Biophysical Assessment: Middle River Pit Expansion Middle River, Victoria County, Cape Breton, Nova Scotia – PIDs 85009397

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1 INTRODUCTION

Municipal Enterprises Limited, Bedford, Nova Scotia (Municipal), is proposing to expand an existing gravel pit in the community of Middle River near Baddeck, Victoria County, Nova Scotia. The pit is presently operating under an industrial approval for a pit less than four hectares in size. An approval to expand the pit beyond the current size is required under the Environmental Assessment Regulations of the Nova Scotia *Environment Act*. Municipal contracted Envirosphere Consultants Limited of Windsor, Nova Scotia, to prepare a biophysical and socio-economic overview and assessment of the proposed pit expansion in support of the Environmental Assessment Registration for a Class 1 undertaking. 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 Lands and Forestry (NSDLF); residents of the Middle River area; contacts with organizations, businesses and individuals in Middle River and the surrounding area; review of published information including soil surveys, reports on geology, archaeology (CRM 2020), 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 21, 2020 and June 24, 2021 (fall and late spring/early summer botany surveys); June 19, 2021 (owls and breeding birds); May 25 and June 15 – 17, 2021 (site reconnaissance); and October 26, 2020 (lichen survey). A site visit by project personnel to review and confirm site conditions in the pit took place on August 16, 2022. Key project personnel included Patrick Stewart (M.Sc.), Hayley Doyle (B.Sc. Environmental Science), and Heather Levy (B.Sc. Hons. Environmental Science) (background review, site reconnaissance, wetlands, water quality & fish habitat assessment); Ruth Newell, M.Sc. (botany survey); Tom Neily (lichens); and Fulton Lavender and Richard Hatch (bird surveys).

3 SITE LOCATION AND STUDY AREA

The Municipal Middle River Pit in Victoria County is located on MacIntyre Road off Cabot Trail /Highway 30 in the community of Middle River, approximately 14 kilometers northwest of the Village of Baddeck, at approximately UTM Zone 20, NAD83, Easting 660577 and Northing 5114190 (Figure 1). The site is shown in recent satellite imagery (Figure 2). The pit is shown in Figures 3 to 5. The study area for this assessment is approximately 24 ha. The proposed pit expansion area will be fully within the study area.

Figure 1. Project location shown on NTS 1:250,000 mapping.

Figure 2. Study area and property (PID85009397) in relation to local site features in 2020 satellite image.

Figure 3. View of Municipal Middle River Pit, facing southwest, June 17, 2021.

Figure 4. View of Municipal Middle River Pit, facing northeast, June 17, 2021.

Figure 5. Stockpile areas northwest of the access road and main pit area, facing southwest toward the access road (*left photo*) and facing north toward an abandoned agricultural field (*right photo*), June 15, 2021.

4 EXISTING ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

4.1.1 CLIMATE AND WINDS

The site is expected to have a climate similar to the more exposed and severe conditions in the Inverness Lowlands ecodistrict (also referred to as the Bras d'Or Lowlands ecodistrict) and Nova Scotia Uplands ecoregion (Province of Nova Scotia 2016), having a mean annual temperature of 5.8°C; and summer and winter temperatures of 16.4 and -4.5°C, respectively; and annual precipitation of 1502 mm, including about 500 mm of rain between May and September (Figure 6). Local climate is influenced by winds from the Gulf of St. Lawrence, but the pit is sheltered by the adjacent uplands, with average winds lower and summer temperatures higher. Winds are generally strongest in winter, predominantly from the west and south quadrants, occurring mainly from the west to northwest in winter (November to February), shifting to northwest and north (February to April), and south (spring to late summer, May to August), and returning to the west in September-October (TDC 1991).

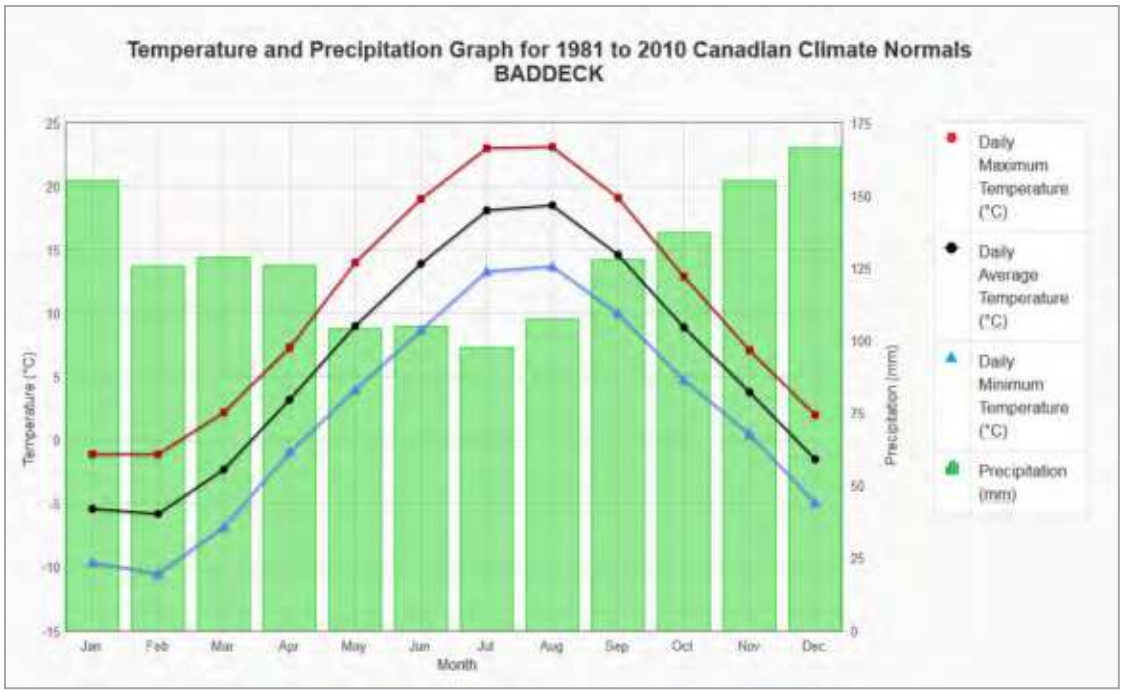

Figure 6. Annual precipitation and temperature cycle, Baddeck (1981-2010) (Canadian Climate Normals 2020).

4.1.2 TOPOGRAPHY AND GEOLOGY

Landscape

The Municipal Middle River Pit is located in the Middle River valley, which cuts through the broad region of hilly uplands known as the Cape Breton Hills that surrounds the Cape Breton Highlands. The site is located near the base of Crowdis Mountain to the east, northwest of MacMillan Mountain, and east of Gairloch Mountain, forming the uplands of the Middle River Valley. The valley leads north along the Middle River, in a network of passes which extend through Lake O'Law to the Margaree River watershed. The pit is excavated in a raised alluvial gravel ridge, resulting in steep banks around the pit floor on the north and east and open on the west, where it meets natural floodplain of Leonard MacLeod Brook. The floodplain extends toward Middle River, which flows along a valley south towards the Bras d'Or Lakes, Nyanza Bay. Cutover, mixed forest, forms the predominant cover (Figure 7). Locally the site supports areas of abandoned and active pasture land, and a series of ponds and wetlands southeast adjacent to the pit (Figure 2).

Figure 7. Forest landscape at Middle River Pit, July 17, 2021.

Bedrock Geology

Bedrock at the site is the carboniferous Windsor Group, consisting of thick sequences of massive red siltstones and shales, with thin beds of limestones, evaporites (mineral salts of seawater), gypsum and anhydrite (Giles and Boehner 2003)(Figure 8). The Windsor Group is typically underlain by the older Horton Group consisting of sandstone and conglomerate. The study site is located on the Hood Island Formation and the undivided Lower Middle Windsor Group of the Windsor Group (Barr and White 2017).

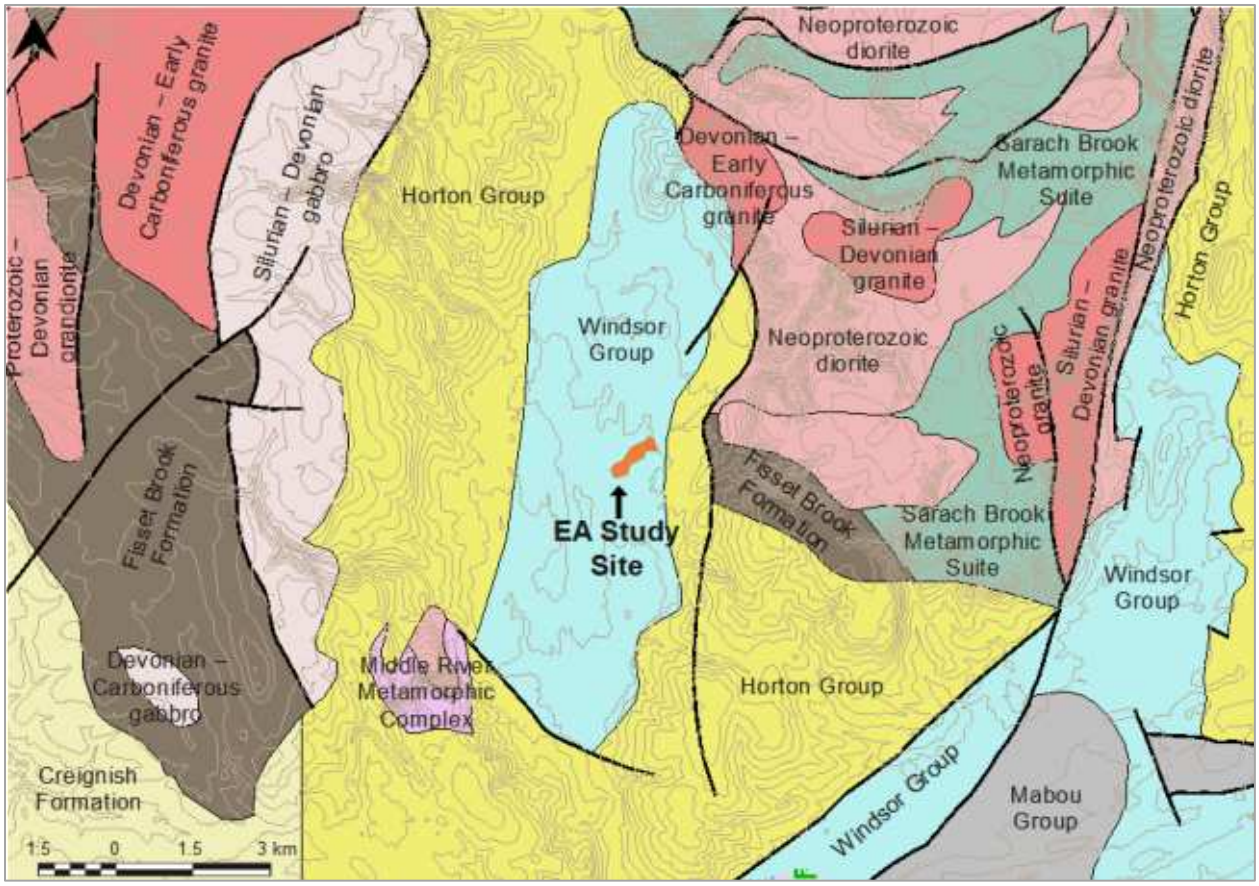

Figure 8. Bedrock formations in the vicinity of the Middle River Pit (Keppie 2000).

Surficial Geology

The Middle River Pit site is on alluvial deposits consisting of gravel, sand and mud and is bedded at the base with finer materials at the top (Figure 9). The deposits were formed as streams and rivers retreated from the last glaciers. Stream channels nearby are generally gravelly sand with sandy floodplains. Topography is flat or gently sloping river valley floodplains and sloping alluvial fans. The alluvial deposits are a major source of groundwater as well as a source of aggregate and are commonly utilized for pasture land. Flooding, high water table, and poor drainage are limitations for use of the land for crop use and construction (Davis and Browne 1996).

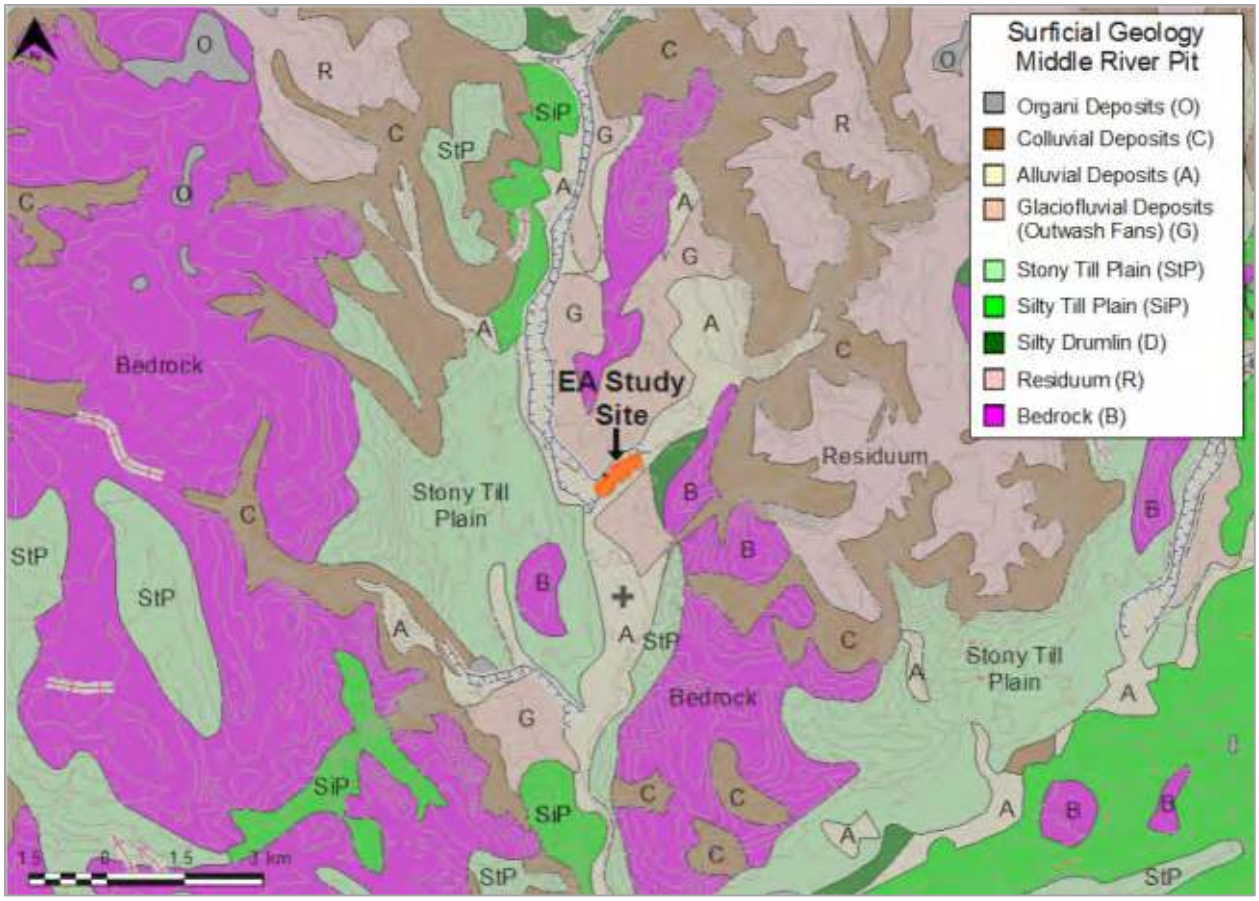

Figure 9. Surficial geology of the study area. From Stea et al. (1992) and digital version (2006).

4.1.3 AIR QUALITY, NOISE & LIGHT

The Middle River area experiences moderate levels of artificial light, ambient noise, and moderate to high air quality. The small community of Middle River is a minor source of artificial light and would be seen as sky reflections from the pit; ambient noise levels at the pit reflect traffic noise along adjacent roads and Cabot Trail, as well as noise from traffic and operations of the pit; and air quality is expected to be good due to the rural location and predominantly forested setting.

Apart from street, business, residential and yard lighting in the community of Middle River, vehicle lights would be the main sources of artificial light at the site. Residences along MacIntyre Road near the site will contribute to light occurring at the site, though traffic travelling MacIntyre Road is expected to be a minimal source. Lights at the pit as well as 'skyshine' from operations when low clouds occur, can probably be seen from Middle River and the Cabot Trail along sightlines to the pit.

The Middle River area is expected to have relatively high natural baseline air quality typical of areas with a high proportion of natural landscape, which at the site is neighbouring forested wilderness areas and farmland. Low levels of human activity, including vehicle traffic along Cabot Trail, as well as that associated with pit activities, have little impact on overall air quality at the site. Periodic dust and vehicle

exhaust emissions from pit activities has been observed by nearby residents on MacIntyre Road, including dust accumulating inside resident homes when trucks pass their property along MacIntyre Road (M. Towel and K. Kennedy, personal communications, October 2021). Regular residential and tourist vehicle traffic are also contributors to particulates and exhaust emissions, but are expected to be at low levels. Calcium chloride has been used in the past to help supress dust created from trucks along MacIntyre Road however, dust is still noticeable to nearby residences (K. Kennedy and D. MacKenzie, personal communications, October 2021).

The pit and associated movement of trucks and equipment would continue to provide a minor and periodic source of noise in the area. Operations at the pit are periodic in response to demand for product and are likely one of the main noise sources in the area. Product is typically screened and occasionally mechanical equipment would be used to sort gravel fractions. Operations can be heard from nearby properties and truck noise can be heard at residences in the vicinity of the site (M. Towle, D. Durton and K, Kennedy, A. MacRae, D. MacKenzie and G. Smith, personal communications, October 2021). The scope of operations, including annual usage, is not expected to change and ambient noise levels in general are expected to be localized. All trucks leaving the site are required to follow Municipal's 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 pit in future will continue to meet the limits established in the Nova Scotia Pit and Quarry Guidelines and are expected to be consistent with those produced by the existing operations at the site.

4.1.4 HYDROLOGY

The Municipal Middle River Pit is located at the middle reaches of the 1FF-2 combined secondary watershed (Baddeck/Middle River) that drains into Bras d'Or Lakes', Nyanza Bay. The three ponds located immediately south and southeast of the study area, flow into unnamed streams continuing to join Middle River southwest of the pit (Figures 2 and 10). The largest and easternmost pond is MacKenzie Pond (also referred to as Grant's Pond and McIver Pond) while the two smaller ponds to the west are currently unnamed. North of the pit, the active flood plain of Leonard MacLeod Brook has created a number of intermittent, braided stream channels, the one closest to the study area supporting a low flow and a series of active beaver dams (Figure 2 and 11, Map A4). The small watercourse becomes more defined as it continues to the west (Figure 2 and Map A4). Sink holes which seasonally fill with water, forming seasonal ponds, are common throughout the site and in the Middle River watershed as a whole, associated with the occurrence of Windsor group gypsum beneath the surficial sedimentary deposits.

Flows in watercourses in the vicinity of the site are expected to follow a seasonal pattern, with highest flows in the fall and winter (October-December), peaking after snow melt in spring (April) and dropping to low levels in summer (July-September) (Figure 12). Much of the Baddeck/Middle River watershed is forested and effects of sudden precipitation events, the occurrence of which is increasing overall due to patterns of climate change, will be moderated. Due to the high permeability of the sand and gravel base material of the pit, and elevations at or below the surrounding landscape, increased flashiness of precipitation will not generate significant surface water flows leaving the pit. The Middle River Pit study area (24.4 ha) occupies only 1.2% of the Middle River watershed upstream of the site and therefore the influence on Middle River flow is expected to be insignificant. Nearly all precipitation minus evaporation will enter groundwater as at present.

Figure 10. The most eastern pond, Mackenzie Pond (*left photo*), located near the southeast boundary of the pit property and the most westerly pond (*right photo*), located south of the pit, June 15, 2021. Both drain south into unnamed streams that connect to the Middle River.

Figure 11. Beaver activity and pond north of the study site has created a flooded and braided landscape with an unnamed stream that continues to flow west, eventually rejoining Leonard MacLeod Brook. June 16, 2021.

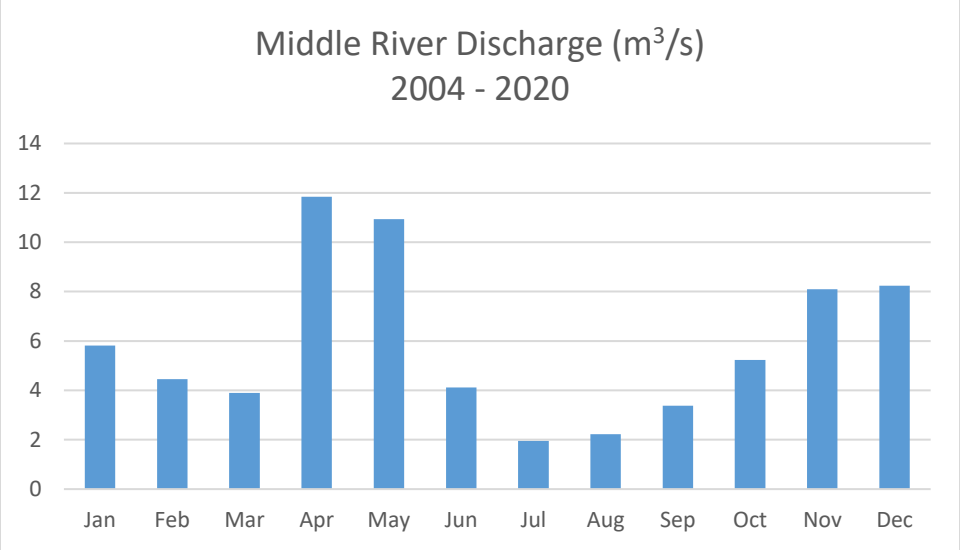

Figure 12. Average daily flow in Middle River at MacLennans Cross Road, 2004 to 2020. Environment and Climate Change Canada Gauging Station 01FF001, located approximately 3 km northwest of the study area.

4.1.5 HYDROGEOLOGY

Groundwater develops in pores in the alluvial sand and gravel deposits which predominate at the site; and in cracks, fissures and cavities in local bedrock, which includes limestone and gypsum in some locations. The water table has not been encountered during previous pit operations, and it is not anticipated that groundwater will be encountered as the proposed expansion will occur at approximately the same pit excavation elevation. An analysis of groundwater levels and projected extraction activity in the existing 4 ha Middle River Pit in May 2022, and projected activity for 2022 in the pit area concluded that "operation of the pit is not likely to impact the hydrological regime of the surface waters nearby (i.e., the unnamed tributary to the west and the wetlands to the east)." The study also indicated that the floor level of the existing pit was typically at least 1 m above the observed water table level at that time, which was a wet period of the year (Dillon Consulting 2022). Surficial and shallow groundwater flow is anticipated to mirror the topographic slope, predominantly west towards Middle River. Precipitation infiltrates the floor of the pit, resulting in little or no surface runoff.

4.1.6 SOILS

The site is located primarily on Hebert soils – stratified greyish brown gravelly sandy loams that are prone to drying and occur along river valleys, where they have developed on sand and gravel deposits from glacial streams (Cann et al. 1963). Topography ranges from level to undulating, but there are places where the gravel is coarser or has been deposited over rougher terrain, and rolling hummocky topography is common (Cann et al. 1963). Hebert soils have a variable amount of gravel and occasionally small boulders are present, with stones and boulders littering the surface. The low moisture holding capacity of the soil is a limitation to agricultural use, but Hebert soils are widely cultivated, and otherwise are typically occupied by forest (Cann et al. 1963).

4.2 BIOLOGICAL RESOURCES AND HABITAT

4.2.1 TERRESTRIAL ENVIRONMENT

The study site is located in the Inverness Lowlands ecodistrict where valley and fault-driven landscapes are surrounded by upland hills dominated by black spruce, white spruce and Balsam Fir as well as areas of tolerant hardwood hills dominated by Sugar Maple, Yellow Birch and beech (NSDLF 2019). The forested areas surrounding the Municipal Middle River Pit support natural stands of predominantly shade-tolerant deciduous forest with additional areas that have been cutover or modified and are regenerating (Map A-3). Former farmland is found on the study site, supporting a mixture of graminoids (grasses), forbs and scattered shrubs and young trees. All plant species identified within the study area were non-invasive and consisted of native species with secure populations in Nova Scotia, as well as exotic species. No species with potential to harm the environment or known to interfere with the ecological balance of the area were identified during botany and site reconnaissance surveys. A full list of plant species identified during October 21, 2020 and June 24, 2021 (fall and late spring/early summer) botany surveys, is presented in Appendix B.

Northeast of the main pit area, a wooded ridge extends from the pit edge to and beyond the northeastern boundary of the survey area (Figure 13). The ridge is dominated by deciduous woodland that appears to have been cutover in the past 20 to 50 years as indicated by the presence of stumps and a medium-aged forest which includes White Birch (*Betula papyrifera*), Yellow Birch (*Betula alleghaniensis*), Balsam Fir (*Abies balsamea*), American Beech (*Fagus grandifolia*), Black Cherry (*Prunus serotina*), Red Maple (*Acer rubrum*) and Sugar Maple (*Acer saccharum*). Shrub species present include Beaked Hazelnut (*Corylus cornuta*), Wild Raspberry (*Rubus idaeus* ssp. *strigosus*), Common Lowbush Blueberry (*Vaccinium angustifolium*), Canada Honeysuckle (*Lonicera canadensis*), Highbush Cranberry (*Viburnum opulus* var. *americanum*), Dwarf Red Raspberry (*Rubus pubescens*) and Red-berried Elder (*Sambucus racemosa* var. *pubens*). Herbaceous species documented within this habitat include Bunchberry (*Cornus canadensis*), Evergreen Woodfern (*Dryopteris intermedia*), Common Speedwell (*Veronica officinalis*), Whorled Wood Aster (*Oclemena acuminata*), Wild Lily-of-the-Valley (*Maianthemum canadense*), Greater Bladder Sedge (*Carex intumescens*), Rough Goldenrod (*Solidago rugosa*), Sweet Vernal Grass (*Anthoxanthum odoratum*), White-edged Sedge (*Carex debilis* var. *rudgii*), New England Sedge (*Carex novae-angliae*), Skunk Currant (*Ribes glandulosum*) and New York Fern (*Parathelypteris noveboracensis*).

Figure 13. Cutover wooded ridge which extends through the centre of the study area from the current, active pit area to the northeastern boundary, R. Newell, October 2020.

Along most of the length of the ridge as well as other areas throughout the study area, depressions of various sizes, believed to be sinkholes, were observed, occasionally with standing water at the bottom (Figure 14). The depths of these natural depressions varied from 10 to 15 feet, with some possibly deeper. The depressions are presumed to be sinkholes occurring in the underlying Windsor Group bedrock (Drage, 2019; Drage and McKinnon 2019). Further investigation into the sinkholes and potential for karst topography was conducted and is summarized in a Karst Summary Report.

Figure 14. View into a sinkhole located along the wooded ridge, June 16, 2021.

An abandoned pasture occurs immediately northwest of the wooded ridge and contains a number of sinkholes both filled with rock (presumably added by the previous owner) and exposed (Figures 15 and 16). The area was most likely used for pasture or hay production, and consists primarily of pasture grasses; however the absence of grazing over time has led to the establishment of various woody and broad-leaved herbaceous plant species. Woody species present include pin cherry (*Prunus pensylvanica*), chokecherry (*Prunus virginiana*), white spruce (*Picea glauca*), common blueberry (*Vaccinium angustifolium*), balsam popular (*Populus balsamifera*), wild apple (*Pyrus malus*) and Wild Raspberry (*Rubus idaeus* ssp*. strigosus*). Broad-leaved herbaceous species which have also become established, include black knapweed (*Centaurea nigra*), common speedwell (*Veronica officinalis*), rough goldenrod (*Solidago rugosa)*, Canada goldenrod (*Solidago canadensis*), bracken fern (*Pteridium aquilinum*), tall buttercup (*Ranunculus acris*) and wild strawberry (*Fragaria virginiana*).

Figure 15. Abandoned pasture with pasture grasses (*left photo*) and trees and shrubs along the pasture edge (*right photo*) along the north and northwestern boundary of the study area, June 16, 2021.

Figure 16. Sink hole filled with rocks within abandoned pasture land, June 16, 2021.

The access road into the main pit area is bordered on both sides by an open habitat that is highly disturbed and supports weed species (Figure 17). Occasional and scattered clumps of white spruce (*Picea glauca*), trembling aspen (*Populus tremuloides*), White Birch (*Betula papyrifera*), and pin cherry (*Prunus pensylvanica*) tree species occur in this area. Shrub species present include Lowbush Blueberry (*Vaccinium angustifolium*), velvet-leaved Bblueberry (*V. myrtilloides*), willows (*Salix* spp.), Wild Raspberry (*Rubus idaeus* ssp. *strigosus*) and witherod (*Viburnum nudum* var. *cassinoides*). Herbaceous species present include pearly everlasting (*Anaphalis margaritacea*), common speedwell (*Veronica officinalis*), black

knapweed (*Centaurea nigra*), common St. John's-wort (*Hypericum perforatum*), coltsfoot (*Tussilago farfara*), clovers (*Trifolium* spp.) and both native and non-native grasses including fescues (*Festuca* spp.), bent grasses (*Agrostis* spp.), and poverty grass (*Danthonia spicata*).

Figure 17. Highly disturbed area located between the main access road and the active pit area and colonized by weed species, June 17, 2021.

Near the western boundary of the study area, a small wooded area west of a weigh scale supports tree species including white spruce (*Picea glauca*), red spruce (*Picea rubens*), Red Maple (*Acer rubrum*), White Birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*). Herbaceous species include rough goldenrod (*Solidago rugosa*), tall white aster (*Doellingeria umbellata*) and common speedwell (*Veronica officinalis*); ground cover was primarily various mosses.

4.2.2 KARST TOPOGRAPHY

Government bedrock geology mapping indicates the presence of Windsor Group bedrock underlying the site which could suggest karst topography in the area—where the underlying rock is dissolved by flowing water or ground water and collapses. Some sinkholes have been observed throughout the site (Figures 14 and 16), and the freshwater ponds located south of the site are features which could have been caused by karst processes. Further investigation into the sinkholes and potential for karst topography was conducted and is summarized in a Karst Summary Report. Karst landscapes are uncommon in Nova Scotia, so they have important landscape and conservation value (Mazerole et al. 2015). The Middle River site is not a good example of karst topography, with the occurrence of sink holes comparatively infrequent, due to the thick layer of alluvial deposits which occurs over the Windsor Group bedrock.

4.2.3 AQUATIC ENVIRONMENT

The pit and study area lack permanent surface water features; however the site is immediately south of a major second order stream (Leonard MacLeod Brook) and a small unnamed intermittent drainage channel to the northwest; and several large permanent ponds and associated watercourses to the south. Stream gradients are low, as the site is on a level outwash plain formed at the base of Campbell's Mountain and which extends into the floor of the valley occupied by Middle River.

The intervale along Leonard MacLeod Brook is occupied by the remnants of many braided overflow channels, one of which forms an intermittent stream that flows along the north side of the study site and eventually rejoins the Brook. These channels and their surroundings have rich soils and are well-vegetated with a diverse mix of species from ground cover to a canopy of tree species (Figures 20 and 21). The intermittent watercourse, which was dry in upstream areas on June 16, 2021, has been dammed by beavers, resulting in a chain of small ponds (Figure 18, Map A4). Seasonal flooding of the area likely occurs as a result of overflows from the brook and the beaver activity, creating areas of standing water which show algae development and saturated soils (Figure 19). Downstream of the beaver dams, the unnamed intermittent is more channelized, with a wet width of less than 0.5 m, and was flowing during the June 2021 survey.

Figure 18. Several beaver dams occur through the middle section of a stream in the interval floodplain north of the Middle River pit (left photo), and more channelized section downstream, June 16, 2021.

Figure 19. Flooding and saturated soil along the unnamed watercourse north of the study site, June 16, 2021.

Two small, sinkhole ponds occur in a wooded area west of the active pit (WL1 and WL2, Figure 27). Three large ponds are situated immediately south and southeast of the Middle River Pit expansion area, draining south into unnamed streams that eventually join to discharge into Middle River (Figure 2). MacKenzie Pond (also known as Grant's Pond) (2.8 ha) is the largest and most easterly. The pond supports marshes around the margins with emergent plant species adjacent to the shoreline include water parsnip (*Sium sauve*) and spikerush (*Eleocharis* sp.). The pond is occupied by beaver, evidenced by the presence of felled trees and presence of a suspected active lodge, and the pond supports brook trout. Nearshore substrate is predominantly soft with some cobble and occasional boulders and instream vegetation, woody debris and some litter (Figure 20).

Figure 20. Mackenzie Pond (left photo); and typical nearshore substrate of fine sediment with woody debris (right photo), June 15, 2021.

The western-most pond (0.22 ha) drains south through a culvert under MacIntyre Road (Figure 21). Nearshore substrate is predominantly sand and silt with occasional cobble and gravel that may have been washed into the pond from MacIntyre Road; and fine substrate is expected in central areas of the pond.

The pond is bordered by marsh with riparian and emergent species including broad-leaved cattail (*Typha latifolia*), bluejoint reed-grass (*Calamagrostis, canadensis*), and water sedge (*Carex aquatilis*), and filamentous green algae in shallow areas near the north lobe of the pond (Figure 22). The smallest of the three ponds at 0.11 ha, located between Mackenzie Pond and the western-most pond (Figure 23). Beaver activity was noted around both the western and middle unnamed ponds.

Figure 21. Westernmost pond (left) and exit culvert under MacIntyre Road, June 15, 2021.

Figure 22. Filamentous green algae and shoreline vegetation at the northern end of the westernmost pond, June 17, 2021.

Figure 23. Pond between MacKenzie Pond and westernmost pond. R. Newell, June 2021.

4.2.4 WATER QUALITY

Water quality measurements were made during the June 15-17, 2021 field survey at several locations, including: MacKenzie Pond (WS1 and WS2) and the western-most unnamed pond (WS3), both located south of the Middle River Pit; and in an intermittent stream north of the study site which flows west (WS4 and WS5 in beaver ponds along the stream, Figure 24 and Map A4). Surface water quality at all sampling sites was high and generally within acceptable guideline levels. The largest ponds (WS1, WS2 and WS3) showed moderate conductivities, warm temperatures, low suspended sediment levels and neutral pH (Table 1). Dissolved oxygen levels were below the CCME Freshwater Aquatic Life (FAL) water quality guideline of 6.5 mg/L (CCME 1999), although not significantly. Surface waters on the unnamed intermittent watercourse north of the Middle River Pit (WS4 and WS5) showed high dissolved oxygen levels, moderate conductivity, warm temperatures, neutral acidity, and low suspended sediment (Table 1). A slightly elevated TSS level at site WS4 was attributed to organic matter (Table 1) and no source was identified.

Table 1. Water quality measurements from surface waters located within the vicinity of the Middle River Pit. Sampling locations shown on Map A4.

Site Location & Date	June 15, 2021				June 16, 2021
	WS1	WS2	WS3	WS4	WS5

Site Description	MacKenzie Pond observation dock	Western edge of MacKenzie Pond	Westernmost unnamed pond south of the study area	Downstream of beaver dam unnamed watercourse	Upstream beaver dam pond, unnamed watercourse
Temperature °C	20.5	20.8	20.6	18.5	18.1
Dissolved Oxygen (mg/L)	4.7	4.5	5.5	6.8	10.3
Dissolved Oxygen Saturation (%)	52.6	51.1	60.3	75.1	86.8
Conductivity (µs/cm)	266.8	275.5	147.6	214.9	32.3
Specific Conductivity (25°) (µs/cm)	291.8	299.5	161.3	245.2	47.2
pH	7.4	--	7.1	6.9	7.0
TSS (mg/L)	<0.5	--	<0.5	28.5[1]	0.5
Note: TSS = Total Suspended Solids. 1. Water was clear (Figure 24) and is presumed to have contained levels of natural organic particulates. The pit was not operating and no artificial sources were identified.					

Figure 24. Water sample locations, downstream of beaver dam (WS4) (left photo); and flooded area near the beaver dam furthest upstream (WS5)(right photo) along the unnamed stream north and adjacent to study area, June 15-16, 2021.

4.2.5 WETLANDS

Wetlands are areas of land that are periodically or permanently flooded and support particular types of vegetation which are adapted to life in such environments. Types of wetlands occurring in the study area at the site are predominantly shrub/treed swamps, small basin wetlands, and sink holes intermittently filled with standing water. Beyond the expansion area, notable marsh wetlands occur around large ponds south and southeast of the Middle River Pit; and wetland conditions occur in flooded intervale areas of Leonard MacLeod Brook caused both by periodic flooding from the Brook and beaver activity in one of the overflow channels which forms an intermittent stream on the north side of the study area.

Two small ponds of indeterminate origin, either manmade or sinkholes, occur in a wooded area immediately west of the current pit (WL 1 and WL2, Table 2, Figures 25, 26 and 27). Plant species in and around the larger of the two ponds included Marsh Cinquefoil (*Potentilla palustre*), small Forget-Me-Not (*Myosotis laxa*), sensitive fern (*Onoclea sensibilis*), and hardstem bulrush (*Schoenoplectus acutus*). The vegetation associated with the smaller pond included chokecherry (*Prunus virginiana*), alternate-leaved dogwood (*Cornus alternifolia*), creeping buttercup (*Ranunculus repens*).

Figure 25. Large sinkhole pond located west of the active pit area (WL1, Figure 27) in spring (*left photo*) and fall (*right photo*).

Figure 26. Small sinkhole pond located west of the current active pit, spring and fall (October 2020).

A shrub swamp that transitions to a treed Red Maple/alder swamp along the edges occurs in the southeast corner of the EA study area (WL5; Figures 27 and 28), and is a component of a complex of wetlands extending around MacKenzie Pond. Wetland plant species in WL5 included cinnamon fern (*Osmundastrum cinnamomeum)*, sensitive fern (*Onoclea sensibilis*), blue-joint (*Calamagrostis* sp.*)*, and

cattails (*Typha* spp.) in the more open areas of the wetland. The wetland continues to the east, beyond the study area, and also south where it narrows along drainage channels leading in the direction of MacKenzie Pond (Figure 27). A short distance west of WL5, an open area of disturbed graminoid swamp wetland (WL9, Figure 27 and 29)) occurs in a small, 25 by 60 m basin. Vegetation in the centre appeared to be stressed, and there an elevated ground surface feature, possibly an artificial berm, around it. This wetland contained species including sensitive fern (*Onoclea sensibilis*), bulrush (*Scirpus* sp.), and buttercup (*Ranunculus* sp.); and the berm was occupied by alder (*Alnus* sp.), chokecherry (*Prunus virginiana*), ash, spruce and maple trees. A small shrub swamp (WL4) was also identified at the north corner of the study area (Figure 27).

Figure 27. Wetlands and surface water features at Middle River Pit in relation to study area.

Figure 28. Shrub swamp (*left*) transitioning into a treed swamp (*right*) located within the study area near the southeast corner of the study area (WL5), June 16, 2021.

Table 2. Wetlands, Middle River Pit Expansion. Locations shown in Figure 27. Approximate boundaries and area within proposed expansion area.

Identification	Area (ha)	Wetland Type and Comments
WL1	0.014	Artificial / sinkhole pond
WL2	0.002	Artificial / sinkhole pond
WL3	0.011	Linear seepage/basin swamp
WL4	0.010	Linear basin swamp
WL5	0.028 (within expansion area)	Shrub swamp to treed swamp and swamp (part of swamp complex around MacKenzie Pond)
WL6	0.37	Marsh
WL7	1.28	Marsh
WL8	0.004	Seepage / Basin Swamp
WL9	0.05	Basin/artificial graminoid swamp

Figure 29. Large, open, stressed area along the southeastern edge of the property (WL9), June 16, 2021.

The three ponds south of the study area (described in Section 4.2.2) are surrounded by marsh and riparian shrub wetland adjacent to the open water areas (W5, W6 and W7, Table 2 and Figure 27). These support various vegetation types ranging from shrubs to *Sphagnum* around the margins, including species such as wood horsetail (*Equisetum sylvaticum*), cinnamon fern (*Osmundastrum cinnamomeum*), speckled alder (*Alnus incana* ssp. *rugosa*), sweet gale (*Myrica gale*), royal fern (*Osmunda regalis*), sensitive fern (*Onoclea sensibilis*), leatherleaf (*Chamaedaphne calyculata*), a variety of sedge species (*Carex* spp.), bracken fern (*Pteridium aquilinum*), northern bush honeysuckle (*Diervilla lonicera*), wild raisin (*Viburnum nudum* var. *cassinoides*), fireweed (*Chamaenerion angustifolium*), pin cherry (*Prunus pensylvanica*), young fir (*Abies balsamea*), rough goldenrod (*Solidago rugosa*), Lowbush Blueberry (*Vaccinium angustifolium*), and Bunchberry (*Cornus canadensis*). Sloped, wooded upland occurs a short distance from the ponds' edges and is often open and disturbed (Figure 30).

Figure 30. Northern tip of western-most, unnamed pond featuring extensive wetland with sloped woodland adjacent to the marsh (W5), June 2021.

The area between the study site and the active floodplain of Leonard MacLeod Brook, along the northwest side of abandoned agricultural fields at the site, has small basins in local depressions with wetland characteristics (Figure 31). These are largely outside the proposed expansion area although one of the larger ones (WL3, Figure 27) extends into it. Plant communities including cattails (*Typha* sp.), rushes (*Juncus* sp.), sedges (*Carex* sp.), and alders (*Alnus* sp) dominate at this location, which serves to channel some surface water drainage from work areas of the existing pit, and contains areas of cracked, bare substrate. The edge of the field along the base of the wooded ridge that extends through the centre of the study area (Map A4; Figure 32) is depressed in elevation. This area was used as a farm trail at one time, connecting to MacIntyre Road. The area features a damp forest floor, however no water was present during site surveys and typical wetland vegetation was not observed. Many of the circular ponds in and adjacent to the site and have wetland-type vegetation around them are presumed to sink holes (Figure 33).

Figure 31. Areas with low elevation wetland plant species between abandoned agricultural field and watercourse in interval on north edge of the expansion area, June 15 and 16, 2021.

Figure 32. Depressed area and associated plant communities on the field edge at the base of the woodland ridge/slope. June 16, 2021.

Figure 33. Water-filled sinkhole along the southern boundary of the study area, June 16, 2021.

4.2.6 FISH & FISH HABITAT

Although no fish habitat occurs within the study area for the pit, the site is adjacent to fish-bearing watercourses and ponds on the north and northwest side; and several ponds occur on the southeast which have productive freshwater ecosystems and are important local fish habitat. All of these surface waters are expected to support a moderate diversity and high abundance of freshwater fish. The study area was established respecting a 30 m buffer from fish-bearing surface waters.

The intermittent watercourse north of the study area has high water quality—supplied by groundwater and precipitation; the stream can be seasonally intermittent; and overflow from Leonard MacLeod Brook can flood into the area seasonally (e.g. high snow melt flows and extreme flow events) during the year. The forest and surrounding abandoned agricultural lands provide a nutrient supply and shade, including overhanging vegetation and instream woody debris, with potential seasonal habitat and nursery areas for salmonids when water is present. Three-spine Stickleback, ranging from 4 to 6 cm, occurred in one of the beaver ponds, and unidentified minnows were seen in an isolated, shallow pool in an upstream area of the stream (Figure 34). This stream likely intermittently supports salmonids such as Brook Trout, although none were observed during site surveys. Suitable fish habitat is present along the reach of the stream providing refugia, aquatic plants, overhanging vegetation and acceptable water quality (moderate to high dissolved oxygen). Beaver ponds, due to the possibility of creating stagnant conditions and trapping individuals at times of low flow, can be detrimental to fish.

Both MacKenzie Pond and the western-most pond located south of the study area, are productive open-water habitats for fish[1]. MacKenzie Pond is stocked annually with Brook Trout and the site is commonly fished recreationally by locals (S. MacKenzie, personal communication, June 2021; NSDFA 2017). A spawning aggregation of White Sucker (*Catastomus commersoni*) was observed at the outlet of the westernmost pond in late-May 2021 during one of the site visits (Figure 35), and potentially the site is a spawning and nursery area for that species.

Fish species of conservation concern potentially occurring in the area include, Atlantic salmon – Eastern Cape Breton population (endangered – COSEWIC), American eel (threatened - COSEWIC), alewife and brook trout (both with sub-national ranking S3). Atlantic salmon historically used the Middle River, and its tributaries for spawning, rearing and migration habitat, and have been observed within six kilometers of the study site (Denny et al 2013; ACCDC 2021). Atlantic salmon are annually stocked in several locations along the Middle River and populations are recently showing signs of improvement within the watershed (Denny et al 2013).

1 Minnow traps captured twenty Brook Trout, ranging from 5 to 10 cm in length and three Three-Spine Sticklebacks in MacKenzie Pond; and four Three-spine Sticklebacks were captured in the westernmost pond during the June 15-17 2021 site visit. A group of eight to ten male White Sucker in breeding coloration and a single female, presumably a spawning aggregation, were also observed swimming near the MacIntyre Road culvert during the May 25, 2021 site visit. Both ponds provide suitable habitat for fish (Figure 37).

Figure 34. Isolated pool in intermittent watercourse in intervale north of expansion area, containing unidentified fish (*left photo*); and littoral area of MacKenzie Pond showing minnow trap (right photo). Brook Trout were captured here, June 15 and 16, 2021.

Figure 35. Spawning aggregation of male White Sucker (*Catastomus commersoni*) (approximately eight to ten individuals) with a single female in outflow channel of westernmost pond, May 25, 2021.

4.2.7 BIRDS

The study area has a diverse landscape with physical components ranging from open water ponds to abandoned agricultural fields, and consequently has the potential to support a wide range of bird species.

22 to 37 species occurred depending on habitat type (Table 3)[2]. The 37 species recorded is a high proportion of the fifty-eight species which have been reported as potentially breeding in the study area in breeding bird surveys (Maritimes Breeding Bird Atlas 2021, Southwestern Cape Breton Island Region 24, Table 4). Most bird species common to the area can be observed from April to September in open, forested and farmland habitats, similar to those in the general vicinity of the site (Figure 36). Eight species on the list which have uncommon to widespread subnational rank (S3 or S3/S4) include Wilson's Snipe (observed as flyovers), Yellow-bellied Flycatcher, Red-Breasted Nuthatch, Ruby-Crowned Kinglet, Swainson's Thrush, and Bay Breasted Warbler. Spotted Sandpiper (S3/S4) was noted nesting in the pit. Nesting period for these species, as well as other S3/S4 species observed within five kilometres of the site is primarily between May to August (Figures 36 and 37). Cape Breton supports the largest population of breeding bald eagles in Nova Scotia, concentrated around the Bras d'Or Lakes, and one nest is located within two kilometers of the study site, and three within ten kilometers (Hatcher 2018; M. Cameron-MacMillan, personal communications, July 2021). The species in Cape Breton forms an important component of the northeastern North America population and is sacred in Mi'kmaw culture (Hatcher 2018). Bald Eagle nest in late March to early April; tall trees suitable for nesting, such as mature Eastern White Pine or other trees which could be suitable for nesting, occur at the Middle River Pit site.

The bird community in the mixed wooded and modified intervale (Sites 1, 2 and 3 on Map A4; Table 3) was, in order of overall abundance and frequency of occurrence, predominantly Red-eyed Vireo, Lincoln's Sparrow, American Crow, Swainson's Thrush, Black-capped Chickadee, American Robin, American Redstart, and Yellow Warbler, which occurred at all sites with the exception of American Robin which occurred at two sites. Red-eyed Vireo, Lincoln's Sparrow, Swainson's Thrush, and American Robin were most abundant. Cedar Waxwing, Dark-eyed Junco, Mourning Warbler and Chestnut-sided Warbler were also relatively abundant and occurred at two sites (Table 2).

Mixed Regenerated forest on the ridge which runs northeast of the pit (Sites 4, 7, 8 and 9; Table 3) was dominated by occurrences of Northern Parula Warbler and Red-eyed Vireo (all sites); and Swainson's Thrush, Ruby-crowned Kinglet, American Robin, American Crow, Blackburnian Warbler, Ovenbird and Black-throated Green Warbler found at three of the four sites (Table 3). Swainson's Thrush was most

[2] Breeding bird surveys are 10-minute point-count surveys which are a modified version of the point count methods described in Ralph et al. (1993) and Huff et al (2000), and are focused on providing a species list and approximate abundance of species which use the major habitats in the vicinity of the quarry or pit. They are intended to provide both local occurrence of birds and additional confirmatory information to that available from other sources such as the Maritime Breeding Birds Atlas (https://www.mba-aom.ca/) and conservation databases such as the Atlantic Canada Conservation Data Centre. Satisfactory weather conditions include good visibility, little or no precipitation, and light winds (less than 20 kph) as recommended by the BBS (https://www.canada.ca/en/environment-climate-change/services/bird-surveys/landbird/north-american-breeding/overview.html) and Ralph et al (1993). Survey points are selected in advance from air photos and forest classification mapping, to provide a representative sample of the dominant habitats, and to have a total number of survey points which can reasonably be surveyed in the recommended time period by observers on foot. Surveys are conducted at dawn, from 15 to 30 minutes before sunrise until approximately 0900 hrs when most birds have stopped calling. An owl and nighthawk survey is conducted from around midnight to early morning depending on conditions. Observers use pre-selected, usually unobstructed sites, to allow for distant call detection. Due to safety considerations associated with the highly modified environment of the quarry or pit and the necessary darkness for the survey, survey points are usually limited to access roads and to the floor of the pit.

abundant; Red-eyed Vireo and Northern Parula were relatively abundant; and American Robin and Blackburnian Warbler were moderately abundant at these sites.

Dominants at the two sites where the forested ridge meets the abandoned field in the northwest section of the site included Swainson's Thrush, American Robin, Red-eyed Vireo, Blue-winged Warbler, American Crow, Least Flycatcher, Mourning Warbler and Northern Parula Warbler, all of which occurred at both sites. Swainson's Thrush was most abundant, with Red-eyed Vireo and American Robin moderately abundant (Table 3).

Species richness and overall bird abundance at the sites ranged from high to moderate. Both the mixed wooded and modified area in the intervale near the entrance to the site; and the regenerated mixed woodland on the ridge had a high number of species (37) and relatively high abundance (66.7 and 41.8 counts per ten minutes respectively). Lowest abundance of 21.5 counts per 10 minutes; and lowest number of species (22) were recorded for the two sites along the abandoned field edge next to the ridge (Table 3).

A Long-eared Owl was heard on the forested ridge northeast of the pit (near Site 4; Table 3); and two Barred Owl were heard offsite south of the farm at MacKenzie Pond during the owl survey (0230 hrs, June 19, 2021).

Other birds identified at or in the general area of the site during site visits included a sighting of a Spotted Sandpiper (nesting on the pit floor), and calls of Wilson's Snipe passing over, as well as a sighting of a family of Ruffed Grouse (juveniles seen) in the northern section of the abandoned field near Site 6. A Ring-necked Duck was heard flying over at Site 3 during the normal survey, and a breeding pair and a second female of the species was seen on the small pond south of the current pit during a May 2021 site visit.

Table 3. Bird species heard or observed during dawn bird surveys conducted June 19, 2021, between 05:00 and 10:00 hrs at the Middle River Pit study site. For locations of observation points, see Map A4.

	Mixed Wooded Modified Intervale (Sites 1, 2 and 3)		Regen Mixed Forest (Sites 4,7,8, and 9)		Old Field and Forest Margin (Sites 5 and 6)	
	No. of sites	Average/ 10 mins	No. of sites	Average/ 10 mins	No. of sites	Average/ 10 mins
PASSERIFORMES						
Alder Flycatcher	1	0.33	0	0	0	0
American Crow	3	3.67	3	1.25	2	1
American Goldfinch	1	0.67	0	0	1	0.5
American Redstart	3	2.67	2	0.75	1	0.5
American Robin	2	6.67	3	2.5	2	2
Bay-Breasted Warbler	0	0	1	0.25	1	1
Belted Kingfisher	1	0.33	1	0.25	0	0
Black-and-White Warbler	0	0	1	0.5	0	0
Blackburnian Warbler	0	0	3	2.25	1	0.5

Table 3. Bird species heard or observed during dawn bird surveys conducted June 19, 2021, between 05:00 and 10:00 hrs at the Middle River Pit study site. For locations of observation points, see Map A4.

	Mixed Wooded Modified Intervale (Sites 1, 2 and 3)		Regen Mixed Forest (Sites 4,7,8, and 9)		Old Field and Forest Margin (Sites 5 and 6)	
	No. of sites	Average/ 10 mins	No. of sites	Average/ 10 mins	No. of sites	Average/ 10 mins
Black-capped Chickadee	3	3	1	0.5	0	0
Black-Throated Green Warbler	0	0	3	1	1	0.5
Blue-Headed Vireo	2	1	2	1	0	0
Blue Jay	0	0	0	0	1	0.5
Blue-Winged Warbler	1	0.33	2	2	2	1.5
Cedar Waxwing	2	2.33	1	0.25	0	0
Chestnut-Sided Warbler	2	3.33	1	0.25	0	0
Chipping Sparrow	1	0.67	0	0	0	0
Common Grackle	1	0.67	2	1.25	1	1
Common Raven	2	0.67	2	0.5	0	0
Common Yellowthroat	1	0.33	0	0	0	0
Dark-eyed Junco	2	2.33	2	0.5	1	0.5
Evening Grosbeak	1	0.33	0	0	0	0
Golden-Crowned Kinglet	1	1	2	1	0	0
Hermit Thrush	0	0	2	0.5	0	0
Least Flycatcher	2	1.33	3	2	2	1
Lincoln's Sparrow	3	8.67	0	0	1	1
Magnolia Warbler	2	0.67	1	0.25	1	0.5
Mourning Warbler	2	3.67	1	1	2	1
Northern Parula Warbler	2	1.67	4	3.75	2	1
Ovenbird	1	0.33	3	1.25	1	0.5
Purple Finch	1	0.33	0	0	0	0
Red-eyed Vireo	3	7	4	3.5	2	2
Red-Winged Blackbird	0	0	1	0.25	0	0
Red-Breasted Nuthatch	0	0	2	0.5	0	0
Ruby-Crowned Kinglet	3	1.67	3	3	0	0
Ruby-Throated Hummingbird	0	0	0	0	1	0.5
Song Sparrow	1	0.67	1	0.25	0	0
Swainson's Thrush	3	5.33	3	6.25	2	3.5
Tennessee Warbler	1	0.33	0	0	0	0
White-Throated Sparrow	0	0	2	0.5	0	0
Yellow-Bellied Flycatcher	0	0	2	0.75	0	0
Yellow-Rumped Warbler	0	0	2	.5	0	0
Yellow Warbler	3	2.0	1	0.25	0	0
CHARADRIFORMES						
Wilson's Snipe	1	1.0	0	0	1	0.33
GALLIFORMES						
Ring-Necked Pheasant	1	0.33	0	0	0	0
Ruffed Grouse	1	0.33	1	0.25	1	0.5

Table 3. Bird species heard or observed during dawn bird surveys conducted June 19, 2021, between 05:00 and 10:00 hrs at the Middle River Pit study site. For locations of observation points, see Map A4.

	Mixed Wooded Modified Intervale (Sites 1, 2 and 3)		Regen Mixed Forest (Sites 4,7,8, and 9)		Old Field and Forest Margin (Sites 5 and 6)	
	No. of sites	Average/ 10 mins	No. of sites	Average/ 10 mins	No. of sites	Average/ 10 mins
PICIFORMES						
Downy Woodpecker	0	0	0	0	1	0.5
Northern Flicker	0	0	1	0.25	0	0
Pileated Woodpecker	1	0.33	1	0.5	0	0
FALCONIFORMES						
Merlin	1	0.33	0	0	0	0
ANSERIFORMES						
Ring-Necked Duck	1	0.33	0	0	0	0
SUMMARY						
Average Abundance	**66.7**		**41.8**		**21.5**	
Total Species per Habitat	**37**		**37**		**22**	
Average Species/Site	**21.0**		**17.75**		**15**	

Tab**le 4. Birds potentially breeding in the Middle River area of the Southwest Cape Breton Island (Maritime Breeding Bird Atlas-Online 2021). Maps 20PS51 & 20PS61**

Swans, Geese & Ducks (Anseriformes: Anatidae)	
Canada Goose	Common Merganser
Ring-necked Duck	
Pheasants, Grouse and Turkeys (Galliformes, Phasianidae)	
Ruffed Grouse	Spruce Grouse
Hawks & Falcons (Falconiformes: Accipitridae, Falconidae)	
Bald Eagle ¤	American Kestrel
Sharp-shinned Hawk	Merlin ‡
Red-tailed Hawk	
Shorebirds Sandpipers & Snipes (Charadriiformes, Scolopacidae)	
Spotted Sandpiper	American Woodcock
Wilson's Snipe	
Pigeons & Doves (Columbiformes: Columbidae)	
Rock Pigeon	
Owls (Strigiformes)	
Great Horned Owl	Northern Saw-whet Owl
Barred Owl	
Swifts (Apodiformes, Apodidae) and Hummingbirds (Apodiformes, Trochilidae)	
Common Nighthawk †	Ruby-throated Hummingbird
Chimney Swift †	
Kingfishers (Coraciiformes, Alcedinidae)	
Belted Kingfisher	
Woodpeckers (Order Piciformes, Picidae)	
Yellow-bellied Sapsucker	Northern Flicker

Table 4. **Birds potentially breeding in the Middle River area of the Southwest Cape Breton Island (Maritime Breeding Bird Atlas-Online 2021). Maps 20PS51 & 20PS61**	
Downy Woodpecker	Pileated Woodpecker
Hairy Woodpecker	
Songbirds (Passeriformes)	
Olive-sided Flycatcher †	Nashville Warbler
Eastern Wood-Pewee	Common Yellowthroat
Alder Flycatcher	American Redstart
Least Flycatcher	Northern Parula
Blue-headed Vireo	Magnolia Warbler
Red-eyed Vireo	Bay-breasted Warbler
Gray Jay	Blackburnian Warbler
Blue Jay	Yellow Warbler
American Crow	Chestnut-sided Warbler
Common Raven	Black-throated Blue Warbler
Tree Swallow	Yellow-rumped Warbler
Cliff Swallow §	Black-throated Green Warbler
Barn Swallow	Chipping Sparrow
Black-capped Chickadee	Savannah Sparrow
Boreal Chickadee	Fox Sparrow
Red-breast Nuthatch	Song Sparrow
Winter Wren	Lincoln's Sparrow
Golden-crown Kinglet	Swamp Sparrow
Ruby-crown Kinglet	White-throat Sparrow
Veery	Dark-eyed Junco
Swainson's Thrush	Bobolink
Hermit Thrush	Rose-breasted Grosbeak
American Robin	Rusty Blackbird †
Gray Catbird	Red-wing Blackbird
European Starling	Common Grackle
Cedar Waxwing	Purple Finch
Ovenbird	Pine Siskin
Northern Waterthrush	American Goldfinch
Black-and-white Warbler	Evening Grosbeak
Tennessee Warbler	House Sparrow
Mourning Warbler	White-winged Crossbill
This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #24 (Southwest 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 09/03/2021. 20PS51 & 20PS61	

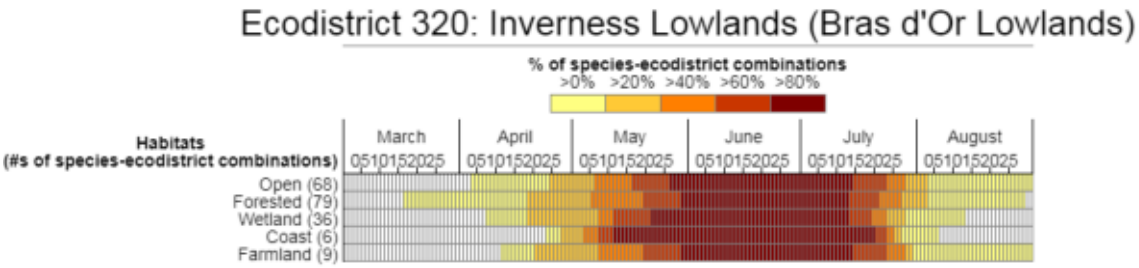

Figure 36. Birds Canada nesting periods for various habitats in the Inverness Lowlands (Bras d'Or Lowlands) ecodistrict (Rousseu and Drolet 2015).

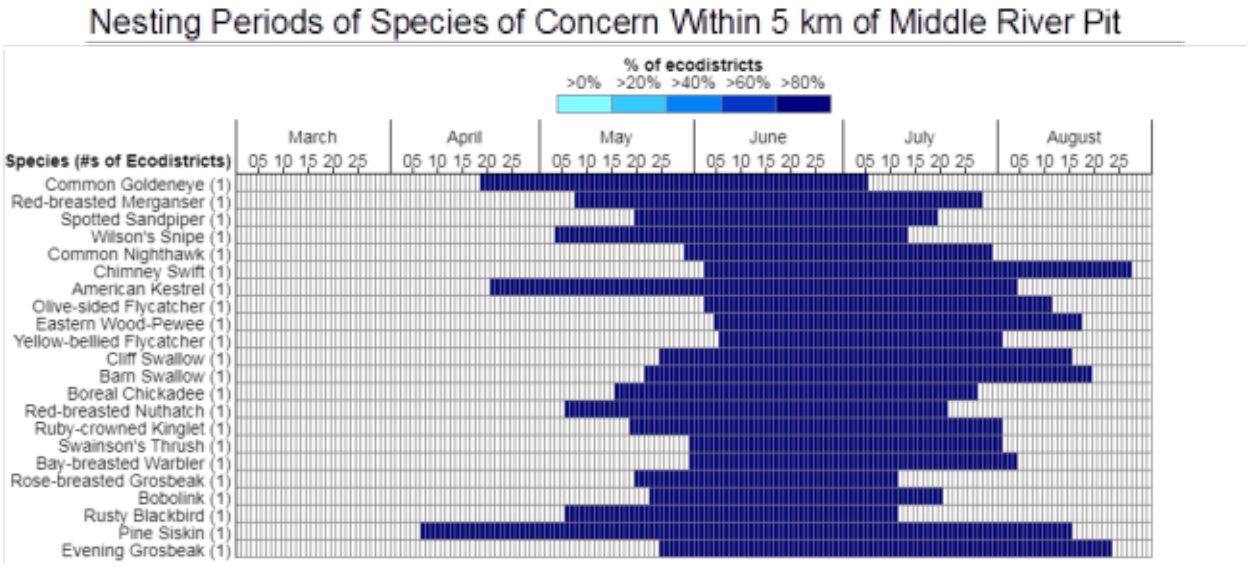

Figure 37. Birds Canada nesting periods for bird Species of Concern found within five kilometers of Middle River Pit (Canada Jay is not included) (Rousseu and Drolet 2015).

4.2.8 MAMMALS

Various large and small mammal species, including game and furbearing species, are found in Victoria County and may occur at the pit 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 as well as agriculture lands. Beaver occur in the immediate vicinity of the study site, and activity was evidenced by the presence of beaver dams on streams, as well as gnawed trees. Moose, Canada Lynx and American Marten (the latter two provincially listed as endangered) are known to occur in the general vicinity of Middle River; a protected area for American marten is located within seven kilometers of the study site (M. Cameron-MacMillan, personal communications, July 2021). Other species likely to occur in the general area include carnivores such as American Fisher, Eastern Coyote, Snowshoe

Hare, Beaver, Red Fox and White-tailed Deer; as well as rodents and small mammals including Red Squirrel, Eastern Chipmunk, voles (Rock Vole, Southern Red-backed Vole) and bats (ACCDC 2021). Rock Vole occur in upland areas in western Cape Breton but are sparsely distributed elsewhere in Nova Scotia. Three endangered bats (Little Brown Bat, Northern Long-eared Bat and the Tri-coloured Bat) which were formerly relatively common throughout Nova Scotia, are now federally and provincially listed as endangered due to recent population declines due to a fungus infection (White Nose Syndrome). Distributions are centred in areas where there are overwintering sites (hibernacula - where bats overwinter and raise young) which are not infected. Hibernacula are typically abandoned mine shafts, caves and old buildings. There are no abandoned mines in the immediate vicinity of the pit (Nova Scotia 2021) and there are no caves in the study area. The pit operations do not require invasive activities including blasting, which would harm bats directly. From hibernacula, bats range widely in the summer, localizing in areas with a good food supply, and therefore may be found in the vicinity of the site roosting. However because of low population numbers overall, occurrences of significant numbers of roosting and feeding individuals in any areas in the vicinity of the pit are unlikely.

4.2.9 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 in the study area. The small ponds and intermittent streams and adjacent riparian areas likely support amphibian species such as Leopard Frog, Wood Frog, Green Frog, Pickerel Frog, American Toad, Spring Peeper and salamanders (e.g. Red-spotted Newt, Blue-spotted Salamander, Yellow-spotted Salamander, and Eastern Redback Salamander) (Nova Scotia Museum 2021). Lands around the pit will support snakes, including the Maritime Garter Snake, Eastern Smooth Green snake and Northern Redbelly Snake. A Maritime Garter Snake was observed basking on MacIntyre Road during the June 15, 2021 site visit (Figure 38). Wood Turtle and Snapping Turtle (both federally and provincially listed) occur within the Baddeck/Middle River watershed, but have not been observed within eight kilometers of the Middle River Pit study area (ACCDC 2021). Local conditions which include low topography, and the local intervale and associated streams and ponds would likely provide suitable conditions for Wood Turtle.

Figure 38. Maritime garter snake observed basking on MacIntyre Road, June 15, 2021.

4.2.10 SPECIES AT RISK

Background: Species at Risk are plants or animals whose existence is threatened, or which are in danger of being threatened, by human activities or natural events. The Canadian Committee on the Status of Endangered Wildlife in Canada (COSEWIC) presently recommends species to be listed for legal federal protection under the federal *Species at Risk Act* (SARA). At the provincial level, the Nova Scotia Species at Risk Working Group completes assessments and recommendations for a species' status. Nova Scotia maintains a list of legally protected species under the *Nova Scotia Endangered Species Act*. A third status list is the *sub-national ranks (S-ranks)*, which is a provincial system used for ranking species rarity or conservation status as a tool for identifying gaps in knowledge for species for which element occurrence data are maintained. S-ranks are specific to a province and consider a variety of factors including number of element occurrences, distribution, population size, abundance trends, and threats. Species listed as "S1" (any species known to be, or believed to be critically imperiled due to extreme rarity or steep declines), and "S2" (any species known to be, or believed to be, imperiled due to restricted ranges, few populations or steep declines) are considered priority species. Species that may be at risk of extirpation or extinction are candidates for a detailed risk assessment by COSEWIC, or provincial or territorial equivalents. The Nova Scotia *Biodiversity Act* sets guidelines for activities in the vicinity of species at risk on Crown Land and also provides guidance for private land owners for working near these species.

Survey Results: The Atlantic Canada Conservation Data Centre (ACCDC) in Sackville, New Brunswick, maintains a database of records of species of conservation concern listed under federal or provincial legislation as well as with general status (Appendix C). Species of conservation concern in the database, including both animals and plants that occur within five kilometres of the Municipal Middle River Pit site

are presented in Table 5. Provincially listed species occurring within 10 km of the site are summarized in Table 6.

No plants of conservation concern in the list were found during spring and fall botany surveys of the site and no animals of particular conservation concern *per se* have been reported at the site. Animal species of conservation concern which potentially could occur at the site because of their distribution in the general area, include Canada Lynx and American Marten which are both currently listed as "endangered" under the *NS Endangered Species Act*, and are of concern due to low numbers. Bird species of particular conservation concern (subnational ranks of S1 and S2) occurring within five kilometers of the study site include the Chimney Swift, Barn Swallow and Bobolink (all listed federally as threatened); Rusty Blackbird (federally listed as special concern and provincially as endangered; Common Nighthawk and Olive-Sided Flycatcher (listed as threatened under the *Federal Species at Risk Act* and provincial *Endangered Species Act* and is listed as special concern by *COSEWIC*); and the Eastern Wood-Pewee and Evening Grosbeak (S3) (listed as special concern by *SARA* and *COSEWIC* and provincially as vulnerable) (ACCDC 2021). Lichen species of concern reported within five kilometers of the study area includes blue felt lichen (*Pectenia (Degelia) plumbea*) (listed federally as special concern and provincially as vulnerable) and Jelly Lichen *Collema leptaleum* (S2S3 rank) (ACCDC 2021).

The mixed woodland, open agriculture fields and softwood habitats surrounding the open pit on the site potentially support many of the bird species of conservation concern from time to time. Of the species listed, both Chimney Swift and Olive-Sided Flycatcher typically are found in mature forested habitats, including treed wetlands near bodies of water that feature large hollow trees (Chimney Swift); and treed (black spruce) sphagnum bogs for Olive-Sided Flycatcher, neither of which habitats occur on the site. Chimney Swift and Olive-Sided Flycatcher have been observed, however, within 0.8 and 0.5 kilometers of the study site, respectively, and may breed elsewhere in the area (ACCDC 2021). Open fields, marshes, swamps, etc. are typical habitat for Barn Swallow and Bobolink, and therefore may occasionally occur on the site. Evening Grosbeak prefer open, mature, mixed wood forests where fir species or white spruce are dominant; Balsam Fir stands occur In the vicinity of the study site but most areas proposed for the expansion contain mixed regenerated stands. Evening Grosbeak were found in the breeding bird survey, and have otherwise been observed approximately 0.5 kilometers from the study site (ACCDC 2021). Common Nighthawk are found in open areas with little ground vegetation including logged or burned over areas, forest clearings, rocky outcrops and peat bogs, and potentially could occur at the site. Eastern Wood-Pewee prefer mature, deciduous forest, which is not present at the site; and Rusty Blackbird are typically associated with forest wetlands such as slow moving streams, peat bogs, sedge meadows, marshes, swamps, beaver ponds and pasture edges during breeding season, and neither are likely to occur within the study area. No federally or provincially listed bird species of conservation concern, with the exception of Evening Grosbeak and Spotted Sandpiper, were observed during dedicated surveys at the study site in June 2021.

Other animals of conservation concern in this part of Nova Scotia include Wood Turtle, a federally-listed species and "threatened" in Nova Scotia, usually occurs along higher order rivers and there are records within three kilometers of the study area (ACCDC 2021). The semi-relict underwing moth (*Catocala semirelicta*), a rare species in Nova Scotia, has not been reported within the vicinity of the Middle River Pit, however an area six kilometers north of the study is currently protected as significant habitat for this

rare species (M. Cameron-MacMillan, personal communications, July 2021). The Little Brown Myotis (*Myotis lucifugus*) (federally and provincially listed as endangered) is another species of concern potentially occurring in the area. The species formerly was widely distributed and has been observed within 9.5 kilometers of the study site and bat hibernacula may also occur in the area (ACCDC 2021). Bats typically overwinter in abandoned mine shafts, natural caves, and old buildings; however there are no abandoned mine shafts in the immediate vicinity of the pit (Nova Scotia 2021) and no caves were identified on site. Numbers of bats are exceedingly low in most areas of Nova Scotia due to the White-Nose Syndrome, and occurrences are unlikely at the pit site due to the low overall numbers. Mackenzie Pond, Middle River and MacLeod Brook, open fields such as the nearby agricultural fields and cemetery, and natural forests in the vicinity can be used as foraging habitat (ACCDC 2021) and forests for daytime roosting.

No plant species of conservation concern listed under either the federal Species-At-Risk legislation or provincial species-at-risk legislation were encountered during the various field studies for this project. *Collema leptaleum*, a jelly lichen species with sub-national ranking of S2S3 was observed in two locations on American elm (*Ulmus americana*) within the Middle River Pit study area and may occur in other areas (Figure 39). Blue felt lichen (*Pectenia plumbea)*, a federally- and provincially-listed lichen species of concern has been reported within five kilometres of the study area although was not observed during dedicated lichen surveys at the study area (Figure 39) (ACCDC 2021; iNaturalist 2021). Blue felt lichen prefers cool, moist habitats, and is typically found on the trunks of old broad leaved trees close to stream and lake margins, which do not occur at the study site (COSEWIC 2010). Other cyanolichen species observed on the site include Tree Lungwort Lichen (*Lobaria pulmonaria)*, Smooth Lungwort (*Lobaria quercizans)*, and Blue Jellyskin Lichen (*Leptogium cyanescens)*.

Figure 39. Important lichen species found at the study site. Red = current study, T. Neily. Yellow = iNaturalist, J. Churchill.

Table 5. Records of rare or uncommon plant and animal species within a 5 km radius of Middle River Pit, Victoria County. Atlantic Canada Conservation Data Centre (ACCDC) Database, January 2021.

Family/Scientific Name		Common Name	Status/Rank				
			SARA	COSEWIC (NPROT[1])	NS ESA (SPROT[2])	SUB-NATIONAL RARITY RANK (SRANK)[3]	GLOBAL RARITY RANKING OF SPECIES (GRANK)[4]
FLORA							
Caprifoliaceae	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed	-	-	-	S2S3	G5
Collemataceae	*Leptogium acadiense*	Acadian Jellyskin Lichen	-	-	-	S3S4	GNR
Cyperaceae	*Carex hirtifolia*	Pubescent Sedge	-	-	-	S2S3	G5
Ericaceae	*Vaccinium boreale*	Northern Blueberry	-	-	-	S3	G4G5
Lycopodioideae	*Diphasiastrum sitchense*	Sitka Ground-cedar	-	-	-	S3	-
Orchidaceae	*Platanthera orbiculata*	Small Rounded-leaved Orchid	-	-	-	S3	G5
Papaveraceae	*Sanguinaria canadensis*	Bloodroot	-	-	-	S3S4	G5
Physciaceae	*Anaptychia palmulata*	Shaggy Fringed Lichen	-	-	-	S3S4	G3G5
Ranunculaceae	*Anemone quinquefolia*	Wood Anemone	-	-	-	S2	G5
	Caltha palustris	Yellow Marsh Marigold	-	-	-	S2	G5
Rosaceae	*Amelanchier fernaldii*	Fernald's Serviceberry	-	-	-	S2S3	G3?
ANIMALS-BIRDS							
Anatidae	*Bucephala clangula*	Common Goldeneye	-	-	-	S2B,S5N	G5
	Mergus serrator	Red-breasted Merganser	-	-	-	S3S4B,S5N	G5
Apodinae	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	G4G5
Caprimulgidae	*Chordeiles minor*	Common Nighthawk	Threatened	Special Concern	Threatened	S2B	G5
Cardinalidae	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	-	-	-	S2S3B	G5
Corvidae	*Perisoreus Canadensis*	Canada Jay	-	-	-	S3	G5
Falconidae	*Falco sparverius*	American Kestrel	-	-	-	S3B	G5
Fringillidae	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	G5
	Spinus pinus	Pine Siskin	-	-	-	S2S3	G5
Hirundinidae	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	G5

Table 5. Records of rare or uncommon plant and animal species within a 5 km radius of Middle River Pit, Victoria County. Atlantic Canada Conservation Data Centre (ACCDC) Database, January 2021.

	Petrochelidon pyrrhonota	Cliff Swallow	-	-	-	S2S3B	G5
Icteridae	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	G5
	Euphagus carolinus	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	G4
Paridae	*Poecile hudsonicus*	Boreal Chickadee	-	-	-	S3	G5
Parulidae	*Setophaga castanea*	Bay-breasted Warbler	-	-	-	S3S4B	G5
Regulidae	*Regulus calendula*	Ruby-crowned Kinglet	-	-	-	S3S4B	G5
Scolopacidae	*Actitis macularius*	Spotted Sandpiper	-	-	-	S3S4B	G5
	Gallinago delicata	Wilson's Snipe	-	-	-	S3B	G5
Sittidae	*Sitta canadensis*	Red-breasted Nuthatch	-	-	-	S3	G5
Turdidae	*Catharus ustulatus*	Swainson's Thrush	-	-	-	S3S4B	G5
Tyrannidae	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Special Concern	Threatened	S2B	G4
	Contopus virens	Eastern Wood-pewee	Special Concern	Special Concern	Vulnerable	S3S4B	G5
	Empidonax flaviventris	Yellow-bellied Flycatcher	-	-	-	S3S4B	G5
ANIMALS-OTHER							
Corduliidae	*Somatochlora forcipata*	Forcipate Emerald	-	-	-	S2S3	G5
Hesperiidae	*Thorybes pylades*	Northern Cloudywing	-	-	-	S2S3	G5
Nymphalidae	*Polygonia progne*	Grey Comma	-	-	-	S3S4	G5
	Polygonia satyrus	Satyr Comma	-	-	-	S1?	G5

1. NPROT, National conservation status of species, as designated by COSEWIC.
Extinct (X) - A wildlife species that no longer exists.
Extirpated (XT) - A wildlife species that no longer exists in the wild in Canada but exists elsewhere.
Endangered (E) - A wildlife species facing imminent extirpation or extinction.
Threatened (T) - A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient (DD)- A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not at Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
2. SPROT=Provincial Rank/Status of Taxon.
3. SRANK, Sub-National (Provincial) Rarity Ranks
S1 Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2 Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3 Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations (21 to 100 occurrences).
S4 Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g. watch list). (100+ occurrences).

Table 5. Records of rare or uncommon plant and animal species within a 5 km radius of Middle River Pit, Victoria County. Atlantic Canada Conservation Data Centre (ACCDC) Database, January 2021.

S5	Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions.
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).
SH	Historical: Element occurred historically throughout its range in the province (with expectation that it may be rediscovered), perhaps having not been verified in the past 20 - 70 years (depending on the species) and suspected to be still extant.
SU	Unrankable: Possibly in peril throughout its range in the province, but status uncertain; need more information.
SX	Extinct/Extirpated: Element is believed to be extirpated within the province.
S?	Unranked: Element is not yet ranked.
SA	Accidental: Accidental or casual in the province (i.e., infrequent and far outside usual range). Includes species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded.
SE	Exotic: An exotic established in the province (e.g., Purple Loosestrife or Coltsfoot); may be native in nearby regions.
SE#	Exotic numeric: An exotic established in the province that has been assigned a numeric rank.
SP	Potential: Potential that Element occurs in the province, but no occurrences reported.
4. GRANK, Global rarity rank of species, using CDC/NatureServe methods	
G1	**Critically Imperiled**—At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
G2	**Imperiled**—At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
G3	**Vulnerable**—At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
G4	**Apparently Secure**—At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5	**Secure**—At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
GU	**Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible (when the range of uncertainty is three consecutive ranks or less), a range rank (e.g., G2G3) should be used to delineate the limits (range) of uncertainty.
GNR	**Unranked**—Global rank not yet assessed.
G#G#	**Range Rank**—A numeric range rank (e.g., G2G3, G1G3) is used to indicate the range of uncertainty about the exact status of a taxon or ecosystem type. Ranges cannot skip more than two ranks (e.g., GU should be used rather than G1G4).
Q	**Questionable taxonomy that may reduce conservation priority**—Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. The "Q" modifier is only used at a global level and not at a national or subnational level.
C	**Captive or Cultivated Only**—Taxon or ecosystem at present is presumed or possibly extinct or eliminated in the wild across their entire native range but is extant in cultivation, in captivity, as a naturalized population (or populations) outside their native range, or as a reintroduced population or ecosystem restoration, not yet established. The "C" modifier is only used at a global level and not at a national or subnational level. Possible ranks are GXC or GHC. This is equivalent to "Extinct" in the Wild (EW) in IUCN's Red List terminology (IUCN 2001).
T	**Infraspecific Taxon** (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species. For example, a G1T2 subrank should not occur. A vertebrate animal population, (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an infraspecific taxon and given a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.
SR	Reported: Element reported in the province but without persuasive documentation, which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.
SRF	Reported falsely: Element erroneously reported in the province and the error has persisted in the literature.
SZ	Zero occurrences: Not of practical conservation concern in the province, because there are no definable occurrences, although the species is native and appears regularly. An NZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations) or transitory. In other words, the migrant regularly passes through the province, but enduring, mappable Element Occurrences cannot be defined.

Table 6. Provincially listed species of concern with potential to occur in the vicinity of the project site (~10 kilometers). Nova Scotia Museum records (Nova Scotia Communities, Culture and Heritage 2021).

Scientific Name	Common Name	SARA	COSEWIC (NPROT[1])	NS ESA (SPROT[2])	SUB-NATIONAL RARITY RANK (SRANK)[3]	GLOBAL RARITY RANKING OF SPECIES (GRANK)[4]
Other						
Anemone quinquefolia	Wood Anemone	-	-	-	S2	G5
Asplenium trichomanes-ramosum	Maidenhair Spleenwort	-	-	-	S3	G5
Carex hirtifolia	Pubescent Sedge	-	-	-	S2S3	G5
Collema leptaleum	Crumpled Bat's Wing Lichen	-	-	-	S2S3	GNR
Cystopteris fragilis	Fragile Fern	-	-	-	S4	G5
Dicranella varia	A moss	-	-	-	S3S4	G5
Diphasiastrum sitchense	Sitka Ground-cedar	-	-	-	S3	G5
Epilobium strictum	Downy Willowherb	-	-	-	S3	G5
Impatiens pallida	Pale Jewelweed	-	-	-	S2	G5
Pectenia plumbea	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	GNR
Peltigera hydrothyria	Eastern Waterfan Lichen	Threatened	Threatened	Threatened	S1	G4
Platanthera orbiculata	Small Round-leaved Orchid	-	-	-	S3	G5
Polypodium appalachianum	Appalachian Polypody	-	-	-	S3	G4G5
Saxifraga paniculata	White Mountain Saxifrage	-	-	-	S2	G5
Scorpidium Scorpioides	Hooked Scorpion Moss	-	-	-	S2?	G5

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

4.2.11 NATURAL AREAS & WILDERNESS

The Middle River area is a relatively remote and undeveloped location in Nova Scotia. Situated on Cape Breton Island in a hilly landscape in the foothills of the Cape Breton Highlands, the area has a relatively high proportion of wilderness and natural areas. Although settlement and consequent expansion and logging in the past changed the character of the landscape, much of the land has returned to forest in most areas. A high proportion of Crown Land in the area has been devoted to protected and managed wildlife areas, leaving many natural and untouched areas, including the Middle River Wilderness Area and Humes River Wilderness Area, as well as a number of nature reserves. Wild land can be preserved for wildlife, hunting and outdoor recreation, all of which are important to 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.

Victoria County is also one of four counties that contain parts of the Bras d'Or Lakes Biosphere Reserve (BLBR) (Figure 40). The BLBR is a UNESCO designated and internationally recognized unique region of natural and cultural heritage. The BLBR has a watershed of over 3,500 km^2 of forest, freshwater and estuarine ecosystems in the centre of Cape Breton Island. The designation recognizes the significance of the area when assessed against various cultural and ecological criteria. The estuarine component of the ecosystem provides habitat for species of various biogeographic ranges, including arctic, temperate, as well as sub-tropical species through its many pockets of protected waters. The people have roots in at least four different languages and cultures: Mi'kmaq, Acadian, Gaelic, and English. The terrestrial, coastal and estuarine ecosystems promote the conservation of biological diversity and contribute to the maintenance of healthy ecosystems. The Biosphere Reserve also provides an opportunity for education about natural systems and how they are changing as well as traditional forms of land use through knowledge sharing and collaborative management (BLBR 2021). The Municipal Middle River Pit although located within the BLBR, is not in any specific protected areas within Biosphere.

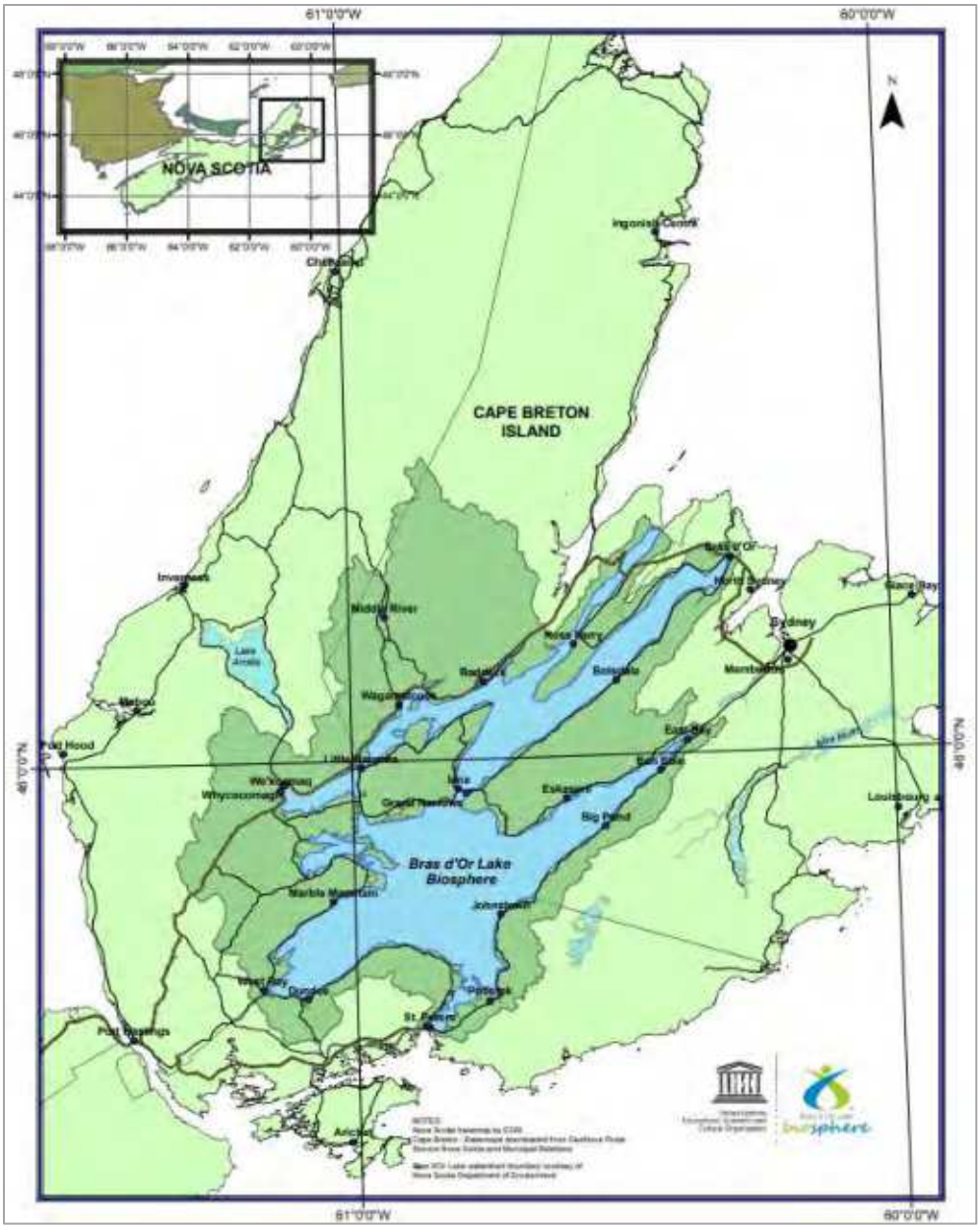

Figure 40. Bras d'Or Lake UNESCO Biosphere Reserve (BLBR).

4.3 HUMAN USES OF THE ENVIRONMENT

4.3.1 MI'KMAQ

The Mi'kmaq maintain aboriginal claim to all of the landmass of Nova Scotia, and the Province of Nova Scotia maintains a policy that proponents of industrial development projects engage with the Mi'kmaq concerning their activities. 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 community to the study area is Wagmatcook, situated in Victoria

County along the western side of the Bras d'Or Lakes and the reserve lands are approximately eight kilometers south of the study area. A second First Nation Community near the study site is We'koma'q First Nation, located in Inverness County approximately 27 kilometers southwest, as the crow flies. Five of the thirteen Nova Scotian First Nations are located on Cape Breton Island. Wagmatcook and We'koma'q together form Waycobah First Nation.

The study area is in what was once the Mi'kmaw territory known as *Unama'kik*, a variation of the word *Mi'kma'kik,* meaning 'Mi'kmaw territory'. Streams, lakes and wetlands, and in particular coastal embankments 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 (CRM 2021). In particular, the Middle River which drains into Nyanza Bay and the Bras d'Or Lakes all would have held particular significance for facilitating travel between the Bras d'Or Lakes and the Gulf of St. Lawrence and providing access to resources (CRM 2021). The Bras d'Or Lakes are known as Petoobok or Pitawpo'q, meaning 'a long dish of salt water' and Wagmatcook or *Waqmitkuk*, located west of the mouth of the Middle River means 'clean waves'. Nyanza or *Pitawo'q* located east of the mouth of Middle River, means "at the spruce bark place'.

There are no registered Mi'kmaq archaeological sites within the study area, and there are four registered archaeological sites within 10 kilometers. Presently, no significant Mi'kmaq cultural activities were identified in or around the study area during this assessment. Modern Mi'Kmaq cultural activities take place on the Wagmatcook reserve and the general area of Middle River including traditional fishing in the Middle River and Nyanza Bay as well as harvesting of plants for medicinal uses, and traditional and spiritual ceremonies.

Two tribal councils exist in Nova Scotia: The Confederacy of Mainland Mi'kmaq (CMM) and Union of Nova Scotia Indians (UNSI). CMM is a not-for-profit organization incorporated in 1986, whose mission is to promote and assist Mi'kmaq communities. The UNSI, created in 1969, was formed *to provide a cohesive political voice for Mi'kmaq people.* The Native Council of Nova Scotia (NCNS) represents Mi'kmaq living off reserve. The NCNS is a self-governing agency located in Truro. The Office of L'Nu 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, and the Province and Government of Canada, and operates from its main office in Millbrook. The Atlantic First Nations Environmental Network (AFNEN) is an environmental organization of Mi'kmaq communities and organizations. The CMM and UNSI are members of the AFNEN, with the Mi'kmaq Confederacy of PEI in Charlottetown currently the acting coordinator. The AFNEN includes a representative from each Mi'kmaq organization and community interested in environmental issues. The Network meets regularly during the year through meetings, conferences, and the Internet to discuss environmental matters or concerns. Two First Nations—

Millbrook First Nation, and Sipekne'katik (Indian Brook) operate independently of these organizations. Millbrook is situated near 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

Middle River is in Victoria Subdivision B, a subdivision in the eastern section of Victoria County municipality, adjacent to the Bras d'Or Lakes. Subdivision B has a population of approximately 3,985, and has been declining slowly over the past several decades, although it increased 7.4% between 2011 and 2016 (Statistics Canada 2017). The main population center is the Village of Baddeck (population 826 (2016)), located approximately 15 kilometers southeast of the study site and, is the largest nearby community (Statistics Canada 2017). Also occurring in close proximity to the Middle River Pit is the Wagmatcook First Nation, which is not included in the Victoria Subdivision B statistics. In 2016, the population of the reserve was 537 with a population percentage change of 3.7% from 2011 to 2016 (Statistics Canada 2017).

Traditionally, the main industries in Victoria County were fishing along the coast, and farming and forestry inland. Today, fishing, forestry, and tourism are the primary industries, along with health care, construction and other businesses and support services. Industry in the Wagmatcook First Nation centres primarily on educational services along with public administration, agriculture, forestry, fishing and hunting, health care and other businesses and industries. Tourism is an important local industry with scenic attractions such as the Cabot Trail, Cape Breton Highlands National Park, Bras d'Or Lakes, and Lake Ainslie which generate tourist traffic through the area, including along Cabot Trail. Cape Breton Island has been named as a top island destination in North America for three years running by a leading American industry magazine (Reid 2020).

Tourism is a major industry in the area. The Cabot Trail passes through Middle River, originating eight kilometers west of Baddeck and looping around a large portion of the northwest tip of Cape Breton Island to Ingonish. Visitors to the area experience recreational and scenic features including wooded walking and hiking trails, cultural activities (music and art), camping, guided and sport fishing, and boating opportunities.

4.3.3 WATER SUPPLY AND RESIDENTIAL WELLS

Drilled wells are used as the primary drinking water sources in the Middle River area. There are 12 drilled groundwater wells in the general vicinity of the pit study area and a number of additional residential wells continuing along Cabot Trail. One drilled well used for domestic water supply is located along MacIntyre Road and is approximately 120 meters from the study area. One public water supply well used by the Middle River Consolidated School is located approximately 850 meters north of the study area and the local churches have private water supplies; the remainder of the wells in the area are used for domestic water supply.

There are no public drinking water supplies in the vicinity of the Middle River Pit. Drinking water for the County of Inverness is provided by both public and private water systems. Victoria County Water Utility operates four municipal water supplies, the nearest to the study site being the Little Narrows water supply located in the community of Bucklaw approximately 18 kilometers southwest of the Middle River Pit. The Little Narrows water supply was originally constructed in 1996 and received upgrades in 2009 adding an additional 17 kilometers of water supply pipe and is now capable of distributing water up to 20 kilometers away (Municipality of the County of Victoria 2021). The water supply plant currently has the capacity to store up to 85,000 gallons in an in-ground reservoir and 45,000 gallons above ground.

4.3.4 LAND USE

Land in the vicinity of the pit is predominantly wilderness and undeveloped forest land, with rural residential use concentrated along Cabot Trail and in the community of Middle River (Map A-3). Two farms and associated residences are also located along MacIntyre Road; one at the west end immediately adjacent to the pit property and a second southeast of the pit near MacKenzie Pond. There is limited forestry in the area; and a number of active and inactive gravel pits (including Fraser MacDonald Pit and Ross Pit) are located in the immediate vicinity of Middle River along the Cabot Trail (Wright 1985). There are a few residences, small woodlots, and home-operated businesses nearby. Travel routes are used by tourists and outdoor recreational enthusiasts. Hunting, trapping and commercial fishing based in Nyanza Bay are important local activities. Land in the immediate vicinity of the pit is primarily privately-owned, with areas of Crown land some of which are reserves (Map A-2).

4.3.5 AQUACULTURE AND SHELLFISH HARVESTING

Rainbow trout aquaculture operations have been operating in the Bras d'Or Lakes for over 40 years (NSDFA 2020). In 2011, We'koqma'q First Nation re-activated rainbow trout farming in the Bras d'Or Lakes at Whycocomagh. We'koqma'q First Nation currently holds a total of seven active, issued marine finfish aquaculture locations in the Bras d'Or Lakes including one issued for Atlantic salmon and rainbow trout and are located just off shore from the Wagmatcook First Nation reserve in Nyanza Bay. Lobster, oysters, scallops and rock crab are the most significant species commercially reared in the Bras d'Or Lakes (Parker et al 2007). Oyster aquaculture occurs in the Bras d'Or Lakes, including areas of St. Patrick's Channel, although at a reduced level due to MSX and SSO parasites as well as the presence of Green Crab, an invasive species that preys upon juvenile bivalve molluscs (Parker et al 2007; DFO 2006). Shellfish harvesting is prohibited at the mouths of Middle River and Baddeck Rivers in Nyanza Bay, but is permitted elsewhere in St. Patrick's Channel.

4.3.6 HUNTING AND TRAPPING

Lands in the vicinity of the Municipal Middle River Pit support 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 may be done in the general vicinity of the site, although trapping statistics indicate that the Victoria County has a small harvest of most species. White-tailed Deer are common, although the county typically ranks among the lowest in Nova Scotia for deer harvest, as well as for black bear. The main furbearers trapped in the five-year period (2015 to 2020) were Coyote and Beaver, although Victoria County had the lowest harvest for Beaver, Muskrat, Otter,

Skunk, squirrel, weasel, and Fisher of any Cape Breton county in 2019 to 2020 (Table 7). No Canada Lynx or American Marten were reported trapped; however American Marten have been observed within seven kilometers of the study site; and a site 6.5 kilometers northeast of the Middle River Pit is protected as significant habitat for the species. Ruffed Grouse and Snowshoe Hare are the most 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, and the Middle River area is included in Moose Management Zones 3 and 4 which encompass Baddeck, Margaree and Hunters Mountain to Fraser Mountain Road as well as the Cabot Trail south to Port Hawkesbury, respectively (NSDLF 2021). The success rate of moose harvest in Zones 3 and 4 were 60.9 % and 47.7 % respectively in 2019 (NSDLF 2021).

Table 7. Five-year summary of wildlife harvested in Victoria County and Nova Scotia (NSDLF 2021).

Animal	Victoria County Reported Harvest	Provincial Reported Harvest	Percent (%) of total for province
LARGE MAMMALS			
Deer (Zone 112)	181	44,926	1.21 %
Bear	25	1,780	1.40 %
UPLAND GAME			
Snowshoe Hare	4,850	276,318	1.76 %
Ruffed Grouse	8,995	150,105	5.99 %
Ring-necked Pheasant	13	14,051	0.09 %
FUR HARVEST			
Beaver	102	10,155	1.00 %
Muskrat	86	29,014	0.30 %
Otter	26	1,307	1.99 %
Mink	2	2,783	0.07 %
Bobcat	85	3,678	2.31 %
Fox	95	1,645	5.77 %
Racoon	9	4,327	0.21 %
Skunk	0	179	0.00 %
Squirrel	8	1,576	0.51 %
Weasel	15	758	1.98 %
Coyote	422	10,841	3.89 %
Canadian Lynx*	0	20	0.00 %
American Marten*	0	12	0.00 %
Fisher	10	497	2.01 %
Total Furbearers	**14,924**	**66,792**	**22.34 %**

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

4.3.7 FORESTRY & AGRICULTURE

Forestry and farming contribute to the mix of industries in Victoria County, but the scale is relatively small compared with the rest of Nova Scotia supporting only 3.1% of the provincial labour force engaged in forestry—among the lowest in the province (APEC 2004). Victoria County farms reported a total of over $1.3 million in gross farm receipts in 2010, accounting for 0.23% of all receipts in Nova Scotia. Main agricultural activities in Victoria County include animal production, other crop farming and cattle ranching, and although these farm types dominate in Inverness, the number of farms has decreased over the years (NS Federation of Agriculture 2017). Farming has historically occurred in the community of Middle River with a fifth generation cattle farm occurring immediately south of the study site and another cattle farm adjacent to the west of the site (S. MacKenzie, personal communications, June 2021). In comparison to Nova Scotia, Victoria County has a higher percentage of sheep and goat farming, vegetable and melon farming, other crop farming, and other animal production. Other types of agricultural activity in Victoria County—including hog, pig, poultry, fruit, grain, and greenhouse farming—fall below the provincial average largely due to the terrain and lack of agricultural land required for these activities, although in the early days of settlement, local agriculture was more important. Agri-tourism is not established in Victoria County to the same extent that it is in other parts of Nova Scotia (NS Federation of Agriculture 2017).

4.3.8 RECREATIONAL, COMMERCIAL, AND MI'KMAQ FISHING

Historically, the Bras d'Or Lakes has supported limited fisheries activities and supports species such as American oyster as well as lobster. In 2016, 14 lobster fishing licences were held for commercial lobster fishing in the Bras d'Or Lakes (LFA 28).

The Unama'ki Institute of Natural Resources (UINR) represents five Mikmaw communities in Cape Breton including Wagmatcook, located about eight kilometres south of Middle River. Oysters, lobster and other species have been harvested by Mi'kmaq people for many years. Atlantic lobster is commonly commercially fished by Unama'ki community members in the Bras d'Or Lakes and is one of the key economic drivers for some communities. The Unama'ki First Nation has holdings in lobster fishing area 28, the Bras d'Or Lakes, which includes the Nyanza Bay, and continue to harvest in other areas of the Bras d'Or Lakes (UINR 2016). Traditionally, cod, hake, smelts, trout (rainbow, brook and brown), herring, mackerel, gaspereau, flounder, lobster, softshell clams, mussels and oysters were fished in the Bras d'Or Lakes, but currently, smelts, trout (brook, brown and rainbow), eels, winter flounder, striped bass, softshell clams, mussels and oysters are the main species fished (NSDFA 2020).

Recreational fishing provides an important resource and pastime for residents and visitors to Victoria County. The study area itself is not particularly important for freshwater recreational fishing but rivers, lakes and ponds in the area including MacKenzie Pond, Macleod Brook, Middle River and Baddeck River and their larger tributaries are fished recreationally primarily for trout. MacKenzie Pond is annually stocked with Brook Trout as a part of the Province of Nova Scotia Hatchery Stocking Program and is a popular recreational fishing spot for locals using non-motorized boats or off the observation deck (Figure 41). Historically, the pond was a part of the spring and fall stocking program, but currently is only stocked during the spring, most recently on May 28, 2021 (NSDAF 2021). Leonard Macleod Brook has also historically received Brook Trout as a part of the spring and fall stocking program, but has not been stocked

since the 1980s (NSDAF 2018). Middle River and Baddeck River are included in the fall stocking program for Atlantic Salmon[3]. The two rivers are included in the Salmon Fishing Area 19, which have an open catch and release fall season for Atlantic salmon. Nyanza Bay and Bras d'Or Lakes also offer recreational fishing for Rainbow Trout, Brook Trout, Smallmouth (Black) Bass, White Perch, Yellow Perch, Brown Bullhead, White Sucker, Chain Pickerel, Lake Whitefish, Striped Bass, Gaspereau, smelt and eel (NSDFA 2020). Fishing off a bank or by boat are a common activities in the Nyanza Bay and St. Patrick's Channel and Mi'kmaq residing in the area likely use the 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.

Figure 41. Observation dock commonly used by recreational fishers on the MacKenzie Pond, June 15, 2021.

4.3.9 HISTORICAL, ARCHAEOLOGICAL AND PALAEONTOLOGICAL RESOURCES

The study area is part of the greater Mi'kmaw territory known as *Unama'kik* (CRM 2021). Mi'kmaq originally occupied the Bras d'Or Lakes area between the late-sixteenth and mid-eighteenth centuries, with predominantly Scottish immigrants settling along the Middle River in the nineteenth century, despite disputes over land cultivation between the Scotch settlers and Mi'kmaq which had begun 40 years earlier.

In the mid to late 1800s, several families from Scotland developed homesteads over hundreds of acres to the east and west of Middle River including the MacKenzie, MacLeod, Campbell, MacRae, MacQuarrie and

3 Middle River recently received approximately 21,090 Atlantic Salmon parr at three locations on October 16, 2020 (J. Vallis, personal communications, October 2021).

Cameron families. The Macleod family acquired approximately 1000 acres on the east side of Middle River which included the northern portion of the study area. The study area was originally cultivated as farmland and several structures from the era have recently been found in the area, including a collapsed barn and dump of old farm equipment and a standing sawmill in the same locations as structures visible from 1953 and 1969 aerial photographs (CRM 2021).

Several local community and commercial buildings were constructed in Middle River in the mid 1800's. One of the area's earliest churches and cemetery (Middle River or Farquaharson Memorial Presbyterian Church) was built in the early 1830s west of the Cabot Trail, southwest of the study site. Reverend Farquaharson was the first missionary sent directly to Cape Breton by the Church of Scotland, and the first Church of Scotland missionary to spend his whole life here, establishing the Middle River Church in 1833 and determining the distribution of Presbyterian parishes in Cape Breton. In 1877, a new church constructed east of the road and the first manse was constructed in the early 1860s north of MacIntyre Road, approximately 100 metres southwest of the study area, both of which are still currently used today, the latter as a private residence.

The Middle River area was the site of an historic mastodon discovery in the early 1800s. A local farmer discovered a mastodon femur in Middle River along the banks of the River while the farmer was plowing his field. New research suggests the femur may have originally been preserved in a sink hole in the underlying Windsor Formation gypsum (Nova Scotia Communities, Culture & Heritage 2021). Radiocarbon dating places the bone at approximately 75,000 years old and suggests that the mammal lived prior to the last glaciation event (CRM 2021)

The Archaeological Resource Impact Assessment (ARIA)(CRA 2021) concluded that the site exhibits low potential for encountering either Mi'kmaq (both Pre-contact and historic) or Euro-Canadian archaeological resources. Moderately to steep slopes; relatively large distances from the coast and travel routes; and extensive occurrence of sink holes that would have made the landscape difficult and dangerous to live upon, all would limit the likelihood of past colonization or of finding archaeological resources (CRM 2021). Pit operations, however, may come across other bones or teeth of pre-historic animals such as mastodon. Pit personnel should be alerted that If any archaeological or paleontological remains are found, operations will be stopped and the Nova Scotia Museum of Natural History should be contacted as soon as possible for assistance in assessing potential significance. The museum may assist in pre-operational assessments of the potential for palaeontological remains (NSCCH 2021).

4.3.10 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 vicinity of the study site including five wilderness areas, one conservation land, ten nature reserves, and eight Provincial Parks. (Table 8, Figure 42). Types of parks and protected areas shown in Table 8 include:

Wilderness Areas are provincially-significant areas that protect representative examples of natural landscapes, native biological diversity, and outstanding natural features of Nova Scotia. They are used for

scientific research, education and a variety of recreation and nature-tourism related activities such as hiking, canoeing, sea-kayaking, sport-fishing and hunting. These areas are designated under Nova Scotia's *Wilderness Areas Protection Act*.

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

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

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

Table 8. Parks and protected areas within a 20 km radius of Middle River Pit, Victoria County. Province of Nova Scotia, Nova Scotia Environment, 2021.

Name of Site	Primary Type of Protection	Protection Status	Area (ha)
Ainslie Point Provincial Park	Provincial Park	Reserve	38
Baddeck Bay Conservation Lands	Land Trust Property	Considered Protected (2016)	39
Baddeck River Wilderness Area	Wilderness Area	Designated (2015)	2,778
Barra Forest and MacNeils Vale Provincial Park	Provincial Park	Reserve	267
Glen Brook Nature Reserve (*Pending*)	Nature Reserve	Pending Designation	320
Gold Brook Nature Reserve (*Pending*)	Nature Reserve	Pending Designation	52
Lake-O-Laws Provincial Park	Provincial Park	Designated; Operational	2
MacAulays Hill Nature Reserve	Nature Reserve	Designated (2015)	105
MacRae Brook Nature Reserve (*Pending*)	Nature Reserve	Pending Designation	383
Margaree Brook Nature Reserve	Nature Reserve	Designated (2017)	298
Mary Harper Nature Reserve	Nature Reserve	Designated (2011)	26
Masons Mountain Nature Reserve	Nature Reserve	Designated (2014)	831
Middle River Wilderness Area	Wilderness Area	Designated (1998)	6,279
Middle River Wilderness Area Addition (*Pending*)	Wilderness Area	Expansion	3,221
North Ainslie Provincial Park	Provincial Park	Reserve	82
North River Wilderness Area	Wilderness Area	Designated (2015)	5,013
Scottsville Provincial Park	Provincial Park	Reserve	35
Seven Falls Nature Reserve	Nature Reserve	Designated (2014)	693
St. Ann's Provincial Park	Provincial Park	Designated; Operational	4
Trout Brook Provincial Park	Provincial Park	Undesignated; Operational	9

Trout Brook Wilderness Area	Wilderness Area	Designated (2016)	3,065
Uisage Ban Falls Provincial Park	Provincial Park	Undesignated; Operational	148
Washabuck River Nature Reserve	Nature Reserve	Designated (2006)	68
Washabuck Nature Reserve Addition (*Pending*)	Nature Reserve	Pending Designation	2

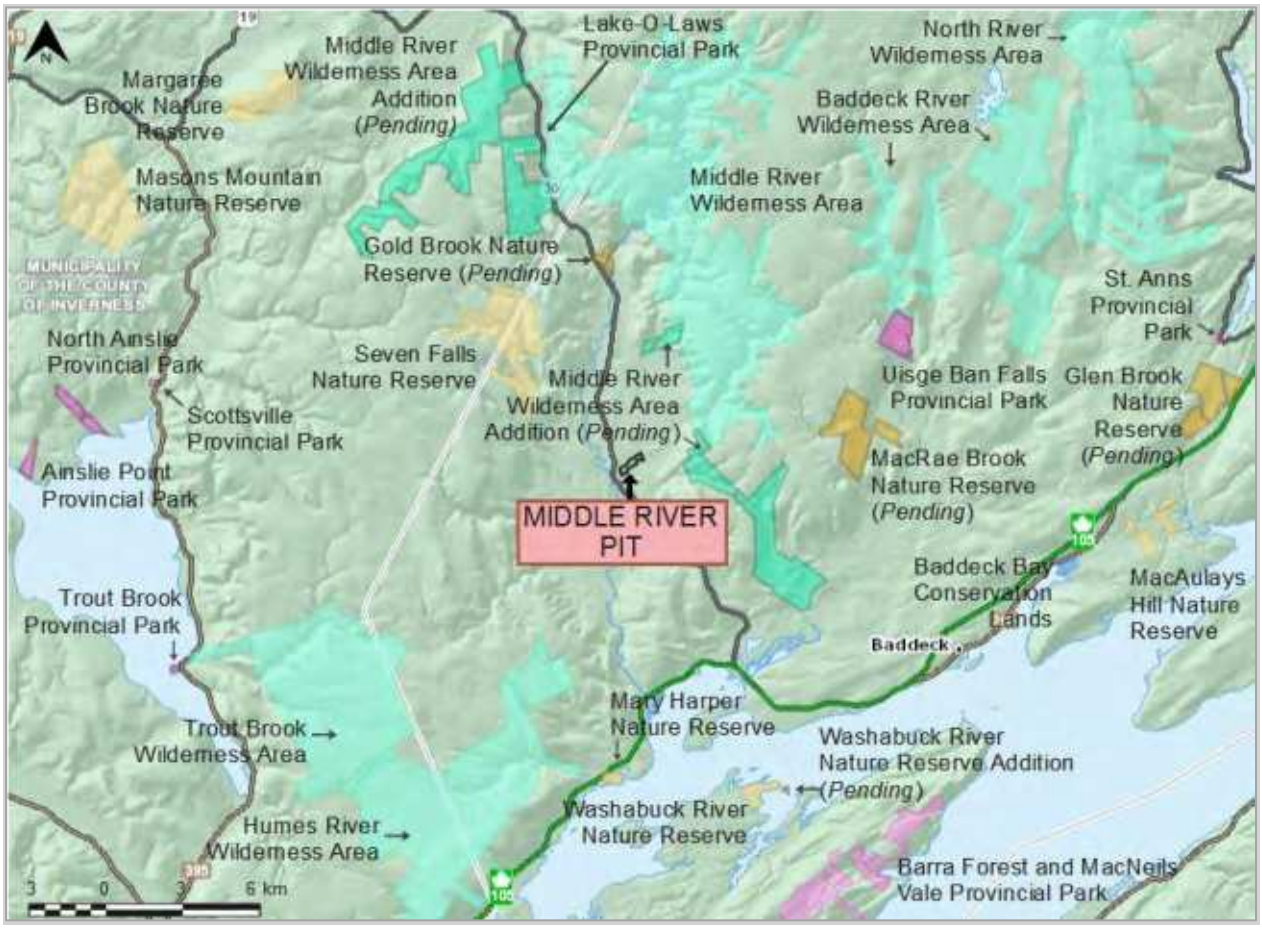

Figure 42. Parks and protected areas in the general vicinity of the Middle River Pit.

4.3.11 RECREATIONAL/CULTURAL FEATURES

Residents and visitors to Victoria County access natural areas for a wide range of outdoor recreation activities. In the Middle River area, the predominant outdoor recreational activities are sightseeing, walking/hiking, birding, camping, boating (i.e., kayaking and canoeing), hunting, angling and snowmobiling. The Middle River Wilderness Area located near the study site, provides scenic views and opportunities for trekking, camping and other adventure activities. Although there are no managed trails, there is potential for hiking or other trails to be developed, with trail head access from the Cabot Trail. The Gairloch Mountain Falls trail is a frequented hiking trail that leads to a beautiful waterfall surrounded by a lush forest environment located in Middle River off of Gairloch Mountain Road. Willow Retreat & Healing Space is a wilderness camp that offers guided meditation, wellness workshops, guided hikes and

plant walks as well as healing treatments. The Wagmatcook First Nation Reserve offers the Wagmatcook Culture and Heritage Centre, which provides an unique view of Mi'kmaw culture, history and heritage. It offers lectures, live performances, and guided tours as well as live dance and drum presentations

4.3.12 RESIDENTIAL USE

Approximately a dozen single family homes are located in the general vicinity of the Middle River Pit, mainly along the Cabot Trail west of the study site (Map A-2). The two nearest residences to the pit are active and former farm buildings located along MacIntyre Road, one adjacent to the west of the study area and the second adjacent to the southeast. In the general area, lot sizes are large and may include agricultural fields such as pasture land as well as surrounding tracts of forested land. Lifestyles of the residents of the general area tend towards retirees maintaining their homes and properties, residents working locally and younger individuals engaged in economic activities such as fishing in the area. Residents use the area and backcountry for recreation such as walking or hiking, canoeing or kayaking, and use of ATVs and snowmobiles, as well as for access to natural resources (e.g. firewood). The study site is located approximately eight kilometers from Wagmatcook First Nation, a growing Mi'kmaw community. The pit is also approximately 14.5 kilometers from Baddeck, where residents can access various local services as well as recreational amenities such as walking trails, golf courses, the Alexander Graham Bell Museum, and local businesses.

4.3.13 COMMERCIAL/INDUSTRIAL DEVELOPMENT

Businesses in the immediate vicinity of the study area include: Middle River Tirecraft, Midway Motors Limited (pre-owned vehicles), Gas-it Enterprises Motorcycle Repair, Hunters Mountain DNR Shooting Range, Hunter's Mountain Chalet, Willow Retreat Campground, cottage rentals, bed & breakfasts, privately-owned campgrounds and RV resorts. The Farquaharson Memorial Presbyterian Church holds a pre-school and daycare, and Middle River Consolidated School is located in the community.

Most major commercial activity is centred in the Village of Baddeck, centred on tourism and outdoor recreation such as fishing and boating, cottage rental cottages, museums, gift shops, restaurants, boat tours and offices for professional services. Wagmatcook supports various businesses including a Culture and Heritage Centre, Canada Post, trading post smoke shop and convenience store, and an Ultramar gas station.

4.3.14 TOURISM AND VIEWSCAPE

Tourism is an important element in the economy of Cape Breton Island in the vicinity of Middle River, centred on tourist traffic focused on the scenery along the Cabot Trail and to access other parts of the Cape Breton; and nature appreciation and outdoor recreational activities, including angling and hunting, hiking, paddling, and camping.

The Cabot Trail which passes through the community of Middle River is perhaps the main tourist attraction of this part of Cape Breton Island, stretching 298 km from Baddeck and the Bras d'Or Lakes through the Cape Breton Highlands to Ingonish. The current pit is at approximately the same elevation as the road, about 500 m from the highway and is not visible from it; the proposed expansion area will not advance the working footprint any closer to the Cabot Trail. Activities and dust from operations, and lights at night,

however may be seen by travellers at times both along the highway as well as at higher elevations along the Cabot Trail west of the study site and the higher elevations of mountain areas further east.

Much of the appeal of the Cabot Trail in the vicinity of Middle River is the availability of natural and undisturbed landscapes. The Middle River Wilderness Area, located east of the Middle River Pit, is one of the local tourist destinations, offering a mix of highland plateaus and deep ravines (Figure 42) which occupy an extensive area to the east. Although there are no managed trails, the wilderness area extends into the back country, with access from a number of locations on MacIntyre Road. Gairloch Mountain Falls is located 4.5 km southwest of the study site and offers 6.1 kilometers of scenic hiking trails and features a waterfall and swimming hole. Hunters Mountain Chalet, located on the Cabot Trail in Hunters Mountain east of the study site near the entrance to the Cabot Trail, offers cottages and cabins in addition to walking trails and scenic views of the Bras d'Or Lakes at the foot of the Cape Breton Highlands. The Village of Baddeck located along Highway 105 (Trans-Canada Highway) is also an important tourist destination.

4.3.15 TRANSPORTATION

Middle River pit is accessed from MacIntyre Road, a gravel road off of Cabot Trail (Trunk 30) the main highway in the area connecting the Bras d'Or Lakes and Highway 105 with communities in western Cape Breton Island. Comparatively low levels of truck and equipment traffic in relation to normal traffic flows, are expected to originate from the Middle River Pit. However at times when there are local highway construction projects, the volume of traffic generated by the pit will be larger. The Cabot Trail is used by local residents, tourists and commercial traffic linking central, north and western Cape Breton. Local use of Cabot Trail Road includes tourist traffic, shipping fish products, pulp logs, and gravel operations in addition to the traffic associated with the pit, which is typically seasonal. The Cabot Trail section nearest Middle River Pit has a low to moderate traffic volume compared with other highways in the Province, with an annual average daily traffic (AADT) of 1,120, 1,110 and 1,045 vehicles in the years 2017, 2018 and 2019 respectively (Nova Scotia Open Data Portal 2020).

When operating, the Middle River Pit contributes truck traffic and movement of some heavy equipment traffic (e.g., trucks, portable screening equipment, asphalt plant, etc.) in the vicinity of the site, typically in the summer and fall construction seasons. Most of the equipment leaving the pit, and production equipment moved to the Municipal Middle River Pit, takes place along the Cabot Trail to Highway 105. Access to the pit from MacIntyre Road is unobstructed with good sight lines (Figure 43). Reports of fast-moving trucks passing nearby residents on the MacIntyre Road have been reported as a potential hazard to local residents, children and animals in the area (M. Towle, K. Kennedy, personal communications, October 2021). The highway intersection with MacIntyre Road is narrow creating poor sight-lines for trucks and the turning radius onto Cabot Trail is minimal posing a potential hazard for commuting trucks and vehicles. (D. MacKenzie and K. Kennedy, personal communications, October 2021).

Figure 43. Middle River Pit entrance along MacIntyre Road, facing north, June 17, 2021.

5 Environmental Impacts, Significance, and Mitigation

5.1 Assessment Approach and Methods

Information for the assessment was obtained from consultants' personal knowledge, from reviews of available information, and knowledge of the purpose and proposed design of the project. The environmental assessment follows *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (NSE September 2009) and uses assessment methodology typical for environmental assessment screenings of this kind. For this assessment a list of valued environmental components (VECs)[4] (also known as VCs)[5], and project activities and outcomes for the proposed expansion of the existing pit 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

[4] 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.

[5] 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).

reduce it to acceptable levels before the project proceeds. The process ensures that potentially significant impacts on VECs are identified and 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 9. 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 10 and 11.

Table 9. Valued Environmental Components (VECs) for Middle River Pit 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
Karst Topography	Residential Use
Fish & Fish Habitat	Commercial /Industrial Use
Flora & Fauna & Habitat	Water Supplies & Residential Wells
Species at Risk	Parks & Protected Areas
Natural Areas & Wilderness	Forestry, Hunting & Trapping

5.3 SOCIOECONOMIC IMPACTS

5.3.1 MI'KMAQ

The Mi'kmaq maintain a general interest in all lands in Nova Scotia 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 Sections 4.3.1 and 4.3.8. In more recent times, treaties made with the British and continued through Canadian law have maintained their rights. Coastal areas of the Bras d'Or Lakes and rivers which flow into it including Middle River likely were used by Mi'kmaq, including as a transportation route inland and to the Gulf of St. Lawrence as Mi'kmaq moved throughout the Province; however, there is low potential for occurrence of Mi'kmaq archaeological resources at the pit site (CRM 2021).

The eight km distance between the pit and the Wagmatcook Reserve (Figure 1, Map A1) is sufficient separation to make activities at the pit unnoticeable. Transport trucks and equipment moving along the Cabot Trail likely can be heard there, and traffic can be experienced by residents using the roads in the area. Product from the pit, which may include sand and gravel may be used for construction and road building on the Reserve. The pit is some distance from Middle River and would not have significant impacts

on fish resources. Best management practices used at the site will reduce any potential impacts of pit activities may have on water quality and quantity and fish habitat, and will be validated through a surface water management and monitoring program that will be established through the subsequent Industrial Approval process. Land around the existing Middle River Pit which is proposed for expansion may be used by Mi'kmaq and /or other local residents for activities such as nature walks, bird watching, and hunting or fishing (either recreationally or for subsistence). 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. Since pit operations are not expected to change in scope or increase in frequency from past use, there is unlikely to be a change in the 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 local walking/hiking and home-based recreation (e.g. gardening) concentrated around the Cabot Trail and local residences. The pit will increase truck traffic on the Cabot Trail principally when the pit is operating. Operations at the pit 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 pit operations could likely be heard and residents would experience truck traffic and other effects of pit operations, the frequency and scope of operations at the pit is not expected to increase from past use, and any impact on normal activities of residents as a result of the proposed pit expansion are expected to be negligible.

5.3.3 TOURISM AND VIEWSCAPE

Expansion of the existing Middle River Pit is not expected to have an impact on tourism and viewscape. The Cabot Trail is perhaps the most important tourist route in Cape Breton and an important commercial route linking Highway 105 to western Cape Breton, and operations at the pit and associated truck traffic would interact with tourist traffic using it. Truck and equipment traffic accessing and exiting the site from the Cabot Trail 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. The intersection of MacIntyre Road and the Cabot Trail is narrow and has reduced view planes which may present a safety concern; however, use of signage (e.g. "Trucks Turning") during periods of onsite activity, would improve safety by alerting travelers. While it is not currently visible from the highway, the Pit may be visible when it achieves full utilization in future; and dust and lights at night may be visible at times currently. Overall, these are expected to have negligible impacts on the tourist experience and use of the Trail for tourism.

5.3.4 RECREATIONAL, COMMERCIAL & MI'KMAQ FISHING

Recreational fishing in Middle River and its tributaries in the area, as well as in the ponds located south of the study area is not expected to be affected by activities at the pit. A small amount of surface water runoff leaves the pit via surface flow, but most precipitation will infiltrate through the porous sand and gravel material in the pit, resulting in a negligible impact on the watercourses and fish habitat downstream. Surface waters at the site have high quality, including low turbidity and neutral pH, which

would lead to good quality of waters downstream for fish. Overall a negligible impact of the pit on recreational, commercial, and Mi'Kmaq fishing is expected.

5.3.5 ARCHAEOLOGICAL/CULTURAL/HISTORICAL

The land proposed for the pit expansion has low potential for pre-contact and/or early historic native or European archaeological resources (CRM 2021). The site itself has been occupied by European settlers but development of the existing pit and modifications to the land due to other activities such as forestry have removed all traces. The site may have been used by Mi'Kmaq pre-contact due to its proximity to Middle River which provided access to the adjacent lands. If an archaeological feature of significance is encountered during pit activities, particularly evidence of Mi'kmaq occupation, operations should be halted, and the Nova Scotia Museum of Natural History and the experts in the Nova Scotia Department of Culture and Heritage consulted to ensure the artifact or feature is not disturbed and is adequately documented and preserved. The archaeological study conducted for the project was permitted by the Province and is on file for future reference if required.

5.3.6 ECONOMY, LAND USE AND VALUE

The community of Middle River has a mix of commercial and economic activities including agriculture but is not a major centre. Activities at the Middle River Pit do not restrict industrial activity in the area and in fact support construction activities, through use of gravel from the pit for projects in the area. The pit provides employment for locals and generates tax revenue. The existing pit 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 Middle River Pit currently generates a comparatively low level of truck traffic on highways in the area, and activity levels are not expected to increase significantly. Consequently the pit is not expected to change the existing traffic volumes significantly. The intersection of MacIntyre Road with the Cabot Trail is narrow with limited sightlines, and trucks turning onto the highway at slow speed may lead to traffic slowdowns. During periods of site operation, signage for truck and equipment operators, as well in as the surrounding communities will be placed (in consultation with the local Nova Scotia Department of Public Works officials) to help avoid dangerous situations at the MacIntyre Road and Cabot Trail intersection. 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. Appropriate signage can be placed in areas leading to the pit, in particular when the pit is operating, to improve safety. Equipment and truck operators for the pit will 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, will little or no change from previous operations at the pit.

5.3.8 RESIDENTIAL USE

Pit activities can potentially interfere with normal use and enjoyment of nearby residential properties by creating background noise, and through truck and equipment traffic and dust, which some residents may find objectionable. No residential structures are located within the required 90-meter setback distance

for pit operations. The residence and farm accessed from MacIntyre Road both will experience noise, dust, and light interference through the full development of the proposed expansion area. Mitigation measures such as maintaining operational buffers, controlling vehicle speed and engine braking, securing equipment to prevent banging (e.g. doors and chains), covering loads, wetting working areas, etc. will be practiced to ensure that pit operations comply with noise and dust limits according to the Pit and Quarry Guidelines. Noise and dust monitoring will be conducted as per the terms and conditions of the Industrial Approval for the pit. Traffic volumes from the site would be moderate when the Pit is in use, and a high frequency of truck traffic would be an irregular occurrence, depending on the supply requirements for particular projects. Dust from operations can be seen and reach nearby residences, including settling on vehicles and entering homes, and attention will be given to dust management through standard dust mitigation strategies (water spray, reducing speeds, gravelling working areas, etc.). Lights, if present, at the site could be seen from nearby residences, but would be controlled by proper environmental management practices at the site (i.e. downward directional lighting).

Pit activities are not expected to impact residential water supplies, as nearby homes use primarily drilled wells in a large aquifer which is unlikely to be impacted significantly by activities at the pit. A groundwater monitoring program will be implemented through the Industrial Approval process to establish baseline groundwater quality prior to expansion and to provide on-going monitoring to ensure that any possible effects of the pit are identified.

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 are unlikely to be a significant disturbance to residents. The pit includes signage with phone numbers and contact persons should any members of the community have inquiries. A complaint resolution procedure will be put in place by Municipal to address complaints and concerns.

5.3.9 COMMERCIAL/INDUSTRIAL USE

Middle River is not a commercial centre although there are several small local businesses, churches, and Middle River Consolidated School as well as cottage rentals. Operations at the Middle River Pit have in past been compatible with other commercial undertakings in the area. The pit contributes to net economic benefit in the community through supporting local trucking operations and providing access to aggregate and other pit products.

5.3.10 WATER SUPPLIES AND RESIDENTIAL WELLS

Nearby residents use drilled wells and dug surface wells for potable water supply depending on a large aquifer, recharge for which is unlikely to be impacted significantly by continued operations. Blasting will not occur onsite, so there will be no blasting related impacts to the aquifer. Groundwater recharge generated by the pit is likely to be of high quality (low conductivity and dissolved solids and neutral in pH). The pit floor is expected to remain at approximately the current elevation across the proposed expansion area. A hydrologic study and approval from NSECC would be required before extraction could occur below the groundwater table. Best management practices will be followed, established operational procedures for fueling will be followed, and a contingency plan will be maintained to mitigate reasonable impacts on aquifers at the site.

5.3.11 Parks and Protected Areas

The proposed expansion of the Middle River Pit site is not expected to make the site more visible by tourists traveling by road. With no change in the scope or frequency of pit activity, road traffic activity due to the pit is not expected to change, or be high enough in volume to disrupt tourist traffic. Wilderness areas near the pit are large in relation to the proposed expansion of the pit, and no features of the pit are likely to interfere with wildlife use in any way. The pit will be reclaimed at the end of its useful life. Expansion of the pit will not affect the integrity of any nearby protected areas.

5.3.12 Resource Use—Forestry, Hunting & Trapping

Use of the land in the expansion area will remove the potential for future forestry use of the site, at least until after the pit is closed and rehabilitated in future; however the area occupied by the pit 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 pit 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

Project activities have the potential to generate dust, combustion emissions, noise, and light, however pit activities are not expected to change from the previous scope of operations. As such dust, emissions, noise, and light will not increase as a result of the proposed expansion. In particular, operation of heavy equipment (e.g. earth movers, mobile and stationary screening equipment), as well as onsite routine operations such as vehicle movement and trucks contribute to dust and particulate levels. Noise levels can impact human use and enjoyment of the environment. Dust emissions are expected to 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, dust suppression systems on screening equipment, and reducing equipment and vehicles speeds. Monitoring of airborne particulate emissions will be conducted at the request of NSE and in accordance with the site Industrial Approval, the Pit and Quarry Guidelines, and the Nova Scotia Air Quality Regulations. Industry standards and best practices will be followed during all phases of operations.

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

With no anticipated change in scope or frequency of operation, noise levels from the expanded pit are expected to be similar to those already produced at the site. Noise mitigation will include maintaining appropriate operational buffers, maintaining vehicles and heavy equipment in proper working order, and giving attention to traffic patterns around the site to reduce the need for heavy equipment to back up

(thus reducing the frequency of backup signals). The operator will ensure that heavy equipment does not exceed the noise limits specified in the Nova Scotia Pit and Quarry Guidelines. Noise monitoring will be conducted if necessary at the request of NSE, in accordance with the terms and conditions of the Industrial Approval.

Occasional nighttime operations may be required. Light during nighttime operations— particularly during times of low-hanging cloud and fog—can attract migrating birds traveling over water towards the rest of the mainland of Nova Scotia. If nighttime operations are required then directional lighting will be used to minimize emanation of light upward and laterally over the horizon.

5.4.2 GROUNDWATER

Activities associated with the project including forest clearing, grubbing and removal of overburden, influence groundwater flow locally in the vicinity of the pit, but are not expected to influence groundwater aquifers over a broader area. The sand and gravel deposit accessed at the site has high permeability and most precipitation percolates readily through it into the local water table. The amount of recharge area involved in project activities is small in relation to the overall size of the aquifers in the general vicinity; however the pit floor will continue to add recharge in approximately the same amount as at present. A contingency plan will be established to manage any spill or release occurrences potentially impacting groundwater in the area. As part of the Industrial Approval process for the expanded pit, a groundwater monitoring program will be established to determine baseline groundwater quality and provide on-going monitoring to ensure that any possible effects of the pit are identified. Overall, the effect on overall groundwater flow patterns are expected to be negligible.

5.4.3 HYDROLOGY

A Water Balance Assessment has been prepared to assess the estimated effects of pit expansion on local hydrology. Expansion of the pit is expected to have negligible effects on the existing surface water hydrology at the site, since virtually all precipitation reaching the site enters the water table. A small amount of surface runoff may enter the intermittent watercourse located along the north margin of the expansion area, but the overall impact is expected to be small. The proposed expansion area is small and consequently the effect on supply to surface waters in the vicinity is not expected to be disrupted significantly and surface flows will be moderated by the surface water management system. Municipal 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 environment.

5.4.4 WATER QUALITY

Water which percolates through the pit floor and enters the groundwater table is expected to be of high quality, due to its origin as rain water and tendency for particulates to be filtered in passing through the gravel and sand base material. Forest clearing and grubbing activities can lead to releases of fines from the soil, resulting locally in elevated suspended sediment levels but little surface water flow from grubbed areas is expected off the site in part due to the small area involved, and sediments will be removed during flow through the adjacent landscapes. Possible release of other contaminants such as oils and lubricants from operating equipment is expected to be mitigated by normal precautions on equipment operations

and fuelling locations. Contaminants arising from operations of the pit are expected to be exceedingly low. All activities will conform to the Nova Scotia Erosion and Sedimentation Control Handbook (NSE 1988) and the Nova Scotia Pit & Quarry Guidelines (NSE 1999). Runoff from road surfaces potentially can lead to temporarily elevated suspended sediment levels in flows in ditches adjacent to them, although effects would be short term. Impact of the pit on water quality in adjacent streams and other waters is expected to be negligible. A surface water management and monitoring program will be established through the Industrial Approval process.

5.4.5 FRESHWATER AQUATIC ENVIRONMENTS AND WETLANDS

There are no permanent streams in the study area and the expansion area has been selected to minimize impacts on wetlands. A buffer of a minimum of 30 m will be maintained between the expanded pit and the pond system and associated wetlands to the south; wetlands on site have been identified and any planned loss of wetland habitat will follow the established Wetland Alteration Approval process, including compensation requirements. Quantities of runoff arising from the site in future from the outer slopes of berms and grubbings piles will be approximately the same as at present and will remain in the same watershed. The pit is unlikely to generate significant quantities of contaminants or suspended sediments that could impact any freshwater or wetland habitat.

5.4.6 TERRESTRIAL ENVIRONMENTS

Proposed expansion will utilize areas which are wholly regenerated medium-aged deciduous and mixed forest—types which are common in the general vicinity, and in particular locally at the site—and the pit will not remove a large proportion of either type. No unique habitats were identified at the site except for the presence of sink holes (see section 5.4.7 below) but the examples found at the site are not associated with plant communities which are not typical of these landscape features. Dust from operations may affect adjacent forest communities although the impacts are likely to be negligible.

5.4.7 KARST TOPOGRAPHY

The occurrence of sink holes in the study area is a relatively uncommon landscape feature, which is known as Karst. Karst topography typically occurs over bedrock consisting of limestone, gypsum, and anhydrite (Baechler 2017). The sink holes here are infrequent, and thus the site is not a good example of this type of landscape. Based on the Karst Investigation Summary Report (Dillon Consulting 2022), subsurface karst features have not been identified within the proposed expansion area and the deposit is consistently alluvial. Potential for occurrence of karst topography should be considered in further developing the pit (Drage and McKinnon 2019). Karst features are unlikely to influence groundwater and surface water quality at the site. Since the Project is not anticipated to cause a significant change to the subsurface flow regime, it is expected that the proposed expansion will have a negligible impact on the potential for future sink hole development.

5.4.8 FISH AND FISH HABITAT

There is no fish habitat in the proposed study area, and none of the proposed project activities will physically impact potentially fish bearing streams or surface waters. The pit will not influence surface or groundwater levels significantly, and therefore will not have indirect effects on surface water conditions.

The ponds found south of the Pit are important and productive fish habitat; the study area provides a buffer of a minimum of 30 m from these water bodies and associated wetlands. The proposed expansion will not advance the working footprint any closer to the adjacent waterbodies than present. The pit will allow largely normal recharge the water table at the site, which is expected to be important in maintaining water levels in the ponds, and so will not affect them significantly. A Water Balance Assessment has been completed as part of the EA process (separate report) which estimates that changes in infiltration and runoff due to the pit expansion are expected to be minimal and within the anticipated range of seasonal variance. This suggests that there will be little / no change in the quantity of runoff from the pit. Water quality typically found in groundwater at the pit will be monitored and is expected to meet NS Environment and Climate Change (NSECC) guidelines and limits stipulated in the Industrial Approval. All guidelines for activities in the pit will be followed. Overall the effects of the pit construction and operations are expected to be negligible.

5.4.9 FLORA AND FAUNA AND HABITAT

Expanding the Municipal Middle River Pit will remove existing terrestrial ecosystem (plants and animals) in the footprint of the pit. With time, areas no longer suitable for pit operations will be remediated, through a site reclamation plan which has been established as a condition of pit Industrial approval. Plant and animal communities that arise in remediated areas will likely differ to some degree from those at present; however, a goal of remediation will be to ensure that conditions (e.g. soil types and topography) are reasonably restored to pre-existing conditions, to allow natural communities to regenerate. 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 pit development shares with logging activities, which affects local ecosystems to a moderate degree, and is allowed in Nova Scotia. Normal management practices regarding forest clearing, such as avoidance of cutting or major clearing activities during critical breeding periods of songbirds from mid-April to mid-September, will reduce loss of nesting birds in forest areas. Expansion of the Middle River Pit 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 pit 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. Pit 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. Spotted Sandpiper was noted to be nesting in the pit; this species occupies similar open sandy habitat along rivers and on lakeshores; attention to the frequent presence of birds while the pit is operating should be noted, experts consulted, and avoidance considered until nesting is completed and the young birds fledged. Fact sheets can be prepared for pit personnel identifying the appropriate mitigation and approach to be used in such situations. Municipal has prepared various fact sheets on important species of conservation concern and for migratory birds for use in its quarry and pit operations.

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. If nightime operations

are required, in particular during migration periods (August – September) which would attract migrating birds, downward directional lighting will be used which focuses downward and below the normal horizon, to limit visibility by birds and insects from a distance.

5.4.10 SPECIES AT RISK

Collema leptaleum, a jelly lichen species with sub-national ranking of S2S3 was observed in two locations within the Study Area. The location of this species was excluded from the proposed expansion area and will not be physically disturbed by the Project. No other federally or provincially-listed species at risk, or species more sensitive than S3 ranking (vulnerable), were found in the study area. American Marten and Canada Lynx (both provincially listed as Endangered) are known to occur in wilderness areas in the general vicinity of the study site. Common nighthawk, a ground-nesting species, potentially could nest in grubbed and marginal but open areas of the pit and Spotted Sandpiper was observed in surveys to be nesting at the site; employees should be made aware of the need to check areas for activity and nests before undertaking activities which would disturb established surfaces. Wood Turtle and Snapping Turtle may be found in areas near watercourses. Activities such as logging and site clearing should be scheduled outside the April to August nesting period for breeding birds. Lights during night operations during migration periods (April – 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.

5.4.11 NATURAL AREAS & WILDERNESS

Natural areas in the vicinity of the site in the Middle River Wilderness Area are appreciated by locals and tourists alike, and the landscape in this part of Cape Breton Island is dominated by natural environments, including some of the most remote and wild areas of Nova Scotia. The proposed expansion of the Middle River Pit will affect only a small proportion of a modified natural landscape previously occupied by human settlement and utilization at the site, and thus will have a limited effect on wilderness and associated values such as tourism and nature appreciation. Municipal is committed to minimizing potential effects of the pit, in particular to reduce traffic, noise, dust and light from operations. When parts of the pit are restored, conservation of biological communities and ecosystems, as well as changes in physical conditions that could affect those communities, will be considered. 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 pit will not be impacted in general by weather, including high rainfall and precipitation, which is expected largely to percolate into the ground. Changing climate may increase the operating season for transportation projects, and the need for aggregates produced by the pit. Pit design, which includes site water management, will allow the site to absorb precipitation from extreme rainfall events. As part of the Industrial Approval process a Stormwater Management Plan and Erosion and Sediment Control Plan will be established for the site. Sand and gravel produced and stored at the site are stable under varying conditions of rainfall. Although extreme rainfall events may currently lead to high flows in watercourses leaving the site, such flows will be manageable through site design and infrastructure. Potential occurrence of subsurface hazards in the underlying Windsor Group bedrock should continue to be investigated prior to and during expansion to identify potential safety and environmental risks associated with the bedrock geology.

Table 10. Potential interactions between project activities and operations and Valued Environmental Components (VECs) for Middle River Pit expansion.

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

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Middle River Pit Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
BIOPHYSICAL COMPONENTS						
Air Quality, Noise & Light	Construction	Noise and dust from heavy equipment during site clearing and grubbing.	Significant	Negative	Take steps to reduce noise sources such as engine braking. Maintain vehicles and equipment to reduce noise and emissions generated from worn parts.	Not significant.
		Light from the pit can be seen in neighbouring areas.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the pit during nighttime operations.	Not significant.
	Operation	Noise from screening equipment; heavy equipment operation; dust.	Significant	Negative	Monitor noise levels and undertake to avoid exceedances of regulatory levels. Institute measures for dust control.	Not significant.
		Noise from engine braking of trucks on MacIntyre Road interfering with local enjoyment of residents.	Significant	Negative	Instruct truck operators to avoid use engine braking leaving the pit and in populated areas.	Not significant.
		Light from the pit can be seen in neighbouring areas.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the pit at night.	Not significant.
		Dust from excavating and screening operations and site activities.	Significant	Negative	Water spray or other approved dust suppressant on pit access road and working areas to reduce the resuspension of dust.	Not significant
Groundwater/ Hydrology	Construction	Forest and soil removal changes surface and groundwater 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	Removal of base material increases infiltration into groundwater. Drilled wells in bedrock and surface wells can be disturbed	Significant	Negative	Analyse groundwater quality and movement to determine changes.	Not significant.
	Operation	Pit and work areas change surface water flows. Increased peak stormwater flows. Washing product	Significant	Negative	Onsite water management to moderate extreme surface water runoff and suspended sediment levels; measures	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Middle River Pit Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
		creates silt-laden surface flows.			to maintain normal flow regime. Arrange washing in closed loop system to retain all wash water onsite.	
	Operation	Accidental hydrocarbon (lubricant and fuel) spills contaminate groundwater.	Significant	Negative	Measures to minimize danger of spills; proper fuel handling strategies, onsite emergency numbers, spill kits etc.; Avoid refueling near pit and 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.	Significant	Negative	Onsite dust control and water management to moderate surface water runoff and suspended sediment levels. Erosion & sedimentation controls.	Not significant.
	Operation	Water chemistry changes in runoff from stockpiles stored on site.	Negligible	Negative	Best management practice allows leaving piles exposed to the environment. Monitor settling ponds; storm-water management.	Not significant.
Natural Areas & Wilderness	Construction & Operation	Presence of pit, emissions, dust etc., detracts from public perception of wild quality of area.	Negligible	Negative	Area affected is small in relation to remaining natural areas, and previous development such as farming and logging 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 ecosystem and enhancing values. Manage dust and light, and control noise.	Not significant.
Freshwater Aquatic Environments	Construction	Potential for local high suspended sediments and nutrient levels from grubbings, road construction, and locally-diverted flows.	Negligible	Negative	Preserve wooded buffer areas for pit. Onsite water management and sedimentation controls to moderate surface water	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Middle River Pit Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
					runoff and suspended sediment levels.	
	Operation	. Residues from aggregate washing unlikely to reach surface waters. Reduced water availability from evaporation from pit floor and exposed surfaces.	Negligible	Negative	Maintain forested buffers. Onsite water management including sedimentation ponds and storage of wash water during off peak season. Minimize unvegetated areas. Preserve woodland in buffer areas of pit.	Not significant.
	Operation	Runoff from materials stored on site entering groundwater.	Negligible	Negative	Isolate and treat runoff from work areas and stored materials piles.	Not significant.
	Construction & Operation	Accidental spills of hydrocarbons (fuel and lubricants) on site.	Significant	Negative	Provide pollution prevention and emergency measures.	Not significant.
Terrestrial Environments and Karst	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 surveys prior to development stages. Monitor species-at-risk birds. Conduct forest removal in small stages corresponding to site development and not in breeding period for birds. Investigate potential risks associated with bedrock geology.	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 surveys prior to excavation. Be aware of critical times for rare species which might occur. Review potential for collapse of pit due to subsurface caves and features.	Not significant.
Fish & Fish Habitat	Construction	Change runoff patterns at site in adjacent watercourse.	Negligible	Negative	Runoff management to maintain normal regime and to avoid sudden flows due to runoff events.	Not significant.
	Operation	Site runoff management and water use affects hydrological and groundwater regime.	Negligible	Negative	Ensure the runoff from storm events is managed.	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Middle River Pit Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
	Construction & Operation	Small releases of fuel, 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 such as on-site spill kits.	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 pit key intersections. Provide pollution prevention and emergency measures (e.g. spill kits).	Not significant.
Terrestrial Flora & Fauna & Habitat	Construction	Removal of Existing Forest Communities	Negligible	Negative	Restore damaged and unused parts of the site (e.g. grubbings) as soon as possible. Long-term site rehabilitation plan developed with NSECC. Cut forest short term only as needed to expand pit. Conduct species specific breeding bird survey in prior to development.	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 pit.	Not significant.
		Removal of potential forest and wildlife resource (i.e. wildlife habitat)	Negligible	Negative	Small area affected relative to total available in vicinity. Minimize footprint of pit. Restore and rehabilitate areas not used. Leave mature standing trees where possible as nest cavities and for rare lichens.	Not significant.
		Pit affects wildlife movement patterns and connectivity of habitats.	Negligible	Negative.	Restoration should include consideration for wildlife movement through the restored site.	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Middle River Pit Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
Species at Risk	Construction	Removal of potential habitat for American Marten and Canada Lynx.	Negligible	Negative	Small area affected relative to total available. Minimize footprint of pit.	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 pit.	Not significant.
		Open and revegetated areas and grubbings 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	Engage with Mi'kmaq in developing pit.	Not significant.
		Contamination of surface waters may affect fish populations in nearby surface waters potentially used by Mi'kmaq.	Not significant	Negative	Employ surface water monitoring program. Use Best Management Practices for pits. Avoid accidental releases of contaminants. Avoid vehicle accidents.	Not significant.
Archaeological, Cultural and Historical Significance	Construction	Expansion may affect undiscovered artifacts.	Not significant	Negligible	Unlikely that artifacts occur at site. Stop work and report discoveries. Minimize project footprint.	Not significant.
Recreation	Construction & Operation	Pit traffic & activities affects local low impact recreation (e.g. walking and ATVs) and traffic along Cabot Trail.	Not significant	Negative	Users will be aware of activity at pit but will not be otherwise impacted by it. Signage of truck use, dangers, and pit activity.	Not significant.
Tourism and Viewscape	Construction & Operation	Presence of pit affects public perception of wilderness values.	Negligible	Negative	Small feature in the landscape and low visibility. 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; safety; operation of trucks	Significant	Negative	Use best management practices to reduce disturbance to nearby residents. Inform	Not significant.

Table 11. Summary of impacts and mitigation on Valued Environmental Components, Middle River Pit Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Suggested Mitigation	Significance after Mitigation
		and transportation of heavy equipment.			residents about pit operations. Provide community with safety information for truck traffic and pit operations (as needed case by case).	
Recreational and Mi'kmaq Hunting and Fishing	Construction & Operation	Accidental hydrocarbon spills contaminate surface waters.	Negligible	Negative	Provide pollution prevention, emergency measures & response capability. Identify and control contaminant releases.	Not significant.
	Construction	Loss of forested area under pit footprint.	Not significant	Negative	Small area affected. Rehabilitate areas no longer needed for activity and future development. Minimize cutting outside pit footprint.	Not significant.
Water Supplies & Residential Wells	Construction and Operation	Pit changes percolation of precipitation into groundwater.	Negligible	Negative	Aquifer is large and pit unlikely to affect volume and quality of resource. Develop groundwater-monitoring plan in consultation with NSECC.	Not significant.
Economy, Land Use and Value	Construction & Operation	Removal of potential forest and wildlife resource (e.g. forestry & trapping).	Not significant	Negative	Small area affected relative to total land available. Minimize footprint of pit. 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 Cabot Trail.	Not significant	No Change	Use good signage, have speed policy in vicinity of pit. Safety training for truck drivers.	Not significant
Industrial & Commercial Use	Operation	Businesses including other pits in the area are industrial and have similar impacts.	Negligible	Neutral	Pit and revenue helps to maintain roads and access roads and support local 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 can be heard in Middle River Wilderness Area and in the general vicinity.	Not significant	Neutral	Employ best management practices for all aspects of pit operation, in particular control of noise, light, & dust.	Not significant.

7 CUMULATIVE EFFECTS

Because of the remoteness of the location, all the potential impacts of the pit operation (dust, noise, lights, traffic volume, etc.) are unlikely to be compounded by other development or human activity. Several other pits currently operate in the general vicinity of Middle River which utilize similar outwash deposits. The added area proposed for the expansion will not expand the impact, and further, since site operations are not expected to increase in frequency or scope from past use, the cumulative effect of the pit and other local activity is not expected to change and will be negligible.

8 MONITORING

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

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

9 PUBLIC CONSULTATION

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

10 PERSONAL COMMUNICATIONS

Mr. Alexander MacRae, Middle River, October 2021.

Mr. David MacKenzie, Middle River, October 2021.

Mr. George Smith, Middle River, October 2021.

Mr. Jamie Vallis, Margaree Hatchery Supervisor, NS Dept of Fisheries and Aquaculture, October 2021.

Mr. John Alexander (Sandy) MacKenzie, Middle River, June 2021 and October 2021.

Ms. Kathryn Kennedy, Middle River, October 2021.

Ms. Maureen Cameron-MacMillan, Regional Biologist, NS Natural Resources and Renewables, July 2021.

Ms. Michelle Towle, Middle River, October 2021.

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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 2020 – November 2021 and the generally accepted assessment practices of our industry. No other warranty is made.

APPENDIX A

MAPS

THE MUNICIPAL GROUP OF COMPANIES

MUNICIPAL ENTERPRISES LIMITED

MIDDLE RIVER PIT EXPANSION

Middle River,
Cape Breton Island, Nova Scotia

Site Location and Features

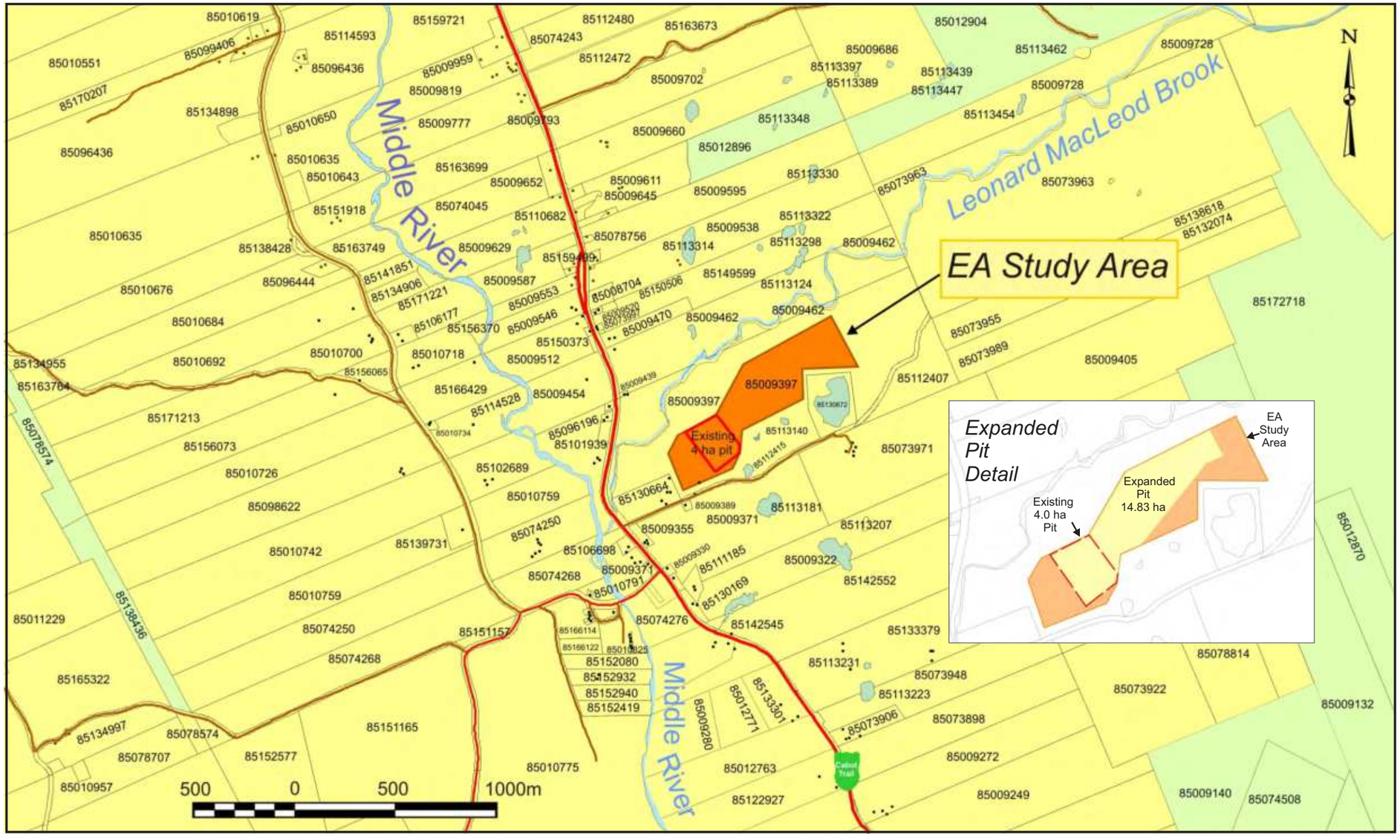
EA Study Area

Mapping by:
Envirosphere Consultants Ltd.
Windsor, Nova Scotia
April 2021

Base Map: Baddeck
NTS 1:50,000
Sheet: 11K/2

MUNICIPAL ENTERPRISES LTD

Map A-1



THE MUNICIPAL GROUP OF COMPANIES

MUNICIPAL ENTERPRISES LIMITED

MIDDLE RIVER PIT EXPANSION

Cape Beton Island, Nova Scotia

Property Ownership

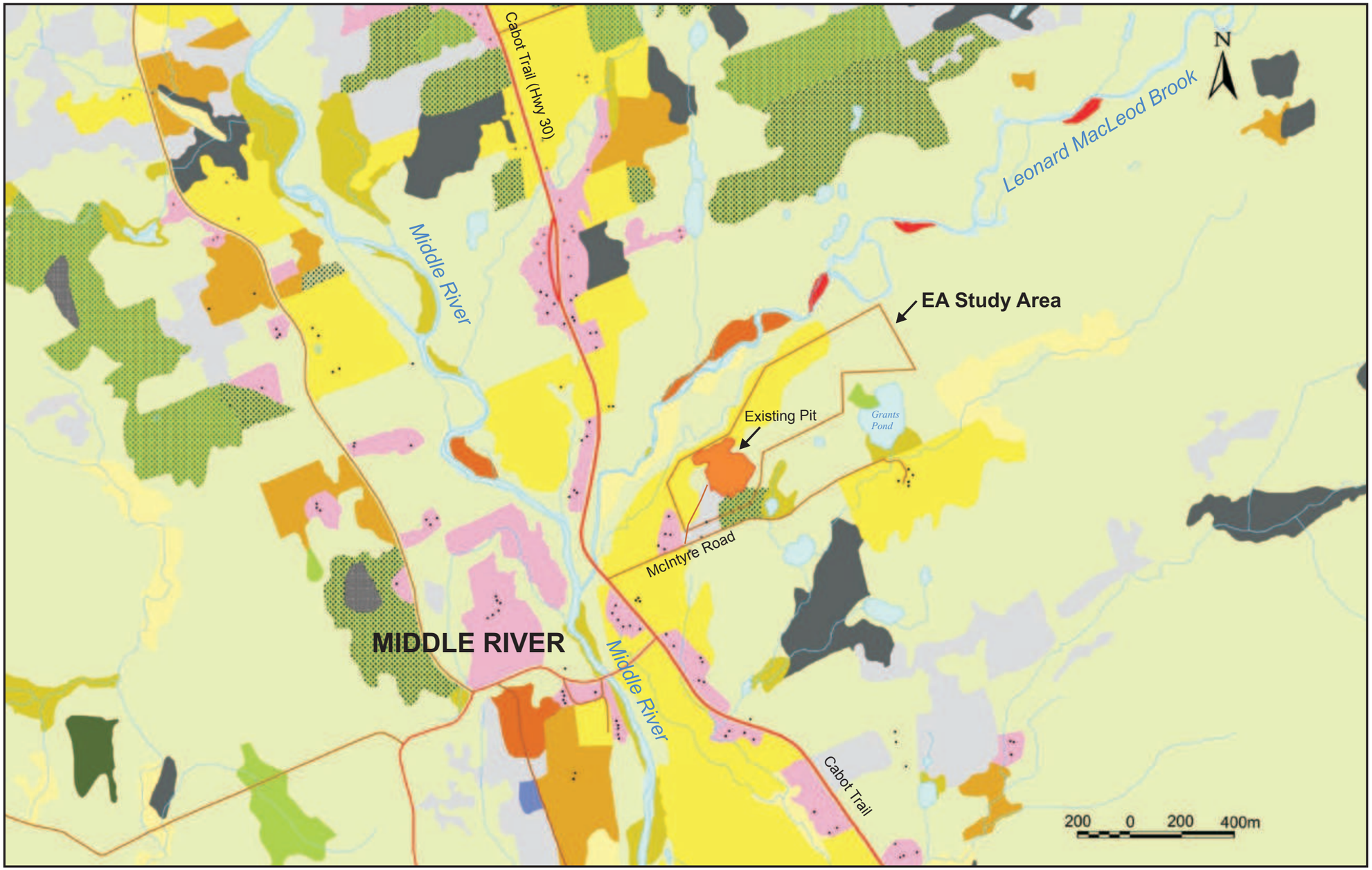
- Crown Land
- Quarry Property
- Property Boundaries
- Major Roads
- Secondary Roads
- 50209980 Property Identification Number (PID)

Mapping by:
Envirosphere Consultants Ltd.
Windsor, Nova Scotia
May 2021

Property Mapping: Province of Nova Scotia, Updated January 2017

MUNICIPAL ENTERPRISES LTD

Map A-2



Map by:
Envirosphere Consultants Limited.
Windsor, Nova Scotia, June 2021

THE MUNICIPAL GROUP OF COMPANIES

MUNICIPAL ENTERPRISES LIMITED

MIDDLE RIVER PIT EXPANSION

Cape Beton Island, Nova Scotia

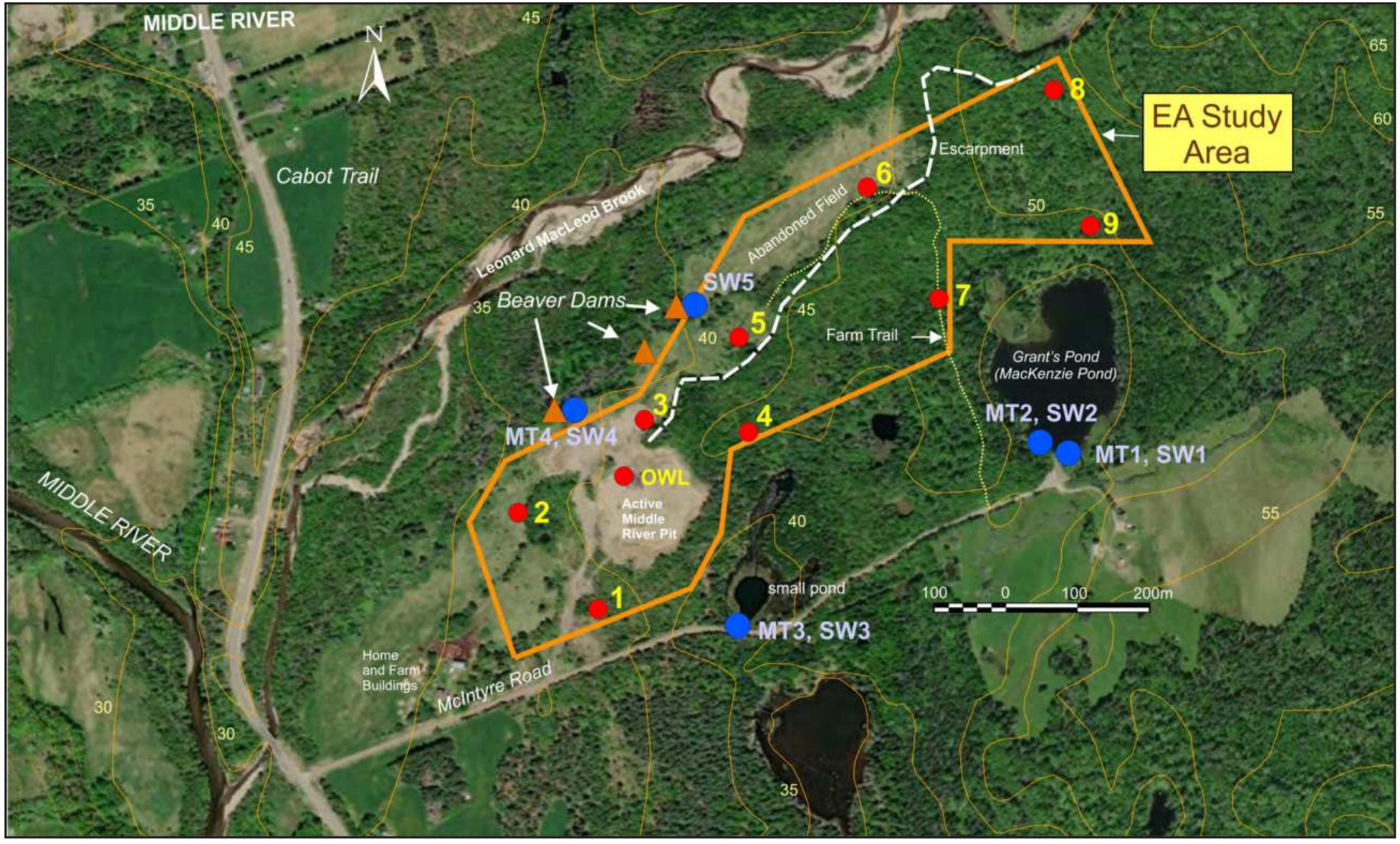
Land Use Classification

(based on NS Forestry Inventory, 2016)

- Agriculture
- Old Field
- Urban
- Stand c/w Dead Trees
- Plantation
- Alders
- Clear / Partial Cut
- Natural Stand
- Pit
- Wetlands General
- Blueberries
- Treated
- Brush
- Open Bog
- Treed Bog
- Inland Water
- Miscellaneous
- Watercourse
- Main Highway
- Trunk Highway
- Secondary Roads & Trails

MUNICIPAL ENTERPRISES LTD

Map A-3



THE MUNICIPAL GROUP OF COMPANIES

MUNICIPAL ENTERPRISES LIMITED

MIDDLE RIVER PIT EXPANSION
Cape Beton Island, Nova Scotia

Site Features

- Water Sampling (SW) & Minnow Traps (MT)
- Bird Survey Point
- Beaver Dam
- Elevation Contour (m)
- Watercourse

Map by:
Envirosphere Consultants Limited.
Windsor, Nova Scotia, December 2021

MUNICIPAL ENTERPRISES LTD

APPENDIX B

BOTANICAL SURVEYS

Fall 2020 & Spring/Early Summer 2021

Fall & Spring Botanical Surveys for a Proposed Dexter Pit Expansion in Middle River, Victoria County, Nova Scotia

Ruth E. Newell, B.Sc. (Hons.), M.Sc.
July 29, 2021

Fall and Spring Botanical Surveys for a Proposed Dexter Pit Expansion in Middle River, Victoria County, Nova Scotia

Introduction

Fall and spring botanical surveys of vascular plants were conducted at the site of a proposed pit expansion by Dexter Construction Company Limited in Middle River (71 MacIntyre Road), Victoria County, Nova Scotia, on October 21, 2020, and June 24, 2021, by botanist Ruth E. Newell, B.Sc. (Hons.), M.Sc. Observations from both surveys are presented in this report.

The main survey area, i.e., the proposed expansion area, is defined by the orange line shown in Figure 1 and is approximately 30 to 35 ha in size (includes the existing pit area). The spring survey was expanded to include wetland habitat associated with three ponds situated just outside of the southeastern side of the delineated survey area (Fig. 1).

Primary habitats examined during the fall survey include (1) an approximately 750 m long wooded ridge situated northeast of the current pit footprint (Figs. 2 & 3), (2) part of an old pasture which parallels and is immediately adjacent to and west of the wooded ridge (Fig. 4) and (3) a small, disturbed, mostly open area occurring southwest of the current pit footprint (Fig. 5). A small, wooded area within this last section has two small ponds (Figs. 6,7, 8 & 9). Aside from these two, possibly seasonal, ponds occurring at the west end of the survey property no other wetlands appear to be present within the footprint of the proposed quarry.

During the spring survey, in addition to the three new ponds and their associated wetland surveys, the woodland ridge was re-surveyed for spring flora and potentially any species missed in the fall survey. Also re-examined were the two small ponds located at the southwest end of the property as recommended in the Fall report.

Figure 1. The Middle River Pit showing the proposed expansion area as delineated by the orange line. Also present in the photo (outside of the orange line) are a series of three ponds situated south of the wooded ridge. The north ends of these ponds were examined during the spring survey due to their proximity to the quarry expansion area.

All vascular plants observed during these surveys as well as the habitats in which they occur and both their provincial general status ranks and the Atlantic Canada Conservation Data Centre (ACCDC) subnational status ranks are provided in APPENDIX 1 at the end of this document. Information on these status ranks including status rank definitions can be found on the Wild Species 2015, The General Status of Species in Canada website (https://www.wildspecies.ca/) and the Atlantic Canada Conservation Data Centre (ACCDC) website (http://www.accdc.com).

Results

Habitat Descriptions

1) Wooded ridge northeast of existing pit

The survey area northeast of the main pit is dominated by a wooded ridge. This ridge begins at the pit edge and extends to and beyond the northeastern boundary of the survey area. The primarily deciduous woodland occurring on the ridge, appears to have been heavily cutover at some point within the past 20-50 years as indicated by the presence of stumps and the ages of the tree presently on site (Fig. 2). Tree species currently present, include White Birch (*Betula papyrifera*), Yellow Birch (*Betula*

alleghaniensis), Balsam Fir (*Abies balsamea*), American Beech (*Fagus grandifolia*), Black Cherry (*Prunus serotina*), Red Maple (*Acer rubrum*) and Sugar Maple (*Acer saccharum*). Shrub species present include Beaked Hazelnut (*Corylus cornuta*), Wild Raspberry (*Rubus idaeus* ssp. *strigosus*), Common Lowbush Blueberry (*Vaccinium angustifolium*) and Red-berried Elder (*Sambucus racemosa* var. *pubens*). Herbaceous species documented within this habitat include Bunchberry (*Cornus canadensis*), Evergreen Woodfern (*Dryopteris intermedia*), Common Speedwell (*Veronica officinalis*), Whorled Wood Aster (*Oclemena acuminata*), Wild Lily-of-the-Valley (*Maianthemum canadense*), Greater Bladder Sedge (*Carex intumescens*) and Rough Goldenrod (*Solidago rugosa*).

Additional species observed within this habitat during the 2021 spring survey include: Sweet Vernal Grass (*Anthoxanthum odoratum*), White-edged Sedge (*Carex debilis* var. *rudgii*), New England Sedge (*Carex novae-angliae*), Canada Honey-suckle (*Lonicera canadensis*), Skunk Currant (*Ribes glandulosum*), Highbush Cranberry (*Viburnum opulus* var. *americanum*), Dwarf Red Raspberry (*Rubus pubescens*) and New York Fern (*Parathelypteris noveboracensis*).

Figure 2. Autumn photo of the wooded ridge which extends in a north-easterly direction from the current active pit area.

While surveying this habitat, pits of various sizes were observed along most of the length of the ridge (Fig. 3). At least one pit was observed to have standing water at the bottom. The locations of a few of these pits were documented during this survey. The coordinates for these are 20T 0660991 5114577; 20T 0660948 5114592; 20T 0660905 5114584 and 20T 0660771 5114379. The depths of these pits varied from 10 to 15 feet, with some possibly deeper.

Figure 3. Part of one of the pits found thinly scattered along the entire length of the wooded ridge occurring northeast of the main quarry/pit area.

Species of conservation concern:

No species of conservation concern were observed along the wooded ridge during either the autumn or spring surveys.

2) Old pasture

An abandoned pasture (Fig. 4) occurs immediately northwest of the wooded ridge described above. In addition to pasture grasses, the absence of grazing over time, has led to the establishment of a variety of woody and broad-leaved herbaceous species. Woody species present include Pin Cherry (*Prunus pensylvanica*), Chokecherry (*Prunus virginiana*), White Spruce (*Picea glauca*), Common Blueberry (*Vaccinium angustifolium*), Balsam Popular (*Populus balsamifera*), Wild Apple (*Pyrus malus*) and Wild Raspberry (*Rubus idaeus* ssp*. strigosus*). A variety of broad-leaved herbaceous species have also become established, including Black Knapweed (*Centaurea nigra*), Common Speedwell (*Veronica officinalis*), Rough Goldenrod (*Solidago rugosa)*, Canada Goldenrod (*Solidago canadensis*), Bracken Fern (*Pteridium aquilinum*), Tall Buttercup (*Ranunculus acris*) and Wild Strawberry (*Fragaria virginiana*).

This habitat was not re-surveyed in the spring.

Figure 4. An abandoned pasture occurring within the survey area adjacent to and northwest of the wooded ridge described previously. Succession is currently taking place within the pasture with woody species beginning to establish along the pasture edges as well as a variety of native and non-native, weedy, herbaceous species.

Species of conservation concern:

There were no species of conservation concern observed in this habitat during the fall survey.

3) Disturbed areas west and southwest of main pit area.

Figure 5. Disturbed area along roadway going into the Middle River pit from the property gate.

The habitat along both sides of the access road into the main pit area (between the gate and the pit) is highly disturbed and weedy (Fig. 5). It is primarily open habitat with scattered and occasional clumps of trees. Tree species present include White Spruce (*Picea glauca*), Trembling Aspen (*Populus tremuloides*), White Birch (*Betula papyrifera*) and Pin Cherry (*Prunus pensylvanica*). Shrub species present include Lowbush Blueberry (*Vaccinium angustifolium*), Velvet-leaved Blueberry (*V. myrtilloides*), willows (*Salix* spp.), Wild Raspberry (*Rubus idaeus* ssp. *strigosus*) and Witherod (*Viburnum nudum* var. *cassinoides*). Herbaceous species present include Pearly Everlasting (*Anaphalis margaritacea*), Common Speedwell (*Veronica officinalis*), Black Knapweed (*Centaurea nigra*), Common St. John's-wort (*Hypericum perforatum*), Coltsfoot (*Tussilago farfara*), clovers (*Trifolium* spp.) and both native and non-native grasses including fescues (*Festuca* spp.), bent grasses (*Agrostis* spp.), and Poverty Grass (*Danthonia spicata*).

This highly disturbed dry quarry area was not resurveyed in the spring.

A small, wooded area, approximately 15 by 15 m, occurs at 20T 0660469, 5114183, just west of the pit weighing station (it was noted during the spring survey that the weighing station had been removed). Tree species present include White Spruce (*Picea glauca*), Red Spruce (*Picea rubens*), Red Maple (*Acer rubrum*), White Birch (*Betula papyrifera*) and Trembling Aspen (*Populus tremuloides*). Herbaceous species include Rough Goldenrod (*Solidago rugosa*), Tall White Aster (*Doellingeria umbellata*) and Common Speedwell (*Veronica officinalis*). Ground cover was primarily composed of various moss species.

Two small ponds (Figs. 6 & 7 and 8 & 9) (20T 0660454, 5114146, 20T 0660459, 5114150), separated by a narrow ridge/pathway, occur on the west side of the wooded area described immediately above. They may be manmade and possibly served as watering holes for livestock in the past, as they are situated immediately adjacent to former pastureland. In the fall there appeared to be relatively little vegetation in both. During the 2021 spring survey, a significant amount of vegetation was evident in the larger of the two ponds (Fig. 7) whereas the smaller pond had much less vegetation and was dry (Fig. 9). The following species were present in the smaller pond: Chokecherry (*Prunus virginiana*), Alternate-leaved Dogwood (*Cornus alternifolia*), Creeping Buttercup (*Ranunculus repens*). Species present in the larger of the two ponds included: Marsh Cinquefoil (*Potentilla palustre*), Small Forget-me-not (*Myosotis laxa*), Sensitive Fern (*Onoclea sensibilis*), and Hardstem Bulrush (*Schoenoplectus acutus*).

Figures 6 & 7. The larger of the two ponds with significantly more vegetation evident in the spring (bottom photo) than in the fall (top photo). Sensitive Fern (*Onoclea sensibilis*) and Hardstem Bulrush (*Schoenoplectus acutus*) are the dominant species in Figure 7.

Figures 8 & 9. The smaller of the two ponds (fall photo above, spring photo below) located southwest of current active pit area. Vascular plant species present in the spring photo include Creeping Buttercup (*Ranunculus repens*), an aster species, Chokecherry (*Prunus virginiana*) and Alternate-leaved Dogwood (*Cornus alternifolia*).

Species of conservation concern:

There were no species of conservation concern observed within the open, disturbed habitat in the vicinity of the main pit area during this survey. As well, no species of conservation concern were observed within a small, wooded area and two small ponds located just west of the pit weighing station.

4) Three ponds southeast of the woodland ridge

The spring survey was expanded to include shorelines and wetlands associated with a series of three ponds situated immediately south and southeast of the proposed pit expansion area (wooded ridge) that occurs northeast of the current open pit (Fig. 1). The largest and eastern most pond is named MacKenzie Lake. The remaining two ponds do not appear to be named and are much smaller than MacKenzie Lake.

The wetland vegetation occurring within and along the north and northwest edges of these ponds (and associated marshes) was documented due to its proximity to the proposed pit expansion area. Some of the vascular plant species observed are described below for each individual pond. All species observed are listed in the APPENDIX.

There were no species of conservation concern observed within these three ponds and their associated wetlands during the spring survey.

The marshy northern tip of the western most pond is shown in Fig. 10. Shoreline and emergent species documented here include Broad-leaved Cattail (*Typha latifolia*), Bluejoint Reed-grass (*Calamagrostis, canadensis*), Water Sedge (*Carex aquatilis*) and Fireweed (*Epilobium angustifolium*). Other vascular plant species observed along the shoreline in shadier areas include Wood Horsetail (*Equisetum sylvaticum*), Brownish Sedge (*Carex brunnescens*) and Cinnamon Fern (*Osmundastrum cinnamomeum*)

Fig. 11 shows the adjacent woodland which is generally 1-2 m above the marsh.

Figure 10. Northern tip of westernmost pond (facing south) (Fig. 1) showing the extensive marshland present in this area.

Figure 11. Woodland adjacent to northern tip of westernmost pond. The woodland (or upland) is 1-2 m above the pond (and marsh).

The middle pond (Figs. 12 & 13) is the smallest of the three ponds and consists of a small area of open water with an open, shrubby marsh at the south end of pond, wet alder thickets on the north and west sides of the pond (Fig. 13), and woodland on the east side of pond. The wet alder thicket (Fig. 13) at the north end of the pond was examined closely as it is nearest the proposed pit expansion area. Commonly occurring vascular plant species within this habitat include Speckled Alder (*Alnus incana* ssp. *rugosa*), Sweet Gale (*Myrica gale*), Royal Fern (*Osmunda regalis*), Sensitive Fern (*Onoclea sensibilis*), Cinnamon Fern (*Osmundastrum cinnamomeum*), Leatherleaf (*Chamaedaphne calyculata*), a variety of sedge species (*Carex* spp.), etc.

Figure 12. North end (left side of photo) of the middle (and smallest) pond located southeast of the wooded ridge.

Figure 13. Wet thicket at the north end of the middle (smallest) pond located southeast of the wooded ridge.

The largest and easternmost pond is named Mackenzie Lake. At the north end of the lake, there is a large marshy cove plus a stretch of narrow marshy shoreline to the east of the cove (Figs. 14 & 15). Marsh species present within the cove and along the shoreline include Broad-leaved cattail (*Typha latifolia*), Blue Flag (*Iris versicolor*), Water Sedge (*Carex aquatilis*), Sensitive Fern (*Onoclea sensibilis*), Common Marsh Bedstraw (*Galium palustris*), etc.

Emergent plant species observed in shallow water adjacent to the shoreline (east of marshy cove) include Water Parsnip (*Sium sauve*) and a spikerush (*Eleocharis* sp.)

Upland adjacent to the lake shoreline at the north end of the lake is only a short distance from the lake edge and is approximately 2-4 m above the lake water level. Much of this upland area at the top of the lake/pond is open and disturbed (Fig. 16). Beaver activity was noted in this area. Vascular plant species present in the upland area include Bracken Fern (*Pteridium aquilinum*), Northern Bush Honeysuckle (*Diervilla lonicera*), Wild Raisin (*Viburnum nudum* var. *cassinoides*), Fireweed (*Chamaenerion angustifolium*), Pin Cherry (*Prunus pensylvanica*), young fir (*Abies balsamea*), Rough Goldenrod (*Solidago rugosa*), Lowbush Blueberry (*Vaccinium angustifolium*), Bunchberry (*Cornus canadensis*), etc.

Figure. 14. A large marsh at north end of MacKenzie Lake.

Figure 15. Large cove at top of Mackenzie Lake east of the extensive marsh shown in Figure 14. The area in the photo has a relatively narrow, marshy shoreline.

Figure 16. Disturbed open upland at the north end of MacKenzie Lake. Some, if not all of the disturbance here, can be attributed to beaver activity.

Discussion

No species listed under either federal species-at-risk legislation or provincial species-at-risk- legislation were observed on the quarry property during these surveys.

All the vascular plant species observed and recorded during this current survey fall into the Nova Scotia general status rank categories of **GREEN, LIGHT GREEN** or **EXOTIC** with GREEN indicating a plant with a secure conservation status within the province, LIGHT GREEN indicating a species that is at a fairly low risk of extirpation within the province and EXOTIC meaning a species that is non-native to Nova Scotia. The Atlantic Canada Conservation Data Centre subnational status ranks all fall into the categories of S5, S4 or SNA, also indicating that all species documented on site during this survey, are not of conservation concern (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 a for example, non-native (exotic) species.

Species listed in the APPENDIX not identified to species are not expected to be of conservation concern.

No species were documented during these surveys that have any degree of conservation concern.

APPENDIX

List of all vascular plant species observed on the Middle River Pit property during surveys conducted on October 21, 2020, and June 24, 2021, the habitats in which they were found and their status ranks (both the Nova Scotia General Status Rank*and the Atlantic Canada Conservation Data Centre Subnational s-rank** are provided for each species). (Habitats: open disturbed areas along the roadway into the main open pit area (D), woodland (W), old pastureland (P) and ponds and their associated wetlands (Pd).

Additional species documented during the spring survey are marked with the following symbol: †.

Species with a rarity ranking (and accompanying information) are in bold font.

Latin Name	**Common Name**	**Nova Scotia General Status Rank***	**ACCDC Subnational Status Rank****	**Habitat(s)**
Abies balsamea	Balsam Fir	S5/secure (green)	S5/secure	W
Acer rubrum	Red Maple	S5/secure (green)	S5/secure	W, Pd
Acer saccharum	Sugar Maple	S5/secure (green)	S5/secure	W
Agrostis spp.	bent grasses	-	-	D, P
Alnus incana ssp. *rugosa*†	Speckled Alder	S5/secure (green)	S5/secure	Pd
Anaphalis margaritacea	Pearly Everlasting	S5/secure (green)	S5/secure	D
Anthoxanthum odoratum†	Sweet Vernal Grass	NA/exotic	SNA	W
Betula alleghaniensis	Yellow Birch	S5/secure (green)	S5/secure	W
Betula papyrifera	White Birch	S5/secure (green)	S5/secure	D, W
Calamagrostis canadensis†	Bluejoint Reed Grass	S5/secure (green)	S5/secure	Pd
Carex aquatilis†	Water Sedge	S4S5/apparently secure to secure (light green to green)	S4S5/apparently secure to secure	Pd
Carex brunnescens†	Brownish Sedge	S5/secure (green)	S5/secure	Pd
Carex debilis var. rudgei†	White-edged Sedge	S5/secure (green)	S5/secure	W, Pd
Carex interior†	Inland Sedge	S4S5/apparently secure to secure (light green to green)	S4S5/apparently secure to secure	Pd
Carex intumescens	Bladder Sedge	S5/secure (green)	S5/secure	W, Pd
Carex novae-angliae†	New England Sedge	S5/secure (green)	S5/secure	W
Carex trisperma†	Three-seeded Sedge	S5/secure (green)	S5/secure	Pd

Latin Name	Common Name	Nova Scotia General Status Rank*	ACCDC Subnational Status Rank**	Habitat(s)
Centaurea nigra	Black Knapweed	NA/exotic	SNA	D, P
Chamaedaphne calyculata †	Leatherleaf	S5/secure (green)	S5/secure	Pd
Chamaenerion angustifolium†	Fireweed	S5/secure (green)	S5/secure	Pd
Comarum palustre†	Marsh Cinquefoil	S5/secure (green)	S5/secure	Pd
Cornus alternifolia†	Alternate-leaved Dogwood	S5/secure (green)	S5/secure	Pd
Cornus canadensis	Bunchberry	S5/secure (green)	S5/secure	W
Corylus cornuta	Beaked Hazelnut	S5/secure (green)	S5/secure	W
Danthonia spicata	Poverty Oat Grass	S5/secure (green)	S5/secure	D
Doellingeria umbellata	Tall White Aster	S5/secure (green)	S5/secure	D, W
Dryopteris cristata†	Crested Wood Fern	S5/secure (green)	S5/secure	Pd
Dryopteris intermedia	Evergreen Wood Fern	S5/secure (green)	S5/secure	D, W, Pd
Eleocharis sp.†	an aquatic spikerush	-	-	Pd
Epilobium angustifolium†	Fireweed	S5/secure (green)	S5/secure	Pd
Equisetum sylvaticum†	Woodland Horsetail	S5/secure (green)	S5/secure	Pd
Euthamia graminifolia	Grass-leaved Goldenrod	S5/secure (green)	S5/secure	D, W
Fagus grandifolia	American Beech	S5/secure (green)	S5/secure	W
Festuca rubra	Red Fescue	S5/secure (green)	S5/secure	D
Fragaria virginiana	Wild Strawberry	S5/secure (green)	S5/secure	D, P
Galium palustre†	Common Marsh Bedstraw	S5/secure (green)	S5/secure	Pd
Hieracium spp.	hawkweeds	-	-	D, W
Hypericum perforatum	Common St. John's-wort	NA/exotic	SNA	D
Iris versicolor†	Blue Flag	S5/secure (green)	S5/secure	Pd
Jacobaea vulgaris	Tansy ragwort	NA/exotic	SNA	P
Juncus effusus†	Soft Rush	S5/secure (green)	S5/secure	Pd
Larix laricina	Larch	S5/secure (green)	S5/secure	D, Pd
Lonicera canadensis†	Canada Fly Honeysuckle	S5/secure (green)	S5/secure	W
Luzula sp.	a woodrush	-	-	W
Maianthemum canadense	Wild Lily-of-the-Valley	S5/secure (green)	S5/secure	W
Malus pumila (=Pyrus malus)	Common Apple	NA/exotic	SNA	D, P, W

Latin Name	Common Name	Nova Scotia General Status Rank*	ACCDC Subnational Status Rank**	Habitat(s)
Myosotis laxa†	Small Forget-me-not	S5/secure (green)	S5/secure	Pd
Myrica gale†	Sweet Gale	S5/secure (green)	S5/secure	Pd
Oclemena acuminata	Whorled Wood Aster	S5/secure (green)	S5/secure	W
Oenothera biennis	Common Evening Primrose	S5/secure (green)	S5/secure	D
Onoclea sensibilis†	Sensitive Fern	S5/secure (green)	S5/secure	Pd
Osmunda regalis†	Royal Fern	S5/secure (green)	S5/secure	Pd
Osmundastrum cinnamomeum†	Cinnamon Fern	S5/secure (green)	S5/secure	Pd
Packera schweinitziana†	Schweinitz's Groundsel	S4/apparently secure (light green)	S4/apparently secure	Pd
Parathelypteris noveboracensis†	New York Fern	S5/secure (green)	S5/secure	W
Phalaris arundinacea	Reed Canary Grass	S5/secure (green)	S5/secure	D
Picea glauca	White Spruce	S5/secure (green)	S5/secure	D, P, W
Plantago lanceolata	English Plantain	NA/exotic	SNA	P
Plantago major	Common Plantain	NA/exotic	SNA	D
Poa trivialis†	Rough Blue Grass	NA/exotic	SNA	Pd
Populus balsamifera	Balsam Poplar	S4/apparently secure (light green)	S4/apparently secure	P
Populus grandidentata	Large-toothed Aspen	S5/secure (green)	S5/secure	D
Populus tremuloides	Trembling Aspen	S5/secure (green)	S5/secure	D, W
Prunus pensylvanica	Pin Cherry	S5/secure (green)	S5/secure	D, P, W
Prunus serotina	Black Cherry	S5/secure (green)	S5/secure	W
Prunus virginiana	Chokecherry	S5/secure (green)	S5/secure	P, Pd
Pteridium aquilinum	Bracken	S5/secure (green)	S5/secure	P
Ranunculus acris	Common Buttercup	NA/exotic	SNA	P
Ranunculus repens†	Creeping Buttercup	NA/exotic	SNA	Pd
Rhododdendron groenlandicum†	Labrador Tea	S5/secure (green)	S5/secure	Pd
Ribes glandulosum†	Skunk Currant	S5/secure (green)	S5/secure	W
Rubus idaeus ssp. *strigosus*	Wild Raspberry	S5/secure (green)	S5	D, P, W
Rubus pubescens†	Dwarf Red Raspberry	S5/secure (green)	S5/secure	W, Pd
Rubus sp.	a blackberry	-	-	D

Latin Name	Common Name	Nova Scotia General Status Rank*	ACCDC Subnational Status Rank**	Habitat(s)
Rumex acetosella	Sheep Sorrel	NA/exotic	SNA	D
Rumex sp.	a dock	-	-	Pd
Salix sp.	a willow	-	-	D
Sambucus racemosa var. *pubens*	Red Elderberry	S5/secure (green)	S5/secure	W
Schoenplectus acutus†	Hardstem Bulrush	S4/apparently secure (light green)	S4/apparently secure	Pd
Scutellaria galericulata†	Marsh Skullcap	S5/secure (green)	S5/secure	Pd
Sium sauve†	Common Water Parsnip	S5/secure (green)	S5/secure	Pd
Solanum dulcamara†	Bittersweet Nightshade	NA/exotic	SNA	Pd
Solidago canadensis	Canada Goldenrod	S5/secure (green)	S5/secure	D, P, W
Solidago rugosa	Rough Goldenrod	S5/secure (green)	S5/secure	D, P, W
Taraxacum officinale	Common Dandelion	NA/exotic	SNA	D
Thelypteris palustris	Eastern Marsh Fern	S5/secure (green)	S5/secure	Pd
Triadenum sp.				
Trifolium pratense	Red Clover	NA/exotic	SNA	D
Tussilago farfara	Coltsfoot	NA/exotic	SNA	D, Pd
Typha latifolia†	Broad-leaved Cattail	S5/secure (green)	S5/secure	Pd
Vaccinium angustifolium	Late Lowbush Blueberry	S5/secure (green)	S5/secure	D, P, W
Vaccinium myrtilloides	Velvet-leaved Blueberry	S5/secure (green)	S5/secure	D, W, Pd
Veronica officinalis	Common Speedwell	NA/exotic	SNA	D, P, W
Viburnum nudum var. *cassinoides*	Witherod	S5/secure (green)	S5/secure	D, W, Pd
Viburnum opulus var. *americanum*†	Highbush Cranberry	S4/apparently secure (light green)	S/4	W
Viola sp.	a violet	--	-	W

*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 (https://www.wildspecies.ca/) ; S**5 = Secure/green** (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/light green** (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**; S3 = Vulnerable/yellow** (at moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors; **S2 = Imperilled/orange (**at high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors); **NA = not applicable** (non-native/exotic).

ACCDC: Atlantic Canada Conservation Data Centre explanation of status ranks used in this report (http://accdc.com/en/rank-definitions.html): **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); **S3 = Vulnerable** (Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.)**;** S2 = **Imperiled** (imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province. **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.

APPENDIX C

ATLANTIC CANADA CONSERVATION DATA CENTRE REPORT

DATA REPORT 6756: Middle River, NS

Prepared 20 January 2021
by J. Churchill, Data Manager

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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
MdRvNS_6756ob.xls	Rare or legally-protected Flora and Fauna in your study area
MdRvNS_6756ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
MdRvNS_6756msa.xls	Managed and Biologically Significant Areas 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
Tel: (506) 364-2660
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Plant Communities
Sarah Robinson, Community Ecologist
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Data Management, GIS
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Billing
Jean Breau
Tel: (506) 364-2657
jean.breau@accdc.ca

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: Emma Vost
(902) 670-8187
Emma.Vost@novascotia.ca

Western: Sarah Spencer
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Elizabeth.Walsh@novascotia.ca

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

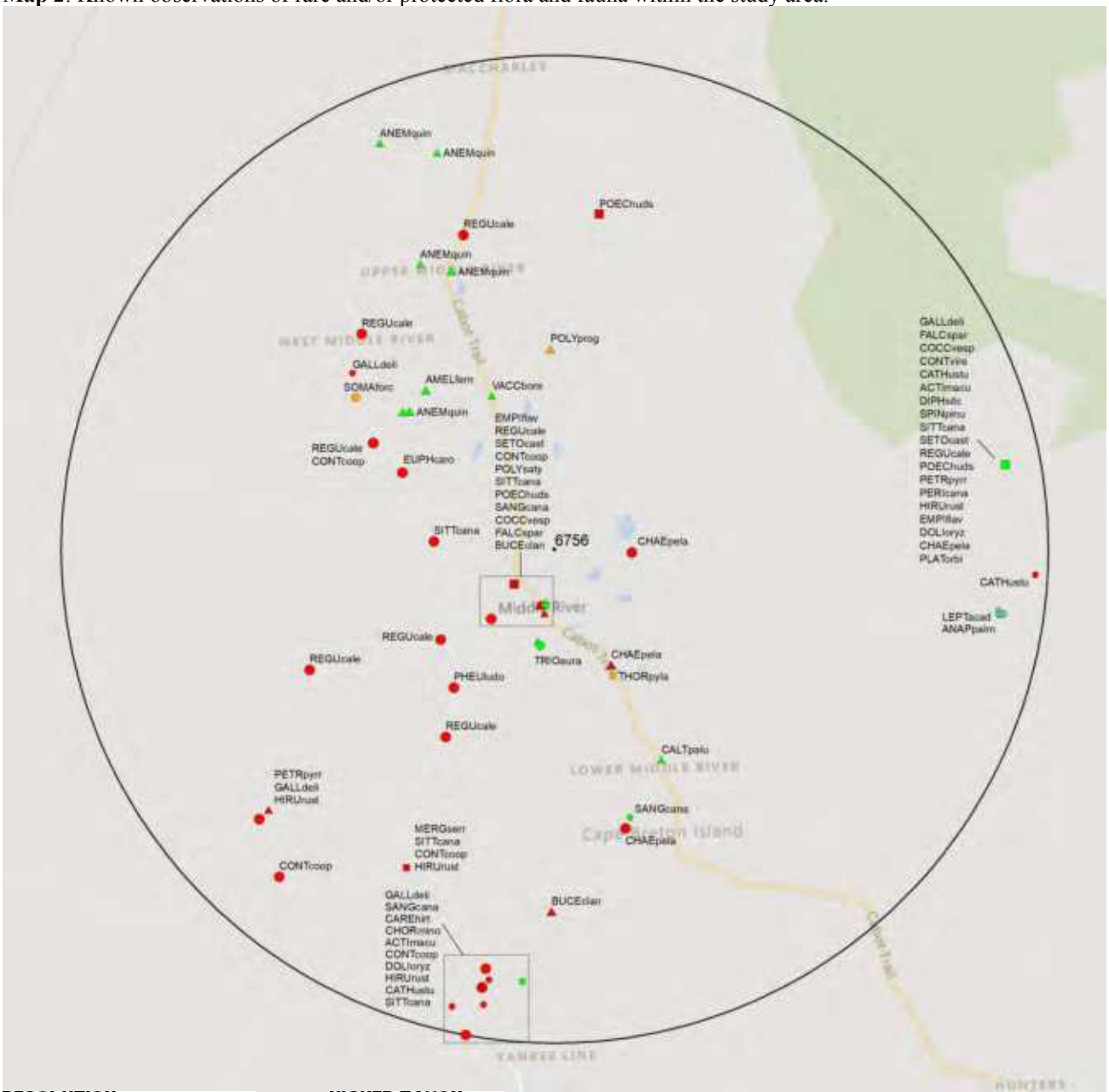
2.1 FLORA

The study area contains 18 records of 9 vascular, 6 records of 2 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 78 records of 23 vertebrate, 4 records of 4 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.



3.0 SPECIAL AREAS

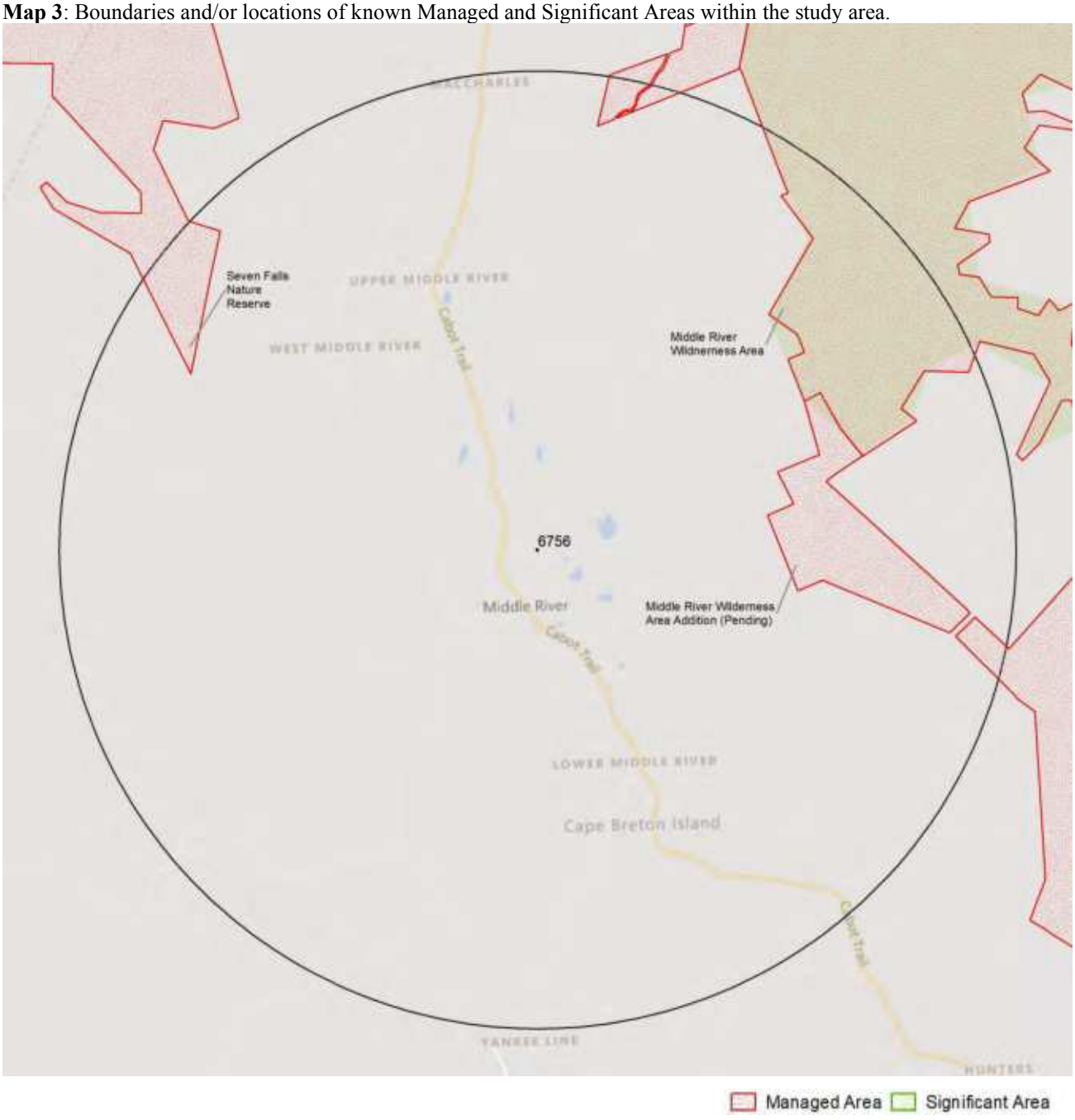
3.1 MANAGED AREAS

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

3.2 SIGNIFICANT AREAS

The GIS scan identified no biologically significant sites in the vicinity of the study area (Map 3).

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



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 (± 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	# recs	Distance (km)
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	5	4.5 ± 0.0
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	1	4.6 ± 0.0
P	*Anemone quinquefolia*	Wood Anemone				S2	6	2.0 ± 1.0
P	*Caltha palustris*	Yellow Marsh Marigold				S2	1	2.4 ± 0.0
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2S3	2	0.9 ± 0.0
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	1	2.1 ± 1.0
P	*Carex hirtifolia*	Pubescent Sedge				S2S3	1	4.4 ± 0.0
P	*Vaccinium boreale*	Northern Blueberry				S3	1	1.7 ± 0.0
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	1	4.6 ± 7.0
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3	2	4.6 ± 5.0
P	*Sanguinaria canadensis*	Bloodroot				S3S4	3	0.6 ± 5.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	6	0.8 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	6	3.6 ± 4.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	4	4.4 ± 0.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	1	1.7 ± 0.0
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	1	4.5 ± 0.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	5	0.5 ± 10.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	1	4.6 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	2	0.6 ± 1.0
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	2	0.7 ± 0.0
A	*Spinus pinus*	Pine Siskin				S2S3	2	4.6 ± 7.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	4	3.9 ± 0.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S2S3B	1	1.7 ± 0.0
A	*Perisoreus canadensis*	Canada Jay				S3	1	4.6 ± 7.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	4	0.5 ± 10.0
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	6	0.5 ± 10.0
A	*Falco sparverius*	American Kestrel				S3B	2	1.0 ± 0.0
A	*Gallinago delicata*	Wilson's Snipe				S3B	7	2.7 ± 0.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	2	4.5 ± 0.0
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3	0.5 ± 10.0
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	11	0.5 ± 10.0
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	4	4.6 ± 7.0
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B	2	0.5 ± 10.0
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5N	1	3.6 ± 4.0
I	*Polygonia satyrus*	Satyr Comma				S1?	1	0.5 ± 2.0
I	*Thorybes pylades*	Northern Cloudywing				S2S3	1	1.4 ± 0.0
I	*Somatochlora forcipata*	Forcipate Emerald				S2S3	1	2.5 ± 0.0
I	*Polygonia progne*	Grey Comma				S3S4	1	2.0 ± 1.0

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?
Fraxinus nigra	Black Ash		Threatened	No
Emydoidea blandingii	*Blanding's Turtle - Nova Scotia pop.*	Endangered	Vulnerable	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Vulnerable	No
Bat hibernaculum or bat species occurrence		[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
48	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
23	eBird. 2020. eBird Basic Dataset. Version: EBD_relFeb-2020. Ithaca, New York. Feb 2020, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology, 5063 recs.
11	Churchill, J.L. 2020. Atlantic Canada Conservation Data Centre Fieldwork 2020. Atlantic Canada Conservation Data Centre, 1083 recs.
3	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
3	Lawrence Benjamin. 2009. Wood Anemone records from Victoria Co., from personal communication with S. Ferguson. Nova Scotia Department of Natural Resources, 5 records.
3	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
3	WIlliams, M. Cape Breton University Digital Herbarium. Cape Breton University Digital Herbarium. 2013.
2	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
2	Canadian Wildlife Service. 2019. Canadian Protected and Conserved Areas Database (CPCAD). December 2019. ECCC.https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/protected-conserved-areas-database.html.
2	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
2	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
1	Benjamin, L.K. 2009. D. Anderson Odonata Records for Cape Breton, 1997-2004. Nova Scotia Dept Natural Resources, 1316 recs.
1	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
1	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
1	Nova Scotia Department of Lands and Forestry. 2020. NS Lands Proposed or Pending Protection. NSDLF, 231 features. Received via email.
1	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
1	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
1	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 25653 records of 152 vertebrate and 550 records of 50 invertebrate fauna; 8848 records of 308 vascular, 1593 records of 166 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 (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	71	9.5 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	5	93.3 ± 0.0	PE
A	*Salmo salar pop. 4*	Atlantic Salmon - Eastern Cape Breton pop.	Endangered			S1	73	5.2 ± 1.0	NS
A	*Salmo salar pop. 6*	Altantic Salmon - Nova Scotia Southern Upland pop.	Endangered			S1	3	84.6 ± 1.0	NS
A	*Eubalaena glacialis*	North Atlantic Right Whale	Endangered	Endangered		S1	1	32.1 ± 1.0	NS
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	900	15.6 ± 5.0	NS
A	*Dermochelys coriacea (Atlantic pop.)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered		S1S2N	2	69.4 ± 0.0	NS
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	168	32.6 ± 1.0	NS
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	1	68.0 ± 0.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	2	40.6 ± 0.0	NS
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Threatened	Endangered	S1S2B	288	15.5 ± 1.0	NS
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S1S2M	108	9.0 ± 20.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	295	8.8 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2	1	57.8 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S2	12	28.8 ± 0.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	61	0.8 ± 0.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	981	8.3 ± 0.0	NS
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	570	3.6 ± 4.0	NS
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Endangered	S3B	269	8.5 ± 0.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	215	4.4 ± 0.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	3	44.6 ± 0.0	NS
A	*Salmo salar pop. 12*	Atlantic Salmon - Gaspe - Southern Gulf of St Lawrence pop.	Special Concern			S1	13	23.4 ± 0.0	NS
A	*Passerculus sandwichensis princeps*	Savannah Sparrow princeps ssp	Special Concern	Special Concern		S1B	3	52.6 ± 7.0	NS
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	97	16.8 ± 4.0	NS
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern		S1S2B	5	9.3 ± 0.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	157	1.7 ± 0.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	126	4.5 ± 0.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	523	0.5 ± 10.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	57	30.6 ± 0.0	NS
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	3	67.2 ± 0.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	1	80.3 ± 0.0	NS
A	*Morone saxatilis pop. 1*	Striped Bass- Southern Gulf of St Lawrence pop.	Special Concern			S2S3N	1	97.1 ± 1.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	109	24.2 ± 0.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	191	4.6 ± 7.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	503	0.6 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Phocoena phocoena pop. 1*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern			S4	4	45.4 ± 0.0	NS
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern		S4N	13	28.4 ± 31.0	NS
A	*Ammodramus savannarum pratensis*	Grasshopper Sparrow, pratensis subspecies	Special Concern	Special Concern			1	23.0 ± 4.0	NS
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S1	198	8.6 ± 1.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B	3	55.3 ± 7.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	15	24.0 ± 0.0	NS
A	*Chlidonias niger*	Black Tern	Not At Risk			S1B	3	53.2 ± 1.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Vulnerable	S1B,SNAM	11	13.8 ± 0.0	NS
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	21	18.8 ± 1.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B	16	13.4 ± 0.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	18	52.8 ± 14.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	17	17.5 ± 0.0	NS
A	*Megaptera novaeangliae*	Humpback Whale (NW Atlantic pop.)	Not At Risk			S3	3	67.2 ± 0.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	693	8.3 ± 1.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	11	23.0 ± 4.0	NS
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	11	29.9 ± 0.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	92	8.2 ± 3.0	NS
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	6	57.5 ± 5.0	NS
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	249	11.4 ± 2.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	105	6.7 ± 1.0	NS
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3	10	26.2 ± 0.0	NS
A	*Martes americana*	American Marten			Endangered	S1	33	7.3 ± 0.0	NS
A	*Alces americanus*	Moose			Endangered	S1	13	24.5 ± 0.0	NS
A	*Picoides dorsalis*	American Three-toed Woodpecker				S1?	8	10.6 ± 7.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B	9	47.6 ± 0.0	NS
A	*Uria aalge*	Common Murre				S1?B,S5N	17	32.6 ± 2.0	NS
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1B	2	14.7 ± 1.0	NS
A	*Anas acuta*	Northern Pintail				S1B	24	32.7 ± 0.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	8	16.1 ± 4.0	NS
A	*Haematopus palliatus*	American Oystercatcher				S1B	7	89.3 ± 7.0	NS
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	1	9.3 ± 3.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	19	17.2 ± 7.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	3	87.0 ± 0.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B	8	21.6 ± 7.0	NS
A	*Setophaga pinus*	Pine Warbler				S1B	5	56.2 ± 0.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S3M	299	24.0 ± 0.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S3S4M	483	8.6 ± 0.0	NS
A	*Vespertilionidae sp.*	bat species				S1S2	127	8.2 ± 0.0	NS
A	*Lasiurus cinereus*	Hoary Bat				S1S2B,S1M	1	74.7 ± 0.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S1S2M	103	33.3 ± 1.0	NS
A	*Microtus chrotorrhinus*	Rock Vole				S2	26	18.8 ± 1.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B	19	22.8 ± 0.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B	11	15.1 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B	8	52.3 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	2	37.1 ± 0.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S2B	73	6.9 ± 0.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B	7	24.8 ± 4.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	14	21.6 ± 7.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	33	13.9 ± 35.0	NS
A	*Alca torda*	Razorbill				S2B,S4N	124	22.3 ± 1.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	249	0.7 ± 0.0	NS
A	*Branta bernicla*	Brant				S2M	9	53.6 ± 1.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3	675	9.0 ± 20.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Asio otus*	Long-eared Owl				S2S3	16	14.6 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S2S3	628	4.6 ± 7.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B	19	37.1 ± 0.0	NS
A	*Rallus limicola*	Virginia Rail				S2S3B	8	25.9 ± 7.0	NS
A	*Tringa semipalmata*	Willet				S2S3B	502	15.6 ± 5.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	168	3.9 ± 0.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S2S3B	95	1.7 ± 0.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B	19	6.9 ± 0.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S5N	217	9.7 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Hudsonian Whimbrel				S2S3M	186	24.5 ± 11.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S2S3M	98	53.0 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	1	56.2 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	446	4.6 ± 7.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	955	0.5 ± 10.0	NS
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	1230	0.5 ± 10.0	NS
A	*Alosa pseudoharengus*	Alewife				S3	56	8.3 ± 0.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	87	5.4 ± 0.0	NS
A	*Menidia menidia*	Atlantic Silverside				S3	2	48.8 ± 0.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	10	18.8 ± 1.0	NS
A	*Pekania pennanti*	Fisher				S3	4	17.6 ± 0.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3?N	40	48.8 ± 1.0	NS
A	*Calcarius lapponicus*	Lapland Longspur				S3?N	12	53.0 ± 1.0	NS
A	*Falco sparverius*	American Kestrel				S3B	246	1.0 ± 0.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	192	19.9 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B	424	2.7 ± 0.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	117	24.5 ± 11.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	13	18.3 ± 0.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	74	10.2 ± 7.0	NS
A	*Dumetella carolinensis*	Gray Catbird				S3B	107	5.5 ± 7.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B	89	17.9 ± 7.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S3S4M	599	10.8 ± 0.0	NS
A	*Oceanodroma leucorhoa*	Leach's Storm-Petrel				S3B,S5M	22	41.9 ± 0.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S3B,S5N	138	9.0 ± 1.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S3B,S5N	107	9.0 ± 1.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	503	8.4 ± 0.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs				S3M	307	8.5 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	227	8.6 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	366	8.5 ± 0.0	NS
A	*Calidris fuscicollis*	White-rumped Sandpiper				S3M	204	32.7 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	197	25.9 ± 0.0	NS
A	*Calidris alba*	Sanderling				S3M,S2N	244	31.3 ± 0.0	NS
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	165	8.5 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3S4	522	9.0 ± 40.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	77	11.4 ± 2.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	55	8.2 ± 3.0	NS
A	*Sorex palustris*	American Water Shrew				S3S4	13	56.2 ± 1.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B	79	12.0 ± 0.0	NS
A	*Spatula discors*	Blue-winged Teal				S3S4B	100	8.0 ± 0.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	723	4.5 ± 0.0	NS
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	661	0.5 ± 10.0	NS
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	1565	0.5 ± 10.0	NS
A	*Catharus fuscescens*	Veery				S3S4B	141	5.5 ± 7.0	NS
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	1037	4.6 ± 7.0	NS
A	*Oreothlypis peregrina*	Tennessee Warbler				S3S4B	152	5.5 ± 7.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B	167	0.5 ± 10.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3S4B	228	10.2 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B	337	5.5 ± 7.0	NS

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A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5N	215	3.6 ± 4.0	NS
A	*Bucephala albeola*	Bufflehead				S3S4N	352	8.5 ± 0.0	NS
A	*Lanius borealis*	Northern Shrike				S3S4N	19	13.8 ± 0.0	NS
A	*Leucophaeus atricilla*	Laughing Gull				SHB	12	41.9 ± 0.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N	10	55.0 ± 0.0	NS
A	*Morus bassanus*	Northern Gannet				SHB,S5M	287	9.0 ± 20.0	NS
A	*Aythya americana*	Redhead				SHB,SNAM	23	48.9 ± 0.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2B	41	20.7 ± 0.0	NS
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Threatened	S1	40	48.0 ± 0.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Threatened	S1S2	1	99.8 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern	Special Concern	Vulnerable	S3	34	14.3 ± 0.0	NS
I	*Quedius spelaeus*	Spelean Rove Beetle				S1	1	42.2 ± 1.0	NS
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S1	21	15.0 ± 2.0	NS
I	*Somatochlora albicincta*	Ringed Emerald				S1	7	42.6 ± 0.0	NS
I	*Somatochlora brevicincta*	Quebec Emerald				S1	7	73.8 ± 0.0	NS
I	*Leucorrhinia patricia*	Canada Whiteface				S1	1	46.0 ± 0.0	NS
I	*Coenagrion interrogatum*	Subarctic Bluet				S1	2	22.8 ± 0.0	NS
I	*Leptodea ochracea*	Tidewater Mucket				S1	19	48.8 ± 1.0	NS
I	*Lycaena dorcas*	Dorcas Copper				S1?	30	24.0 ± 0.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	2	0.5 ± 2.0	NS
I	*Strymon melinus*	Grey Hairstreak				S1S2	2	59.1 ± 0.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S1S2	1	18.6 ± 2.0	NS
I	*Haematopota rara*	Shy Cleg				S1S3	2	63.7 ± 0.0	NS
I	*Lycaena dospassosi*	Salt Marsh Copper				S2	1	40.0 ± 0.0	NS
I	*Boloria chariclea*	Arctic Fritillary				S2	7	10.7 ± 0.0	NS
I	*Aglais milberti*	Milbert's Tortoiseshell				S2	4	15.0 ± 2.0	NS
I	*Somatochlora septentrionalis*	Muskeg Emerald				S2	28	11.0 ± 0.0	NS
I	*Somatochlora williamsoni*	Williamson's Emerald				S2	10	10.8 ± 0.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	81	17.9 ± 0.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	3	9.6 ± 0.0	NS
I	*Thorybes pylades*	Northern Cloudywing				S2S3	3	1.4 ± 0.0	NS
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S2S3	1	41.7 ± 1.0	NS
I	*Euphydryas phaeton*	Baltimore Checkerspot				S2S3	18	15.0 ± 2.0	NS
I	*Gomphus descriptus*	Harpoon Clubtail				S2S3	16	35.4 ± 0.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S2S3	5	36.2 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S2S3	9	2.5 ± 0.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	2	70.6 ± 0.0	NS
I	*Sphaeroderus nitidicollis*	a Ground Beetle				S3	1	76.8 ± 0.0	NS
I	*Iphthiminus opacus*	a Darkling Beetle				S3	2	35.1 ± 0.0	NS
I	*Monochamus marmorator*	a Longhorned Beetle				S3	1	53.6 ± 0.0	NS
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4	15.0 ± 2.0	NS
I	*Polygonia faunus*	Green Comma				S3	15	5.8 ± 0.0	NS
I	*Megisto cymela*	Little Wood-satyr				S3	1	44.4 ± 1.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3	11	11.1 ± 0.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3	1	64.8 ± 0.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3	2	61.2 ± 0.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	3	35.4 ± 0.0	NS
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S3	2	20.5 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3	3	57.0 ± 0.0	NS
I	*Sympetrum danae*	Black Meadowhawk				S3	15	22.9 ± 0.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	9	10.9 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3	25	12.0 ± 1.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	14	15.0 ± 2.0	NS
I	*Lepturopsis biforis*	a Longhorned Beetle				S3S4	1	67.6 ± 0.0	NS
I	*Polygonia progne*	Grey Comma				S3S4	13	2.0 ± 1.0	NS
I	*Lanthus parvulus*	Northern Pygmy Clubtail				S3S4	22	12.0 ± 1.0	NS
I	*Lampsilis radiata*	Eastern Lampmussel				S3S4	6	23.2 ± 0.0	NS

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N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	272	32.4 ± 0.0	NS
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened	Threatened	S1	6	67.2 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S1S2	1	54.5 ± 0.0	NS
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S2S3	1	40.4 ± 0.0	NS
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened	Threatened	S3	1	61.6 ± 1.0	NS
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S1?	8	30.1 ± 1.0	NS
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	114	11.6 ± 0.0	NS
N	*Fissidens exilis*	Pygmy Pocket Moss	Not At Risk			S1S2	6	21.2 ± 0.0	NS
N	*Cinclidium stygium*	Sooty Cupola Moss				S1	2	32.6 ± 0.0	NS
N	*Cetrariella delisei*	Snowbed Icelandmoss Lichen				S1	2	77.1 ± 0.0	NS
N	*Cladonia brevis*	Short Peg Lichen				S1	1	66.7 ± 0.0	NS
N	*Cladonia macroceras*	Bullet-proof Pixie Lichen				S1	1	88.6 ± 2.0	NS
N	*Collema cristatum*	Fingered Tarpaper Lichen				S1	1	23.9 ± 0.0	NS
N	*Flavocetraria cucullata*	Curled Snow Lichen				S1	1	92.2 ± 0.0	NS
N	*Psoroma hypnorum*	Green moss-shingle Lichen				S1	5	89.3 ± 0.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	2	24.7 ± 0.0	NS
N	*Cetraria laevigata*	Pin-striped Icelandmoss Lichen				S1	3	62.0 ± 0.0	NS
N	*Gowardia nigricans*	Gray Witch's Beard Lichen				S1	1	60.2 ± 1.0	NS
N	*Hypogymnia hultenii*	Powdered Honeycomb Lichen				S1	2	78.7 ± 0.0	NS
N	*Metacalypogeia schusterana*	Schuster's Pouchwort				S1?	2	20.2 ± 0.0	NS
N	*Moerckia hibernica*	Irish Ruffwort				S1?	2	20.2 ± 0.0	NS
N	*Brachythecium erythrorrhizon*	Taiga Ragged Moss				S1?	4	19.2 ± 0.0	NS
N	*Calliergon richardsonii*	Richardson's Spear Moss				S1?	1	66.4 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	2	28.7 ± 5.0	NS
N	*Dicranum acutifolium*	Sharp-leaved Broom Moss				S1?	3	79.3 ± 0.0	NS
N	*Dicranum elongatum*	Long-forked Broom Moss				S1?	3	77.5 ± 0.0	NS
N	*Dicranum groenlandicum*	Mountain Broom Moss				S1?	1	77.5 ± 0.0	NS
N	*Entodon concinnus*	Lime Entodon Moss				S1?	2	61.6 ± 0.0	NS
N	*Grimmia laevigata*	a Moss				S1?	2	56.9 ± 0.0	NS
N	*Grimmia pilifera*	a Moss				S1?	2	61.6 ± 0.0	NS
N	*Hygrohypnum smithii*	Smith's Brook Moss				S1?	1	61.9 ± 0.0	NS
N	*Oligotrichum hercynicum*	Hercynian Hair Moss				S1?	3	59.2 ± 0.0	NS
N	*Orthothecium strictum*	Shiny Erect-capsule Moss				S1?	2	61.6 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	1	9.7 ± 5.0	NS
N	*Seligeria recurvata*	a Moss				S1?	1	74.2 ± 1.0	NS
N	*Seligeria tristichoides*	a Moss				S1?	1	74.2 ± 1.0	NS
N	*Timmia norvegica*	a moss				S1?	1	67.3 ± 50.0	NS
N	*Syntrichia ruralis*	a Moss				S1?	1	34.4 ± 1.0	NS
N	*Ulota curvifolia*	a Moss				S1?	1	56.9 ± 0.0	NS
N	*Plagiomnium ellipticum*	Marsh Leafy Moss				S1?	1	61.7 ± 2.0	NS
N	*Sanionia orthothecioides*	Coastal Hook Moss				S1?	2	93.4 ± 0.0	NS
N	*Flavocetraria nivalis*	Crinkled Snow Lichen				S1?	19	43.8 ± 0.0	NS
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S1?	1	77.2 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1?	7	59.4 ± 0.0	NS
N	*Aulacomnium heterostichum*	One-sided Groove Moss				S1S2	1	94.0 ± 1.0	NS
N	*Buxbaumia minakatae*	Hump-Backed Elves				S1S2	2	13.4 ± 100.0	NS
N	*Dicranodontium denudatum*	Beaked Bow Moss				S1S2	3	61.6 ± 0.0	NS
N	*Dicranoweisia crispula*	Mountain Thatch Moss				S1S2	1	52.6 ± 0.0	NS
N	*Didymodon ferrugineus*	a moss				S1S2	3	72.7 ± 0.0	NS
N	*Hygrohypnum montanum*	a Moss				S1S2	2	79.1 ± 0.0	NS

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N	*Hypnum pratense*	Meadow Plait Moss				S1S2	1	77.9 ± 1.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	2	72.7 ± 0.0	NS
N	*Plagiobryum zieri*	a Moss				S1S2	6	61.6 ± 0.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	1	42.7 ± 3.0	NS
N	*Seligeria calcarea*	Chalk Brittle Moss				S1S2	2	72.7 ± 0.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2	4	39.2 ± 0.0	NS
N	*Tetrodontium brownianum*	Little Georgia				S1S2	1	79.3 ± 0.0	NS
N	*Timmia megapolitana*	Metropolitan Timmia Moss				S1S2	1	98.9 ± 0.0	NS
N	*Hamatocaulis vernicosus*	a Moss				S1S2	2	30.5 ± 0.0	NS
N	*Schistidium trichodon*	a Moss				S1S2	2	72.7 ± 0.0	NS
N	*Collema bachmanianum*	Bachman's Tarpaper Lichen				S1S2	1	21.5 ± 0.0	NS
N	*Cladonia sulphurina*	Greater Sulphur-cup Lichen				S1S2	1	89.0 ± 0.0	NS
N	*Leptogium intermedium*	Forty-five Jellyskin Lichen				S1S2	1	89.1 ± 1.0	NS
N	*Massalongia carnosa*	Rockmoss Rosette Lichen				S1S2	2	85.9 ± 0.0	NS
N	*Peltigera malacea*	Veinless Pelt Lichen				S1S2	2	79.8 ± 3.0	NS
N	*Barbilophozia lycopodioides*	Greater Pawwort				S1S3	1	54.7 ± 0.0	NS
N	*Odontoschisma sphagni*	Bog-Moss Flapwort				S1S3	2	65.0 ± 0.0	NS
N	*Cladonia rappii*	Slender Ladder Lichen				S1S3	1	78.7 ± 3.0	NS
N	*Stereocaulon grande*	Grand Foam Lichen				S1S3	3	32.8 ± 0.0	NS
N	*Stereocaulon intermedium*	Pacific Brain Foam Lichen				S1S3	1	93.4 ± 4.0	NS
N	*Nephroma resupinatum*	a lichen				S2	12	85.2 ± 0.0	NS
N	*Anaptychia crinalis*	Hanging Fringed Lichen				S2	8	70.9 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2?	3	73.7 ± 1.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	8	34.8 ± 0.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	2	22.2 ± 30.0	NS
N	*Bryum algovicum*	a Moss				S2?	2	81.6 ± 0.0	NS
N	*Campylium polygamum*	a Moss				S2?	2	49.2 ± 0.0	NS
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S2?	2	37.4 ± 0.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	2	94.2 ± 0.0	PE
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S2?	2	34.8 ± 0.0	NS
N	*Fontinalis hypnoides*	a moss				S2?	2	63.1 ± 1.0	NS
N	*Fontinalis sullivantii*	a Moss				S2?	1	13.4 ± 100.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	3	30.1 ± 0.0	NS
N	*Hygrohypnum bestii*	Best's Brook Moss				S2?	2	75.9 ± 0.0	NS
N	*Kiaeria blyttii*	Blytt's Fork Moss				S2?	8	79.1 ± 0.0	NS
N	*Kiaeria starkei*	Starke's Fork Moss				S2?	6	74.2 ± 1.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	1	56.9 ± 0.0	NS
N	*Philonotis marchica*	a Moss				S2?	3	52.2 ± 0.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	6	34.8 ± 0.0	NS
N	*Pseudoleskea patens*	Patent Leskea Moss				S2?	5	68.0 ± 0.0	NS
N	*Pseudoleskea stenophylla*	Narrow-leaved Leskea Moss				S2?	7	70.9 ± 1.0	NS
N	*Racomitrium affine*	a Moss				S2?	2	79.3 ± 0.0	NS
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S2?	5	60.9 ± 0.0	NS
N	*Saelania glaucescens*	Blue Dew Moss				S2?	1	81.8 ± 0.0	NS
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2?	11	20.8 ± 0.0	NS
N	*Seligeria donniana*	Donian Beardless Moss				S2?	3	71.5 ± 2.0	NS
N	*Sematophyllum marylandicum*	a Moss				S2?	5	61.7 ± 0.0	NS
N	*Sphagnum subnitens*	Lustrous Peat Moss				S2?	3	53.0 ± 0.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S2?	4	65.4 ± 0.0	NS
N	*Tortella fragilis*	Fragile Twisted Moss				S2?	12	19.1 ± 0.0	NS
N	*Anomobryum filiforme*	a moss				S2?	5	60.9 ± 0.0	NS
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	6	11.6 ± 0.0	NS
N	*Platylomella lescurii*	a Moss				S2?	2	61.7 ± 1.0	NS
N	*Leptogium teretiusculum*	Beaded Jellyskin Lichen				S2?	1	93.6 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Leptogium imbricatum*	Scaly Jellyskin Lichen				S2?	1	39.0 ± 0.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	18	43.4 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S2?	24	39.6 ± 0.0	NS
N	*Platydictya subtilis*	Bark Willow Moss				S2S3	1	68.0 ± 0.0	NS
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2S3	10	61.7 ± 0.0	NS
N	*Limprichtia revolvens*	a Moss				S2S3	9	28.9 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S2S3	3	61.3 ± 0.0	NS
N	*Cetraria muricata*	Spiny Heath Lichen				S2S3	34	54.0 ± 0.0	NS
N	*Cladonia borealis*	Boreal Pixie-cup Lichen				S2S3	2	89.0 ± 0.0	NS
N	*Cladonia wainioi*	False Reindeer Lichen				S2S3	10	48.8 ± 0.0	NS
N	*Leptogium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	7	24.7 ± 0.0	NS
N	*Melanelia hepatizon*	Rimmed Camouflage Lichen				S2S3	6	60.5 ± 0.0	NS
N	*Racodium rupestre*	Rockhair Lichen				S2S3	1	83.4 ± 0.0	NS
N	*Umbilicaria hyperborea*	Blistered Rocktripe Lichen				S2S3	9	60.5 ± 0.0	NS
N	*Umbilicaria polyphylla*	Petalled Rocktripe Lichen				S2S3	16	60.5 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	1	39.1 ± 0.0	NS
N	*Stereocaulon condensatum*	Granular Soil Foam Lichen				S2S3	1	93.4 ± 4.0	NS
N	*Cetraria arenaria*	Sand-loving Icelandmoss Lichen				S2S3	1	77.0 ± 0.0	NS
N	*Cladonia coccifera*	Eastern Boreal Pixie-cup Lichen				S2S3	15	19.1 ± 2.0	NS
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S2S3	3	60.0 ± 0.0	NS
N	*Collema tenax*	Soil Tarpaper Lichen				S3	3	24.6 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3	5	45.1 ± 0.0	NS
N	*Leptogium subtile*	Appressed Jellyskin Lichen				S3	3	25.5 ± 0.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	33	40.6 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3	1	61.3 ± 0.0	NS
N	*Heterodermia squamulosa*	Scaly Fringe Lichen				S3	1	61.0 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3	1	59.0 ± 0.0	NS
N	*Leptogium lichenoides*	Tattered Jellyskin Lichen				S3	11	24.7 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	4	32.4 ± 1.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	152	11.4 ± 0.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S3	10	49.9 ± 0.0	NS
N	*Fuscopannaria sorediata*	a Lichen				S3	1	80.6 ± 0.0	NS
N	*Ephebe lanata*	Waterside Rockshag Lichen				S3	1	83.2 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	3	21.4 ± 0.0	NS
N	*Drummondia prorepens*	a Moss				S3?	5	52.1 ± 2.0	NS
N	*Anomodon tristis*	a Moss				S3?	2	52.5 ± 0.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	3	19.2 ± 0.0	NS
N	*Sphagnum riparium*	Streamside Peat Moss				S3?	4	19.5 ± 0.0	NS
N	*Phaeophyscia pusilloides*	Pompom-tipped Shadow Lichen				S3?	2	29.0 ± 0.0	NS
N	*Cladonia pocillum*	Rosette Pixie-cup Lichen				S3?	6	20.2 ± 0.0	NS
N	*Cladonia stygia*	Black-footed Reindeer Lichen				S3?	3	48.8 ± 0.0	NS
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	1	73.0 ± 0.0	NS
N	*Dicranella varia*	a Moss				S3S4	4	39.3 ± 0.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	13	61.7 ± 0.0	NS
N	*Encalypta procera*	Slender Extinguisher Moss				S3S4	13	12.1 ± 0.0	NS
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	4	61.6 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3S4	2	45.2 ± 0.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	4	65.4 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	6	54.8 ± 1.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	4	52.6 ± 0.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	1	17.8 ± 3.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	18	45.0 ± 1.0	NS
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	91	10.8 ± 0.0	NS

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N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	15	4.5 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	6	32.2 ± 0.0	NS
N	*Sphaerophorus fragilis*	Fragile Coral Lichen				S3S4	9	61.3 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	264	44.2 ± 0.0	NS
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	2	76.5 ± 2.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	6	4.6 ± 0.0	NS
N	*Evernia prunastri*	Valley Oakmoss Lichen				S3S4	2	90.4 ± 0.0	NS
N	*Dermatocarpon luridum*	Brookside Stippleback Lichen				S3S4	3	18.1 ± 2.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	7	36.0 ± 2.0	NS
P	*Fraxinus nigra*	Black Ash	Threatened		Threatened	S1S2	113	8.6 ± 0.0	NS
P	*Juncus caesariensis*	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	240	52.8 ± 0.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S2	14	47.0 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2	20	18.0 ± 1.0	NS
P	*Salix candida*	Sage Willow			Endangered	S1	47	27.0 ± 0.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S1	4	18.2 ± 0.0	NS
P	*Osmorhiza depauperata*	Blunt Sweet Cicely				S1	3	92.4 ± 0.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1	5	10.3 ± 1.0	NS
P	*Zizia aurea*	Golden Alexanders				S1	4	96.1 ± 1.0	NS
P	*Arnica lonchophylla*	Northern Arnica				S1	11	59.4 ± 7.0	NS
P	*Artemisia campestris ssp. canadensis*	Canada Wormwood				S1	10	86.6 ± 0.0	NS
P	*Bidens hyperborea*	Estuary Beggarticks				S1	3	25.9 ± 7.0	NS
P	*Erigeron compositus*	Cut-leaved Fleabane				S1	2	61.3 ± 0.0	NS
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S1	1	54.7 ± 3.0	NS
P	*Ageratina altissima*	White Snakeroot				S1	2	93.4 ± 1.0	NS
P	*Betula glandulosa*	Glandular Birch				S1	5	56.5 ± 7.0	NS
P	*Barbarea orthoceras*	American Yellow Rocket				S1	1	91.8 ± 0.0	NS
P	*Cardamine dentata*	Toothed Bittercress				S1	5	25.4 ± 10.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1	4	57.0 ± 0.0	NS
P	*Draba norvegica*	Norwegian Whitlow-Grass				S1	9	29.8 ± 2.0	NS
P	*Silene acaulis*	Moss Campion				S1	1	86.8 ± 0.0	NS
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2	31.9 ± 2.0	NS
P	*Hudsonia tomentosa*	Woolly Beach-heath				S1	7	89.5 ± 1.0	NS
P	*Diapensia lapponica*	Diapensia				S1	10	52.6 ± 0.0	NS
P	*Kalmia procumbens*	Alpine Azalea				S1	4	77.0 ± 0.0	NS
P	*Phyllodoce caerulea*	Blue Mountain Heather				S1	4	92.2 ± 0.0	NS
P	*Rhododendron lapponicum*	Lapland Rosebay				S1	1	62.0 ± 0.0	NS
P	*Vaccinium ovalifolium*	Oval-leaved Bilberry				S1	22	82.5 ± 0.0	NS
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S1	3	98.8 ± 1.0	NS
P	*Pinguicula vulgaris*	Common Butterwort				S1	11	52.6 ± 1.0	NS
P	*Utricularia ochroleuca*	Yellowish-white Bladderwort				S1	1	36.1 ± 1.0	NS
P	*Fraxinus pennsylvanica*	Red Ash				S1	1	43.8 ± 0.0	NS
P	*Oxyria digyna*	Mountain Sorrel				S1	8	69.3 ± 0.0	NS
P	*Bistorta vivipara*	Alpine Bistort				S1	2	56.7 ± 1.0	NS
P	*Montia fontana*	Water Blinks				S1	2	69.6 ± 1.0	NS
P	*Anemone multifida*	Cut-leaved Anemone				S1	5	56.1 ± 1.0	NS
P	*Anemone parviflora*	Small-flowered Anemone				S1	3	57.2 ± 0.0	NS
P	*Potentilla litoralis*	Coastal Cinquefoil				S1	4	61.1 ± 1.0	NS
P	*Salix uva-ursi*	Bearberry Willow				S1	3	62.0 ± 0.0	NS
P	*Salix vestita*	Hairy Willow				S1	1	61.8 ± 0.0	NS
P	*Saxifraga aizoides*	Yellow Mountain Saxifrage				S1	10	61.8 ± 0.0	NS
P	*Saxifraga cernua*	Nodding Saxifrage				S1	4	87.2 ± 0.0	NS
P	*Saxifraga oppositifolia*	Purple Mountain Saxifrage				S1	4	61.4 ± 1.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S1	1	37.4 ± 0.0	NS
P	*Pedicularis palustris*	Marsh Lousewort				S1	9	88.1 ± 0.0	NS

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P	*Rhinanthus minor ssp. groenlandicus*	Little Yellow Rattle				S1	2	98.4 ± 0.0	NS
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S1	2	17.5 ± 1.0	NS
P	*Carex alopecoidea*	Foxtail Sedge				S1	2	88.9 ± 0.0	NS
P	*Carex granularis*	Limestone Meadow Sedge				S1	21	22.9 ± 0.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S1	16	22.3 ± 0.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1	2	35.9 ± 0.0	NS
P	*Carex rariflora*	Loose-flowered Alpine Sedge				S1	12	78.4 ± 5.0	NS
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S1	2	66.0 ± 0.0	NS
P	*Carex tincta*	Tinged Sedge				S1	1	88.9 ± 1.0	NS
P	*Carex viridula var. elatior*	Greenish Sedge				S1	54	8.8 ± 0.0	NS
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	6	99.0 ± 0.0	NS
P	*Carex saxatilis*	Russet Sedge				S1	7	70.0 ± 7.0	NS
P	*Cyperus lupulinus*	Hop Flatsedge				S1	5	88.9 ± 0.0	NS
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	7	89.4 ± 1.0	NS
P	*Eleocharis erythropoda*	Red-stemmed Spikerush				S1	6	21.8 ± 0.0	NS
P	*Rhynchospora capillacea*	Slender Beakrush				S1	8	9.7 ± 0.0	NS
P	*Scirpus atrovirens*	Dark-green Bulrush				S1	1	28.5 ± 0.0	NS
P	*Blysmopsis rufa*	Red Bulrush				S1	6	49.3 ± 1.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	2	27.0 ± 0.0	NS
P	*Luzula spicata*	Spiked Woodrush				S1	26	81.8 ± 4.0	NS
P	*Triantha glutinosa*	Sticky False-Asphodel				S1	15	27.3 ± 0.0	NS
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	1	82.7 ± 7.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S1	11	56.1 ± 0.0	NS
P	*Calamagrostis stricta ssp. inexpansa*	Slim-stemmed Reed Grass				S1	1	92.4 ± 5.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S1	9	20.1 ± 0.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	1	79.6 ± 4.0	NS
P	*Festuca altaica*	Northern Rough Fescue				S1	3	87.2 ± 0.0	NS
P	*Hordeum brachyantherum*	Meadow Barley				S1	2	35.6 ± 0.0	NS
P	*Phleum alpinum*	Alpine Timothy				S1	11	34.1 ± 0.0	NS
P	*Torreyochloa pallida var. pallida*	Pale False Manna Grass				S1	2	72.2 ± 1.0	NS
P	*Graphephorum melicoides*	Purple False Oats				S1	4	24.4 ± 0.0	NS
P	*Sparganium androcladum*	Branching Bur-Reed				S1	3	12.6 ± 0.0	NS
P	*Adiantum pedatum*	Northern Maidenhair Fern				S1	2	81.8 ± 0.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	8	41.4 ± 0.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	3	37.9 ± 1.0	NS
P	*Epilobium lactiflorum*	White-flowered Willowherb				S1?	1	68.6 ± 5.0	NS
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S1?	1	59.0 ± 0.0	NS
P	*Bolboschoenus robustus*	Sturdy Bulrush				S1?	2	14.0 ± 5.0	NS
P	*Dichanthelium lindheimeri*	Lindheimer's Panicgrass				S1?	1	69.1 ± 1.0	NS
P	*Huperzia selago*	Northern Firmoss				S1?	2	43.7 ± 2.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S1S2	1	95.9 ± 7.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S1S2	9	37.9 ± 4.0	NS
P	*Cornus suecica*	Swedish Bunchberry				S1S2	32	75.5 ± 0.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	11	25.2 ± 1.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S1S2	6	18.9 ± 7.0	NS
P	*Parnassia parviflora*	Small-flowered Grass-of-Parnassus				S1S2	17	21.5 ± 3.0	NS
P	*Carex livida*	Livid Sedge				S1S2	28	60.1 ± 5.0	NS
P	*Juncus greenei*	Greene's Rush				S1S2	1	89.5 ± 1.0	NS

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P	*Juncus alpinoarticulatus ssp. americanus*	Northern Green Rush				S1S2	14	22.3 ± 0.0	NS
P	*Juncus bulbosus*	Bulbous Rush				S1S2	13	62.4 ± 0.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	5	29.1 ± 13.0	NS
P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S1S2	2	10.2 ± 1.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1S2	24	54.2 ± 0.0	NS
P	*Festuca subverticillata*	Nodding Fescue				S1S2	98	81.9 ± 0.0	NS
P	*Festuca prolifera*	Proliferous Fescue				S1S2	7	51.8 ± 1.0	NS
P	*Sparganium hyperboreum*	Northern Burreed				S1S2	13	25.9 ± 7.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S1S2	18	24.2 ± 0.0	NS
P	*Woodsia alpina*	Alpine Cliff Fern				S1S2	11	39.4 ± 2.0	NS
P	*Selaginella selaginoides*	Low Spikemoss				S1S2	9	32.5 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	5	87.0 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S2	3	61.8 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	22	16.7 ± 10.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2	8	18.3 ± 0.0	NS
P	*Solidago multiradiata*	Multi-rayed Goldenrod				S2	16	45.0 ± 2.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S2	2	31.3 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2	13	9.7 ± 0.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2	15	17.9 ± 0.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2	10	31.6 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S2	8	40.7 ± 1.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2	26	26.4 ± 1.0	NS
P	*Lobelia kalmii*	Brook Lobelia				S2	99	23.1 ± 0.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2	7	79.4 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S2	1	56.1 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2	4	28.6 ± 2.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	16	63.1 ± 1.0	NS
P	*Hypericum majus*	Large St John's-wort				S2	2	9.7 ± 0.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S2	8	59.3 ± 7.0	NS
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	6	57.0 ± 0.0	NS
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2	1	74.6 ± 7.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S2	6	17.1 ± 0.0	NS
P	*Utricularia resupinata*	Inverted Bladderwort				S2	1	56.9 ± 0.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2	1	18.0 ± 1.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2	11	22.9 ± 2.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2	21	52.4 ± 1.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	15	49.3 ± 1.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2	10	2.0 ± 1.0	NS
P	*Anemone virginiana*	Virginia Anemone				S2	32	34.1 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2	48	2.4 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S2	95	15.3 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S2	12	27.6 ± 0.0	NS
P	*Comandra umbellata*	Bastard's Toadflax				S2	52	19.7 ± 7.0	NS
P	*Saxifraga paniculata*	White Mountain Saxifrage				S2	2	61.3 ± 0.0	NS
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S2	29	11.5 ± 0.0	NS
P	*Tiarella cordifolia*	Heart-leaved Foamflower				S2	1	67.2 ± 3.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S2	12	24.0 ± 0.0	NS
P	*Carex bebbii*	Bebb's Sedge				S2	30	15.4 ± 0.0	NS
P	*Carex capillaris*	Hairlike Sedge				S2	25	53.2 ± 1.0	NS
P	*Carex castanea*	Chestnut Sedge				S2	27	30.1 ± 0.0	NS
P	*Carex comosa*	Bearded Sedge				S2	1	29.2 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2	37	19.5 ± 5.0	NS
P	*Carex scirpoidea*	Scirpuslike Sedge				S2	29	32.1 ± 4.0	NS

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P	*Carex tenera*	Tender Sedge				S2	3	76.0 ± 1.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S2	2	10.9 ± 0.0	NS
P	*Carex atratiformis*	Scabrous Black Sedge				S2	29	24.6 ± 7.0	NS
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S2	31	10.3 ± 5.0	NS
P	*Vallisneria americana*	Wild Celery				S2	2	41.2 ± 10.0	NS
P	*Juncus stygius ssp. americanus*	Moor Rush				S2	40	27.7 ± 7.0	NS
P	*Allium schoenoprasum*	Wild Chives				S2	1	54.3 ± 0.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S2	8	51.1 ± 7.0	NS
P	*Lilium canadense*	Canada Lily				S2	15	6.7 ± 1.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	36	21.0 ± 0.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	19	19.7 ± 7.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	372	11.9 ± 0.0	NS
P	*Platanthera flava*	Southern Rein-Orchid				S2	2	48.2 ± 0.0	NS
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S2	2	52.5 ± 3.0	NS
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	3	74.6 ± 0.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	27	33.8 ± 0.0	NS
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S2	6	90.3 ± 0.0	PE
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2	4	45.9 ± 0.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	1	75.3 ± 10.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2	8	28.8 ± 0.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	9	17.9 ± 7.0	NS
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S2	28	8.7 ± 0.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S2	13	25.4 ± 7.0	NS
P	*Polystichum lonchitis*	Northern Holly Fern				S2	51	29.0 ± 1.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2	25	11.5 ± 0.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S2?	59	20.8 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	4	88.2 ± 7.0	NS
P	*Epilobium coloratum*	Purple-veined Willowherb				S2?	2	94.0 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	1	12.9 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	3	85.2 ± 3.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2?	2	51.1 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2?	3	55.5 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S2S3	47	26.5 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S2S3	1	75.9 ± 4.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S2S3	11	21.8 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S2S3	13	64.4 ± 0.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S2S3	1	92.0 ± 5.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2S3	1	93.0 ± 5.0	PE
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	1	39.4 ± 2.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2S3	125	0.9 ± 0.0	NS
P	*Shepherdia canadensis*	Soapberry				S2S3	388	18.5 ± 0.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	19	56.3 ± 7.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	13	23.8 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S2S3	52	38.7 ± 0.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	3	54.6 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	1	34.5 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	17	15.4 ± 1.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	6	2.1 ± 1.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	2	72.3 ± 2.0	NS
P	*Galium aparine*	Common Bedstraw				S2S3	10	85.6 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Salix pellita*	Satiny Willow				S2S3	8	17.2 ± 2.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	6	70.0 ± 7.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S2S3	6	4.4 ± 0.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S2S3	9	38.0 ± 0.0	NS
P	*Oreojuncus trifidus*	Highland Rush				S2S3	60	12.1 ± 7.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2S3	49	69.4 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	105	19.1 ± 0.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S2S3	52	12.0 ± 2.0	NS
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	47	9.7 ± 0.0	NS
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	17	24.6 ± 7.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	11	41.3 ± 5.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	1	39.2 ± 5.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	68	22.4 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	142	19.8 ± 0.0	NS
P	*Hieracium paniculatum*	Panicled Hawkweed				S3	2	87.1 ± 0.0	NS
P	*Bidens beckii*	Water Beggarticks				S3	6	18.5 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3	170	18.8 ± 0.0	NS
P	*Betula pumila var. pumila*	Bog Birch				S3	17	27.0 ± 7.0	NS
P	*Betula pumila*	Bog Birch				S3	60	27.9 ± 0.0	NS
P	*Campanula aparinoides*	Marsh Bellflower				S3	2	26.0 ± 5.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	1	61.6 ± 0.0	NS
P	*Viburnum edule*	Squashberry				S3	125	31.3 ± 7.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	107	34.3 ± 0.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3	151	1.7 ± 0.0	NS
P	*Vaccinium cespitosum*	dwarf bilberry				S3	28	18.2 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	106	59.7 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3	1	55.7 ± 0.0	NS
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	51	8.9 ± 0.0	NS
P	*Teucrium canadense*	Canada Germander				S3	63	9.3 ± 0.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3	5	17.8 ± 0.0	NS
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	166	11.7 ± 2.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	21	7.3 ± 5.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	1	39.4 ± 7.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3	12	26.6 ± 3.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3	11	54.8 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	3	27.4 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	1	21.3 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	19	13.0 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3	143	21.6 ± 0.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	35	20.3 ± 0.0	NS
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	100	8.8 ± 0.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3	468	8.8 ± 0.0	NS
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	248	10.7 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3	11	21.4 ± 0.0	NS
P	*Galium kamtschaticum*	Northern Wild Licorice				S3	108	7.3 ± 5.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3	107	32.2 ± 7.0	NS
P	*Limosella australis*	Southern Mudwort				S3	9	34.0 ± 0.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	2	56.4 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	14	17.8 ± 0.0	NS
P	*Verbena hastata*	Blue Vervain				S3	8	26.6 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	18	21.0 ± 0.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	203	19.5 ± 0.0	NS
P	*Carex lupulina*	Hop Sedge				S3	5	93.6 ± 0.0	NS
P	*Carex rosea*	Rosy Sedge				S3	6	7.0 ± 5.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	10	18.8 ± 0.0	NS
P	*Carex wiegandii*	Wiegand's Sedge				S3	114	40.0 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Carex foenea*	Fernald's Hay Sedge				S3	13	76.8 ± 0.0	NS
P	*Eleocharis nitida*	Quill Spikerush				S3	2	92.9 ± 0.0	NS
P	*Schoenoplectus americanus*	Olney's Bulrush				S3	2	68.5 ± 0.0	NS
P	*Elodea canadensis*	Canada Waterweed				S3	8	17.8 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3	9	56.4 ± 1.0	NS
P	*Juncus dudleyi*	Dudley's Rush				S3	66	21.5 ± 0.0	NS
P	*Goodyera oblongifolia*	Menzies' Rattlesnake-plantain				S3	79	11.7 ± 3.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	38	20.6 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	46	24.0 ± 0.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	21	24.3 ± 0.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	9	27.7 ± 0.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	29	4.6 ± 7.0	NS
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3	11	33.3 ± 0.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3	18	17.9 ± 0.0	NS
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	15	15.5 ± 7.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	13	11.7 ± 5.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	13	15.5 ± 7.0	NS
P	*Sparganium natans*	Small Burreed				S3	22	15.8 ± 0.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	60	31.4 ± 2.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	38	11.5 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3	72	5.8 ± 0.0	NS
P	*Equisetum variegatum*	Variegated Horsetail				S3	48	18.2 ± 0.0	NS
P	*Isoetes tuckermanii ssp. acadiensis*	Acadian Quillwort				S3	10	38.3 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3	205	4.6 ± 5.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3	41	31.4 ± 1.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	3	39.2 ± 5.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	7	20.0 ± 0.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	10	11.4 ± 0.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	10	28.5 ± 2.0	NS
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	6	24.3 ± 1.0	NS
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	17	8.9 ± 0.0	NS
P	*Sanguinaria canadensis*	Bloodroot				S3S4	127	0.6 ± 5.0	NS
P	*Polygonum fowleri*	Fowler's Knotweed				S3S4	2	95.3 ± 0.0	NS
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	3	90.8 ± 0.0	PE
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	79	19.1 ± 0.0	NS
P	*Fragaria vesca*	Woodland Strawberry				S3S4	2	29.0 ± 0.0	NS
P	*Salix petiolaris*	Meadow Willow				S3S4	8	38.5 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	3	5.3 ± 0.0	NS
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	5	39.5 ± 0.0	NS
P	*Sisyrinchium atlanticum*	Eastern Blue-Eyed-Grass				S3S4	1	70.9 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	8	15.4 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	5	19.3 ± 4.0	NS
P	*Luzula parviflora*	Small-flowered Woodrush				S3S4	112	6.9 ± 5.0	NS
P	*Luzula parviflora ssp. melanocarpa*	Black-fruited Woodrush				S3S4	1	84.2 ± 0.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	20	16.0 ± 1.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	1	44.1 ± 0.0	NS
P	*Trisetum spicatum*	Narrow False Oats				S3S4	57	22.0 ± 0.0	NS
P	*Cystopteris bulbifera*	Bulblet Bladder Fern				S3S4	428	7.6 ± 0.0	NS
P	*Equisetum hyemale*	Common Scouring-rush				S3S4	1	38.5 ± 0.0	NS
P	*Equisetum hyemale ssp. affine*	Common Scouring-rush				S3S4	69	18.4 ± 0.0	NS
P	*Equisetum scirpoides*	Dwarf Scouring-Rush				S3S4	79	7.6 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	10	32.7 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Schizaea pusilla*	Little Curlygrass Fern				S3S4	56	31.3 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	1	34.0 ± 0.0	NS
P	*Poa alpina*	Alpine Blue Grass				SH	2	45.6 ± 0.0	NS
P	*Botrychium minganense*	Mingan Moonwort				SH	1	41.1 ± 1.0	NS

5.1 SOURCE BIBLIOGRAPHY (100 km)

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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67	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
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64	Busby, D.G. 1999. 1997-1999 Bicknell's Thrush data, unpublished files. Canadian Wildlife Service, Sackville, 17 recs.
63	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
63	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
59	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
57	Knapton, R. & Power, T.; Williams, M. 2001. SAR Inventory: Fortress Louisbourg NP. Parks Canada, Atlantic, SARINV01-13. 157 recs.
56	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
52	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
50	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
49	Parker, G.R., Maxwell, J.W., Morton, L.D. & Smith,G.E.J. 1983. The ecology of Lynx , Lynx canadensis, on Cape Breton Island. Canadian Journal of Zoology, 61:770-786. 51 recs.
47	Patrick, A.; Horne, D.; Noseworthy, J. et. al. 2017. Field data for Nova Scotia and New Brunswick, 2015 and 2017. Nature Conservancy of Canada.
44	anon. 2001. S.. H.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 76 recs.
44	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.
41	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
37	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
36	Arsenault, M. 2019. Cormorant colony nest counts. PE Department of Communities, Land, and Environment.
33	Parks Canada. 2010. Specimens in or near National Parks in Atlantic Canada. Canadian National Museum, 3925 recs.
33	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
30	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
29	Neily, T.H. 2017. Maritmes Lichen and Bryophyte records. Atlantic Canada Conservation Data Centre, 1015 recs.
29	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
26	Cameron, R.P. 2017. 2017 rare species field data. Nova Scotia Environment, 64 recs.
26	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
26	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
24	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
21	Belland, R.J. & W.B. Schofield. 1993. Salix vestita Pursh & Saxifraga oppositifolia L.: arctic-alpine species new to Nova Scotia. Rhodora, 95: 76-78.
21	Hill, N.M. 1994. Status report on the Long's bulrush Scirpus longii in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
21	Whittam, R.M. 2006. Bicknell's Thrush in CBHNP, BSC database. Bird Studies Canada, 21 recs.
20	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
20	Gillis, J. 2015. Rare plant records from Cape Breton gypsum sites. Pers. comm., 25 rare plant records.
20	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
18	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
18	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
18	Misc. rare species records gathered by NSDNR staff or communicated to NSDNR and forwared to ACCDC
17	Bryson, I., Douglas, M., Kennedy, C. 2013. Nova Scotia rare plant observations. CBCL.
17	Robinson, S.L. 2011. 2011 ND dune survey field data. Atlantic Canada Conservation Data Centre, 2715 recs.
16	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
16	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
16	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
15	Basquill, S.P. 2012. 2012 Bryophyte specimen data. Nova Scotia Department of Natural Resources, 37 recs.
15	Catling, P.M., Erskine, D.S. & MacLaren, R.B. 1985. The Plants of Prince Edward Island with new records, nomenclatural changes & corrections & deletions, 1st Ed. Research Branch, Agriculture Canada, Ottawa, Publication 1798. 22pp.
15	Newell, R.E. 2004. Assessment and update status report on the New Jersey Rush (Juncus caesariensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 recs.
15	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.

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14	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
14	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
13	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
12	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
12	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
11	Burns, L. 2013. Personal communication concerning bat occurrence on PEI. Winter 2013. Pers. comm.
11	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
11	e-Butterfly. 2016. Export of Maritimes records and photos. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
11	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
11	Neily, T.H. 2012. 2012 Erioderma pedicellatum records in Nova Scotia.
10	Murphy, S. 2006. Juncus caesariensis data from Yava Technologies In Situ Leach Mining Environmental Assessment. Jacques Whitford Inc., 10 recs.
10	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
10	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
9	Bryson, I. 2020. Nova Scotia and Newfoundland rare species observations, 2018-2020. Nova Scotia Environment.
9	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
9	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
9	Hinds, H.R. 1984. Additions to the flora of Cape Breton Highlands National Park, Nova Scotia. Rhodora, 86:67-72.
9	Holder, M.L.; Kingsley, A.L. 2000. Kinglsey and Holder observations from 2000 field work.
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8	Neily, T.H. Tom Neily NS Sphagnum records (2009-2014). T.H. Neily, Atlantic Canada Conservation Data Centre. 2019.
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8	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
8	White, S. 2018. Notable species sightings, 2016-2017. East Coast Aquatics.
7	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
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7	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
7	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
7	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.
6	Clayden, S. Digitization of Wolfgang Maass Nova Scotia forest lichen collections, 1964-2004. New Brunswick Museum. 2018.
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6	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
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6	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
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5	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
5	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
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5	Lawrence Benjamin. 2009. Wood Anemone records from Victoria Co., from personal communication with S. Ferguson. Nova Scotia Department of Natural Resources, 5 records.
5	MacDonald, M. 2008. PEI Power Corridor Floral Surveys, 2004-08. Jacques Whitford Ltd, 2238 recs (979 rare).
5	Marshall, L. 1998. Atlantic Salmon: Cape Breton SFA 18 (part) & SFA 19. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-09. 5 recs.
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4	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
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4	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
4	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
4	Erskine, D. 1960. The plants of Prince Edward Island, 1st Ed. Research Branch, Agriculture Canada, Ottawa., Publication 1088. 1238 recs.
4	Newell, R.E. 2001. Fortress Louisbourg Species at Risk Survey 2001. Parks Canada, 4 recs.
4	Rousseau, J. 1938. Notes Floristiques sur l'est de la Nouvelle-Ecosse in Contributions de l'Institut Botanique de l'Universite de Montreal. Universite de Montreal, 32, 13-62. 11 recs.
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3	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
3	Klymko, J. 2019. Atlantic Canada Conservation Data Centre zoological fieldwork 2018. Atlantic Canada Conservation Data Centre.
3	Layberry, R.A. 2012. Lepidopteran records for the Maritimes, 1974-2008. Layberry Collection, 1060 recs.
3	Neily, T.H. 2016. Email communication (May 6, 2016) to Sean Blaney regarding Fissidens exilis observations made in 2016 in Nova Scotia. Pers. Comm., 3 recs.
3	Taylor, B.R., and Tam, J.C. 2012. Local distribution of the rare plant Triosteum aurantiacum in northeastern Nova Scotia, Canada. Rhodora, 114(960): 366-382.

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2	Basquill, S. 2019. Festuca rubra records. Nova Scotia Department of Lands and Forestry.
2	Belliveau, A.G. 2014. Plant Records from Southern and Central Nova Scotia. Atlantic Canada Conservation Data Centre, 919 recs.
2	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
2	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
2	Bruce, James. 2013. Emailed locations of first NS record of Saxifraga cernua at Blair River, Cape Breton. NS Department of Natural Resources, 2 records.
2	Chapman, C.N. (Cody). 2020. Nova Scotia Black Ash (Fraxinus nigra) field observations by Confederacy of Mainland Mi'kmaq. Forestry Program, Confederacy of Mainland Mi'kmaq.
2	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
2	Dibblee, R.L. 1999. PEI Cormorant Survey. Prince Edward Island Fisheries, Aquaculture & Environment, 1p. 21 recs.
2	Gillis, J. 2007. Botanical observations from bog on Skye Mountain, NS. Pers. comm., 8 recs.
2	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
2	Hill, N. 2003. Floerkea proserpinacoides at Heatherdale, Antigonish Co. 2002. , Pers. comm. to C.S. Blaney. 2 recs.
2	Klymko, J. Henry Hensel's Butterfly Collection Database. Atlantic Canada Conservation Data Centre. 2016.
2	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.
2	Lock, A.R., Brown, R.G.B. & Gerriets, S.H. 1994. Gazetteer of Marine Birds in Atlantic Canada. Canadian Wildlife Service, Atlantic Region, 137 pp.
2	Munden, C. 2018. Email communication on Cypripedium parviflorum. Amateur naturalist, 2.
2	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
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2	Quigley, E.J. 2006. Plant records, Mabou & Port Hood. Pers. comm. to S.P. Basquill, Jun. 12. 4 recs, 4 recs.
2	Selva, S.B. 2002. Status Report on frosted glass-whiskers, Sclerophora peronella. Committee on the Status of Endangered Wildlife in Canada, Draft Revision, May 2002. 2 recs.
1	Anderson, D. 2019. Black Ash observation, Baddeck, Nova Scotia. pers. comm. to J.L. Churchill.
1	Anderson, D.G. 2011. New site for showy ladyslipper on Cape Breton. Nova Scotia Department of Natural Resources, pers.comm. to R. Lautenschlager, Jul 5, 2011.
1	Anon. 2017. Export of Maritimes Butterfly records. Global Biodiversity Information Facility (GBIF).
1	Baechler, Lynn. 2016. Plant observations & photos, 2016. Pers. comm. to S. Blaney, May 2016, 2 recs.
1	Beaulieu-Bouchard, M. 2014. Email to S. Blaney regarding Salix reticulata & vestita in NS. Canadian Museum of Nature, 1 obs.
1	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
1	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
1	COSEWIC (Committee on the Status of Wildlife in Canada). 2013. COSEWIC Assessment and Status Report on the Eastern Waterfan Peltigera hydrothyria in Canada. COSEWIC, 46 pp.
1	Crowell, M. 2013. email to Sean Blaney regarding Listera australis at Bear Head and Mill Cove Canadian Forces Station. Jacques Whitford Environmental Ltd., 2.
1	Curley, F.R. 2005. PEF&W Collection 2003-04. PEI Fish & Wildlife Div., 716 recs.
1	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
1	Doucet, D.A. 2009. Census of Globally Rare, Endemic Butterflies of Nova Scotia Gulf of St Lawrence Salt Marshes. Nova Scotia Dept of Natural Resources, Species at Risk, 155 recs.
1	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
1	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
1	Gilman, A.; Testo, W. 2015. Use of Gemma Characters to Identify North American Huperzia (Lycopodiaceae). American Fern Journal, 105(3):145-161.
1	Kelly, Glen 2004. Botanical records from 2004 PEI Forestry fieldwork. Dept of Environment, Energy & Forestry, 71 recs.
1	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
1	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
1	Lautenschlager, R.A. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 2 recs.
1	Layberry, R.A. 1987. Butterflies; Superfamilies Hesperioidea and Papilionoidea in Lafontaine, J. D., S. Allyson, V. M. Behan-Pelletier, A. Borkent, J. M. Campbell, K. G A. Hamilton, J. E H. Martin, and L. Masner. 1987. The insects, spiders and mites of Cape Breton Highlands National Park. Agriculture Canada, Ottawa, ON. , 216-222.
1	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
1	McKendry, Karen. 2016. Rare species observations, 2016. Nova Scotia Nature Trust, 19 recs.
1	Munro, M.K. 2008. Email to Sean Blaney regarding Maidenhair Fern (Adiantum pedatum) on Polletts Cove River, Inverness Co. NS. pers. comm, 1 rec.
1	NatureServe Canada. 2018. iNaturalist Butterfly Data Export . iNaturalist.org and iNaturalist.ca.
1	New York Botanical Garden. 2006. Virtual Plant Herbarium - Vascular Plant Types Catalog. Sylva, S.; Kallunki, J. (ed.) International Plant Science Centre, Web site: http://sciweb.nybg.org/science2/vii2.asp. 4 recs.
1	Newell, R.E. 2017. Loiseleuria procumbens at Money Point, NS. pers. comm., 1 record.
1	Phinney, Lori; Toms, Brad; et. al. 2016. Bank Swallows (Riparia riparia) in Nova Scotia: inventory and assessment of colonies. Merset Tobeiatc Research Institute, 25 recs.
1	Richardson, D., Anderson, F., Cameron, R, McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen (Anzia colpodes). COSEWIC.
1	Schmidt, B.C. 2017. Details about a Speyeria aphrodite specimen at the Canadian National Collection from Baddeck, NS, sent via email on 15 February 2017.
1	Schori, M. 2003. Hieracium robinsonii locations in Atlantic Canada. Pers. comm. to C.S. Blaney. Gray Herbarium, Harvard University, 1 rec.
1	Shortt, R. UNB specimen data for various tracked species formerly considered secure. Connell Memorial Herbarium, UNB, Fredericton NB. 2019.
1	Spicer, C.D. 2004. Specimens from CWS Herbarium, Mount Allison Herbarium Database. Mount Allison University, 5939 recs.

APPENDIX D

NOVA SCOTIA MUSEUM REPORT

HERITAGE AND BIOLOGICAL RESOURCES

NOVA SCOTIA

Communities, Culture & Heritage

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

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

April 26, 2021

Hayley Doyle
Envirosphere Consultants Ltd.
PO Box 2906 Unit 5 - 120 Morison Drive
Windsor, NS B0N 2T0

Dear Hayley Doyle:

RE: Environmental Screening 2021-04-13a
Middle River Pit

Further to your request of April 13, 2021 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.

Botany

The following species are located within 10 km of the intended development.
Table 1: Plant and lichen species from public records

Group	taxon_species_name	Rank	COSEWIC / SARA status
Lichen	*Peltigera hydrothyria*	S1	Threatened
Vascular plant	*Cystopteris fragilis*	S2	
Vascular plant	*Impatiens pallida*	S2	
Lichen	*Collema leptaleum*	S2S3	
Moss	*Scorpidium revolvens*	S2S3	
Lichen	*Pectenia plumbea*	S3	Special Concern
Vascular plant	*Diphasiastrum sitchense*	S3	
Vascular plant	*Polypodium appalachianum*	S3	
Moss	*Dicranella varia*	S3S4	

Table 2: Records of vascular plants from the Nova Scotia Museum database

Genus	**Species**	**Authority**	**Status**
Carex	*hirtifolia*	Mackenzie	S2S3
Habenaria	*orbiculata*	(Pursh) Torr.	S3

Table 3: Records of vascular plants from the Rare Plants Atlas

Genus	**species**	**authority**	**status**
Anemone	*quinquefolia*	L.	yellow
Asplenium	*trichomanes–ramosum*	L.	yellow
Epilobium	*strictum*	Muhl.	yellow
Saxifraga	*paniculata*	Mill	yellow

Palaeontology

This general region along the Middle River was the site of a historic Mastodon discovery in the early 1800s. A large femur had been found by a farmer while they were plowing their field. New research suggests that this femur may have originally been preserved in a sink hole in the underlying Windsor Formation gypsum - and subsequently eroded out during deglaciation erosion of the landscape and deposited among the Holocene surficial geology along the Middle River. Based on this information there is an increased possibility that the quarry operations may come across other bones or teeth of Mastodons. If quarry operations do come across potential fossil bones or other remains, it would be desirable to contact the Museum Curator as soon as possible for help in assessing potential significance. The Museum Curator may also be available for a pre-site assessment of potential palaeontology remains.

If you have any questions, please contact me at anna.cross@novascotia.ca.

Sincerely,

Anna Cross
Special Places Assistant

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: 24-Jun-21 Report Number: A0845

Envirosphere Consultants Ltd
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
L2021-40	Grants Pond	Middle River	surface water	6/18/2021	6/23/2021	<0.5	REG	0.5 mg/L	
L2021-40	Med Pond	Middle River	surface water	6/18/2021	6/23/2021	<0.5	REG	0.5 mg/L	
L2021-40	Beaver Pond	Middle River	surface water	6/18/2021	6/23/2021	28.5	REG	0.5 mg/L	
L2021-40	U/S Beaver Pond	Middle River	surface water	6/18/2021	6/23/2021	0.5	REG	0.5 mg/L	
L2021-40	U/S Beaver Pond (DUP)	Middle River	surface water	6/18/2021	6/23/2021	<0.5	DUP	0.5 mg/L	
L2021-40	CRM	Middle River	CRM		6/23/2021	215.5	STD	0.5 mg/L	CRM TSS = 209 mg/L
L2021-40	Blank	Middle River	dH2O		6/23/2021	<0.5	BLANK	0.5 mg/L	

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

This laboratory applies standard practice in conformance with ISO/IEC 17025:2017, "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 =

Envirosphere Consultants Limited

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

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Envirosphere Consultants
unit 5 - 120 Morison Drive
Windsor, NS | B0N 2T0

Environmental Sample Analysis Report

Report Date: 24-Jun-21 Report Number: A0847

Lab #	Sample ID	Sample Details	Sample Material	Date Received	Date Analyzed	pH	Type of Sample	Detection Limit	Sample Comments
L2021-40	Grants Pond	Middle River	surface water	6/18/2021	6/19/2021	7.4	REG	0.1	
L2021-40	Med Pond	Middle River	surface water	6/18/2021	6/19/2021	7.1	REG	0.1	
L2021-40	Beaver Pond	Middle River	surface water	6/18/2021	6/19/2021	6.9	REG	0.1	
L2021-40	Beaver Pond (DUP)	Middle River	surface water	6/18/2021	6/19/2021	6.9	DUP	0.1	
L2021-40	U/S Beaver Pond	Middle River	surface water	6/18/2021	6/19/2021	7.0	REG	0.1	
L2021-40	CRM	Middle River	CRM		6/19/2021	7.0	STD	0.1	CRM pH=7.0

Name of Analyst: MH Hilliard Analyses reviewed by: Director / Lab Manager (circle one)

This laboratory applies standard practice in conformance with ISO/IEC 17025:2017, "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.