nova Scotia as Sensitive (Yellow), also potentially occur, having been found within 5 km of the study area (Table 6) (ACCDC 2018). None of these species were noted during the spring and fall botany surveys of the study area (Appendix B). A list of plants and animals of concern within a 100-kilometer radius of the study site is included in Appendix C.

Boreal Felt Lichen, a rare species in Nova Scotia, may occur in forested habitats in the Gabarus Lake area, but none have been found there, and no suitable modeled habitat occurs within 1 km of the site (Figure 34).



Figure 34. Modeled areas of forest habitat (areas in brown northwest of the Gabarus Quarry) suitable for Boreal Felt Lichen (*Erioderma pedicellatum*), 2018. Mapping courtesy of Brad Thoms, Mersey Tobeatic Research Centre, Kempt, Queens County, Nova Scotia.

Table 5. Records of species of concern within a 5 km radius of Gabarus Quarry, Cape Breton County. Atlantic Canada Conservation Data Centre (ACCDC) Database, December 2018.								
Family/Scientific Name	Common Name	Status/Rank					General Status of Wild Species Rankings ³	AC CDC ⁴ Rankings (GRANK, SRANK ⁵)
		SARA	COSEWIC (NPROT ¹)	NS ESA (SPROT ²)				
FLORA								
Juncaceae	<i>Juncus caesariensis</i>	New Jersey Rush	Special Concern	Special Concern	Vulnerable	3 Sensitive	G2G3, S2	
	<i>Juncus stygius ssp. americanus</i>	Moor Rush	-	-	-	3 Sensitive	G5T5, S2	
Lobariaceae	<i>Sticta fuliginosa</i>	Peppered Moon Lichen	-	-	-	3 Sensitive	G3G5, S3	
Schizaeaceae	<i>Schizaea pusilla</i>	Little Curlygrass Fern	-	-	-	4 Secure	G3G4, S3S4	
ANIMALS-BIRDS								
Ardeidae	<i>Botaurus lentiginosus</i>	American Bittern	-	-	-	3 Sensitive	G4, S3S4B	
Corvidae	<i>Perisoreus canadensis</i>	Gray Jay	-	-	-	3 Sensitive	G5, S3	
Falconidae	<i>Falco sparverius</i>	American Kestrel	-	-	-	4 Secure	G5, S3B	
Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Endangered	1 At Risk	G5, S2S3B	
Laridae	<i>Sterna hirundo</i>	Common Tern	-	Not at Risk	-	3 Sensitive	G5, S3B	
Paridae	<i>Poecile hudsonica</i>	Boreal Chickadee	-	-	-	3 Sensitive	G5, S3	
Parulidae	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	1 At Risk	G5, S3B	
Regulidae	<i>Regulus calendula</i>	Ruby-crowned Kinglet	-	-	-	3 Sensitive	G5, S3S4B	
Scolopacidae	<i>Gallinago delicata</i>	Wilson's Snipe	-	-	-	3 Sensitive	G5, S3B	
	<i>Actitis macularius</i>	Spotted Sandpiper	-	-	-	3 Sensitive	G5, S3S4B	
Sittidae	<i>Sitta canadensis</i>	Red-breasted Nuthatch	-	-	-	4 Secure	G5, S3	
Turdidae	<i>Catharus ustulatus</i>	Swainson's Thrush	-	-	-	4 Secure	G5, S3S4B	
	<i>Catharus fuscescens</i>	Veery	-	-	-	4 Secure	G5, S3S4B	
Tyrannidae	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	-	-	-	3 Sensitive	G5, S3S4B	
	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Special Concern	Threatened	1 At Risk	G4, S2B	
Other								
Clupeidae	<i>Alosa pseudoharengus</i>	Alewife	-	-	-	3 Sensitive	G5, S3	
Margaritiferidae	<i>Margaritifera</i>	Eastern Pearlshell	-	-	-	3 Sensitive	G4, S2	
Salmonidae	<i>Salmo salar</i>	Atlantic Salmon	-	-	-	2 May Be at Risk	G5, S1	
	<i>Salvelinus fontinalis</i>	Brook Trout	-	-	-	3 Sensitive	G5, S3	
<p>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.</p>								

Table 5. Records of species of concern within a 5 km radius of Gabarus Quarry, Cape Breton County. Atlantic Canada Conservation Data Centre (ACCDC) Database, December 2018.

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. General Status of Wild Species Rank listed for Nova Scotia: 0.2=Extinct (Blue); 0.1=Extirpated (Purple); 1=At Risk (Red); 2=May be at Risk (Orange); 3=Sensitive (Yellow); 4=Secure (Green); 5=Undetermined (light grey); 6=Not Assessed (dark grey); 7=Exotic (Black); 8=Accidental (Aqua).

4. Atlantic Canada Conservation Data Centre (ACCDC).

5.

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.

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 of 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.

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).

Table 5. Records of species of concern within a 5 km radius of Gabarus Quarry, Cape Breton County. Atlantic Canada Conservation Data Centre (ACCDC) Database, December 2018.

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.
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.

4.2.9 NATURAL AREAS & WILDERNESS

The Gabarus Lake area of Eastern Cape Breton Island is a relatively remote location in Nova Scotia. Situated near the southeastern coast, the area has a relatively high proportion of wilderness and natural areas both inland and along its largely untouched coast. A low population density is spread along a few major travel routes, connecting it with Marion Bridge on the north and the coastal fishing communities of Gabarus and Fourchu on the northeast and southeast respectively, some 10 km distant. Although settlement and consequent agricultural expansion and logging in the past changed the character of the landscape, much of the land has returned to forest in most areas, although logging activity is currently taking place in a recent stage of forest harvesting. A high proportion of Crown Land in the area has been devoted to protected and managed wildlife areas, leaving many natural and untouched areas. Gabarus Wilderness Area and Fourchu Coast Wilderness area have been set aside not far from the study site to represent these wild coastal ecosystems. In addition to preservation for wildlife, hunting and outdoor recreation are important experiences of locals and visitors to the area. People living in these areas are exposed to the natural environment day-to-day and appreciate the presence of, and access to, undeveloped land and nature, while accepting the usual activities needed to use the resources (e.g. aggregate quarries, forestry operations) on which many of them depend for their livelihood.

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 consult with the Mi'kmaq concerning their activities. Dexter Construction has contacted First Nations representatives concerning the present Gabarus Quarry expansion project. The study area is in what was once the Mi'kmaw territory known as *Unama'kik*. Streams, lakes and wetlands, and in particular coastal embayment's and waters of this area would have provided hunting and transportation opportunities for the Mi'kmaq, their ancestors and predecessors prior to the arrival of European settlers; however, no archaeological evidence of earlier Mi'kmaq occupation in the area has been found in the immediate vicinity of the quarry. There are no registered Mi'kmaq archaeological sites within or surrounding the study area perimeter, and the vicinity of the quarry is considered to have low potential for precontact and early historic archaeological resources due to the absence of findings and the low and wet landscape (Cultural Resource Management Group (CRM), 2019). Several registered archeological sites representing Mi'kmaq fishing camps are located approximately 6 kilometers southeast of the study area along Belfry Beach, at the head of Fourchu Bay. The Mira River would have also been a historically important area as a resource base and transportation route (Cultural Resource Management Group (CRM), 2019). Presently, no significant Mi'kmaq cultural activities occur in or around the study area although traditional fishing and hunting continues in the general area of Gabarus Lake.

Many of Nova Scotia's Mi'kmaq reside in Cape Breton and access lands throughout the region for various uses such as hunting and fishing, as well as traditional ceremonial activities. The nearest First Nations communities to the study area are Eskasoni, situated in Cape Breton County along the eastern side of the Bras d'Or Lakes about 32 km west of the study area, as the crow flies; and Membertou First Nation, located in Cape Breton Regional Municipality near Sydney, about 34 km north, as the crow flies. Five of the thirteen Nova Scotian First Nations are located on Cape Breton Island.

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 people living off reserve. The NCNS is a self-governing agency located in Truro. The 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 represent 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 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, Sipekne'katik (Indian Brook) can 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

Gabarus Lake is located in the Cape Breton Regional Municipality (CBRM), the municipal unit occupying the north eastern region of Cape Breton Island. CBRM is the second largest municipality in Nova Scotia, with a population of approximately 94,285, and has been declining over the past several decades, dropping 3.2% between 2016 and 2011 (Statistics Canada, 2016). Over three quarters of the Island's population reside in the CBRM. The main population centres in CBRM are Sydney (population 29,904 (2011)), Sydney Mines (population 14,135 (2011)), and Glace Bay (population 19,100 (2011)). Sydney is the largest population centre, located approximately 43.5 km north of Gabarus Lake. Despite a relatively diverse industrial economy, the CBRM has an unemployment rate of 13.7% (Statistics Canada, 2017).

Traditionally, the main industry in the CBRM was coal and industrial mining. From the mid-1960s to early 2000, the coal and steel industries were phased out. Today, fishing, forestry, and tourism are the primary industries, along with education, health care, and other business and support services. Tourism has become an important local industry in recent years with attractions such as the Cabot Trail, Cape Breton Highlands National Park, Bras d'Or Lakes, and the Fortress of Louisbourg (Parks Canada) contributing to Cape Breton Island being named as a top island destination in North American by a leading American industry magazine (Travel and Leisure, 2016). The CBRM has benefited from growing culinary, boutique

accommodation, and cruise ship (Port of Sydney) businesses as well as increased infrastructure development.

The Fourchu Road is a scenic highway (*Fleur-de-lis Trail*) that passes through Fourchu and Gabarus Lake and connects to the Gabarus Highway (Route 327), which leads to the coastal fishing community of Gabarus. Visitors reach Marion Bridge along Hwy 327 to make a highway connection the Fortress of Louisbourg⁵. Visitors to the area utilize recreational and scenic features including coastal and wooded hiking trails, cobble and sandy beaches, Gabarus Lake sport fishing, and paddling and boating opportunities. Local businesses in the general area include cottage rentals, bed & breakfasts, privately owned campgrounds and RV resorts, a Gabarus Community Center/Fire Hall and Canada Post outlet.

4.3.3 WATER SUPPLY AND RESIDENTIAL WELLS

Both drilled and dug wells are used as drinking water sources in the Gabarus Lake area. Two homes, which would use groundwater wells, are located within 1 km of the study area, including one of which is a drilled well belonging to the residents of 769 Grand Mira Gabarus Road. Dexter Construction has a blasting waiver agreement with both. There are no municipal water supplies in the area.

4.3.4 LAND USE

Land in the vicinity of the quarry is predominantly wilderness and undeveloped forest land, with rural residential use concentrated along the Fourchu Road (*Fleur-de-lis Trail*) and in the coastal communities of Gabarus Lake, and Gabarus to the east. A handful of residences are also located along Grand Mira Gabarus Road. Limited forestry and commercial use (e.g. quarries) as well as residences, small woodlots, and home-operated businesses are found nearby. Travel routes are used by tourists and outdoor recreational enthusiasts. Hunting, trapping and commercial fishing based in Gabarus are important local activities. Land ownership in the vicinity is a mix of privately-owned land and Crown land in the general vicinity (Map A-3).

4.3.5 HUNTING AND TRAPPING

The Gabarus quarry site supports many of the common game and fur-bearing species characteristic of Nova Scotia in general, including some less common fur-bearing species, such as Canada Lynx and American Marten. Some hunting or trapping activity may take place in the general vicinity of the site, although trapping statistics indicate that the CBRM has a small harvest of most species. White-tail Deer are common, although the county typically ranks among the lowest for deer harvest by county, as it does for Black Bear, in Nova Scotia. The main furbearers trapped in the five-year period (2014 to 2018) were beaver, muskrat, otter, and fox. No lynx, marten, or fisher were reported trapped. Snowshoe Hare, Ruffed Grouse, and Ring-Necked Pheasant are the commonly hunted upland game (Table 6). Moose are an important contributor to the hunting economy both for Mi'kmaq and for non-natives in Cape Breton, however the eastern region of Cape Breton, including Cape Breton County, is not zoned for moose hunting.

⁵ A direct coastal road connection between Gabarus and Louisbourg through Oceanview has been abandoned.

Table 6. Five-year summary of wildlife harvested in Cape Breton Regional Municipality and Nova Scotia.			
Animal	CBRM Reported Harvest	Provincial Reported Harvest	Percent (%) of total for province
LARGE MAMMALS			
Deer (Zone 111)	1,746	45,711	3.8%
Bear	7	1,511	0.5%
UPLAND GAME			
Snowshoe Hare	17,388	376,317	4.6%
Ruffed Grouse	16,516	220,954	7.5%
Ring-necked Pheasant	795	21,866	3.6%
FUR HARVEST			
Skunk	0	279	0.0%
Canada Lynx*	0	28	0.0%
American Marten*	0	26	0.0%
Fisher	0	610	0.0%
Raccoon	53	7417	0.7%
Squirrel	62	4490	1.4%
Mink	145	5673	2.6%
Coyote	249	9374	2.7%
Bobcat	92	3322	2.8%
Weasel	47	1689	2.8%
Beaver	556	15855	3.5%
Muskrat	2135	59642	3.6%
Otter	70	1747	4.0%
Fox	236	2000	11.8%
Total Furbearers	3645	112,152	3.3%
*Trapped incidentally. Trappers Association of Nova Scotia prepares incidental pelts for auction and all proceeds go to the NS Species at Risk Conservation Fund.			

4.3.6 FORESTRY & AGRICULTURE

Forestry and farming contribute to the mix of industries in the CBRM, but the impact here is relatively small compared with the rest of Nova Scotia. Farming is not a large economic sector in CBRM, including in the immediate study area, accounting for only 2% of all registered farms in Nova Scotia for 2018-2019 (Nova Scotia Open Data Portal 2019). Cape Breton County farms reported a total of over \$8 million in gross farm receipts in 2006, excluding forestry products. Main agricultural activities are cattle ranching and animal production (NS Federation of Agriculture, online, 2019).

4.3.7 RECREATIONAL, COMMERCIAL, AND MI'KMAQ FISHING

Commercial fishing takes place from the communities of Gabarus and Fourchu. Approximately 40 jobs are tied directly to commercial fishing in Gabarus, with another 30 or so jobs tied indirectly (T. Menk; E. Kersey, pers. comm. 2019). Recreational fishing provides an important resource and pastime for residents

of the CBRM and marine fisheries are the mainstay of coastal communities such as Gabarus and Fourchu. The study area itself is not particularly important for freshwater recreational fishing but rivers in the area (e.g. Mira River), are fished recreationally, and Gabarus Lake supports ice fishing for Rainbow Smelt and trout (F. Carswell, resident of Gabarus, pers. comm. 2019; A.M. MacLean, Gabarus Lake, pers. comm. 2019), Striped Bass fishing, and a recreational fishery from April 15 – 30 for landlocked salmon (NS Anglers Handbook 2018). Mi'kmaq residing in the area likely use the limited recreational fishing resource as well. Other streams in the area are either too small, are not accessible, or have too steep a gradient to promote fishing.

4.3.8 HISTORICAL, ARCHAEOLOGICAL AND PALAEOLOGICAL RESOURCES

The study area is part of the once greater Mi'kmaw territory known as *Unama'kik* (CRM 2019). Mi'kmaq originally occupied the area, with Europeans entering the shores of Cape Breton from the early sixteenth century, mainly in the areas of St. Peter's and St. Ann's to pursue fishing, until formal establishment of fishing stations in the early seventeenth century (CRM 2019). As supply centers for the Fortress of Louisbourg, the trading posts attracted Acadian settlers to the area until British military rule in 1745 and again in 1763, when Cape Breton was annexed to Nova Scotia. Beginning in the early 1800's, Scottish settlers moved into the area, settling mainly along the Bras D'or Lake and established farming as the dominant economic activity, replacing fishing. As early as the 1820's, the Scottish had become the dominant ethnic group in Cape Breton (CRM 2019).

The communities of Gabarus Lake and Gabarus, approximately one kilometer and eight kilometers east of the study area, respectively, appear on seventeenth century maps. Historical documents indicate the French settled the villages as early as 1714. Early census data shows 47 inhabitants of Gabarus in 1774. Shipbuilding occurred between 1854 and 1900, during which time the village was home to numerous craftsmen and business establishments. The nearest registered archaeological site is located approximately 11 kilometers southeast of the study area on Fourchu Island.

Prior to the arrival of European settlers, Mi'kmaq would have used the streams, lakes and wetlands surrounding the study area as a means of transportation and resource base. The Gabarus Quarry site, however, likely lacks the environmental features that would have been suitable for encampments and there are no registered Mi'kmaq archaeological sites within the study area or surrounding the perimeter. Several nearby areas, however, are registered archeological sites representing Mi'kmaq fishing camps, approximately 6 kilometers southeast of the study area along Belfry Beach, at the head of Fourchu Bay. The Mira River would have also been a historically important area as a resource base and transportation route (CRM, 2019).

Archaeology database searches show no records of archaeological sites within the study area (CRM 2019). Based on the lack of evidence of historic land use in the vicinity of the Gabarus Quarry site; site reconnaissance and the absence of signs of settlement; and other limiting physical factors such as the low and wet landscape, the study area is considered to have low potential for encountering precontact and/or early historic Mi'kmaq and/or Euro-Canadian archaeological resources (CRM 2019). Cemeteries, including Lakeview Cemetery in Gabarus provide a record of recent life in the area (Figure 35).



Figure 35. Lake View Cemetery, Gabarus, Nova Scotia

4.3.9 PARKS AND PROTECTED AREAS

The Province of Nova Scotia actively protects natural landscapes and promotes and supports nature-based recreation and conservation through its Provincial Parks and Wilderness Areas system, and through other management and protection means. Several wilderness and protected areas, and provincial parks, have been designated in the general area of the quarry site: Gabarus Wilderness Area; The Stillwaters Wilderness Area; Middle River - Framboise Wilderness Area; Fourchu Coast Wilderness Area; Belfry Beach Park Reserve; Gaspereau River Provincial Park; and Framboise Intervale Nature Reserve (pending). Parks Canada operates the Fortress of Louisbourg National Historic Site of Canada, located approximately 20 kilometers, as the crow flies, from the study site (Figure 36).



Figure 36. Parks and protected areas in the general vicinity of the Gabarus Quarry.

4.3.10 RECREATIONAL/CULTURAL FEATURES

Residents and visitors to Cape Breton County access natural areas for a wide range of outdoor recreation activities. In the Gabarus Lake area, the predominant outdoor recreational activities are sightseeing, hiking and snow shoeing, beachcombing, snowmobiling and ATV use, as well as hunting and angling. Locals use ATVs in summer and snowmobiles in winter to access trails running in the vicinity of the quarry. A 3-km stretch of the Fourchu Road between Gabarus and Marion Bridge has been opened to ATVs on a trial basis to accommodate ATV users in the area and provide a link for forest trails in the area. Locals can pull over onto an old section of highway on the edge of Gabarus Lake as a rest stop and to picnic; and Gabarus Lake is used for boating by some residents in summer and for ice-fishing in winter. There is a frequently used hiking trail on the north shore of the Gabarus Wilderness area – Gull Cove Trail – which features coastal views, local flora unique to the area, and historical remnants of a late 1800's fishing community

on Gull Cove. Belfry Beach Park Reserve, a two-kilometer beach on Fourchu Bay, provides access to the southern region of the Gabarus Wilderness Area as well as paddling opportunities and enjoyment of other beach activities along the shores of Fourchu Bay. The Fourchu Coast Wilderness Area, which extends from Belfry Beach about 20 kilometers south along the coast and surrounding coastal lakes, provides a variety of recreational opportunities including hiking, beachcombing, bird watching, paddling routes, angling and hunting. Two privately owned tourist accommodations exist in the immediate area, with a greater density of campgrounds and RV resorts, Bed & Breakfasts, and cottage rentals located west of the Mira River and along the Bra D'or Lake, as well as near Louisbourg.

4.3.11 RESIDENTIAL USE

There are few residences in Gabarus Lake in the vicinity of the quarry, located mainly along the Fourchu highway (Map A-3). Lot sizes are large and may include surrounding tracts of forested land. Lifestyles of the residents of the general area include younger individuals engaged in economic activities such as fishing in the area, retirees maintaining their homes and properties, and residents working locally. Residents use the area and backcountry for recreation such as walking or hiking, and use of ATVs and winter snowmobiling, as well as for access to natural resources (e.g. firewood).

4.3.12 COMMERCIAL/INDUSTRIAL DEVELOPMENT

No active businesses operate in the immediate vicinity of the study area, with the exception of a Christmas tree farm, located on Gabarus Lake South Road (MacDonald's Family Christmas Tree Farm, 19 Gabarus Lake South Road). Most commercial activity in the Gabarus Lake area centres on fishing and tourism, including rental cottages (Mira River Cottages, 856 Grand Mira South Road) and a Bed & Breakfast (Fiddlerslake B&B and Holiday Apartment, 21 Joanne Langford Drive). A Canada Post outlet is located in Gabarus, on the Gabarus Highway (8841 NS-327, Gabarus).

4.3.13 TOURISM AND VIEWSCAPE

Tourism in the vicinity of Gabarus Lake and the community of Gabarus center on nature and outdoor recreational activities, including angling and hunting, hiking, paddling, and beachcombing. Historical significance of the area as a trading post and fishing village, originally by French settlers in the seventeenth century, and ultimately by the British in 1763 also occasionally attracts tourists to the area. The area offers significant coastal views including along the Gull Cove Hiking Trail (Gabarus Wilderness Area), from several cobble and sand beaches, and along the coastal Fourchu Road (*Fleur-de-lis Trail*). A small nature park exists in the fishing village of Gabarus and the decommissioned Gabarus Lighthouse still stands, although is not open to the public. The quarry is not visible from the Grand Mira Gabarus Road or from nearby areas of the countryside (Figure 37).



Figure 37. Gabarus Quarry entrance along Grand Mira Gabarus Road, facing east, June 11, 2019.

4.3.14 TRANSPORTATION

Grand Mira Gabarus Road, which runs past the quarry site, is a local provincial connector gravel road connecting communities along the Mira River (Grand Mira North and South, Marion Bridge, and Victoria Bridge) with the Fourchu Road and Gabarus Highway (Route 327) at Gabarus Lake, the main coastal route in the area. Gabarus Grand Mira Road supports mainly traffic arising from the quarry, and some local traffic, although most locals use the paved Fourchu Road for local activities and to access more populous areas like Sydney which is a short 35 minutes away. Local industries using the highway include shipping fish products, pulp logs and gravel operations in addition to the traffic associated with the quarry, which is typically seasonal. Roads in the area support moderate traffic compared to Trunk 4, the main highway from the mainland to Sydney on the eastern side of the Bras d'Or Lakes. Traffic volumes on Fourchu Road and Route 327 have ranged from 269 to 520 vehicles per day (annual average of from 260 to 420 vehicles per day) in the 2011 to 2017 period, lowest in the spring (May) and increasing in summer to fall, reflecting tourist traffic. In contrast, traffic on Trunk 4, the main provincial trunk highway connecting the mainland to Sydney on the east side of the Bras d'Or lakes, shows approximately twice to five times the traffic volume depending on season, from 872 to 2545 vehicles per day (annual averages of 880 to 2040 vehicles per day) over a comparable period (Nova Scotia Open Data Portal 2019). When operating, the quarry will contribute truck traffic and some heavy equipment traffic (e.g. trucks, crushers, asphalt trucks etc.) in the vicinity of the site, typically in the summer / fall construction season. Most of the trucks leaving the quarry, and production equipment moved to the Gabarus Quarry, takes place along Fourchu Road to and from Marion Bridge, a paved route in contrast to Grand Mira Gabarus Road of which only the west end is paved. "The Crossroads" where the section of Fourchu Road leading to Marion Bridge Road branches from the road to Gabarus, and along which the truck traffic from the quarry passes, can experience a slowing of

traffic at the intersection, particularly of tourists unfamiliar with the area, which can be a safety consideration⁶. Access to the quarry from Grand Mira Gabarus Road is unobstructed with good sight lines (Figure 37), and similarly the nearby intersection with Fourchu Road is clear despite being on a curve (Figure 38). Neither are expected to be hazardous.



Figure 38. Intersection of Grand Mira Gabarus Road and Fourchu Road (*Fleur-de-lis Trail*). Gabarus Lake is on the left.

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

⁶ Noted by a resident living at the intersection (July 2019).

components (VECs)⁷ (also known as VCs)⁸, and project activities and outcomes for the 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 all potentially significant impacts on VECs are identified and all 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 7. 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 8 and 9.

Table 7. Valued Environmental Components (VECs) for Gabarus 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

7 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.

8 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).

5.3 SOCIOECONOMIC IMPACTS

5.3.1 MI'KMAQ

The Mi'kmaq maintain a general interest in all lands in Nova Scotia and claim they have never surrendered, ceded, or sold the Aboriginal title, and that they claim all of Nova Scotia. 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 Section 4.3.1. In more recent times, treaties made with the British and continued through Canadian law have maintained their rights. Coastal areas, freshwater bodies such as Gabarus Lake, and the Mira River system may have been used by Mi'kmaq, including as a transportation route as Mi'kmaq migrated between areas; however, there is low potential for occurrence of Mi'kmaq archaeological resources at the quarry site (CRM 2019).

Operation of the Gabarus Quarry will use land that would otherwise be occupied by terrestrial ecosystems and would not likely be used for Mi'kmaq activities or by other residents for activities such as nature walks and hunting or fishing (either recreationally or for subsistence). Best management practices used at the site will reduce any potential impacts quarry activities may have on water quality and quantity. The land area affected is small in relation to the available wildlife habitat in the area, and would not likely affect wildlife or fish populations, potentially used by Mi'kmaq, and there are unlikely to be cumulative effects of other activities in the area; consequently none of these effects are considered significant.

5.3.2 RECREATIONAL ACTIVITIES

Recreational use and nature appreciation of the environment in the vicinity of the site consists principally of walking/hiking, camping, hunting, fishing, and general enjoyment of home-based recreation (e.g. gardening) concentrated around Gabarus Lake. Only hiking and nature appreciation, which takes place in the summer, would be affected by quarry activities—principally by vehicle traffic—and then principally when the quarry is operating. Operations at the quarry would be cyclic, likely occupying several weeks during the construction season during the years in which the site is active, and the facilities are well maintained. Although quarry operations could likely be heard and residents would experience truck traffic and other effects of quarry operations, the frequency and scope of 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.

5.3.3 TOURISM AND VIEWSCAPE

The Gabarus Quarry would have little influence on tourism and viewscape. The property is located approximately one kilometer from Gabarus Lake and Fourchu Road and is not currently visible from either the Gabarus Grand Mira Road, on which the quarry is located, or from the Fourchu Road. Truck and equipment traffic accessing and exiting the Grand Mira Gabarus Road onto the Fourchu Road is expected to be the main interaction with tourists. This traffic is expected to be occasional, will be similar now as in the future, and would likely be only a minor impediment to tourist vehicle traffic in the area. Both intersections have good sightlines, are well maintained, and do not present a particular safety concern; however, use of signage (e.g. “Trucks Turning”) during periods of onsite activity, would improve safety by alerting travelers. Lights and dust, if present, at the site can be seen from immediate residents, but would

be controlled by proper environmental management practices at the site. Overall the impacts on viewscape and tourism are expected to be negligible.

5.3.4 RECREATIONAL, COMMERCIAL & MI'KMAQ FISHING

The watercourses in the immediate vicinity of the Gabarus Quarry support fish potentially used by the recreational fishery; however, they will not be altered by the quarry expansion and presence of the quarry will not result in significant changes in flow regime or water quality in waterways downstream of the site. A minimum 30 m buffer will be maintained between the quarry site and adjacent watercourses. There is no direct runoff from the quarry into adjacent streams, and waters are expected to remain to be good for salmonids, including low turbidity and neutral pH, which would lead to good quality of waters downstream for fish. Overall a negligible impact of the quarry on 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 native or European archaeological resources (CRM 2019). The area was not settled by Europeans until late in the seventeenth century and not intensely settled until more recently, and then generally along travel routes. The quarry is set back from the Grand Mira Gabarus Road and from Fourchu Road, and the adjacent land has not been used for agriculture and likely was used only for resource removal such as logging, trapping and hunting. If an archaeological feature of significance is encountered during quarry activities, particularly evidence of Mi'kmaq occupation, the effects can be reduced by halting operations and consulting with experts in the field to ensure the artifact or feature is not disturbed and is adequately documented and preserved.

5.3.6 ECONOMY, LAND USE AND VALUE

Forestry, hunting and trapping, marine fisheries, tourism, as well as rural-residential activities, are the major economic activities in the vicinity of the site and the study area as a whole. The land on the site is not suitable for agriculture or subsurface mining, and aggregate production is among the only potential commercial uses of the area. Land in the general vicinity of the site (12 km as the crow flies) is also designated for conservation and wildlife management (e.g. Gabarus Wilderness Area, Fourchu Coast Wilderness Area) and contains habitat for game species such as White-tailed Deer, which support hunting—an important activity for locals, visitors and Mi'kmaq alike. The expanded quarry will remove only a small fraction of available land for these purposes in the area, and therefore won't have a significant impact on these uses. Areas not required for the quarry will be preserved if possible, to assist in maintaining forest ecosystems and wetlands for wildlife, and to buffer adjacent areas from quarry activities. Quarry activities are also not expected to impact existing residential, industrial or conservation and scientific use of nearby areas. As the quarry has been in operation for some time, and the scope and frequency of activities are not expected to change from past use, residential property values in the area are not expected to change significantly. The existing quarry has been operating at the site with little to no impact, while providing economic development and a source of aggregate for local construction projects.

5.3.7 TRANSPORTATION

The quarry generates a low level of truck traffic on highways in the area, but activity levels are not expected to increase significantly, and consequently the quarry is not expected to change the existing traffic volumes significantly. Suitable signage for truck and equipment operators, as well as the surrounding communities, would help avoid dangerous situations both at the quarry entrance, and at the intersection of Grand Mira Gabarus Road and Fourchu Road. 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. Warning signs and speed limits can be placed in areas leading to the quarry, in particular when the quarry is operating, to improve safety. Equipment and truck operators for the quarry can be given instruction on safe and environmentally acceptable procedures. With suitable foresight and care, overall the impact of the project on transportation and safety is expected to be minimal.

5.3.8 RESIDENTIAL USE

Quarry activities can potentially interfere with normal use and enjoyment of nearby residential properties by creating background noise, and through truck and equipment traffic, which some residents may find objectionable. The property is located approximately one kilometer from the community of Gabarus Lake and is not visible. Noise from routine operations in the quarry will be within regulated limits and will not normally disturb residents living nearby; truck movements along the Grand Mira Gabarus Road and Fourchu Road are responsible, however, for periodic elevated noise and dust levels. Mitigation measures such as controlling vehicle speed and engine braking, securing equipment to prevent banging (e.g. doors and chains), covering loads, etc. will be practiced ensuring quarry operations comply with noise and dust limits according to the Pit and Quarry Guidelines. Normal traffic noise on Fourchu Road would likely exceed any noise coming from the quarry for homes located nearby. Traffic volumes from the site would be moderate, and a high frequency of truck traffic would be an irregular occurrence, depending on the supply requirements for particular projects. Dust from operations is unlikely to reach residential areas. Quarry activities such as blasting, are not expected to impact residential water supplies, as homes are located at a significant distance from the site, but a groundwater monitoring program for water supplies could be implemented to ensure changes, if any, suspected to be due to the quarry, are detected. Most operations at the site occur during daylight hours. On rare circumstances when they are undertaken at night, activities will involve minimal additional lighting and noise, and is unlikely to be a serious disturbance to residents. The quarry will include signage with phone numbers and contact persons should any members of the community wish to register complaints or concerns. A complaint resolution procedure will be put in place by Dexter Construction to address complaints and concerns.

5.3.9 COMMERCIAL/INDUSTRIAL USE

There are no businesses near 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

Nearby residents use drilled wells and dug surface wells for potable water supply, and there are few wells in the general vicinity of the quarry. Water supply and quality may be maintained by implementation of a

groundwater monitoring program and liaison with residents and CBRM to ensure water quality and supply is maintained. Groundwater recharge generated by the quarry is likely to be of high quality (low conductivity and dissolved solids and neutral in pH). Additionally, best management practices for operations will be implemented to mitigate any possible impact on aquifers at the site.

5.3.11 PARKS AND PROTECTED AREAS

The Gabarus Quarry site is not expected to be visible by tourists traveling by road, and road traffic activity due to the quarry is not expected to be high enough in volume to disrupt tourist traffic. Occasional blasting may be heard in the community of Gabarus Lake and Gabarus Wilderness Area, but occurrences are likely to be brief, and distant, and not likely to be a significant concern to visitors/users of those areas. The quarry will be restored at the end of its useful life. Expansion of the quarry will not affect the integrity of any nearby protected areas. The quarry will not affect Important Bird Areas located in Fourchu and Gabarus Bays, and the potential effect of noise on birds will not be increasing over that which has occurred in past.

5.3.12 RESOURCE USE—FORESTRY, HUNTING & TRAPPING

Use of the land for a quarry will remove the potential for logging 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.

5.4 BIOPHYSICAL IMPACTS—IMPACTS OF THE PROJECT ON THE ENVIRONMENT

5.4.1 AIR QUALITY, NOISE, AND LIGHT

Quarry activities are not expected to change from the previous scope of operations, however various project activities have 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, operation of an asphalt plant, as well as onsite routine operations contribute to increased dust and particulate levels. Noise levels can impact human use and enjoyment of the environment. Dust emissions during the construction phase will be localized and short term and are expected to be minimal from routine operations. Dust management will be undertaken, including use of water spray and covering working and laydown areas with blasted rock. Monitoring of airborne particulate emissions will be conducted at the request of NSE and in accordance with 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 and potential air-borne odours will occasionally be generated by the operation of vehicles and equipment and may be detected at a distance from the site; however prevailing winds are generally from the southwest to northwest and the general direction of travel of such emissions would be into unpopulated areas and offshore. Given 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 may be conducted at the request of NSE.

Noise levels from the expanded quarry are expected to be similar to those already produced at the site, since the operations are expected to be similar in size at a given time. The operator should ensure that they do not exceed those specified in the Nova Scotia Pit and Quarry Guidelines. Blasting is expected to occur infrequently (1-2 times per year).

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. Measures can be taken to ensure use of directional lighting, which minimizes 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 (e.g. in Gabarus Lake). The amount of recharge area involved in project activities is moderate in relation to the overall size of the aquifers in the general vicinity; however the quarry floor will continue to add recharge in approximately the same amount as at present, although the response time in influencing groundwater flow would be shorter and the flows would be more sudden; overall, the effect on overall groundwater flow patterns will be negligible.

5.4.3 HYDROLOGY

Expansion of the quarry will modify the existing hydrology at the site, resulting in an artificial though managed regime of surface water movement and runoff at the site, and slightly altered flow conditions in the tributary stream passing north of the site. The proposed expansion area is entirely within the watershed of the northern tributary and will reduce surface water runoff and groundwater supply to portions of that tributary slightly. The reduction is expected to be small since the maximum expanded area of the quarry is no more than 15% of the associated watershed area. Precipitation and groundwater intercepted by the quarry, however, will be channelled by the quarry drainage system to re-enter the northern tributary further downstream, where much of that flow in the stream will be restored. Surface water runoff from the quarry is inherently flashy; however the flashiness is buffered by the drainage system and associated wetlands and is not expected to affect overall flow characteristics in downstream areas significantly. Runoff from the outside areas of the quarry such as the surrounding berms will be managed to ensure that it meets acceptable environmental standards. Dexter Construction will maintain the drainage management system which is currently in place and continue to manage the flow in a natural way and minimize damage to the local landscape.

5.4.4 WATER QUALITY

Water quality downslope of the site is important for fish habitat in the unnamed stream that runs along the north side of the study area, in particular as a water supply to Gabarus Lake. Quality of water leaving the site and entering groundwater is high, due both to the onsite management and the low-contaminant characteristics of the bedrock. Quarry rock is within acceptable limits for sulphur and acid-generating potential. Blasting is not expected to result in groundwater quality changes, particularly with efforts to reduce releases of other chemicals such as nitrates used in blasting. 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 and sediments may settle out before the water enters nearby streams. All quarry site activities will be maintained at a minimum distance of 30 m from adjacent watercourses. Release of other contaminants such as oils and lubricants from operating equipment, as well as contaminants which may be found in material, such as recycled asphalt, which may be stored at the site, 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 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.

5.4.5 FRESHWATER AQUATIC ENVIRONMENTS AND WETLANDS

The only permanent stream at the site expected to be affected by the expansion is located on the outer margin of the study area to the northeast. A stream to the south is separated from the quarry by Grand Mira Gabarus Road and is not influenced by the quarry. Presence of the expanded quarry will reduce surface water and groundwater flow into the northern stream slightly along the quarry boundary (surface water flows at present are the source for wetlands there and these flows would be removed by quarry expansion) but much of the flow will be reintroduced to the stream downstream by drainage from the quarry floor and groundwater flow. Wetlands at the site are chiefly on the margins of the proposed expansion area although approximately 0.7 ha of wetlands in the northwest and up to 0.2 ha in the northeast may be removed or altered when the quarry has been fully developed. It is expected that any wetland removal will be negotiated with Nova Scotia Environment following the normal legal process and all wetlands which are removed or altered are expected to be compensated for as development proceeds. Surface runoff from the quarry floor is managed on site to control sediment levels before leaving the site. Quantities of runoff arising from the site in future from the outer slopes of berms and grubbing 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.

5.4.6 TERRESTRIAL ENVIRONMENTS

Proposed expansion will utilize areas which are mainly medium-aged softwood and mixed 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. Land at the quarry will be reclaimed and revegetated, and will eventually return to a functioning ecosystem, possibly similar to that which occurs at the site at present.

5.4.7 FISH AND FISH HABITAT

None of the proposed project activities will physically impact potentially fish bearing streams. Reductions in flow in parts of the northern stream adjacent to the quarry are expected to be small, and flows will largely be restored downstream via surface water drainage from the quarry floor. Blasting occurs infrequently at the site and will be sufficiently separated in distance from the unnamed stream and adhere to seasonal timing as per Fisheries and Oceans Canada (DFO) recommendations for use of explosives near fish bearing habitat (Wright and Hopkey 1998) to eliminate any harm to fish. Water quality typically found

in runoff from the quarry will be monitored and is expected to meet guidelines for maintenance of Freshwater Aquatic Life. All guidelines for activities and timing of blasting in the quarry will be followed. Overall the effects of the quarry construction and operations are expected to be negligible.

5.4.8 FLORA AND FAUNA AND HABITAT

The effect of expanding the Gabarus Quarry will be the removal of existing terrestrial ecosystem (plants and animals) in those areas, to be covered by the footprint of the quarry. With time, areas no longer suitable for quarry operations will be remediated, according to agreements made with the Nova Scotia government as a condition of quarry 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. During recovery and revegetation of abandoned areas, the forest succession will provide habitat for a moderate diversity of species. 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. Areas of the site where Olive-sided Flycatcher was heard during the baseline survey, will be revisited prior to any expansion of the quarry into that area, or the area will be avoided. No other species of conservation concern, which were highlighted, were in the proposed expansion area or areas immediately adjacent. 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 loss of nesting birds in forest areas. Several species of migratory birds are in decline in Nova Scotia, in particular interior forest birds, which rely on large expanses and continuity of intact forest. Other wildlife species need large areas of undisturbed forest to live and reproduce naturally. Expansion of the Gabarus Quarry will result in only a comparatively small change in the coverage of natural and mature forest stands in the area and is expected to have comparatively small impact on interior forest birds and wildlife. During 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. Night operation lighting during migration periods (August – September) would attract migrating birds. Lighting used at the site should focus downward and below the normal horizon, to limit visibility by birds and insects from a distance. Expansion of the quarry will result in only a small change in the amount of softwood and mixed forest at the site, and therefore is likely to have a negligible potential impact on Olive-sided Flycatcher.

5.4.9 SPECIES AT RISK

Olive-sided Flycatcher, an endangered bird species, was identified as potentially breeding in the forest northeast of the study area. The proposed expansion of the quarry will not extend into this area due to the proposed 30-metre buffer from the property boundary, and there is no potential for impact on suitable habitat. Quarry activities are not expected to impact water balance in wetlands which form the habitat, and so will not affect the species.

Apart from Olive-sided Flycatcher, no species at risk were found at the site. Common Nighthawk, a ground-nesting endangered bird 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. Lights during night operations during migration periods (May – June, August – September) 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 are appreciated by locals and tourists alike, and the Gabarus Lake area is dominated by natural areas, including some of the most remote and wild areas of Nova Scotia. The pockets of human development along the Fourchu Road, and in the communities of Gabarus and Fourchu, contrast with the coastal wilderness in those areas. The quarry affects a small proportion of the natural landscape at the site and has a limited effect on visitors to the area who are looking for nature experiences. Efforts will be made to minimize the effects of the quarry, in particular to reduce traffic, noise, dust and light from operations. Restoration should 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 IMPACTS OF THE ENVIRONMENT ON THE PROJECT

The operating quarry will not be impacted in general by weather, including high rainfall and precipitation, through its nature and design, which includes site water management; although the potential for excessive rainfall flooding the floor of the quarry occasionally should be addressed in planning. Aggregate and other rock products stored at the site are stable under varying conditions of rainfall and wind. Integrity of any runoff management structures at the site must be maintained and appropriately designed to remove the possibility of catastrophic failure. Changing climate may increase the operating season for transportation projects, and the need for aggregates produced by the quarry.

7 CUMULATIVE EFFECTS

Because of the remoteness of the location, all the potential impacts of the quarry operation (dust, noise, lights, blasting, traffic volume) are unlikely to be compounded by other development or human activity. Since site operations are not expected to increase in frequency or scope from past use, the cumulative effect of other local human activity is not expected to increase from past levels.

Table 8. Potential interactions between project activities and operations and Valued Environmental Components (VECs) for Gabarus Quarry expansion.

General Category of VEC	Biophysical									Socioeconomic											
	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	Mikmaq	Cultural/Historical	Recreation, Tourism & Viewscape	Residential Use	Recreational, Commercial & Mikmaq Fishing	Water Supplies/ Residential Wells	Economy, Land Use, and Value	Transportation	Commercial /Industrial Use	Parks & Protected Areas	Forestry Hunting /Trapping	
Project Component (potential interactions shown by ✓)																					
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 9. Summary of impacts and mitigation on Valued Environmental Components, Gabarus Quarry Expansion.							
VEC	Project Component	Nature of Effect	Significance	Nature of Impact	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 neighbouring 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; air-borne emissions from asphalt plant.	Significant	Negative	Monitor noise levels and undertake to avoid exceedances of regulatory levels. Institute measures for dust control. Monitor and maintain asphalt plant to minimize emissions.	Not significant.	
		Noise from engine breaking of trucks turning off the Fourchu Road at Gabarus.	Significant	Negative	Instruct truck operators to avoid use engine breaking at "The Crossroads" intersection.	Not significant.	
		Light from the quarry can be seen in neighbouring 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 crushing spreads to reduce dust. Water spray or other approved dust suppressant on quarry 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	Significant	Negative	Monitor groundwater quality and movement to determine changes.	Not significant.

Table 9. Summary of impacts and mitigation on Valued Environmental Components, Gabarus Quarry Expansion.						
VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
		patterns. Drilled wells in bedrock and surface wells can be disturbed				
	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; measures to maintain normal flow regime. 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; proper fuel handling strategies, onsite emergency numbers, spill kits etc.; Avoid refueling near watercourses.	Not significant.
Water Quality	Construction	Altered surface water flows and turbidity in watershed flowages from site runoff.	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 materials 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	Presence of quarry, emissions, dust etc., detracts from public perception of wild quality of area. Site is far removed from civilization and is near wilderness areas.	Negligible	Negative	Area affected is small in relation to remaining natural areas, and previous development has occurred in the area, diminishing value of natural areas and wilderness. Attempt to minimize footprint and avoid damage to areas that contribute most to supporting the natural	Not significant.

Table 9. Summary of impacts and mitigation on Valued Environmental Components, Gabarus Quarry Expansion.						
VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
					ecosystem and enhancing values. Manage releases of dust and light, and control noise.	
Freshwater Aquatic Environments	Construction	Potential for local high suspended sediments and nutrient levels from grubbing's, road construction, and locally diverted flows.	Negligible	Negative	Preserve wooded buffer areas for quarry. 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. Residues from aggregate washing. Reduced water availability from evaporation from pit floor and exposed surfaces.	Negligible	Negative	Maintain forested buffers. Onsite water management. Sedimentation ponds and storage 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	Runoff from Gabarus Grand Mira Road.	Significant	Negative	Advise provincial authorities of maintenance needs.	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 property boundary buffers. Conduct species specific breeding bird survey in northeast part the property prior to excavation. Monitor species-at-risk birds.	Not significant.
	Operation	Dust, nutrient inputs from runoff, changes to environment and functioning of forest communities.	Negligible	Negative	Maintain property boundary buffers. Conduct species specific breeding bird survey of northeast part the property prior to excavation. Be aware of critical times for rare	Not significant.

Table 9. Summary of impacts and mitigation on Valued Environmental Components, Gabarus Quarry Expansion.						
VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
					species which might occur there.	
Fish & Fish Habitat	Construction	Change runoff patterns at site in local and adjacent watersheds.	Negligible	Negative	Runoff management from quarry entrance road, to avoid sudden runoff events.	Not significant.
	Operation	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	Small releases of oils, hydraulic fluids etc. from operating equipment. Accidental spills of hydrocarbons on site.	Negligible	Negative	Maintain equipment to minimize loss of lubricants and fuels. Provide pollution prevention and emergency measures.	Not significant.
	Operation	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 and intersection of Fourchu Road. Provide pollution prevention and emergency measures.	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 NSE. Cut forest short term only as needed to expand quarry. Conduct species specific breeding bird survey in northeast part the property prior to excavation.	Not significant.
	Construction & Operation	Accidental contaminant releases, contamination of habitat.	Significant	Negative	Provide pollution prevention and emergency measures & response capability. Remediate areas affected by spills.	Not significant.
		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 total available. Minimize footprint of quarry. Restore and rehabilitate areas not	Not significant.

Table 9. Summary of impacts and mitigation on Valued Environmental Components, Gabarus Quarry Expansion.						
VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
					used. Leave mature standing trees where possible as nest cavities.	
		Quarry affects wildlife movement patterns and connectivity of habitats.	Significant	Negative.	Restoration should include consideration for wildlife movement through the restored site.	Not significant.
Species at Risk	Construction	Olive-sided Flycatcher occurs in forest northeast of site.	Significant	Negative	Survey for additional occurrences of species. Develop management plan. Minimize footprint and maintain as much natural (uncut) natural vegetation as possible.	Not significant.
	Operation	Sound from blasting can harm bats and birds.	Negligible	Negative	Minimize blasting activity and concentrate in spring and fall (outside breeding and migratory periods) when species are absent.	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.	Significant	Negative	Educate personnel to look for bird life prior to activities; periodically conduct nesting bird survey at site to identify bird issues.	Not significant.
SOCIOECONOMIC COMPONENTS						
Mi'kmaq	Construction and Operation	Any land use conflicts with Mi'kmaq Right to Use Land	Significant	Neutral	Consult with Mi'kmaq in developing quarry.	Not significant.
		Contamination and alteration of flow regime of streams may affect fish populations potentially used by Mi'kmaq.	Negligible	Negative	Employ surface water monitoring program. Use Best Management Practices for 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.

Table 9. Summary of impacts and mitigation on Valued Environmental Components, Gabarus Quarry Expansion.						
VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Recreation	Construction & Operation	Quarry traffic & activities affects local light recreation (e.g. walking and ATVs along Grand Mira Gabarus Road).	Not significant	Negative	Users will be aware of activity at quarry but will not be otherwise impacted by it. Signage of truck use, dangers, and quarry activity.	Not significant.
Tourism and Viewscape	Construction & Operation	Presence of quarry affects public perception of wilderness values.	Negligible	Negative	Quarry cannot be seen from a distance. Dust & noise control. Maintain a clean operation. Rehabilitate areas no longer needed for activity and future development.	Not significant.
Residential Use	Construction & Operation	Noise; light pollution; dust; odours; operation of trucks and transportation of heavy equipment.	Significant	Negative	Use best management practices to reduce disturbance to nearby residents. Inform residents about quarry operations. Provide community with safety information for truck traffic and quarry operations.	Not significant.
Recreational and Mi'kmaq Hunting and Fishing	Construction & Operation	Accidental hydrocarbon spills and blasting residues contaminate surface waters.	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	Rehabilitate areas no longer needed for activity and future development. Minimize cutting outside quarry footprint.	Not significant.
Water Supplies & Residential Wells	Construction and Operation	Blasting potentially impacts local aquifers.	Significant	Negative	Develop groundwater-monitoring plan in consultation with NSE. Monitor local wells.	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 Grand Mira Gabarus and Fourchu Roads.	Not significant	No Change	Use good signage, have speed policy in vicinity of quarry. Safety training for truck drivers.	Not significant

Table 9. Summary of impacts and mitigation on Valued Environmental Components, Gabarus Quarry Expansion.						
VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Industrial & Commercial Use	Operation	No businesses nearby.	Negligible	Neutral	Quarry helps to maintain access roads to site for future development.	Not significant.
Resource Use Forestry, Hunting & Trapping	Construction & Operation	Removes woodland; game habitat.	Not significant	Negative	Relatively small area is used. Minimize footprint.	Not significant.
Parks and Protected areas	Construction & Operation	Noise and blasting can be heard from Gabarus Wilderness Area and Associated beaches.	Not significant	Neutral	Employ best management practices for all aspects of quarry operation, in particular control of noise, light, & dust.	Not significant.

8 MONITORING

In accordance with Pit and Quarry Guidelines under the NS Environmental Act and the Industrial Approval for the quarry site, Dexter Construction will implement surface and groundwater monitoring programs to monitor hydrological conditions (e.g. runoff patterns and flows) as well as water quality. Routine monitoring of noise levels and particulate levels will be conducted in accordance with the site Industrial Approval.

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 Gabarus Lake and eastern Cape Breton area, Dexter Construction will be undertaking consultations with the local community through public notices, contacts with municipal and provincial government officials, and discussions 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

Mr. Eugene Kersey, Resident of Gabarus, Co-Director of Friends of Gabarus (FOG), July 17, 2019.

Mr. F. Carswell, Resident of Gabarus, July 2019.

Mr. Harrison Moore, Wildlife Biologist, Nova Scotia Department of Lands and Forestry.

Mr. J. Hancock, Resident of Gabarus, July 2019.

Mr. Sean Weseloh-McKeane, NS Museum of Natural History, Coordinator, Special Places, January 2019.

Mr. Tim Menk, Resident of Gabarus, Co-Director of Friends of Gabarus (FOG), July 17, 2019.

Ms. A.M. MacLean, Resident of Gabarus Lake, July 2019.

11 REFERENCES

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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 October 2018 – August 2019 and the generally accepted assessment practices of our industry. No other warranty is made.

APPENDIX A

MAPS

APPENDIX B

WETLAND/BOTANTICAL SURVEYS

Fall 2018 & Spring/Early Summer 2019

APPENDIX C

ATLANTIC CANADA CONSERVATION DATA CENTRE REPORT

APPENDIX D

NOVA SCOTIA MUSEUM REPORT

HERITAGE AND BIOLOGICAL RESOURCES

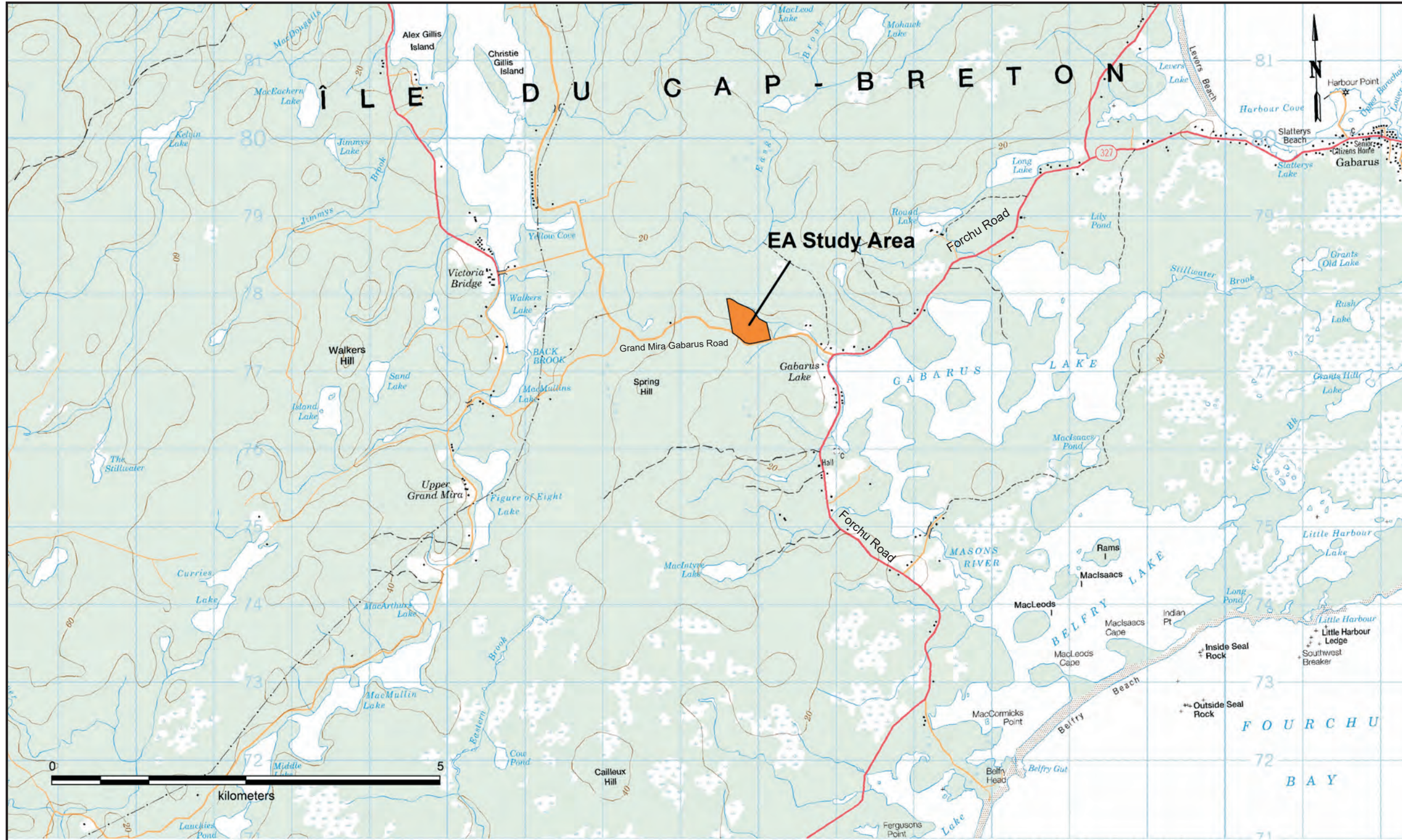
APPENDIX E

LABORATORY RESULTS

TSS & pH

APPENDIX A

MAPS



**THE MUNICIPAL GROUP
OF COMPANIES**

**DEXTER CONSTRUCTION
COMPANY LTD.**

**GABARUS QUARRY
EXPANSION**

**Gabarus Lake, CBRM,
Nova Scotia**

Site Location

 EA Study Area

Mapping by:
Envirosphere Consultants Ltd.
Windsor, Nova Scotia
June 2019

Base Map: NTS 1:50,000, 11F16



Map A-1



**THE MUNICIPAL GROUP
OF COMPANIES**

**DEXTER CONSTRUCTION
COMPANY LTD.**

**GABARUS QUARRY
EXPANSION
CBRM, NOVA SCOTIA**

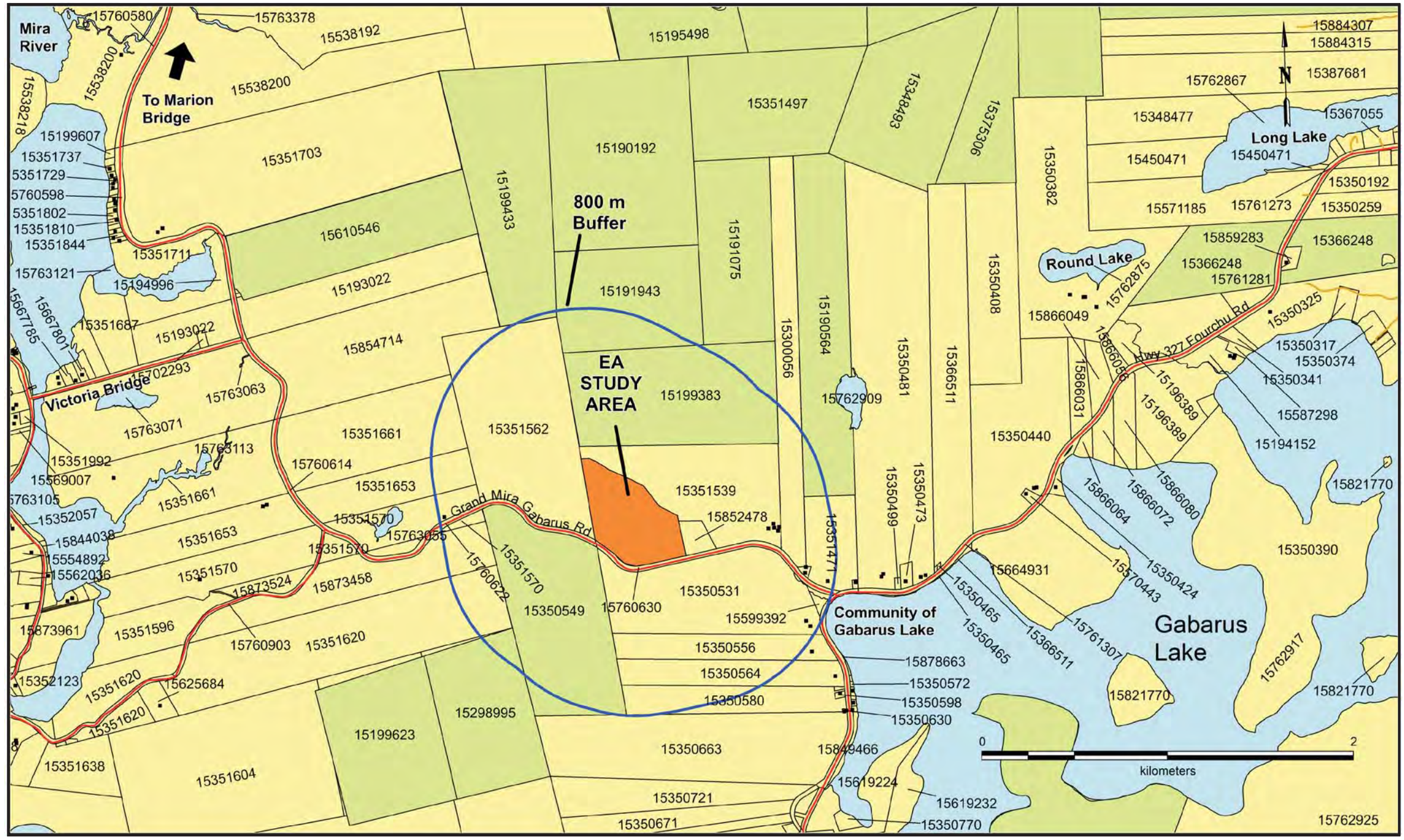
Site Features

- Bird Survey Locations
- Water Samples
- 100 — Elevations (m)
- Surface Waters
- EA Study Area

Map by:
 EnviroSphere Consultants Limited.
 Windsor, Nova Scotia, June 2019
 Aerial Image:
 Google Earth, July 2003.
 Quarry Inset: Dexter Construction
 July 2018.



Map A-2



THE MUNICIPAL GROUP OF COMPANIES

DEXTER CONSTRUCTION COMPANY LTD.

GABARUS QUARRY EXPANSION

Gabarus Lake, CBRM, Nova Scotia

Property Ownership

- Crown Land
- Quarry Study Area
- Property Boundaries
- Major Roads
- Minor Roads
- 800 m Buffer

Map by:
 EnviroSphere Consultants Limited
 Windsor, Nova Scotia, June 2019

Property Updated:
 September 24, 2018



DEXTER CONSTRUCTION COMPANY LIMITED

Map A-3

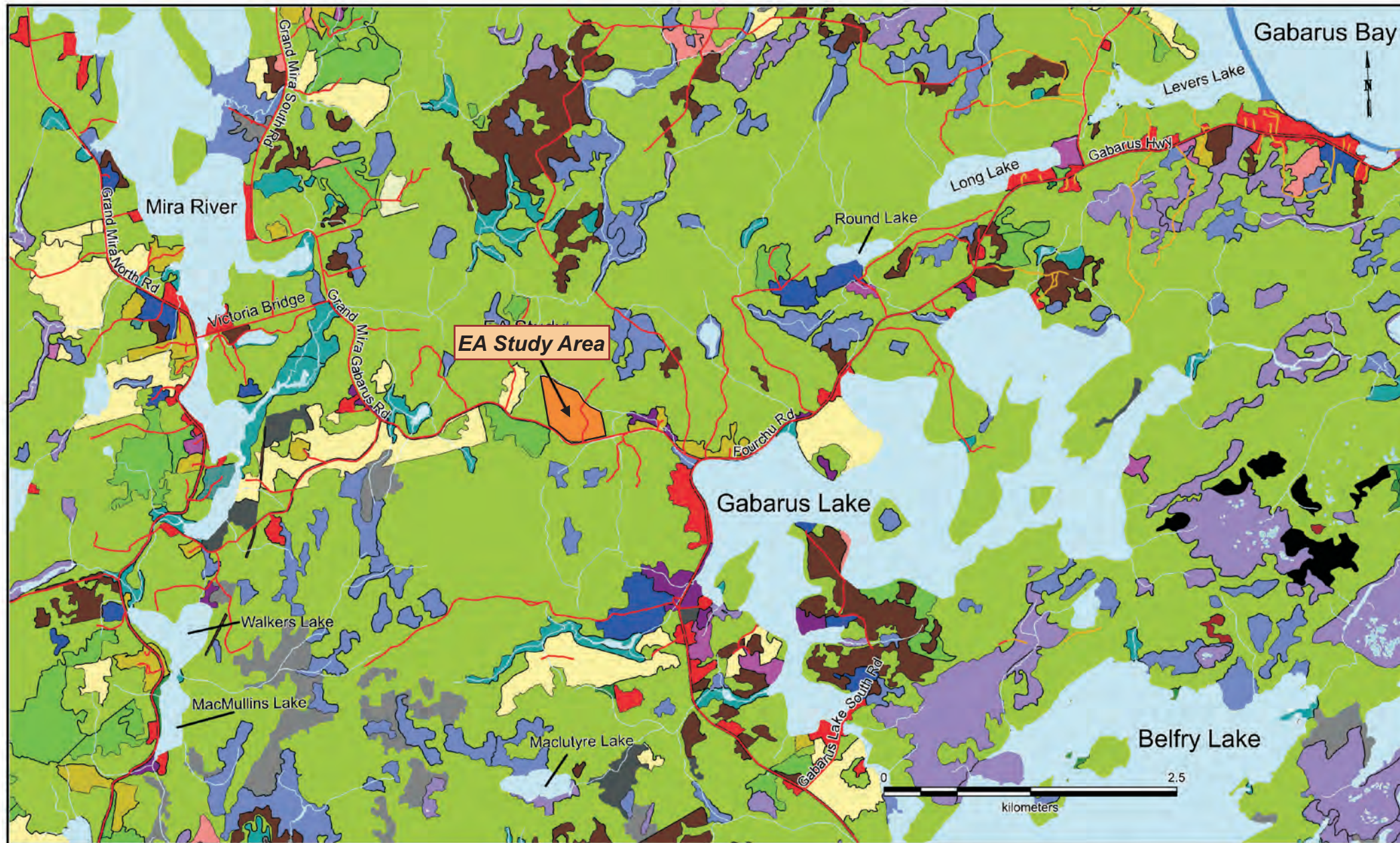
**THE MUNICIPAL GROUP
OF COMPANIES**

**DEXTER CONSTRUCTION
COMPANY LTD.**

**GABARUS QUARRY
EXPANSION
Gabarus Lake, CBRM, N.S.**

**Land Use
Classification**

(based on NS Forestry
Inventory, 2016)

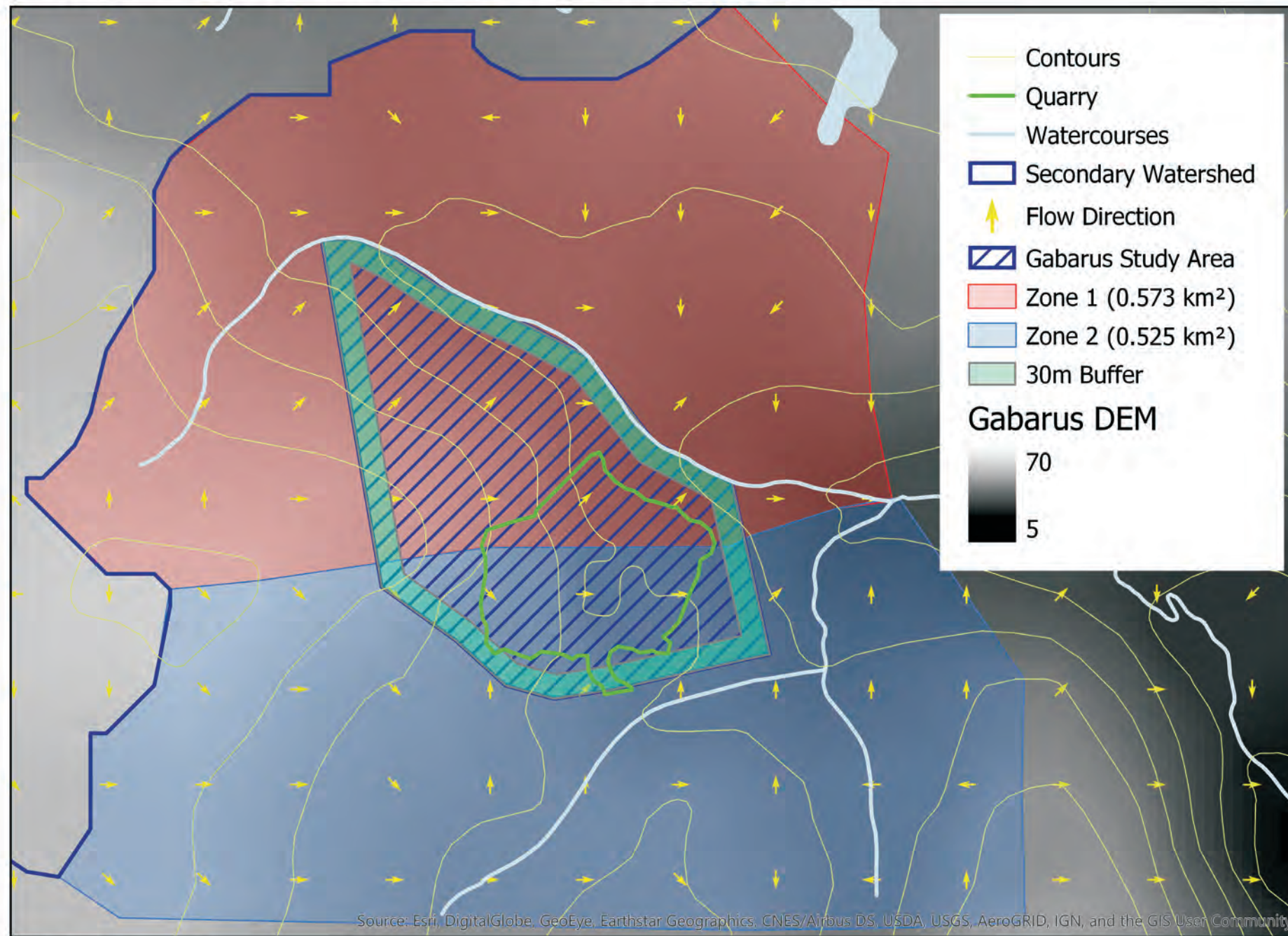


- | | | | |
|---|------------------------------|---|-----------------------------|
|  | Treed Bogs |  | Natural Stand |
|  | Lake Wetland |  | Treated |
|  | Cliffs, Dunes, Coastal Rocks |  | Old Field |
|  | Inland Water |  | Dead |
|  | Rocks Barren |  | Dead 1 |
|  | Barren |  | Dead 2 |
|  | Agriculture |  | Treated Stand |
|  | Urban |  | Plantation |
|  | Miscellaneous |  | Brush |
|  | Beach |  | Alders Less than 75% Cover |
|  | Gravel Pit |  | Alders 75% or Greater Cover |
|  | Road Corridor |  | Clear Cut |
|  | EA Study Area |  | Partial Depletion |
|  | Major Roads |  | Wetlands General |
|  | Watercourses |  | Open Bogs |
|  | Minor Roads | | |

Map by:
Envirosphere Consultants Limited
Windsor, Nova Scotia, June 2019



Gabarus Flow Direction & Areas of Influence



0 0.050.1 0.2 0.3 0.4
Kilometers



**THE MUNICIPAL GROUP
OF COMPANIES**

**DEXTER CONSTRUCTION
COMPANY LTD.**

**GABARUS QUARRY
EXPANSION**

Gabarus Lake, CBRM,
Nova Scotia

**Catchment Areas &
Slope**

Map by:
Envirosphere Consultants Limited
Windsor, Nova Scotia, November 2019

Property Updated:
September 24, 2018



APPENDIX B

WETLAND/BOTANTICAL SURVEYS

Fall 2018 & Spring/Early Summer 2019

**Vegetation and Plant Species Occurrences
Gabarus Quarry**

Gabarus Lake,
Cape Breton Regional Municipality, Nova Scotia

November 14, 2018

Prepared By:
Dr. Nicholas Hill,
Fern Hill Institute for Plant Conservation

Introduction

This report describes the habitats and plants in the area adjacent to the existing quarry's footprint. The area is mainly vegetated in young stands of mixed and coniferous trees in the uplands and in black spruce and in yellow birch in the wetland swamps. A survey was performed in October and so the list accompanying this report will not contain all species at the site.

Methods

On October 22, 2018, land adjacent to the Gabarus quarry was investigated and all vascular plant species were recorded. The landscape is low elevation and low relief. The area is surrounded by Pictou group sedimentary rocks (Roland, 1982) but the quarry is situated on a small area of Forchu Group basaltic flow (Barr et al., 1991). Each habitat observed was thoroughly examined. Botanical references included Zinck (1992) and the website GoBotany. Nomenclature follows the Atlantic Canada Conservation Data Base in Sackville, New Brunswick.

Results

Plant communities at the Gabarus Quarry reflect a combination of both upland and wetland habitats observed at the site. Wetlands were an important component, consisting of fen (low stature vegetation on flowing peatland) and swamps (shrub or tree dominated) draining toward a northern boundary stream. The remaining landscape was composed of conifer woodland (balsam fir and white spruce) or a mixture of birch species (*Betula populifolia* and *B. papyrifera*), red maple and balsam fir. The conifer woodland was shaded and poorest in species of vascular plants; there was usually high understory cover of mosses (*Pleurozium shreberi* and *Hylocomium splendens*). The mixed wood supported a variety of small herbs (e.g. *Linnaea borealis*, *Coptis trifolia*, *Cornus canadensis*, *Oclemena acuminata*), ferns (*Dryopteris intermedia* and *D. carthusiana* and *Dennstaedtia punctiloba*) and shrubs (*Vaccinium myrtilloides* and *Viburnum nudum*).

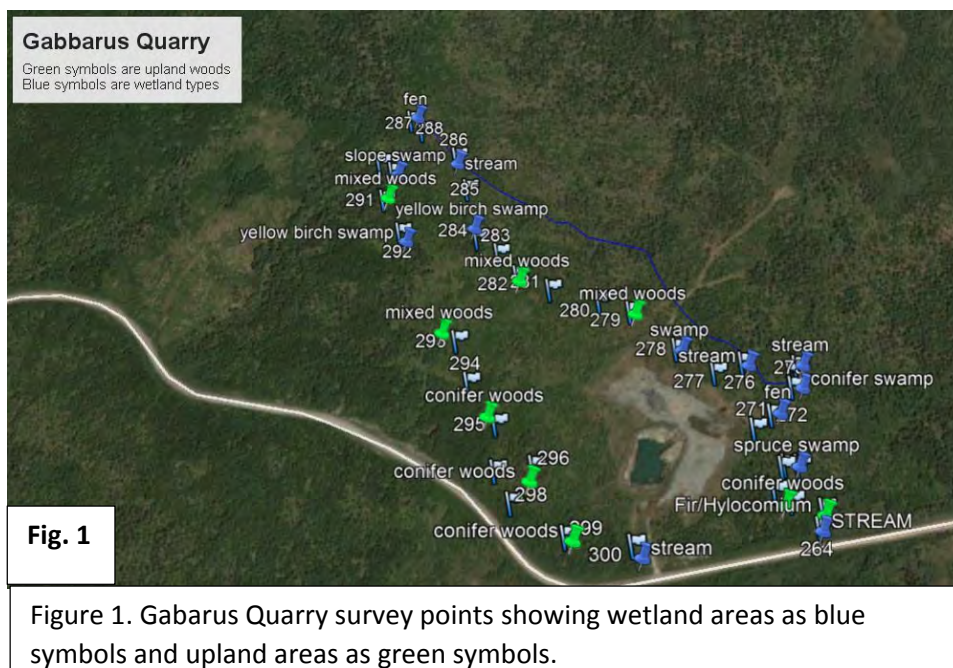




Fig. 2



Fig. 3

Figure 2 (top photo) Mixed wood showing paper birch (*Betula papyrifera*) and balsam fir (*Abies balsamea*) with *Dryopteris intermedia*.

Figure 3. (bottom photo) Young woodland with birches (*B. populifolia* and *B. papyrifera*), red maple (*Acer rubrum*) and balsam fir with ferns (*D. intermedia*, *D. carthusiana* and *Dennstaedtia punctiloba*) and bunchberry (*Cornus canadensis*).

The open wetland communities of fens near the stream were generally most diverse. Most of these wetlands had a layer of peat laid down by their *Sphagnum* species (e.g. *S. magellanicum*, *S. rubellum*, *S. girgensohnii*). The treed swamps were either yellow birch slope swamps with balsam fir understory or were black spruce and tamarack near the northern stream. In the wetter areas next to the stream, treed swamps gave way to alder shrub swamps dominated by *Alnus incana* but featuring many herbs (e.g. *Thalictrum pubescens*, *Athyrium felix-femina*, *Geum rivale*, *Glyceria canadensis* and *striata*). Fens—open peatlands with water flowing through the surface layer—were also *Sphagnum* dominated and these supported small sedges (*Carex trisperma*, *C. echinata*, *C. magellanicum*, and *Eriophorum virginicum*), grasses (e.g. the *Glyceria* spp.), forbs (*Geum rivale*, *Rubus pubescens*, *Viola* spp., *Lycopus uniflorus*, *Maianthemum trifolium*, *Iris versicolor*, and *Galium* spp.).



Fig 4



Fig 6

Fig 5

Figure 4 shows an alder swamp beside the northern stream. Figure 5 is an open peatland and the exotic, *Ranunculus repens* reflects disturbance history. Figure 6 is a fen herb community consisting of *Geum rivale*, *Rubus pubescens* and *Carex trisperma*.

Discussion

The landscape to the north of the existing quarry is predominantly wetland—swamps and fen leading to a stream. There were no rare plants observed, however, this survey was performed in October and an early summer survey would reveal more guilds (e.g. sedges and orchids—e.g. twayblades) and greater diversity. The upland areas were less diverse which may reflect logging history impacts. The landscape has been disturbed by forestry as well doubtless as by the current development. Evidence of this disturbance includes the various small clearings, the young regenerating forest, the absence of any shade tolerant dominants in the mixed wood forest and the exotic herbs incorporated into the wetland plant communities (e.g. *Ranunculus repens* and *Tussilago farfara*, see Hill and Blaney, 2009).

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APPENDIX A

Site vegetation inventory, Dexter Gabarus Quarry, surveyed October 22, 2018.			
NSDLF STATUS	SRank	Common Name	Scientific Name
GREEN	S5	Balsam Fir	<i>Abies balsamea</i>
GREEN	S5	Red Maple	<i>Acer rubrum</i>
GREEN	S5	Spreading Bentgrass	<i>Agrostis stolonifera</i>
GREEN	S5	Speckled Alder	<i>Alnus incana</i>
GREEN	S5	Serviceberry	<i>Amelanchier laevis</i>
GREEN	S5	Pearly Everlasting	<i>Anaphalis margaritacea</i>
GREEN	S5	Lady Fern	<i>Athyrium filix-femina</i>
GREEN	S5	Yellow Birch	<i>Betula alleghaniensis</i>
GREEN	S5	Paper Birch	<i>Betula papyrifera</i>
GREEN	S5	Wire Birch	<i>Betula populifolia</i>
GREEN	S5	Fringed Brome	<i>Bromus ciliatus</i>
GREEN	S5	Bluejoint	<i>Calamagrostis canadensis</i>
GREEN	S5	Silvery Sedge	<i>Carex canescens</i>
GREEN	S5	Little Prickly Sedge	<i>Carex echinata</i>
GREEN	S5	Bladder Sedge	<i>Carex intumescens</i>
GREEN	S5	Boreal Bog Sedge	<i>Carex magellanicum</i>
GREEN	S5	Tussock Sedge	<i>Carex stricta</i>
GREEN	S5	Three-seeded Sedge	<i>Carex trisperma</i>
GREEN	S5	Goldthread	<i>Coptis trifolia</i>
GREEN	S5	Bunchberry	<i>Cornus canadensis</i>
GREEN	S5	Poverty Oat Grass	<i>Danthonia spicata</i>
GREEN	S5	Hay-scented Fern	<i>Dennstaedtia punctiloba</i>
GREEN	S5	Northern Bush Honeysuckle	<i>Diervilla lonicera</i>
GREEN	S5	Parasol White-Top	<i>Doellingeria umbellata</i>
GREEN	S5	Mountain Wood Fern	<i>Dryopteris campyloptera</i>
GREEN	S5	Crested Shield Fern	<i>Dryopteris cristata</i>
GREEN	S5	Evergreen Woodfern	<i>Dryopteris intermedia</i>
GREEN	S5	Spinulose Woodfern	<i>Dryopteris carthusiana</i>
GREEN	S5	Field Horsetail	<i>Equisetum arvense</i>
GREEN	S5	Woodland Horsetail	<i>Equisetum sylvaticum</i>
GREEN	S5	Mayflower	<i>Epigaea repens</i>
GREEN	S5	Bog Willowherb	<i>Epilobium leptophyllum</i>
GREEN	S5	Tawny Cottongrass	<i>Eriophorum virginicum</i>
GREEN	S5	Spotted Joe Pye Weed	<i>Eupatorium maculatum</i>
GREEN	S5	Virginia Strawberry	<i>Fragaria virginiana</i>
GREEN	S5	Stiff Marsh Bedstraw	<i>Galium tinctorium</i>

Site vegetation inventory, Dexter Gabarus Quarry, surveyed October 22, 2018.

NSDLF STATUS	SRank	Common Name	Scientific Name
GREEN	S5	Sweet-scented Bedstraw	<i>Galium triflorum</i>
GREEN	S5	Creeping Snowberry	<i>Gaultheria hispidula</i>
GREEN	S5	Eastern Teaberry	<i>Gaultheria procumbens</i>
GREEN	S5	Purple Avens	<i>Geum rivale</i>
GREEN	S5	Rattlesnake Grass	<i>Glyceria canadensis</i>
GREEN	S5	Common Tall Manna Grass	<i>Glyceria grandis</i>
GREEN	S5	Fowl Manna Grass	<i>Glyceria striata</i>
GREEN	S5	American Water-Pennywort	<i>Hydrocotyle americana</i>
GREEN	S5	Canada Holly	<i>Ilex verticillata</i>
GREEN	S5	Blue Flag Iris	<i>Iris versicolor</i>
GREEN	S5	Canada Rush	<i>Juncus canadensis</i>
GREEN	S5	Softrush	<i>Juncus effusus</i>
GREEN	S5	Bog Rush	<i>Juncus pelocarpus</i>
GREEN	S5	Sheep laurel	<i>Kalmia angustifolia</i>
GREEN	S5	Pale Bog Laurel	<i>Kalmia polifolia</i>
GREEN	S5	Tamarack	<i>Larix laricina</i>
GREEN	S5	Common Labrador Tea	<i>Ledum groenlandicum</i>
GREEN	S5	Twinflower	<i>Linnaea borealis</i>
GREEN	S5	Mountain Honeysuckle	<i>Lonicera villosa</i>
GREEN	S5	Stiff Clubmoss	<i>Lycopodium annotinum</i>
GREEN	S5	Running Clubmoss	<i>Lycopodium clavatum</i>
GREEN	S5	Flat-branched Tree Clubmoss	<i>Lycopodium obscurum</i>
GREEN	S5	Wild Lily-of-The-Valley	<i>Maianthemum canadense</i>
GREEN	S5	Three-Leaved False Solomon's Seal	<i>Maianthemum triflorum</i>
GREEN	S5	Partidgeberry	<i>Mitchella repens</i>
GREEN	S5	Mi'kmaw Pipe	<i>Monotropa uniflora</i>
GREEN	S5	Northern Bayberry	<i>Morella pensylvanica</i>
GREEN	S5	Small Forget-me-not	<i>Myosotis laxa</i>
GREEN	S5	Mountain Holly	<i>Nemopanthus mucronata</i>
GREEN	S5	Whorled Aster	<i>Oclemena acuminata</i>
GREEN	S5	Bog Aster	<i>Oclemena nemoralis</i>
GREEN	S5	Sensitive Fern	<i>Onoclea sensibilis</i>
GREEN	S5	Cinnamon Fern	<i>Osmunda cinnamomea</i>
GREEN	S5	Interrupted Fern	<i>Osmunda claytonia</i>
GREEN	S5	Common Wood Sorrel	<i>Oxalis montana</i>
GREEN	S5	Northern Beech Fern	<i>Phegopteris connectilis</i>
GREEN	S5	White Spruce	<i>Picea glauca</i>

Site vegetation inventory, Dexter Gabarus Quarry, surveyed October 22, 2018.

NSDLF STATUS	SRank	Common Name	Scientific Name
GREEN	S5	Black Spruce	<i>Picea mariana</i>
GREEN	S5	White Pine	<i>Pinus strobus</i>
GREEN	S5	Rock Polypody	<i>Polypodium virginicum</i>
GREEN	S5	Pin Cherry	<i>Prunus pennsylvanicum</i>
GREEN	S5	Bracken Fern	<i>Pteridium aquilinum</i>
GREEN	S5	Bristly Black Currant	<i>Ribes lacustre</i>
GREEN	S5	Bog Rose	<i>Rosa nitida</i>
GREEN	S5	Virginia Rose	<i>Rosa virginiana</i>
GREEN	S5	Northern Dewberry	<i>Rubus flagellaris</i>
GREEN	S5	Raspberry	<i>Rubus idaeus</i>
GREEN	S5	Dwarf Red Raspberry	<i>Rubus pubescens</i>
GREEN	S5	Bebb's Willow	<i>Salix bebbiana</i>
GREEN	S5	Balsam Willow	<i>Salix pyrifolia</i>
GREEN	S5	Cottongrass Bulrush	<i>Scirpus cyperinus</i>
GREEN	S5	Canada Goldenrod	<i>Solidago canadensis</i>
GREEN	S5	Rough-Leaf Goldenrod	<i>Solidago rugosa</i>
GREEN	S5	American Mountain Ash	<i>Sorbus americana</i>
GREEN	S5	Narrow-leaved Meadowsweet	<i>Spiraea alba</i>
GREEN	S5	New York Aster	<i>Symphyotrichum novibelgii</i>
GREEN	S5	Purple-stemmed Aster	<i>Symphyotrichum puniceum</i>
GREEN	S5	Tall Meadow Rue	<i>Thalictrum pubescens</i>
GREEN	S5	New York Fern	<i>Thelypteris novaboracensis</i>
GREEN	S5	Starflower	<i>Trientalis borealis</i>
GREEN	S3S4	Narrow False-Oats	<i>Trisetum spicatum</i>
GREEN	S5	Cattail	<i>Typha latifolia</i>
GREEN	S5	Late Lowbush Blueberry	<i>Vaccinium angustifolium</i>
GREEN	S5	Large Cranberry	<i>Vaccinium macrocarpon</i>
GREEN	S5	Velvet-leaved Blueberry	<i>Vaccinium myrtilloides</i>
GREEN	S5	Mountain Cranberry	<i>Vaccinium vitis-idaea</i>
GREEN	S5	Marsh Blue Violet	<i>Viola cucullata</i>
GREEN	S5	Smooth White Violet	<i>Viola macloskeyi</i>
EXOTIC	SE	Woodland Angelica	<i>Angelica sylvestris</i>
EXOTIC	SE	Tall hawkweed	<i>Hieracium piloselloides</i>
EXOTIC	SE	St. John's-Wort	<i>Hypericum perforatum</i>
EXOTIC	SE	Creeping Buttercup	<i>Ranunculus repens</i>
EXOTIC	SE	Coltsfoot	<i>Tussilago farfara</i>
EXOTIC	SE	Wood Speedwell	<i>Veronica officinalis</i>

Late Spring/Early Summer Botanical Survey for Proposed
Quarry Expansion near Gabarus, Cape Breton Island,
Nova Scotia

Ruth E. Newell, B.Sc. (Hons.), M.Sc.
July 08, 2019

Late Spring/Early Summer Botanical Survey for Proposed Quarry Expansion near Gabarus, Cape Breton Island, Nova Scotia

INTRODUCTION

A late spring/early summer botanical survey of vascular plants was conducted by botanist, Ruth E. Newell, B.Sc. (Hons.), M.Sc., on June 24th and 25th, 2019 for a proposed quarry expansion on the Grand Mira South Road near Gabarus, Cape Breton County, Cape Breton Island, Nova Scotia. This is a follow-up survey to a fall survey conducted by Dr. Nicholas Hill on October 22, 2018.

The survey was carried out on foot and involved conducting several meandering transects throughout the various habitats present on site in order to document early flowering or fruiting vascular plant species that would not be detectable late in the growing season.

The specific area surveyed is enclosed by the yellow line in Figure 1.

Populations of species of conservation concern if encountered were to be given an estimate of population size, photographed and their precise location documented with GPS coordinates.

All vascular plant species observed and identified during this survey that *were not* documented in the fall report, their provincial (subnational) status rank and their provincial general status rank as sourced from the Atlantic Canada Conservation Data Center website (<http://www.accdc.com/en/rank-definitions.html>) and The General Status of Wild Species in Canada website (<https://www.wildspecies.ca/home>) respectively are provided in TABLE 1 at the end of this report.

Information on the various status ranks used in this report including status rank definitions can be found at the above websites as well as in TABLE 1.

The presence or absence of species of conservation concern for this site is discussed in the **Discussion** section of this report.

Nomenclature used in this document follows <https://data.canadensys.net/vascan/search>.



Figure 1. Satellite image of the existing quarry. The specific area surveyed is that enclosed within the yellow line and outside of the current quarry footprint.

HABITAT DESCRIPTIONS

Disturbed, vegetated, outer edge of quarry (buffer zone between open pit and surrounding woodland)

This area either drops abruptly or gently slopes down to the surrounding woodland and is usually mesic or moderately dry and vegetated with a mixture of graminoids, forbs and scattered shrubs and young trees (Fig. 2). At least one area (20T 0714053 E, 5077579 N) (on the east side of the quarry) had wet open marsh habitat (Fig. 3) with drainage occurring eastwards. Common species in this specific marshy area include Broad-leaved Cattail (*Typha latifolia*), Speckled Alder (*Alnus incana*, ssp. *rugosa*), Purple-stemmed Aster (*Symphotrichum puniceum*), Balsam Willow (*Salix pyrifolia*) and Soft Rush (*Juncus effusus* s.l.).



Figure 2. Mesic buffer zone between quarry (on left) and woodland.



Figure 3. Marshy buffer zone between quarry (on left) and woodland.

Mixed and Coniferous Mesic Woodland Areas

Mesic woodland (woodland with a moderate amount of moisture present in the soil/substrate), both mixed (mixture of deciduous and coniferous species) (Fig. 4) and coniferous (Fig. 5), occurs primarily in the southeast corner of the survey area and on the lower west side of the property.

The mixed woodlands were treed with Balsam Fir (*Abies balsamea*), White Spruce (*Picea glauca*), Red Maple (*Acer rubrum*) and White Birch (*Betula papyrifera*). There were also occasional Larch (*Larix laricina*) present. Common shrubs present included several blueberry species (Lowbush Blueberry/*Vaccinium angustifolium*, Velvet-leaved Blueberry/*V. myrtilloides*), Lambkill (*Kalmia angustifolia*) and Mountain Holly (*Ilex mucronata*). Common herbaceous species present included Bunchberry (*Cornus canadensis*), Twinflower (*Linnaea borealis*), Cinnamon Fern (*Osmundastrum cinnamomeum*), Starflower (*Lysimachia borealis*), etc. Common mosses include Schreber's Red-stemmed Feather Moss (*Pleurozium schreberi*) and Stair Step Moss (*Hylocomium splendens*). The coniferous woodland areas generally were composed of Balsam Fir, White Spruce and, Larch with limited herbaceous ground cover and similar mosses present as in the mixed woodland.

Both habitats described above, have scattered to occasional, small, damp pockets of sphagnum moss (*Sphagnum* spp.).



Figure 4. Mixed, mesic woodland with both coniferous and deciduous trees present and a variety of herbaceous plant species. Dominant mosses in this habitat include Red-stemmed Feather Moss (*Pleurozium schreberi*) and Stairstep Moss (*Hylocomium splendens*).



Figure 5. Mesic coniferous woodland showing general scarcity of herbaceous species on the forest floor and mosses as dominant ground cover.

Open Woodland

(woodland with scattered openings; substrate varying from mesic to somewhat boggy or damp)

Between the north tip of the quarry and the stream marking the northeast boundary of the survey area, (see Fig. 1) there is an area of woodland with numerous small openings. These openings range from relatively dry (mesic) (Fig. 6) to somewhat wet or damp (Fig. 7). The forest openings in this area may be the result of past disturbance such as localized cutting. The satellite image (Fig. 1) also indicates a roadway/trail running through this area in a north-easterly direction, originating from the quarry.

Common species in the dryer openings include Bracken Fern (*Pteridium aquilinum*), Meadowsweet (*Spiraea alba* var. *latifolia*), Rough Goldenrod (*Solidago rugosa*), Canada Goldenrod (*Solidago canadensis*) Pearly Everlasting (*Anaphalis margaritacea*), Wild Strawberry (*Fragaria virginiana*), Wild Raspberry (*Rubus idaeus* ssp. *strigosus*) and patches of reindeer lichens (*Cladonia* spp.).

Common species in the damper areas (openings) include Sphagnum mosses (*Sphagnum* species), Cinnamon Fern (*Osmundastrum cinnamomeum*), New York Fern (*Thelypteris noveboracensis*), Balsam Willow (*Salix pyrifolia*) and Beaked Willow (*Salix bebbiana*).



Figure 6. One of a number of mesic woodland openings occurring in a area north of the current quarry footprint.



Figure 7. One of several damp woodland openings north of the current quarry footprint.

Wet Woodlands & Stream

Wet woodlands occur in the vicinity of the stream which forms the northeast boundary of the survey area, and they also make up the bulk of the large forested area occurring northwest of the existing quarry (Fig. 8). Tree species present in these areas include Red Maple (*Acer rubrum*), Black Spruce (*Picea mariana*), Balsam Fir (*Abies balsamea*), Larch (*Larix laricina*) and several birch species (*Betula* spp.). The substrate is dominated primarily by sphagnum mosses (*Sphagnum* spp.) and numerous ferns. Common herbaceous plants and shrub species present include Cinnamon Fern (*Osmundastrum cinnamomeum*), Interrupted Fern (*Claytosmunda claytoniana*), Sensitive Fern (*Onoclea sensibilis*), Beech Fern (*Phegopteris connectilis*), Lady Fern (*Athyrium filix-femina*), a variety of Wood ferns (*Dryopteris* spp.), Sheep Laurel (*Kalmia angustifolia*), Bunchberry (*Cornus canadensis*), Wood Aster (*Oclemena acuminata*), Wild Sarsaparilla (*Aralia nudicaulis*), sedges (*Carex* spp.), Mountain Holly (*Ilex mucronata*), Woodland Horsetail (*Equisetum sylvaticum*), Small Enchanter's Nightshade (*Circaea alpina*), etc.

The woodland northwest of the quarry showed signs of past disturbance (possibly cutting) as there are wide, heavy vehicle ruts present within this area.



Figure 8. Large area of wet woodland occurring northwest of the existing quarry.

DISCUSSION

An additional twenty vascular plant species were documented during this late spring/early summer survey, sixteen native and four non-natives.

Of the new species observed, none are listed under either federal species-at-risk legislation or provincial species-at-risk- legislation. In addition, there were no non-listed vascular plant species of conservation concern (e.g. sensitive or vulnerable species) observed during this survey.

Three species of orchids were observed during the late spring/early summer survey. These were Pink Lady's-slipper (*Cypripedium acaule*), Early Coralroot (*Corallorhiza trifida*) and Tall Northern Green Orchid (*Platanthera aquilonis*). None of these species is currently considered to be of conservation concern.

TABLE 1. List of additional vascular plant species observed during the current late spring/early summer survey that were not documented in the previous (fall) survey. The ACCDC (Atlantic Canada Conservation Data Centre) Subnational Status Rank and the Provincial General Status Rank (Sgsrank) sourced from The General Status of Wild Species in Canada website (<https://www.wildspecies.ca/home>) are also provided.

Latin Name	Common Name	ACCDC Subnational Status Rank*	Sgsrank**
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	S5	S4 Secure
<i>Carex brunnescens</i>	Brownish Sedge	S5	S4 Secure
<i>Carex crinita s.l.</i>	Fringed Sedge	S5	S4 Secure
<i>Carex disperma</i>	Two-seeded Sedge	S5	S4 Secure
<i>Carex leptalea</i>	Bristly-stalked Sedge	S5	S4 Secure
<i>Carex nigra</i>	Smooth Black Sedge	S5	S4 Secure
<i>Chamaenerion angustifolium</i>	Fireweed	S5	S4 Secure
<i>Circaea alpina</i>	Small Enchanter's Nightshade	S5	S4 Secure
<i>Corallorhiza trifida</i>	Early Coralroot	S4	S4 Secure
<i>Cypripedium acaule</i>	Pink Lady's-slipper	S5	S4 Secure
<i>Gymnocarpium dryopteris</i>	Oak Fern	S5	S4 Secure
<i>Lycopus uniflorus</i>	Northern Water Horehound	S5	S4 Secure
<i>Moneses uniflora</i>	One-flowered Wintergreen	S4S5	S4 Secure
<i>Platanthera aquilonis</i>	Tall Northern Green Orchid	S4	S4 Secure
<i>Spiraea tomentosa</i>	Steeplebush	S5	S4 Secure
<i>Viburnum nudum var. cassinoides</i>	Northern Wild Raisin	S5	S4 Secure
<i>Oenothera biennis</i>	Common Evening Primrose	SNA	S7 Exotic
<i>Poa nemoralis</i>	Wood Blue Grass	SNA	S7 Exotic
<i>Poa trivialis</i>	Rough Blue Grass	SNA	S7 Exotic
<i>Ranunculus acris</i>	Common Buttercup	SNA	S7 Exotic

*ACCDC: Atlantic Canada Conservation Data Centre ; explanation of status ranks: **S5 = Secure** (common, widespread, and abundant in the province); **S4 = Apparently Secure** (uncommon but not rare; some cause for long-term concern due to declines or other factors); **SNA = Not Applicable** - A conservation status rank is not applicable because the species is not a suitable target for conservation activities, e.g. a non-native species (<http://www.accdc.com/en/rank-definitions.html>).

The Nova Scotia general status ranks used in this report are based on the ranks used in the 2015 Wild Species of Canada Report (available at <http://www.wildspecies.ca/home>) ; **S5 = secure (at very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats; **S4 = apparently secure** (at a fairly low risk of extirpation in the jurisdiction 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; **S7 = non-native** (exotic).

APPENDIX C

ATLANTIC CANADA CONSERVATION DATA CENTRE

REPORT

DATA REPORT 6269: Gabarus Quarry, NS

Prepared 10 December 2018
by J. Churchill, Data Manager

CONTENTS OF REPORT

1.0 Preface

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Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
GabarusQuarrNS_6269ob.xls	All Rare and legally protected <i>Flora and Fauna</i> in your study area
GabarusQuarrNS_6269ob100km.xls	A list of Rare and legally protected <i>Flora and Fauna</i> within 100 km of your study area
GabarusQuarrNS_6269ma.xls	All <i>Managed Areas</i> in your study area
GabarusQuarrNS_6269sa.xls	All <i>Significant Natural Areas</i> in your study area

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

- a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
- b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
- c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
- d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
- e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
- f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
- g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries

Sean Blaney, Senior Scientist, Executive Director

Tel: (506) 364-2658

sean.blaney@accdc.ca

Animals (Fauna)

John Klymko, Zoologist

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Plant Communities

Sarah Robinson, Community Ecologist

Tel: (506) 364-2664

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Data Management, GIS

James Churchill, Data Manager

Tel: (902) 679-6146

james.churchill@accdc.ca

Billing

Jean Breau

Tel: (506) 364-2657

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Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Western: Duncan Bayne

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For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

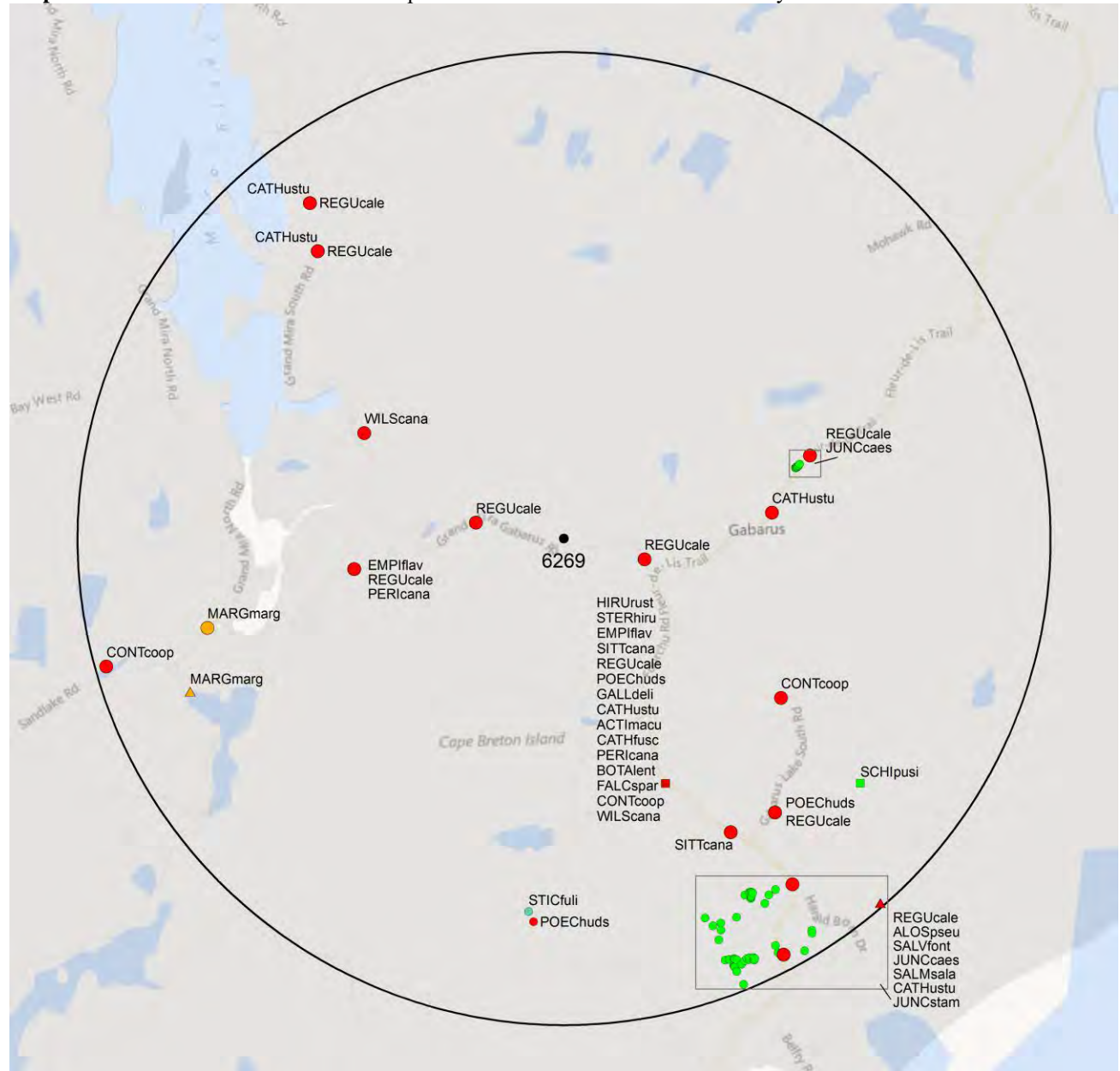
2.1 FLORA

The study area contains 50 records of 3 vascular, 1 record of 1 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 54 records of 18 vertebrate, 2 records of 1 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



- RESOLUTION**
- 4.7 within 50s of kilometers
 - 4.0 within 10s of kilometers
 - 3.7 within 5s of kilometers
 - △ 3.0 within kilometers
 - △ 2.7 within 500s of meters
 - ◇ 2.0 within 100s of meters
 - ◇ 1.7 within 10s of meters

- HIGHER TAXON**
- vertebrate fauna
 - invertebrate fauna
 - vascular flora
 - nonvascular flora

3.0 SPECIAL AREAS

3.1 MANAGED AREAS

The GIS scan identified 2 managed areas in the vicinity of the study area (Map 3 and attached file: *ma*.xls).

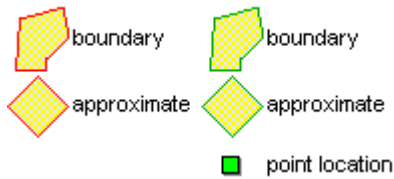
3.2 SIGNIFICANT AREAS

The GIS scan identified 1 biologically significant site in the vicinity of the study area (Map 3 and attached file: *sa*.xls).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



MANAGED AREAS SIGNIFIANT AREAS



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (\pm the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	<i>Sticta fuliginosa</i>	Peppered Moon Lichen				S3	3 Sensitive	1	3.9 \pm 0.0
P	<i>Juncus caesariensis</i>	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	48	2.5 \pm 0.0
P	<i>Juncus stygius ssp. americanus</i>	Moor Rush				S2	3 Sensitive	1	4.7 \pm 0.0
P	<i>Schizaea pusilla</i>	Little Curlygrass Fern				S3S4	4 Secure	1	4.0 \pm 5.0

4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1 At Risk	3	2.7 \pm 7.0
A	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	2	2.3 \pm 0.0
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	1 At Risk	5	2.7 \pm 7.0
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B	3 Sensitive	1	2.7 \pm 7.0
A	<i>Salmo salar</i>	Atlantic Salmon				S1	2 May Be At Risk	1	5.0 \pm 0.0
A	<i>Perisoreus canadensis</i>	Gray Jay				S3	3 Sensitive	3	2.2 \pm 0.0
A	<i>Poecile hudsonica</i>	Boreal Chickadee				S3	3 Sensitive	4	2.7 \pm 7.0
A	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	4 Secure	4	2.7 \pm 7.0
A	<i>Alosa pseudoharengus</i>	Alewife				S3	3 Sensitive	1	5.0 \pm 0.0
A	<i>Salvelinus fontinalis</i>	Brook Trout				S3	3 Sensitive	1	5.0 \pm 0.0
A	<i>Falco sparverius</i>	American Kestrel				S3B	4 Secure	1	2.7 \pm 7.0
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3B	3 Sensitive	2	2.7 \pm 7.0
A	<i>Botaurus lentiginosus</i>	American Bittern				S3S4B	3 Sensitive	1	2.7 \pm 7.0
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B	3 Sensitive	1	2.7 \pm 7.0
A	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	3	2.2 \pm 0.0
A	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	3 Sensitive	13	0.9 \pm 0.0
A	<i>Catharus fuscescens</i>	Veery				S3S4B	4 Secure	1	2.7 \pm 7.0
A	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	4 Secure	7	2.2 \pm 0.0
I	<i>Margaritifera margaritifera</i>	Eastern Pearlshell				S2	3 Sensitive	2	3.8 \pm 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species “location sensitive”. Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with “YES”.

Nova Scotia

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Fraxinus nigra</i>	Black Ash		Threatened	No
<i>Emydoidea blandingii</i>	Blanding's Turtle - Nova Scotia pop.	Endangered	Vulnerable	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	No
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Vulnerable	No
<i>Bat Hibernaculum</i>		[Endangered] ¹	[Endangered] ¹	No

¹ *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NS Endangered Species Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
49	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
48	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
4	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
2	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
2	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
2	Staff, DNR 2007. Restricted & Limited Use Land Database (RLUL).
1	Knapton, R. & Power, T.; Williams, M. 2001. SAR Inventory: Fortress Louisbourg NP. Parks Canada, Atlantic, SARINV01-13. 157 recs.
1	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
1	NS DOE. Protected Areas

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 11765 records of 121 vertebrate and 363 records of 42 invertebrate fauna; 4855 records of 248 vascular, 898 records of 62 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (\pm the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	30	31.0 \pm 0.0	NS
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	1 At Risk	120	7.1 \pm 0.0	NS
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1B	1 At Risk	3	99.9 \pm 0.0	NS
A	<i>Calidris canutus rufa</i>	Red Knot rufa ssp	Endangered		Endangered	S2M	1 At Risk	131	11.6 \pm 0.0	NS
A	<i>Rangifer tarandus pop. 2</i>	Woodland Caribou (Atlantic-Gasp [rsie pop.]	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	1	93.5 \pm 0.0	NS
A	<i>Caprimulgus vociferus</i>	Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	1 At Risk	1	99.8 \pm 0.0	NS
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Special Concern	Endangered	S1S2B	1 At Risk	84	20.4 \pm 7.0	NS
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2	3 Sensitive	53	13.3 \pm 5.0	NS
A	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	Threatened			S2	2 May Be At Risk	1	7.6 \pm 0.0	NS
A	<i>Anguilla rostrata</i>	American Eel	Threatened			S2	4 Secure	2	45.9 \pm 0.0	NS
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	1 At Risk	42	19.1 \pm 7.0	NS
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	2 May Be At Risk	134	7.6 \pm 7.0	NS
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1 At Risk	245	2.7 \pm 7.0	NS
A	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	94	2.3 \pm 0.0	NS
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	3 Sensitive	91	7.0 \pm 0.0	NS
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Vulnerable	S1B,SNAM	3 Sensitive	4	51.7 \pm 0.0	NS
A	<i>Bucephala islandica (Eastern pop.)</i>	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	1 At Risk	1	48.1 \pm 16.0	NS
A	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern		S1S2B	2 May Be At Risk	5	45.1 \pm 7.0	NS
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	2 May Be At Risk	95	6.1 \pm 0.0	NS
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	1 At Risk	51	7.6 \pm 7.0	NS
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	1 At Risk	310	2.7 \pm 7.0	NS
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	1 At Risk	11	51.9 \pm 0.0	NS
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern			S2S3M	3 Sensitive	1	43.1 \pm 0.0	NS
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	3 Sensitive	2	14.0 \pm 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3 Sensitive	78	7.6 ± 7.0	NS
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern		Vulnerable	S3S4B,S3N	4 Secure	122	9.3 ± 0.0	NS
A	<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper	Special Concern			SNA	8 Accidental	23	41.8 ± 0.0	NS
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S1	1 At Risk	85	19.4 ± 1.0	NS
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1?B	5 Undetermined	1	27.5 ± 7.0	NS
A	<i>Sorex dispar</i>	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	12	50.7 ± 1.0	NS
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S2?B	5 Undetermined	7	45.1 ± 7.0	NS
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk			S3	4 Secure	17	48.3 ± 0.0	NS
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B	3 Sensitive	327	2.7 ± 7.0	NS
A	<i>Sialia sialis</i>	Eastern Bluebird	Not At Risk			S3B	3 Sensitive	5	29.1 ± 7.0	NS
A	<i>Accipiter gentilis</i>	Northern Goshawk	Not At Risk			S3S4	4 Secure	55	11.7 ± 7.0	NS
A	<i>Circus cyaneus</i>	Northern Harrier	Not At Risk			S3S4B	4 Secure	135	7.6 ± 7.0	NS
A	<i>Ammodramus nelsoni</i>	Nelson's Sparrow	Not At Risk			S3S4B	4 Secure	31	12.2 ± 0.0	NS
A	<i>Morone saxatilis</i>	Striped Bass	E,E,SC			S2S3	2 May Be At Risk	4	7.6 ± 0.0	NS
A	<i>Martes americana</i>	American Marten			Endangered	S1	1 At Risk	18	52.1 ± 0.0	NS
A	<i>Alces americanus</i>	Moose			Endangered	S1	1 At Risk	2	86.4 ± 0.0	NS
A	<i>Salmo salar</i>	Atlantic Salmon				S1	2 May Be At Risk	64	5.0 ± 0.0	NS
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S1?	5 Undetermined	3	65.0 ± 7.0	NS
A	<i>Uria aalge</i>	Common Murre				S1?B,S5N	4 Secure	3	63.7 ± 0.0	NS
A	<i>Anas acuta</i>	Northern Pintail				S1B	2 May Be At Risk	4	12.0 ± 0.0	NS
A	<i>Haematopus palliatus</i>	American Oystercatcher				S1B	5 Undetermined	7	78.1 ± 0.0	NS
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S1B	4 Secure	12	27.8 ± 7.0	NS
A	<i>Vireo gilvus</i>	Warbling Vireo				S1B	5 Undetermined	4	53.9 ± 7.0	NS
A	<i>Calidris minutilla</i>	Least Sandpiper				S1B,S3M	4 Secure	202	11.4 ± 0.0	NS
A	<i>Charadrius semipalmatus</i>	Semipalmated Plover				S1B,S3S4M	4 Secure	270	11.4 ± 0.0	NS
A	<i>Pluvialis dominica</i>	American Golden-Plover				S1S2M	3 Sensitive	73	11.4 ± 0.0	NS
A	<i>Limosa haemastica</i>	Hudsonian Godwit				S1S2M	3 Sensitive	92	11.6 ± 0.0	NS
A	<i>Microtus chrotorrhinus</i>	Rock Vole				S2	4 Secure	18	63.2 ± 0.0	NS
A	<i>Vireo philadelphicus</i>	Philadelphia Vireo				S2?B	5 Undetermined	3	33.4 ± 7.0	NS
A	<i>Anas clypeata</i>	Northern Shoveler				S2B	2 May Be At Risk	1	47.5 ± 0.0	NS
A	<i>Anas strepera</i>	Gadwall				S2B	2 May Be At Risk	1	47.9 ± 0.0	NS
A	<i>Empidonax traillii</i>	Willow Flycatcher				S2B	3 Sensitive	1	76.3 ± 0.0	NS
A	<i>Dendroica tigrina</i>	Cape May Warbler				S2B	3 Sensitive	36	19.1 ± 7.0	NS
A	<i>Piranga olivacea</i>	Scarlet Tanager				S2B	5 Undetermined	1	59.4 ± 7.0	NS
A	<i>Pooecetes gramineus</i>	Vesper Sparrow				S2B	2 May Be At Risk	5	61.6 ± 0.0	NS
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S2B	4 Secure	15	20.4 ± 7.0	NS
A	<i>Alca torda</i>	Razorbill				S2B,S4N	3 Sensitive	50	49.8 ± 7.0	NS
A	<i>Bucephala clangula</i>	Common Goldeneye				S2B,S5N	4 Secure	57	42.6 ± 0.0	NS
A	<i>Branta bernicla</i>	Brant				S2M	3 Sensitive	1	92.5 ± 16.0	NS
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2S3	3 Sensitive	241	7.6 ± 7.0	NS
A	<i>Asio otus</i>	Long-eared Owl				S2S3	2 May Be At Risk	9	11.7 ± 7.0	NS
A	<i>Carduelis pinus</i>	Pine Siskin				S2S3	3 Sensitive	162	11.3 ± 7.0	NS
A	<i>Rallus limicola</i>	Virginia Rail				S2S3B	5 Undetermined	3	85.4 ± 7.0	NS
A	<i>Tringa semipalmata</i>	Willet				S2S3B	2 May Be At Risk	319	10.0 ± 0.0	NS
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B	2 May Be At Risk	89	7.6 ± 7.0	NS
A	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak				S2S3B	3 Sensitive	47	20.4 ± 7.0	NS
A	<i>Icterus galbula</i>	Baltimore Oriole				S2S3B	2 May Be At Risk	1	91.8 ± 7.0	NS
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	131	9.3 ± 7.0	NS
A	<i>Numenius phaeopus hudsonicus</i>	Hudsonian Whimbrel				S2S3M	3 Sensitive	152	11.6 ± 0.0	NS
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S2S3M	4 Secure	72	11.6 ± 0.0	NS
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S2S3M	3 Sensitive	1	43.9 ± 0.0	NS
A	<i>Perisoreus canadensis</i>	Gray Jay				S3	3 Sensitive	244	2.2 ± 0.0	NS
A	<i>Poecile hudsonica</i>	Boreal Chickadee				S3	3 Sensitive	443	2.7 ± 7.0	NS
A	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	4 Secure	350	2.7 ± 7.0	NS
A	<i>Alosa pseudoharengus</i>	Alewife				S3	3 Sensitive	42	5.0 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Salvelinus fontinalis</i>	Brook Trout				S3	3 Sensitive	54	5.0 ± 0.0	NS
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3	4 Secure	9	63.2 ± 0.0	NS
A	<i>Pekania pennanti</i>	Fisher				S3	3 Sensitive	1	81.2 ± 0.0	NS
A	<i>Calidris maritima</i>	Purple Sandpiper				S3?N	3 Sensitive	21	26.7 ± 10.0	NS
A	<i>Falco sparverius</i>	American Kestrel				S3B	4 Secure	128	2.7 ± 7.0	NS
A	<i>Charadrius vociferus</i>	Killdeer				S3B	3 Sensitive	107	20.4 ± 7.0	NS
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3B	3 Sensitive	240	2.7 ± 7.0	NS
A	<i>Sterna paradisaea</i>	Arctic Tern				S3B	2 May Be At Risk	78	11.8 ± 0.0	NS
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B	2 May Be At Risk	5	27.5 ± 7.0	NS
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3B	3 Sensitive	40	11.3 ± 7.0	NS
A	<i>Dumetella carolinensis</i>	Gray Catbird				S3B	2 May Be At Risk	59	7.6 ± 7.0	NS
A	<i>Wilsonia pusilla</i>	Wilson's Warbler				S3B	3 Sensitive	57	19.1 ± 7.0	NS
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S3B,S3S4M	3 Sensitive	382	11.4 ± 0.0	NS
A	<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel				S3B,S5M	4 Secure	20	21.5 ± 0.0	NS
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S3B,S5N	3 Sensitive	74	8.1 ± 7.0	NS
A	<i>Fratercula arctica</i>	Atlantic Puffin				S3B,S5N	3 Sensitive	34	58.2 ± 7.0	NS
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3M	4 Secure	311	11.4 ± 0.0	NS
A	<i>Tringa flavipes</i>	Lesser Yellowlegs				S3M	4 Secure	163	11.4 ± 0.0	NS
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	4 Secure	142	11.6 ± 0.0	NS
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3M	3 Sensitive	234	11.4 ± 0.0	NS
A	<i>Calidris fuscicollis</i>	White-rumped Sandpiper				S3M	4 Secure	158	11.6 ± 0.0	NS
A	<i>Limnodromus griseus</i>	Short-billed Dowitcher				S3M	4 Secure	158	11.4 ± 0.0	NS
A	<i>Calidris alba</i>	Sanderling				S3M,S2N	4 Secure	159	11.4 ± 0.0	NS
A	<i>Somateria mollissima</i>	Common Eider				S3S4	4 Secure	181	7.5 ± 8.0	NS
A	<i>Picoides arcticus</i>	Black-backed Woodpecker				S3S4	3 Sensitive	41	11.3 ± 7.0	NS
A	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	4 Secure	21	11.3 ± 7.0	NS
A	<i>Botaurus lentiginosus</i>	American Bittern				S3S4B	3 Sensitive	38	2.7 ± 7.0	NS
A	<i>Anas discors</i>	Blue-winged Teal				S3S4B	2 May Be At Risk	53	7.6 ± 7.0	NS
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B	3 Sensitive	432	2.7 ± 7.0	NS
A	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	428	2.2 ± 0.0	NS
A	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	3 Sensitive	979	0.9 ± 0.0	NS
A	<i>Catharus fuscescens</i>	Veery				S3S4B	4 Secure	60	2.7 ± 7.0	NS
A	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	4 Secure	596	2.2 ± 0.0	NS
A	<i>Vermivora peregrina</i>	Tennessee Warbler				S3S4B	3 Sensitive	83	7.6 ± 7.0	NS
A	<i>Dendroica castanea</i>	Bay-breasted Warbler				S3S4B	3 Sensitive	100	6.3 ± 0.0	NS
A	<i>Dendroica striata</i>	Blackpoll Warbler				S3S4B	3 Sensitive	138	15.4 ± 7.0	NS
A	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B	4 Secure	172	9.3 ± 7.0	NS
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3S4B,S5N	4 Secure	105	12.6 ± 7.0	NS
A	<i>Bucephala albeola</i>	Bufflehead				S3S4N	4 Secure	9	46.5 ± 1.0	NS
A	<i>Eremophila alpestris</i>	Horned Lark				SHB,S4S5N	4 Secure	2	39.1 ± 7.0	NS
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	4 Secure	28	11.2 ± 0.0	NS
A	<i>Aythya americana</i>	Redhead				SHB,SNAM	4 Secure	2	48.6 ± 11.0	NS
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Endangered	S2B	3 Sensitive	11	44.0 ± 0.0	NS
I	<i>Lampsilis cariosa</i>	Yellow Lampmussel	Special Concern	Special Concern	Threatened	S1	1 At Risk	37	26.9 ± 1.0	NS
I	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern		Vulnerable	S3	3 Sensitive	3	10.3 ± 0.0	NS
I	<i>Quedius speleus</i>	Spelean Rove Beetle				S1		1	60.1 ± 1.0	NS
I	<i>Papilio brevicauda bretonensis</i>	Short-tailed Swallowtail				S1	1 At Risk	11	48.8 ± 0.0	NS
I	<i>Somatochlora albicincta</i>	Ringed Emerald				S1	2 May Be At Risk	7	87.1 ± 0.0	NS
I	<i>Leucorrhinia patricia</i>	Canada Whiteface				S1	2 May Be At Risk	1	91.0 ± 0.0	NS
I	<i>Coenagrion interrogatum</i>	Subarctic Bluet				S1	2 May Be At Risk	2	65.8 ± 0.0	NS
I	<i>Leptodea ochracea</i>	Tidewater Mucket				S1	3 Sensitive	17	23.6 ± 1.0	NS
I	<i>Lycaena dorcas</i>	Dorcas Copper				S1?	6 Not Assessed	24	17.8 ± 0.0	NS
I	<i>Polygonia satyrus</i>	Satyr Comma				S1?	3 Sensitive	1	37.2 ± 1.0	NS
I	<i>Strymon melinus</i>	Grey Hairstreak				S1S2	4 Secure	1	59.5 ± 0.0	NS
I	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S1S2	4 Secure	1	45.1 ± 1.0	NS
I	<i>Haematopota rara</i>	Shy Cleg				S1S3	5 Undetermined	1	43.4 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
I	<i>Lycaena dospassosi</i>	Salt Marsh Copper				S2	1 At Risk	1	94.9 ± 0.0	NS
I	<i>Boloria chariclea grandis</i>	Purple Lesser Fritillary				S2	3 Sensitive	2	21.2 ± 1.0	NS
I	<i>Aglais milberti milberti</i>	Milbert's Tortoise Shell				S2	4 Secure	1	50.1 ± 1.0	NS
I	<i>Somatochlora septentrionalis</i>	Muskeg Emerald				S2	3 Sensitive	21	67.8 ± 1.0	NS
I	<i>Somatochlora williamsoni</i>	Williamson's Emerald				S2	2 May Be At Risk	10	56.0 ± 0.0	NS
I	<i>Margaritifera margaritifera</i>	Eastern Pearlshell				S2	3 Sensitive	70	3.8 ± 0.0	NS
I	<i>Pantala hymenaea</i>	Spot-Winged Glider				S2?B	3 Sensitive	2	68.0 ± 0.0	NS
I	<i>Thorybes pylades</i>	Northern Cloudywing				S2S3	3 Sensitive	1	63.6 ± 0.0	NS
I	<i>Euphydryas phaeton</i>	Baltimore Checkerspot				S2S3	4 Secure	7	37.7 ± 1.0	NS
I	<i>Gomphus descriptus</i>	Harpoon Clubtail				S2S3	3 Sensitive	16	71.7 ± 0.0	NS
I	<i>Ophiogomphus aspersus</i>	Brook Snaketail				S2S3	2 May Be At Risk	5	77.6 ± 0.0	NS
I	<i>Somatochlora forcipata</i>	Forcinate Emerald				S2S3	2 May Be At Risk	7	9.5 ± 0.0	NS
I	<i>Alasmidonta undulata</i>	Triangle Floater				S2S3	4 Secure	2	67.5 ± 0.0	NS
I	<i>Iphthiminius opacus</i>	a Darkling Beetle				S3		1	73.2 ± 0.0	NS
I	<i>Polygonia faunus</i>	Green Comma				S3	4 Secure	11	45.1 ± 1.0	NS
I	<i>Oeneis jutta</i>	Jutta Arctic				S3	2 May Be At Risk	6	55.0 ± 0.0	NS
I	<i>Aeshna clepsydra</i>	Mottled Darner				S3	4 Secure	1	90.0 ± 0.0	NS
I	<i>Boyeria grafiana</i>	Ocellated Darner				S3	3 Sensitive	1	20.0 ± 1.0	NS
I	<i>Gomphaeschna furcillata</i>	Harlequin Darner				S3	3 Sensitive	3	71.7 ± 0.0	NS
I	<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald				S3	4 Secure	2	55.4 ± 0.0	NS
I	<i>Nannothemis bella</i>	Elfin Skimmer				S3	4 Secure	3	86.0 ± 0.0	NS
I	<i>Sympetrum danae</i>	Black Meadowhawk				S3	3 Sensitive	12	14.8 ± 1.0	NS
I	<i>Enallagma vernale</i>	Vernal Bluet				S3	5 Undetermined	8	57.5 ± 0.0	NS
I	<i>Amphiagrion saucium</i>	Eastern Red Damsel				S3	4 Secure	15	35.2 ± 1.0	NS
I	<i>Polygonia interrogationis</i>	Question Mark				S3B	4 Secure	8	45.1 ± 1.0	NS
I	<i>Polygonia progne</i>	Grey Comma				S3S4	4 Secure	10	45.1 ± 1.0	NS
I	<i>Lanthus parvulus</i>	Northern Pygmy Clubtail				S3S4	4 Secure	14	25.3 ± 1.0	NS
I	<i>Lampsilis radiata</i>	Eastern Lampmussel				S3S4	3 Sensitive	5	28.0 ± 0.0	NS
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	1 At Risk	261	8.2 ± 0.0	NS
N	<i>Pannaria lurida</i>	Veined Shingle Lichen	Threatened		Threatened	S1S2	2 May Be At Risk	1	31.6 ± 0.0	NS
N	<i>Sclerophora peronella</i> (Nova Scotia pop.)	Frosted Glass-whiskers Lichen - Nova Scotia pop.	Special Concern	Special Concern		S1?		5	19.0 ± 0.0	NS
N	<i>Degelia plumbea</i>	BluDegelia plumbeae Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	4 Secure	66	12.0 ± 0.0	NS
N	<i>Cladonia brevis</i>	Short Peg Lichen				S1		1	43.2 ± 0.0	NS
N	<i>Peltigera lepidophora</i>	Scaly Pelt Lichen				S1	2 May Be At Risk	2	50.0 ± 0.0	NS
N	<i>Gowardia nigricans</i>	Gray Witch's Beard Lichen				S1	6 Not Assessed	1	96.1 ± 1.0	NS
N	<i>Cavernularia hultenii</i>	Powdered Honeycomb Lichen				S1	2 May Be At Risk	1	36.9 ± 1.0	NS
N	<i>Metacalypogeia schusterana</i>	Schuster's Pouchwort				S1?	5 Undetermined	1	46.5 ± 0.0	NS
N	<i>Moerckia hibernica</i>	Irish Ruffwort				S1?		1	46.5 ± 0.0	NS
N	<i>Brachythecium erythrorrhizon</i>	Taiga Ragged Moss				S1?		2	47.9 ± 0.0	NS
N	<i>Conardia compacta</i>	Coast Creeping Moss				S1?	3 Sensitive	2	88.1 ± 2.0	NS
N	<i>Paludella squarrosa</i>	Tufted Fen Moss				S1?	3 Sensitive	1	56.1 ± 5.0	NS
N	<i>Syntrichia ruralis</i>	a Moss				S1?	3 Sensitive	1	65.2 ± 1.0	NS
N	<i>Sanionia orthothecioides</i>	Coastal Hook Moss				S1?	5 Undetermined	1	45.2 ± 0.0	NS
N	<i>Flavocetraria nivalis</i>	Crinkled Snow Lichen				S1?	3 Sensitive	1	95.5 ± 0.0	NS
N	<i>Parmeliella parvula</i>	Poor-man's Shingles Lichen				S1?	2 May Be At Risk	6	20.9 ± 0.0	NS
N	<i>Buxbaumia minakatae</i>	Hump-Backed Elves				S1S2	3 Sensitive	1	55.0 ± 100.0	NS
N	<i>Platydictya confervoides</i>	a Moss				S1S2	3 Sensitive	1	41.8 ± 3.0	NS
N	<i>Sphagnum platyphyllum</i>	Flat-leaved Peat Moss				S1S2		2	63.7 ± 0.0	NS
N	<i>Hamatocaulis vernicosus</i>	a Moss				S1S2	3 Sensitive	1	74.3 ± 0.0	NS
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S2?	3 Sensitive	1	47.1 ± 30.0	NS
N	<i>Campyllum radicale</i>	Long-stalked Fine Wet Moss				S2?	5 Undetermined	1	73.9 ± 0.0	NS
N	<i>Fontinalis sullivantii</i>	a Moss				S2?	3 Sensitive	1	55.0 ± 100.0	NS
N	<i>Grimmia anomala</i>	Mountain Forest Grimmia				S2?	3 Sensitive	1	86.9 ± 0.0	NS

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N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2?	3 Sensitive	1	93.1 ± 0.0	NS
N	<i>Pseudoleskea patens</i>	Patent Leskea Moss				S2?	3 Sensitive	1	94.6 ± 0.0	NS
N	<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss				S2?	3 Sensitive	7	45.3 ± 0.0	NS
N	<i>Sematophyllum marylandicum</i>	a Moss				S2?	3 Sensitive	3	96.8 ± 1.0	NS
N	<i>Tortella fragilis</i>	Fragile Twisted Moss				S2?	3 Sensitive	2	46.5 ± 0.0	NS
N	<i>Cyrtomnium hymenophylloides</i>	Short-pointed Lantern Moss				S2?	3 Sensitive	1	60.8 ± 0.0	NS
N	<i>Nephroma arcticum</i>	Arctic Kidney Lichen				S2?	2 May Be At Risk	1	33.0 ± 0.0	NS
N	<i>Peltigera collina</i>	Tree Pelt Lichen				S2?	3 Sensitive	16	11.9 ± 0.0	NS
N	<i>Platydictya subtilis</i>	Bark Willow Moss				S2S3	3 Sensitive	1	94.6 ± 0.0	NS
N	<i>Limprichtia revolvens</i>	a Moss				S2S3	3 Sensitive	6	63.7 ± 0.0	NS
N	<i>Cetraria muricata</i>	Spiny Heath Lichen				S2S3	5 Undetermined	2	94.1 ± 1.0	NS
N	<i>Fuscopannaria leucosticta</i>	Rimmed Shingles Lichen				S2S3	2 May Be At Risk	1	39.0 ± 0.0	NS
N	<i>Leptogium tenuissimum</i>	Birdnest Jellyskin Lichen				S2S3	6 Not Assessed	1	50.0 ± 0.0	NS
N	<i>Racodium rupestre</i>	Rockhair Lichen				S2S3	5 Undetermined	1	31.4 ± 0.0	NS
N	<i>Usnea mutabilis</i>	Bloody Beard Lichen				S2S3	3 Sensitive	1	78.1 ± 0.0	NS
N	<i>Collema tenax</i>	Soil Tarpaper Lichen				S3		2	50.0 ± 0.0	NS
N	<i>Sticta fuliginosa</i>	Peppered Moon Lichen				S3	3 Sensitive	3	3.9 ± 0.0	NS
N	<i>Fuscopannaria ahlneri</i>	Corrugated Shingles Lichen				S3	4 Secure	31	9.7 ± 0.0	NS
N	<i>Heterodermia speciosa</i>	Powdered Fringe Lichen				S3	4 Secure	1	22.9 ± 0.0	NS
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S3	3 Sensitive	1	22.8 ± 0.0	NS
N	<i>Leptogium lichenoides</i>	Tattered Jellyskin Lichen				S3	2 May Be At Risk	2	50.0 ± 0.0	NS
N	<i>Nephroma bellum</i>	Naked Kidney Lichen				S3	3 Sensitive	1	33.0 ± 0.0	NS
N	<i>Platismatia norvegica</i>	Oldgrowth Rag Lichen				S3	4 Secure	128	8.9 ± 0.0	NS
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen				S3	4 Secure	9	9.7 ± 0.0	NS
N	<i>Calliergon giganteum</i>	Giant Spear Moss				S3?	3 Sensitive	1	56.5 ± 0.0	NS
N	<i>Mnium stellare</i>	Star Leafy Moss				S3?	5 Undetermined	1	47.9 ± 0.0	NS
N	<i>Dicranella varia</i>	a Moss				S3S4	5 Undetermined	2	62.3 ± 0.0	NS
N	<i>Encalypta procera</i>	Slender Extinguisher Moss				S3S4	4 Secure	1	57.1 ± 0.0	NS
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S3S4	4 Secure	1	32.9 ± 0.0	NS
N	<i>Schistidium agassizii</i>	Elf Bloom Moss				S3S4	4 Secure	1	83.2 ± 2.0	NS
N	<i>Hylocomiastrum pyrenaicum</i>	a Feather Moss				S3S4	3 Sensitive	1	80.8 ± 3.0	NS
N	<i>Arctoparmelia incurva</i>	Finger Ring Lichen				S3S4	4 Secure	3	96.1 ± 1.0	NS
N	<i>Hypogymnia vittata</i>	Slender Monk's Hood Lichen				S3S4	4 Secure	34	19.6 ± 0.0	NS
N	<i>Cladonia floerkeana</i>	Gritty British Soldiers Lichen				S3S4	5 Undetermined	3	20.6 ± 0.0	NS
N	<i>Leptogium acadense</i>	Acadian Jellyskin Lichen				S3S4		1	22.5 ± 0.0	NS
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S3S4	4 Secure	258	8.9 ± 0.0	NS
N	<i>Heterodermia neglecta</i>	Fringe Lichen				S3S4	4 Secure	5	35.8 ± 0.0	NS
P	<i>Juncus caesariensis</i>	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	239	2.5 ± 0.0	NS
P	<i>Isoetes prototypus</i>	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	13	39.8 ± 0.0	NS
P	<i>Floerkea proserpinacoides</i>	False Mermaidweed	Not At Risk			S2	3 Sensitive	19	70.1 ± 7.0	NS
P	<i>Salix candida</i>	Sage Willow			Endangered	S1	2 May Be At Risk	42	88.0 ± 0.0	NS
P	<i>Thuja occidentalis</i>	Eastern White Cedar			Vulnerable	S1	1 At Risk	2	41.7 ± 0.0	NS
P	<i>Acer saccharinum</i>	Silver Maple				S1	5 Undetermined	1	36.6 ± 0.0	NS
P	<i>Sanicula odorata</i>	Clustered Sanicle				S1	2 May Be At Risk	6	55.2 ± 1.0	NS
P	<i>Arnica lonchophylla</i>	Northern Arnica				S1	2 May Be At Risk	1	63.1 ± 7.0	NS
P	<i>Bidens hyperborea</i>	Estuary Beggarticks				S1	2 May Be At Risk	2	89.8 ± 7.0	NS
P	<i>Prenanthes racemosa</i>	Glaucous Rattlesnakeroot				S1	2 May Be At Risk	1	47.0 ± 3.0	NS
P	<i>Betula glandulosa</i>	Glandular Birch				S1	2 May Be At Risk	4	92.2 ± 7.0	NS
P	<i>Barbarea orthoceras</i>	American Yellow Rocket				S1	2 May Be At Risk	4	81.7 ± 0.0	NS
P	<i>Cardamine pratensis var. angustifolia</i>	Cuckoo Flower				S1	2 May Be At Risk	5	70.1 ± 0.0	NS
P	<i>Cochlearia tridactylites</i>	Limestone Scurvy-grass				S1	2 May Be At Risk	1	91.3 ± 0.0	NS
P	<i>Draba norvegica var. clivicola</i>	Norwegian Whitlow-Grass				S1	2 May Be At Risk	1	86.7 ± 2.0	NS

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P	<i>Stellaria crassifolia</i>	Fleshy Stitchwort				S1	2 May Be At Risk	1	66.8 ± 2.0	NS
P	<i>Suaeda maritima</i> ssp. <i>richii</i>	White Sea-blite				S1	5 Undetermined	1	85.9 ± 7.0	NS
P	<i>Diapensia lapponica</i>	Diapensia				S1	2 May Be At Risk	1	98.3 ± 0.0	NS
P	<i>Pinguicula vulgaris</i>	Common Butterwort				S1	2 May Be At Risk	1	98.3 ± 1.0	NS
P	<i>Utricularia ochroleuca</i>	Yellowish-white Bladderwort				S1	5 Undetermined	1	78.2 ± 1.0	NS
P	<i>Polygonum viviparum</i>	Alpine Bistort				S1	2 May Be At Risk	1	53.2 ± 1.0	NS
P	<i>Montia fontana</i>	Water Blinks				S1	2 May Be At Risk	2	89.5 ± 1.0	NS
P	<i>Agalinis paupercula</i> var. <i>borealis</i>	Small-flowered Agalinis				S1		1	72.2 ± 0.0	NS
P	<i>Pedicularis palustris</i>	Marsh Lousewort				S1	2 May Be At Risk	3	35.7 ± 0.0	NS
P	<i>Scrophularia lanceolata</i>	Lance-leaved Figwort				S1	5 Undetermined	1	49.5 ± 1.0	NS
P	<i>Carex granularis</i>	Limestone Meadow Sedge				S1	2 May Be At Risk	21	55.5 ± 0.0	NS
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S1	2 May Be At Risk	16	60.1 ± 0.0	NS
P	<i>Carex haydenii</i>	Hayden's Sedge				S1	2 May Be At Risk	1	75.3 ± 0.0	NS
P	<i>Carex rariflora</i>	Loose-flowered Alpine Sedge				S1	2 May Be At Risk	14	24.5 ± 5.0	NS
P	<i>Carex saxatilis</i>	Russet Sedge				S1	2 May Be At Risk	3	99.3 ± 7.0	NS
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S1	2 May Be At Risk	2	45.3 ± 0.0	NS
P	<i>Carex viridula</i> var. <i>elatior</i>	Greenish Sedge				S1	2 May Be At Risk	54	56.1 ± 0.0	NS
P	<i>Eleocharis erythropoda</i>	Red-stemmed Spikerush				S1	2 May Be At Risk	6	53.1 ± 0.0	NS
P	<i>Rhynchospora capillacea</i>	Slender Beakrush				S1	2 May Be At Risk	8	55.6 ± 1.0	NS
P	<i>Iris prismatica</i>	Slender Blue Flag				S1	2 May Be At Risk	2	10.8 ± 0.0	NS
P	<i>Triantha glutinosa</i>	Sticky False-Asphodel				S1	2 May Be At Risk	14	88.1 ± 0.0	NS
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S1	2 May Be At Risk	11	80.0 ± 0.0	NS
P	<i>Elymus wiegandii</i>	Wiegand's Wild Rye				S1	2 May Be At Risk	9	37.6 ± 1.0	NS
P	<i>Elymus hystrix</i> var. <i>bigeloviana</i>	Spreading Wild Rye				S1	2 May Be At Risk	1	40.1 ± 4.0	NS
P	<i>Hordeum brachyantherum</i>	Meadow Barley				S1	2 May Be At Risk	1	89.1 ± 0.0	NS
P	<i>Phleum alpinum</i>	Alpine Timothy				S1	2 May Be At Risk	3	88.1 ± 0.0	NS
P	<i>Torreyochloa pallida</i> var. <i>pallida</i>	Pale False Manna Grass				S1	0.1 Extirpated	2	10.1 ± 1.0	NS
P	<i>Trisetum melicoides</i>	Purple False Oats				S1	2 May Be At Risk	3	65.8 ± 4.0	NS
P	<i>Sparganium androcladum</i>	Branching Bur-Reed				S1	2 May Be At Risk	2	55.1 ± 0.0	NS
P	<i>Equisetum palustre</i>	Marsh Horsetail				S1	2 May Be At Risk	8	95.7 ± 0.0	NS
P	<i>Botrychium lunaria</i>	Common Moonwort				S1	2 May Be At Risk	2	65.5 ± 1.0	NS
P	<i>Halenia deflexa</i> ssp. <i>brentoniana</i>	Spurred Gentian				S1?	5 Undetermined	2	21.1 ± 0.0	NS
P	<i>Spiraea septentrionalis</i>	Northern Meadowsweet				S1?	2 May Be At Risk	2	97.1 ± 0.0	NS
P	<i>Schoenoplectus robustus</i>	Sturdy Bulrush				S1?	5 Undetermined	2	49.9 ± 5.0	NS
P	<i>Hyperzia selago</i>	Northern Firmoss				S1?	2 May Be At Risk	2	36.8 ± 2.0	NS
P	<i>Fraxinus nigra</i>	Black Ash			Threatened	S1S2	1 At Risk	82	28.7 ± 0.0	NS
P	<i>Arabis hirsuta</i> var. <i>pycnocarpa</i>	Western Hairy Rockcress				S1S2	2 May Be At Risk	7	41.8 ± 0.0	NS
P	<i>Cornus suecica</i>	Swedish Bunchberry				S1S2	3 Sensitive	30	12.6 ± 0.0	NS
P	<i>Anemone virginiana</i> var. <i>alba</i>	Virginia Anemone				S1S2	3 Sensitive	8	55.8 ± 1.0	NS
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1S2	2 May Be At Risk	6	35.8 ± 1.0	NS
P	<i>Parnassia palustris</i> var. <i>parviflora</i>	Marsh Grass-of-Parnassus				S1S2	2 May Be At Risk	16	46.3 ± 3.0	NS
P	<i>Carex livida</i> var. <i>radiculis</i>	Livid Sedge				S1S2	2 May Be At Risk	27	12.4 ± 0.0	NS
P	<i>Juncus alpinoarticulatus</i> ssp. <i>nodulosus</i>	Richardson's Rush				S1S2	2 May Be At Risk	11	47.7 ± 0.0	NS
P	<i>Juncus bulbosus</i>	Bulbous Rush				S1S2	5 Undetermined	12	20.3 ± 1.0	NS
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S1S2	5 Undetermined	4	22.6 ± 100.0	NS
P	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	Slim-stemmed Reed Grass				S1S2	3 Sensitive	1	55.6 ± 1.0	NS
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S1S2	2 May Be At Risk	24	78.9 ± 0.0	NS
P	<i>Sparganium hyperboreum</i>	Northern Burreed				S1S2	3 Sensitive	10	20.3 ± 1.0	NS
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S1S2	2 May Be At Risk	17	71.5 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Woodsia alpina</i>	Alpine Cliff Fern				S1S2	2 May Be At Risk	4	67.7 ± 2.0	NS
P	<i>Selaginella selaginoides</i>	Low Spikemoss				S1S2	2 May Be At Risk	2	45.2 ± 0.0	NS
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	2 May Be At Risk	15	70.6 ± 10.0	NS
P	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane				S2	3 Sensitive	6	46.5 ± 1.0	NS
P	<i>Solidago multiradiata</i>	Multi-rayed Goldenrod				S2	2 May Be At Risk	2	35.7 ± 0.0	NS
P	<i>Symphotrichum ciliolatum</i>	Fringed Blue Aster				S2	3 Sensitive	1	89.6 ± 7.0	NS
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2	3 Sensitive	8	47.7 ± 7.0	NS
P	<i>Caulophyllum thalictroides</i>	Blue Cohosh				S2	2 May Be At Risk	15	78.3 ± 0.0	NS
P	<i>Betula borealis</i>	Northern Birch				S2	3 Sensitive	4	64.3 ± 0.0	NS
P	<i>Arabis drummondii</i>	Drummond's Rockcress				S2	3 Sensitive	4	42.1 ± 1.0	NS
P	<i>Cardamine parviflora</i> var. <i>arenicola</i>	Small-flowered Bittercress				S2	3 Sensitive	10	49.2 ± 0.0	NS
P	<i>Draba arabisans</i>	Rock Whitlow-Grass				S2	3 Sensitive	11	65.8 ± 4.0	NS
P	<i>Lobelia kalmii</i>	Brook Lobelia				S2	2 May Be At Risk	95	11.7 ± 7.0	NS
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S2	3 Sensitive	5	24.1 ± 0.0	NS
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	3 Sensitive	1	81.7 ± 0.0	NS
P	<i>Chenopodium rubrum</i>	Red Pigweed				S2	2 May Be At Risk	3	41.6 ± 0.0	NS
P	<i>Hypericum majus</i>	Large St John's-wort				S2	3 Sensitive	2	51.1 ± 1.0	NS
P	<i>Crassula aquatica</i>	Water Pygmyweed				S2	3 Sensitive	8	10.0 ± 0.0	NS
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil				S2	3 Sensitive	5	54.0 ± 0.0	NS
P	<i>Utricularia resupinata</i>	Inverted Bladderwort				S2	3 Sensitive	1	29.5 ± 0.0	NS
P	<i>Oenothera fruticosa</i> ssp. <i>glauca</i>	Narrow-leaved Evening Primrose				S2	5 Undetermined	1	82.0 ± 1.0	NS
P	<i>Rumex salicifolius</i> var. <i>mexicanus</i>	Triangular-valve Dock				S2	3 Sensitive	13	35.7 ± 0.0	NS
P	<i>Primula mistassinica</i>	Mistassini Primrose				S2	3 Sensitive	1	97.2 ± 1.0	NS
P	<i>Anemone quinquefolia</i>	Wood Anemone				S2	3 Sensitive	4	66.9 ± 1.0	NS
P	<i>Anemone virginiana</i>	Virginia Anemone				S2	3 Sensitive	8	87.8 ± 0.0	NS
P	<i>Caltha palustris</i>	Yellow Marsh Marigold				S2	3 Sensitive	20	49.5 ± 2.0	NS
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2	3 Sensitive	89	9.7 ± 0.0	NS
P	<i>Salix pedicellaris</i>	Bog Willow				S2	3 Sensitive	12	75.3 ± 0.0	NS
P	<i>Comandra umbellata</i>	Bastard's Toadflax				S2	2 May Be At Risk	4	47.0 ± 3.0	NS
P	<i>Saxifraga paniculata</i> ssp. <i>neogaea</i>	White Mountain Saxifrage				S2	3 Sensitive	7	60.9 ± 0.0	NS
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S2	3 Sensitive	11	61.2 ± 0.0	NS
P	<i>Carex atratifomis</i>	Scabrous Black Sedge				S2	3 Sensitive	5	65.8 ± 1.0	NS
P	<i>Carex bebbii</i>	Bebb's Sedge				S2	3 Sensitive	25	42.2 ± 0.0	NS
P	<i>Carex castanea</i>	Chestnut Sedge				S2	2 May Be At Risk	22	61.3 ± 0.0	NS
P	<i>Carex comosa</i>	Bearded Sedge				S2	3 Sensitive	1	93.6 ± 1.0	NS
P	<i>Carex hystericina</i>	Porcupine Sedge				S2	2 May Be At Risk	36	41.8 ± 0.0	NS
P	<i>Carex scirpoidea</i>	Scirpuslike Sedge				S2	3 Sensitive	5	48.2 ± 10.0	NS
P	<i>Carex tenera</i>	Tender Sedge				S2	3 Sensitive	1	80.0 ± 3.0	NS
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S2	3 Sensitive	2	57.5 ± 0.0	NS
P	<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush				S2	3 Sensitive	30	13.1 ± 0.0	NS
P	<i>Vallisneria americana</i>	Wild Celery				S2	2 May Be At Risk	1	36.2 ± 10.0	NS
P	<i>Juncus stygius</i> ssp. <i>americanus</i>	Moor Rush				S2	3 Sensitive	33	4.7 ± 0.0	NS
P	<i>Allium schoenoprasum</i>	Wild Chives				S2	2 May Be At Risk	1	36.4 ± 0.0	NS
P	<i>Allium schoenoprasum</i> var. <i>sibiricum</i>	Wild Chives				S2	2 May Be At Risk	5	17.5 ± 7.0	NS
P	<i>Lilium canadense</i>	Canada Lily				S2	2 May Be At Risk	14	40.9 ± 7.0	NS
P	<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Yellow Lady's-slipper				S2	3 Sensitive	9	49.8 ± 0.0	NS
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper				S2	3 Sensitive	17	46.5 ± 0.0	NS
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S2	2 May Be At Risk	325	34.5 ± 0.0	NS
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	2 May Be At Risk	26	27.3 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Piptatherum canadense</i>	Canada Rice Grass				S2	3 Sensitive	1	90.4 ± 0.0	NS
P	<i>Piptatherum pungens</i>	Slender Rice Grass				S2	3 Sensitive	1	31.4 ± 10.0	NS
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S2	2 May Be At Risk	7	81.3 ± 0.0	NS
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S2	2 May Be At Risk	9	29.1 ± 7.0	NS
P	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern				S2	2 May Be At Risk	7	57.0 ± 0.0	NS
P	<i>Dryopteris fragrans</i> var. <i>remotiuscula</i>	Fragrant Wood Fern				S2	3 Sensitive	9	66.9 ± 1.0	NS
P	<i>Polystichum lonchitis</i>	Northern Holly Fern				S2	3 Sensitive	9	49.5 ± 7.0	NS
P	<i>Woodsia glabella</i>	Smooth Cliff Fern				S2	3 Sensitive	12	47.7 ± 7.0	NS
P	<i>Symphotrichum boreale</i>	Boreal Aster				S2?	3 Sensitive	57	11.7 ± 7.0	NS
P	<i>Rumex maritimus</i> var. <i>persicarioides</i>	Peach-leaved Dock				S2?	2 May Be At Risk	1	55.3 ± 0.0	NS
P	<i>Eleocharis ovata</i>	Ovate Spikerush				S2?	3 Sensitive	1	38.5 ± 0.0	NS
P	<i>Scirpus pedicellatus</i>	Stalked Bulrush				S2?	3 Sensitive	3	80.1 ± 0.0	NS
P	<i>Hieracium robinsonii</i>	Robinson's Hawkweed				S2S3	3 Sensitive	11	64.1 ± 1.0	NS
P	<i>Iva frutescens</i> ssp. <i>oraria</i>	Big-leaved Marsh-elder				S2S3	3 Sensitive	1	48.3 ± 4.0	NS
P	<i>Senecio pseudoarnica</i>	Seabeach Ragwort				S2S3	3 Sensitive	11	34.6 ± 7.0	NS
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch				S2S3	3 Sensitive	8	35.6 ± 7.0	NS
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S2S3	4 Secure	1	79.5 ± 5.0	NS
P	<i>Hypericum dissimulatum</i>	Disguised St John's-wort				S2S3	3 Sensitive	1	28.9 ± 2.0	NS
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2S3	3 Sensitive	75	64.4 ± 0.0	NS
P	<i>Shepherdia canadensis</i>	Soapberry				S2S3	3 Sensitive	101	41.6 ± 1.0	NS
P	<i>Empetrum eamesii</i> ssp. <i>atropurpureum</i>	Pink Crowberry				S2S3	3 Sensitive	2	79.4 ± 3.0	NS
P	<i>Empetrum eamesii</i> ssp. <i>eamesii</i>	Pink Crowberry				S2S3	3 Sensitive	3	92.9 ± 7.0	NS
P	<i>Chamaesyce polygonifolia</i>	Seaside Spurge				S2S3	3 Sensitive	4	36.7 ± 0.0	NS
P	<i>Halenia deflexa</i>	Spurred Gentian				S2S3	3 Sensitive	41	11.3 ± 0.0	NS
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2S3	3 Sensitive	1	35.5 ± 1.0	NS
P	<i>Polygonum buxiforme</i>	Small's Knotweed				S2S3	5 Undetermined	1	96.5 ± 7.0	NS
P	<i>Polygonum raii</i>	Sharp-fruited Knotweed				S2S3	5 Undetermined	10	35.5 ± 1.0	NS
P	<i>Amelanchier fernaldii</i>	Fernald's Serviceberry				S2S3	5 Undetermined	4	20.7 ± 7.0	NS
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S2S3	3 Sensitive	2	47.6 ± 0.0	NS
P	<i>Salix pellita</i>	Satiny Willow				S2S3	3 Sensitive	5	38.7 ± 7.0	NS
P	<i>Veronica serpyllifolia</i> ssp. <i>humifusa</i>	Thyme-Leaved Speedwell				S2S3	3 Sensitive	6	36.6 ± 0.0	NS
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	3 Sensitive	1	99.3 ± 7.0	NS
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2S3	3 Sensitive	4	62.0 ± 0.0	NS
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S2S3	3 Sensitive	7	75.9 ± 0.0	NS
P	<i>Juncus trifidus</i>	Highland Rush				S2S3	3 Sensitive	7	55.6 ± 0.0	NS
P	<i>Cypripedium parviflorum</i>	Yellow Lady's-slipper				S2S3	3 Sensitive	81	34.3 ± 1.0	NS
P	<i>Poa glauca</i>	Glaucous Blue Grass				S2S3	3 Sensitive	14	57.5 ± 1.0	NS
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	3 Sensitive	7	51.7 ± 0.0	NS
P	<i>Stuckenia filiformis</i> ssp. <i>alpina</i>	Thread-leaved Pondweed				S2S3	3 Sensitive	32	46.8 ± 0.0	NS
P	<i>Botrychium lanceolatum</i> var. <i>angustisegmentum</i>	Lance-Leaf Grape-Fern				S2S3	3 Sensitive	6	25.3 ± 1.0	NS
P	<i>Botrychium simplex</i>	Least Moonwort				S2S3	3 Sensitive	4	73.3 ± 3.0	NS
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	3 Sensitive	1	42.5 ± 5.0	NS
P	<i>Angelica atropurpurea</i>	Purple-stemmed Angelica				S3	4 Secure	28	42.5 ± 0.0	NS
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	3 Sensitive	65	45.6 ± 0.0	NS
P	<i>Erigeron hyssopifolius</i> var. <i>hyssopifolius</i>	Daisy Fleabane				S3	3 Sensitive	1	45.8 ± 0.0	NS
P	<i>Megalodonta beckii</i>	Water Beggarticks				S3	4 Secure	5	28.1 ± 1.0	NS
P	<i>Packera paupercula</i>	Balsam Groundsel				S3	4 Secure	99	45.4 ± 0.0	NS
P	<i>Betula pumila</i>	Bog Birch				S3	3 Sensitive	13	74.3 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Betula pumila</i> var. <i>pumila</i>	Bog Birch				S3	3 Sensitive	2	98.0 ± 0.0	NS
P	<i>Campanula aparinoides</i>	Marsh Bellflower				S3	3 Sensitive	2	70.1 ± 5.0	NS
P	<i>Viburnum edule</i>	Squashberry				S3	3 Sensitive	5	88.1 ± 0.0	NS
P	<i>Empetrum eamesii</i>	Pink Crowberry				S3	3 Sensitive	8	93.0 ± 0.0	NS
P	<i>Vaccinium boreale</i>	Northern Blueberry				S3	3 Sensitive	30	8.6 ± 0.0	NS
P	<i>Vaccinium caespitosum</i>	Dwarf Bilberry				S3	4 Secure	9	15.4 ± 7.0	NS
P	<i>Vaccinium uliginosum</i>	Alpine Bilberry				S3	3 Sensitive	21	15.2 ± 0.0	NS
P	<i>Bartonia virginica</i>	Yellow Bartonia				S3	4 Secure	1	52.0 ± 0.0	NS
P	<i>Proserpinaca palustris</i>	Marsh Mermaidweed				S3	4 Secure	25	28.3 ± 2.0	NS
P	<i>Proserpinaca palustris</i> var. <i>crebra</i>	Marsh Mermaidweed				S3	4 Secure	24	55.4 ± 0.0	NS
P	<i>Teucrium canadense</i>	Canada Germander				S3	3 Sensitive	36	46.6 ± 0.0	NS
P	<i>Decodon verticillatus</i>	Swamp Loosestrife				S3	4 Secure	4	63.1 ± 7.0	NS
P	<i>Epilobium hornemannii</i>	Hornemann's Willowherb				S3	4 Secure	13	73.7 ± 6.0	NS
P	<i>Epilobium strictum</i>	Downy Willowherb				S3	3 Sensitive	15	47.0 ± 1.0	NS
P	<i>Polygala sanguinea</i>	Blood Milkwort				S3	3 Sensitive	1	73.4 ± 7.0	NS
P	<i>Polygonum pensylvanicum</i>	Pennsylvania Smartweed				S3	4 Secure	8	70.6 ± 3.0	NS
P	<i>Polygonum scandens</i>	Climbing False Buckwheat				S3	3 Sensitive	7	80.0 ± 0.0	NS
P	<i>Plantago rugelii</i>	Rugel's Plantain				S3	4 Secure	1	61.6 ± 0.0	NS
P	<i>Primula laurentiana</i>	Laurentian Primrose				S3	4 Secure	1	75.5 ± 7.0	NS
P	<i>Samolus valerandi</i> ssp. <i>parviflorus</i>	Seaside Brookweed				S3	3 Sensitive	11	33.3 ± 0.0	NS
P	<i>Pyrola asarifolia</i>	Pink Pyrola				S3	4 Secure	6	48.9 ± 0.0	NS
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	3 Sensitive	11	32.1 ± 1.0	NS
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup				S3	4 Secure	81	42.9 ± 0.0	NS
P	<i>Rhamnus alnifolia</i>	Alder-leaved Buckthorn				S3	4 Secure	459	14.4 ± 0.0	NS
P	<i>Agrimonia gryposepala</i>	Hooked Agrimony				S3	4 Secure	171	34.2 ± 0.0	NS
P	<i>Amelanchier stolonifera</i>	Running Serviceberry				S3	4 Secure	4	36.8 ± 2.0	NS
P	<i>Galium kamschatcicum</i>	Northern Wild Licorice				S3	4 Secure	7	58.8 ± 5.0	NS
P	<i>Geocaulon lividum</i>	Northern Comandra				S3	4 Secure	11	45.0 ± 0.0	NS
P	<i>Limosella australis</i>	Southern Mudwort				S3	4 Secure	8	22.5 ± 0.0	NS
P	<i>Lindernia dubia</i>	Yellow-seeded False Pimperel				S3	4 Secure	2	81.6 ± 0.0	NS
P	<i>Laportea canadensis</i>	Canada Wood Nettle				S3	3 Sensitive	14	80.0 ± 0.0	NS
P	<i>Verbena hastata</i>	Blue Vervain				S3	4 Secure	1	70.6 ± 0.0	NS
P	<i>Carex cryptolepis</i>	Hidden-scaled Sedge				S3	4 Secure	13	34.2 ± 0.0	NS
P	<i>Carex eburnea</i>	Bristle-leaved Sedge				S3	3 Sensitive	135	45.4 ± 0.0	NS
P	<i>Carex rosea</i>	Rosy Sedge				S3	4 Secure	3	59.6 ± 5.0	NS
P	<i>Carex tribuloides</i>	Blunt Broom Sedge				S3	4 Secure	8	36.7 ± 0.0	NS
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	3 Sensitive	10	42.8 ± 0.0	NS
P	<i>Carex foenea</i>	Fernald's Hay Sedge				S3	4 Secure	3	45.8 ± 0.0	NS
P	<i>Eleocharis nitida</i>	Quill Spikerush				S3	4 Secure	2	43.9 ± 0.0	NS
P	<i>Elodea canadensis</i>	Canada Waterweed				S3	4 Secure	8	82.2 ± 0.0	NS
P	<i>Juncus subcaudatus</i> var. <i>planisepalus</i>	Woods-Rush				S3	3 Sensitive	9	17.0 ± 2.0	NS
P	<i>Juncus dudleyi</i>	Dudley's Rush				S3	4 Secure	61	47.8 ± 0.0	NS
P	<i>Goodyera oblongifolia</i>	Menzies' Rattlesnake-plantain				S3	3 Sensitive	13	57.7 ± 0.0	NS
P	<i>Goodyera repens</i>	Lesser Rattlesnake-plantain				S3	3 Sensitive	21	32.9 ± 0.0	NS
P	<i>Listera australis</i>	Southern Twayblade				S3	4 Secure	45	46.7 ± 0.0	NS
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	4 Secure	15	27.2 ± 1.0	NS
P	<i>Platanthera hookeri</i>	Hooker's Orchid				S3	4 Secure	2	62.2 ± 0.0	NS
P	<i>Platanthera orbiculata</i>	Small Round-leaved Orchid				S3	4 Secure	7	42.5 ± 0.0	NS
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S3	4 Secure	4	12.3 ± 0.0	NS
P	<i>Alopecurus aequalis</i>	Short-awned Foxtail				S3	4 Secure	16	48.1 ± 0.0	NS
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	4 Secure	10	75.7 ± 1.0	NS
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S3	3 Sensitive	10	6.1 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Potamogeton zosteriformis</i>	Flat-stemmed Pondweed				S3	3 Sensitive	10	57.6 ± 0.0	NS
P	<i>Sparganium natans</i>	Small Burreed				S3	4 Secure	18	21.1 ± 0.0	NS
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S3	4 Secure	17	42.1 ± 2.0	NS
P	<i>Asplenium trichomanes-ramosum</i>	Green Spleenwort				S3	3 Sensitive	28	41.3 ± 0.0	NS
P	<i>Equisetum pratense</i>	Meadow Horsetail				S3	3 Sensitive	22	61.1 ± 0.0	NS
P	<i>Equisetum variegatum</i>	Variiegated Horsetail				S3	4 Secure	37	38.1 ± 2.0	NS
P	<i>Isoetes acadensis</i>	Acadian Quillwort				S3	3 Sensitive	9	15.9 ± 5.0	NS
P	<i>Lycopodium sitchense</i>	Sitka Clubmoss				S3	4 Secure	8	22.0 ± 1.0	NS
P	<i>Huperzia appalachiana</i>	Appalachian Fir-Clubmoss				S3	3 Sensitive	7	65.5 ± 4.0	NS
P	<i>Botrychium dissectum</i>	Cut-leaved Moonwort				S3	4 Secure	1	42.5 ± 5.0	NS
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	5 Undetermined	4	48.1 ± 0.0	NS
P	<i>Asclepias incarnata ssp. pulchra</i>	Swamp Milkweed				S3?	5 Undetermined	57	46.7 ± 0.0	NS
P	<i>Lycopodium sabinifolium</i>	Ground-Fir				S3?	4 Secure	8	70.5 ± 5.0	NS
P	<i>Atriplex franktonii</i>	Frankton's Saltbush				S3S4	4 Secure	8	21.1 ± 0.0	NS
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	4 Secure	5	36.8 ± 0.0	NS
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	4 Secure	12	46.7 ± 0.0	NS
P	<i>Sanguinaria canadensis</i>	Bloodroot				S3S4	4 Secure	109	12.5 ± 0.0	NS
P	<i>Fragaria vesca ssp. americana</i>	Woodland Strawberry				S3S4	4 Secure	61	37.6 ± 0.0	NS
P	<i>Salix petiolaris</i>	Meadow Willow				S3S4	4 Secure	8	44.1 ± 0.0	NS
P	<i>Carex argyrantha</i>	Silvery-flowered Sedge				S3S4	4 Secure	3	41.4 ± 0.0	NS
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	4 Secure	4	63.4 ± 0.0	NS
P	<i>Triglochin gaspensis</i>	Gasp Arrowgrass				S3S4	5 Undetermined	6	47.3 ± 100.0	NS
P	<i>Juncus acuminatus</i>	Sharp-Fruit Rush				S3S4	4 Secure	3	60.4 ± 4.0	NS
P	<i>Luzula parviflora</i>	Small-flowered Woodrush				S3S4	4 Secure	10	15.9 ± 0.0	NS
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3S4	4 Secure	15	15.7 ± 2.0	NS
P	<i>Panicum tuckermanii</i>	Tuckerman's Panic Grass				S3S4	4 Secure	1	67.2 ± 0.0	NS
P	<i>Trisetum spicatum</i>	Narrow False Oats				S3S4	4 Secure	11	55.6 ± 0.0	NS
P	<i>Cystopteris bulbifera</i>	Bulblet Bladder Fern				S3S4	4 Secure	344	32.9 ± 0.0	NS
P	<i>Equisetum hyemale var. affine</i>	Common Scouring-rush				S3S4	4 Secure	27	28.2 ± 2.0	NS
P	<i>Equisetum scirpoides</i>	Dwarf Scouring-Rush				S3S4	4 Secure	74	37.3 ± 0.0	NS
P	<i>Lycopodium complanatum</i>	Northern Clubmoss				S3S4	4 Secure	6	32.8 ± 5.0	NS
P	<i>Schizaea pusilla</i>	Little Curlygrass Fern				S3S4	4 Secure	14	4.0 ± 5.0	NS
P	<i>Viola canadensis</i>	Canada Violet				SH	0.1 Extirpated	1	88.2 ± 0.0	NS
P	<i>Poa alpina</i>	Alpine Blue Grass				SH	0.1 Extirpated	2	62.5 ± 0.0	NS
P	<i>Botrychium minganense</i>	Mingan Moonwort				SH	0.1 Extirpated	1	56.6 ± 1.0	NS

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The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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APPENDIX D

NOVA SCOTIA MUSEUM REPORT

HERITAGE AND BIOLOGICAL RESOURCES



**Communities,
Culture & Heritage**

1741 Brunswick Street
3rd Floor
P.O. Box 456
Halifax, NS
B3J 2R5

Tel: (902) 424-6475
Fax: (902) 424-0560

January 17, 2019

Heather Levy
Envirosphere Consultants Ltd
PO Box 2906 Unit 5 -120 Morrison Dr.
Windsor, NS B0N 2T0

Dear Heather Levy:

**RE: Environmental Screening 18-11-29
Gabarus Quarry Expansion**

Further to your request of November 29, 2018 staff at Communities, Culture and Heritage has reviewed their files for reference to the presence of natural and heritage resources in the study area. Please be aware that the information is not comprehensive and may include varying degrees of accuracy with respect to the precise location and condition of natural and heritage resources.

It should be noted that the amount and degree of disturbance from previous developments could have a significant role in establishing the presence, absence or condition of natural and heritage resources in this area.

Archaeology

There are no recorded archaeological sites at the location of the planned quarry expansion. However, there is a cluster of 5 recorded pre-contact sites just southeast of the project area and adjacent the Gabarus Wilderness Area. Historic maps also indicate some settlement in the area. Given the proximity of watercourses and location of other sites, an Archaeological Resource Impact Assessment is recommended for the project area.

Paleontology

The bedrock geology at that site is Neoproterozoic (575 mya) Frochu Group, series of volcanic and sandstones. No fossils are known or likely from this stratum. Overlying surficial geology is of Wisconsinan age, that represents glacial till deposits, not likely to have significant fossil materials.

Zoology

There are no records for the footprinted site. However, there are records in the general area for two species of Bat (*Myotis lucifugus* and *Myotis septentrionalis*). Both these species are COSEWSIC listed as ENDANGERED due to White Nose Syndrome, which is now recorded on Cape Breton. There are not specific records for the area, but potential hibernation sites would be considered "critical habitat" for

H. Levy
January 17, 2019
page 2

both species. Both species are also listed as ENDANGERED under the Nova Scotia Endangered Species Act

Although there are no specific records for the area, there are records of Rock Vole (*Microtus chrotorrhinus*) from upland areas in the West of Cape Breton. This species is sparsely distributed in the province, so may be of concern.

There are also records for Lake Whitefish (*Coregonus clupeaformis*) from the Mira River system which have been identified as having unique genetics, although no work has been undertaken on that population in recent years. Activities that may affect the water quality draining into that watershed may be of concern. The river also retains a population of Atlantic Salmon (*Salmo salar*). This (Eastern Cape Breton) population has been designated as ENDANGERED by COSEWIC, so the same restrictions regarding water quality and habitat maintenance would apply.

Also, there have been several recent confirmed reports of nesting Snapping Turtles in the Mira watershed.

There are records of several Breeding Migratory Birds with conservation status in the general area. We refer the proponent to the latest edition of the Maritime Breeding Bird Atlas (<https://www.mba-aom.ca/>) for specific contemporary mapping of nesting species. Please note that species of concern such as Barn Swallows, Canada Warbler, Olive-sided Flycatcher, Bobolink and Common Nighthawk, which are Provincially listed are noted as nesting or potentially nesting in the area.

If you have any questions, please contact me at 424-6475.

Sincerely,



Sean Weseloh-McKeane
Coordinator, Special Places

Enclosure

APPENDIX E

LABORATORY RESULTS

TSS & pH

Envirosphere Consultants Limited

Unit 5—120 Morison Drive, Box 2906, Windsor, Nova Scotia, B0N 2T0

ph: (902) 798-4022, fax: (902) 798-2614, e-mail: enviroco@ns.sympatico.ca, website: www.envirosphere.ca

Environmental Sample Analysis Report

Report Date: 19-Jun-19 Report Number: A0761

Envirosphere Consultants
PO Box 2906
Unit 5, 120 Morison Drive
Windsor, NS B0N 2T0

Lab #	Sample ID	Sample Details	Sample Material	Date Received	Date Analyzed	TSS (mg/L)	Type of Sample	Detection Limit	Sample Comments
L2019-24	BLANK	Municipal Gabarus Quarry	dH2O	6/13/2019	6/18/2019	<0.5	BLANK	0.5 mg/L	
L2019-24	CRM	Municipal Gabarus Quarry	CRM	6/13/2019	6/18/2019	211.0	STD	0.5 mg/L	CRM 211 mg/L
L2019-24	WS1	Municipal Gabarus Quarry	Stream water	6/13/2019	6/18/2019	2.0	REG	0.5 mg/L	
L2019-24	WS2	Municipal Gabarus Quarry	Stream water	6/13/2019	6/18/2019	4.5	REG	0.5 mg/L	
L2019-24	WS3	Municipal Gabarus Quarry	Stream water	6/13/2019	6/18/2019	9.5	REG	0.5 mg/L	
L2019-24	WS4	Municipal Gabarus Quarry	Stream water	6/13/2019	6/18/2019	84.5	REG	0.5 mg/L	
L2019-24	WS5	Municipal Gabarus Quarry	Stream water	6/13/2019	6/18/2019	12.0	REG	0.5 mg/L	

Name of Analyst: J. Baker Analyses reviewed by: HL Director / Lab Manager (circle one)

This laboratory applies standard practice in conformance with ISO/IEC 17025:2005, "General Requirements for the Competence of Testing and Calibration Laboratories".

Validation Range: 1-1000 mg/L. The results in this report relate only to the items tested. More information is available upon request.

The quality of the results is dependent on the quality of sample provided.

Samples for TSS analysis should be kept cool until delivery to the lab unless they are analyzed immediately. A minimum sample volume of 500 ml is preferred. Place sample in a clean plastic container free of cracks or contamination. Fill the bottle to the top and then cap. Samples should reach the lab within 24 hours of sampling, but will be accepted up to 7 days.

Methods: Modified from Standard Methods for the Examination of Water and Wastewater 23rd Edition, 2017 and online version. 2540D. Total Suspended Solids. ECL method 3, Total Suspended Solids.

Type of Sample: REG = regular; STD = standard; DUP = duplicate; CRM = certified reference material.

Sample Comments: BDL = Below Detection limit; QR = Qualified result; NR = No result, damaged or insufficient sample; MAC = Maximum Allowable Concentration.

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Environmental Sample Analysis Report

Report Date: 19-Jun-19 Report Number: A0761

Envirosphere Consultants
PO Box 2906
Unit 5, 120 Morison Drive
Windsor, NS B0N 2T0

Lab #	Sample ID	Sample Details	Sample Material	Date Received	Date Analyzed	TSS (mg/L)	Type of Sample	Detection Limit	Sample Comments
L2019-24	WS5 (dup)	Municipal Gabarus Quarry	Stream water	6/13/2019	6/18/2019	11.5	DUP	0.5 mg/L	

Name of Analyst: Jay Baker Analyses reviewed by: HL Director / Lab Manager (circle one)

This laboratory applies standard practice in conformance with ISO/IEC 17025:2005, "General Requirements for the Competence of Testing and Calibration Laboratories".

Validation Range: 1-1000 mg/L. The results in this report relate only to the items tested. More information is available upon request.

The quality of the results is dependent on the quality of sample provided.

Samples for TSS analysis should be kept cool until delivery to the lab unless they are analyzed immediately. A minimum sample volume of 500 ml is preferred. Place sample in a clean plastic container free of cracks or contamination. Fill the bottle to the top and then cap. Samples should reach the lab within 24 hours of sampling, but will be accepted up to 7 days.

Methods: Modified from Standard Methods for the Examination of Water and Wastewater 23rd Edition, 2017 and online version, 2540D. Total Suspended Solids. ECL method 3, Total Suspended Solids.

Type of Sample: REG = regular; STD = standard; DUP = duplicate; CRM = certified reference material.

Sample Comments: BDL = Below Detection limit; QR = Qualified result; NR = No result, damaged or insufficient sample; MAC = Maximum Allowable Concentration.

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Environmental Sample Analysis Report

Report Date: 13-Jun-19

Report Number: A0760

Envirosphere
PO Box 2906
120 Morison Drive
Windsor, Nova Scotia

Lab #	Sample ID	Sample Details	Sample Material	Date Received	Date Analyzed	pH	Type of Sample	Detection Limit	Sample Comments
L2019-24	CRM	Municipal Gabarus Quarry	CRM	6/13/2019	6/13/2019	7.0	STD	0.1	pH = 7.0 +- 0.01
L2019-24	WS1	Municipal Gabarus Quarry	Stream water	6/13/2019	6/13/2019	6.1	REG	0.1	
L2019-24	WS2	Municipal Gabarus Quarry	Stream water	6/13/2019	6/13/2019	6.1	REG	0.1	
L2019-24	WS2 (dup)	Municipal Gabarus Quarry	Stream water	6/13/2019	6/13/2019	6.1	DUP	0.1	
L2019-24	WS3	Municipal Gabarus Quarry	Stream water	6/13/2019	6/13/2019	6.6	REG	0.1	
L2019-24	WS4	Municipal Gabarus Quarry	Stream water	6/13/2019	6/13/2019	6.2	REG	0.1	
L2019-24	WS5	Municipal Gabarus Quarry	Stream water	6/13/2019	6/13/2019	7.0	REG	0.1	

Name of Analyst:

P. Stewart

Analyses reviewed by:

HL

Director / Lab Manager (circle one)

This laboratory applies standard practice in conformance with ISO/IEC 17025:2005, "General Requirements for the Competence of Testing and Calibration Laboratories".

Validation Range: 3-10 units The results in this report relate only to the items tested. More information is available upon request.

The quality of the results is dependent on the quality of sample provided.

Comment: Samples for pH should be kept cool until delivery to the lab unless the samples are analyzed immediately. Preferably samples should be analyzed within 24 hours. Hach manual recommends filling bottle completely and capping tightly; cooling to 4°C for storage and analyzing within 6 hours. If this can't be done, Hach manual recommends reporting the holding time with results.

Method: Standard Methods for the Examination of Water and Wastewater 23rd Edition. 2017 and online version., 4500-HB. Electrometric measurement of pH. ECL Method 8, pH.

Type of Sample: REG = regular; STD = standard; DUP = duplicate; CRM = certified reference material.

Sample Comments: BDL = Below Detection limit; QR = Qualified result; NR = No result, damaged or insufficient sample; MAC = Maximum Allowable Concentration.