

Halifax Exhibition Centre Opportunity Site

Initiation Report Resubmission

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Prepared for

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1.0

LAND SUITABILITY ANALYSIS



1.1 — Introduction

This land suitability analysis has been prepared for the Halifax Regional Municipality in order to delineate, assess, and inventory any sensitive environmental and cultural features that may exist within the boundaries of the Halifax Exhibition Centre Opportunity Site. Within each section, recommendations will be made for mitigation measures that will support the health and function of the lands and its natural features. The information in this report is derived from a series of both desktop and physical sources. The majority of the GIS data used to create this report was obtained from either the Halifax Regional Municipality, the Province of Nova Scotia, or the Government of Canada. The accuracy of the information in this report is dependent on the quality of this data and any inconsistencies or deficiencies in these original datasets may affect the information presented. Throughout this document, “the province” refers to the Province of Nova Scotia and “the municipality” refers to the Halifax Regional Municipality unless otherwise specified.

1.1.1 — PROJECT BACKGROUND

The Halifax Exhibition Centre (HEC) lands were designated as an “Opportunity Site” by HRM council in the fall of 2022 as a part of Phase 3 of the Regional Plan Review. According to the Regional Plan, Opportunity Sites are identified to guide development into mixed-use neighbourhoods that offer a variety of housing types, recreation lands and walkable streets and neighbourhoods. The planning process should address the appropriate range of housing options, land uses, development density, suitable areas for development that minimize environmental impacts, and necessary infrastructure upgrades to support the proposed mixed-use development.

As a part of the planning process, a Land Suitability Analysis (LSA) is required by the municipality in order to delineate and inventory any sensitive features of the HEC lands and to identify lands that are constrained, partially constrained, or not constrained for development. This type of analysis involves a significant amount of mapping and research with the goal of helping guide decision making regarding the future of the master plan.

1.1.2 — STUDY AREA & CONTEXT

The HEC lands are situated approximately 4.5km southwest of the Halifax Peninsula along Prospect Road (also known as Highway 333). Driving north from the HEC lands leads into Halifax via NS Highway 3 and driving south from the HEC lands leads to a series of communities within the Chebucto Peninsula including Brookside, Prospect, and Shad Bay. Prospect Road is perhaps best known for being the main route to Peggy’s Cove, generating a significant amount of

through traffic in the tourist season.

The HEC lands are almost completely enclosed by either provincially- or municipally-owned land. The north and east boundaries of the HEC lands abut **Long Lake Provincial Park** which features a variety of trails, swimming areas, and fishing spots. Although the majority of the access points to Long Lake Provincial Park lie along Dunbrack Road, individuals at the HEC lands can still easily access the provincial park either through the informal the HEC lands Trail or by driving north to the parking lot entrance along Highway 3.

The southern boundary of the lands abut a parcel owned by the province but part of an active planning application as of October 2024 (PLANAPP 2023-01903). The applicant dropped their application for a new Provincial Sound Stage in early 2025 and there are no plans for the land in the interim.

The HEC land’s western boundary abuts land allocated for the **Ragged Lake Business Park** on the other side of Prospect Road. The business park is in the early stages of development but the municipality is actively working towards plans for expansion.

Within the boundaries of the HEC lands, a newly-built Petro-Can gas bar and Tim Hortons franchise was completed in 2019; the result of a 2017 development agreement. The southern portion of the HEC lands features the Halifax Exhibition Centre (HEC) which acts as the primary use of the HEC lands.

The HEC hosts a variety of events and conventions as well as a weekly flea market. In this summertime, the HEC lands also occasionally features a carnival. The HEC lands also boasts a brand-new outdoor go-kart track that opened in May 2023. Across its four buildings, the HEC has more than 100,000 ft²

of facilities as well as enough parking for over 2,000 vehicles (~20 acres).

The entire HEC lands has three main access points to Prospect Road as well as one informal access point in the south of the property that is blocked by concrete barriers. There are two known electrical easements that cross the HEC lands. Extending off of Prospect Road, one is approximately 40ft (12.2m) wide and 850ft (259.1m) long, extending eastward into the HEC lands. The other easement runs along prospect road and crosses into the gas bar properties.

The HEC lands are located within Planning District 4 and is consequently regulated by the **Planning District 4 (Prospect) Municipal Planning Strategy and Land Use By-Law**. The HEC lands are currently zoned **CR-2** for Commercial Recreation and allows a select amount of uses including racing tracks, rifle ranges, amusement parks, bowling alleys, and exhibition parks. The HEC lands was previously located within the community of Goodwood but following a redrawing of the boundary, the Opportunity Site is now located within the community of Beechville.

While mapping for the HEC lands includes the properties containing the gas bar and Exhibition Centre, only the PID with the Halifax Exhibition Centre is proposed to be redeveloped. The existing gas bar is not planned to be altered should this development proceed. In total, these three properties comprise nearly **113 acres** and are broken down as follows:

- 41432642 (Gas Bar Parcel A) - 2.1 Acres
- 41457987 (Gas Bar Parcel B) - 1.5 Acres
- 40600728 (Primary Parcel) - 109.4 Acres



1.1.3 — METHODOLOGY

Organizing Indicators

A number of different indicators were assessed during the production of the LSA. Indicators were largely chosen by reviewing the baseline LSA requirements set out by HRM, but several additional indicators were included to provide more context or information to the analyses.

The indicators are grouped into the following sections:

Topography

- Elevation
- Solar Aspect
- Slope

Geology and Soils

- Soils
- Surficial Geology
- Bedrock Geology
- Karst Topography
- Acid Rock Drainage (ARD)
- Indoor Radon Risk

Hydrology

- Stormwater
- Watercourses
- Wetlands

Indicators are grouped based on overlapping attributes and the shared ways in which they affect the surrounding ecosystem. For example, wetlands and watercourses frequently work in tandem regarding the provision of habitat and stormwater management, making it logical to analyze them together.

Natural Features

- Forestry
- Landscape Connectivity
- Species at Risk

Contaminated Sites

- Contaminated Sites

Cultural Significance

- Heritage Sites
- Archaeological Study

Data Collection and Analysis

This assessment was largely completed as a desktop study. Some field research was undertaken during the wetland/watercourse delineation and archaeological assessment which both informed parts of the LSA, but all of the remaining information was sourced online.

Desktop sources of information included GIS datasets published by the Government of Nova Scotia (especially the Department of Natural Resources and Renewables), GIS datasets published by the Government of Canada, satellite imagery, provincial reports, academic papers, as well as a number of municipal priority plans and planning documents.

Indicators with available GIS data were represented visually with maps in ArcGIS Pro. However, only some of the indicators feature dedicated maps in the LSA; others, such as karst topography, do not feature a dedicated map because the entire HEC lands are underlaid with the same unit, making a map showing the single unit unnecessary.

Once visualized, many of the indicators could be analyzed to identify important ecological features or environmentally sensitive areas. Further information about the specific methods employed can be found within each section of the LSA

Constraint Evaluation

Once natural features had been identified, a scoring system was applied to each. Features assigned a higher score are considered to be more constrained while features with a low score or a score of zero are considered to be less constrained or not constrained at all.





Figure 3 — Aerial Looking West

1.2 — Topography

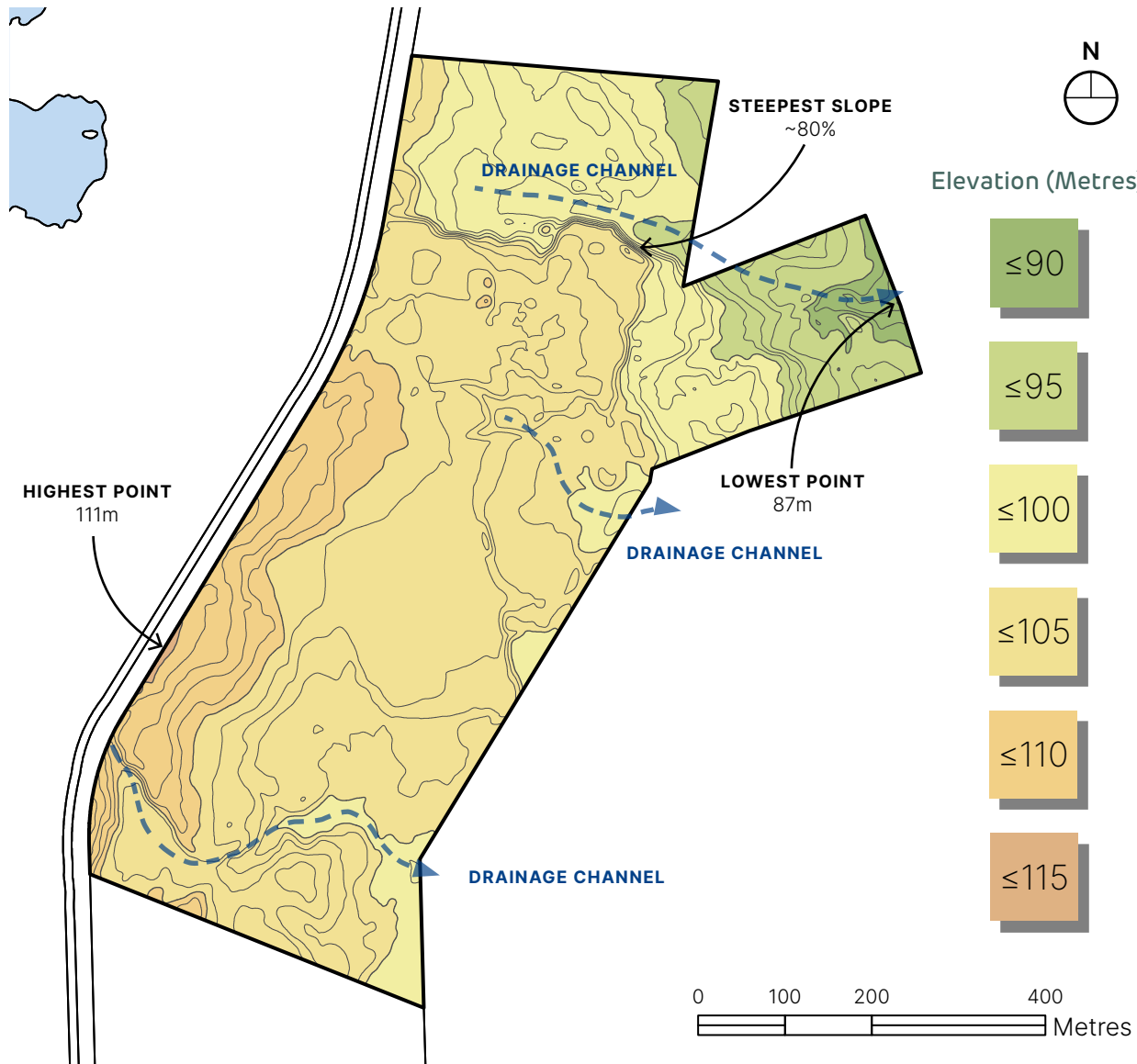


Figure 4 — Elevation Map with 1m contour lines

METHODS

LiDAR data was sourced from the Provincial Elevation Explorer tool and analyzed using ArcGIS Pro. The most recent LiDAR scans are from 2019. Conclusions about drainage and contours were made by reviewing the maps produced following the GIS analysis. Conclusions about the drainage channels were reinforced by the wetland and watercourse delineation.

1.2.1 — ELEVATION AND SLOPE

Figure 4 depicts the elevations and elevation changes within the HEC lands. The colouring and contour lines indicate 5m and 1m changes in elevation, respectively. When the lines and colour breaks sit closer together, it indicates more intense changes in elevation. These correspond to steeper slopes, as shown in the slope map in Figure 5. The overall lack of bunched contour lines and steep slopes, as shown on both maps, points to a generally flat terrain that gently slopes from west to east.

The highest point of the Halifax Exhibition Centre (HEC) lands are a 111m peak abutting Prospect Road in the southwestern portion of the HEC lands. The lowest point on the HEC lands sits at an elevation of 87m and lies within one of the identified drainage channels. If a straight line was drawn between the highest point and lowest point of the HEC lands, it would extend for 943m and see approximately 24m of elevation change, representing an average slope of only 2.55%.

The central area of the HEC lands are relatively flat compared to other portions of the HEC lands. This is largely a result of the existing exhibition centre and the grading that took place to enable construction.

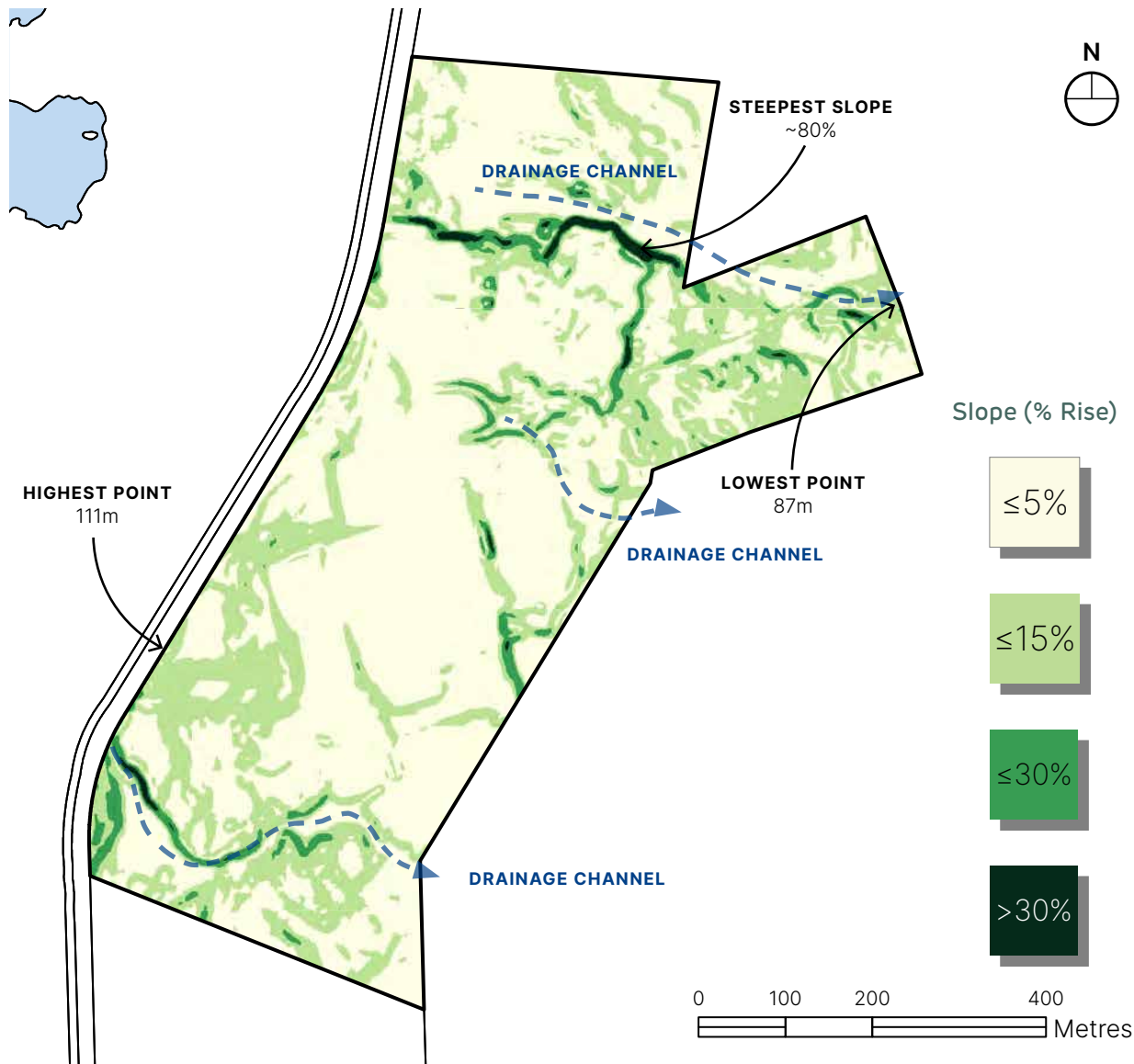


Figure 5 — Slope Map

This flat area sits within an elevation range of 100m to 105m and makes up the majority of the HEC lands.

The drainage channels shown in both Figures 2 and 3 were identified visually by analyzing the contours of the HEC lands. The wetland delineation reinforced these findings, identifying a series of watercourses within these channels. In general, runoff from the HEC lands travel eastward into Long Lake Provincial Park and the series of adjacent wetlands and watercourses. The southernmost drainage channel leads directly to a Wetland of Special Significance (WSS) as identified by the province. This channel also sees a high concentration slope exceeding 15% relative to other areas of the HEC lands.

The portion of the HEC lands with the most varied slope lies within the section of the main parcel that extends eastward towards Long Lake Provincial Park. Known throughout this document as “the panhandle”, the terrain in this section is less uniform and regularly alternates between slopes of 0% to 15%+.

A ridge in the north of the HEC lands feature the steepest slopes in the entire site. Extending approximately 370m east to west, slopes along this ridge reach as high as 80% in one small area but mostly sit between 20% to 65%. The ridge is a result of fill being added to the HEC lands in the early 2000s when a section of forest was cleared. More fill was added during the construction of the gas bar.

Other areas with slopes exceeding 15% can be observed along the eastern border with the provincial park as well as in small pockets throughout the centre of the HEC lands. Many of these slopes are the result of fill being added for roads and parking areas. The edges of these vehicle travel ways often decline down to the natural terrain, appearing as steep slopes once the LiDAR data are analyzed. The relative effects of disturbing existing fill are lesser than disturbing natural soil, meaning that the slopes around these areas of fill are less constrained than natural ridges, such as the drainage channel in the south of the HEC lands. More detail on the changes to the natural grade can be found in the soil subsection of this document.

1.2.2 — SOLAR ASPECT

Unlike elevation and slope, solar aspect carries less relevance when analyzing constrained areas and recommending mitigation strategies. It refers to how a HEC land's natural topography informs the amount of solar exposure that it will receive. This information is still valuable, but ultimately does not play a significant role in determining the best course of action for supporting the health and function of surrounding land and natural features.

The different colours in Figure 5 correlate to specific cardinal directions of sun exposure, as demonstrated by the colour wheel visualization. North-facing slopes (indicated by red on the map), receive less sunlight compared to other cardinal orientations. Conversely, south-facing portions of the HEC lands (indicated by light blue on the map) can rely on year-round solar access.

While the solar aspect of the HEC lands are mixed, there are large portions of land that face either east, southeast, or south, and therefore benefit from better solar access. This is especially apparent in the central section of the HEC lands, where the flatter terrain is coloured primarily yellow, green, and blue.

While many areas of the HEC lands have a solar aspect that appears to be somewhat irregular, there is not enough relief on this HEC lands for the solar aspect to have a major impact on the design of this development.

1.2.3 — DISCUSSION

While the majority of the HEC lands are relatively flat, the areas of with greater variations in their terrain warrant special consideration. This is primarily due to the fact that watercourses on HEC lands tend to

adhere to the drainage channels created by the areas with steeper slopes.

The southern drainage channel is especially important due to its connection to the Wetland of Special Significance (WSS). It also likely predates the infilling of the HEC lands given the degree of forestation surrounding it. Further, this drainage channel directly connects to a large body of open water in the southern portion of the HEC lands, potentially providing a key habitat to inset, plant, and animal species in the area. In order to reduce downstream impacts, protect the identified watercourse, and reduce any issues caused from disturbing the terrain, it is recommended that a buffer be placed around this southernmost drainage channel to preserve it from development while also protecting everything south of the channel a conservation area.

This drainage channel already bisects the HEC lands from west to east, creating a logical barrier between the development and the forest. The area to the south of the drainage channel also contains one of the few remaining areas of untouched forest on the property. Given the more varied terrain in this section of the HEC lands, developing beyond the drainage channel would likely see some level of grading and infilling required to make the terrain suitable for construction, disrupting or damaging this untouched forest. For these reasons, it appears clear that leaving this section of the HEC lands untouched and protected is the best course of action to support the health and function of these lands.

Regarding the area within the panhandle, variation in the slope could act as a constraint to development and may cause a greater disturbance to the environment if partially graded or filled. It would be favourable to leave this section of the HEC lands untouched as a gateway into the provincial park in an attempt

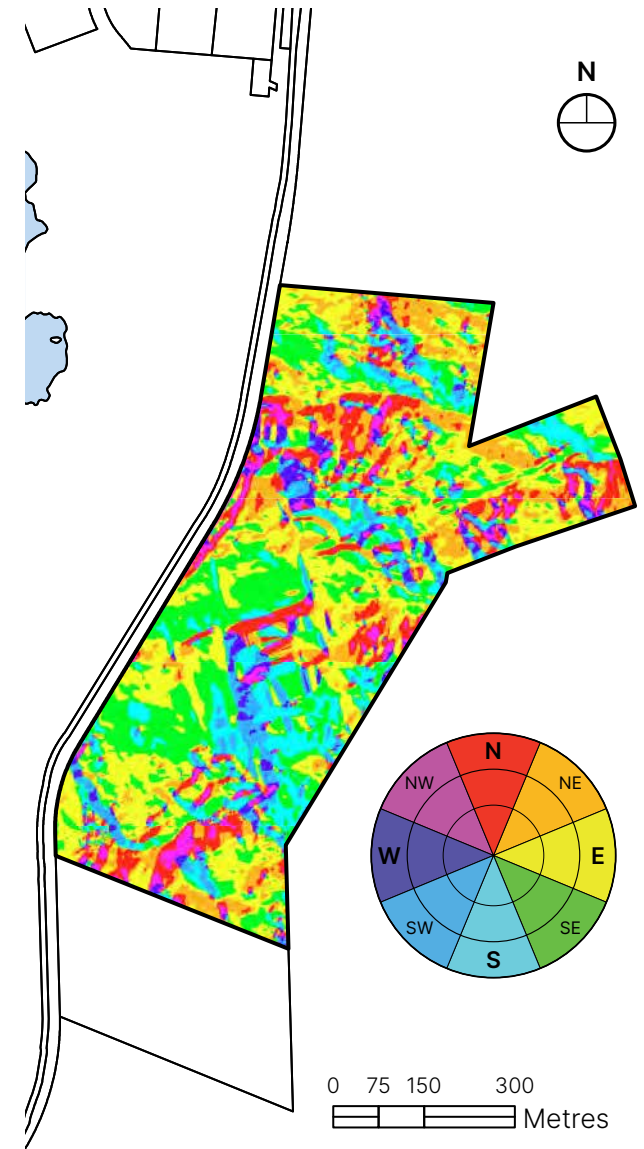


Figure 6 — Solar Aspect Map

to reduce the overall impact of the development on the surrounding natural areas. This conclusion is supported by findings in the archaeological report regarding areas of high potential for L'nuk archaeological resources.

As with the southern section of the HEC lands, the panhandle is largely untouched and forested with a significant watercourse running through it. In fact, watercourse mapping from both the province and the delineation show a convergence of streams within this portion of the HEC lands. Given the presence of these streams in addition to areas of high ground overlooking the streams (as can be observed in Figure 3) and mature trees, the archaeological report identified three areas of high potential for L'nuk archaeological resources in this area and recommended that this section of the HEC lands be left untouched.

Other mitigation strategies besides conservation could be employed elsewhere in the HEC lands. In the northern section, for example, two areas of relatively flat land are separated by a drainage channel and wetland. While the ecological features here have value, they are largely the result of infilling that created the steep ridge in the first place. They have yet to revegetate, as noted in the archaeological study, potentially indicating a lower ecological value for plant and animal life. Additionally, the soil context here differs from other steep areas of the HEC lands and merits other considerations.

While further detailed in section 1.5, the surficial unit in the northern section of the HEC lands are largely

designated as till blanket while the eastern panhandle, for example, is designated as bedrock. Steeper bedrock slopes are more stable and difficult to modify compared to slopes made of till or alluvial fill, like with the steep ridge in the north of the HEC lands. This means that modifications of the terrain in this location, either for development or to strengthen the existing ecological features, would be easier and more feasible than in order areas of the HEC lands.

Recommended Mitigation Strategies

- Designate a 30m buffer around the southernmost drainage channel and all lands to the south of this drainage channel as conservation areas.
- Designate all of the land in the panhandle as a conservation area.
- Consider designating the lands north of the fill-created ridge as a conservation area.
- Consider developing the northern area of the HEC lands but preserving and strengthening the existing watercourse and wetland.

1.2.4 — CONSTRAINT SCORING

Steep slopes were identified as the primary constraint pertaining to the topography of the HEC lands. The slopes have been categorized into three classes based on their percent rise: 0-5%, 5.01-15%, and >15%. Flatter areas (0%-5%) are ranked as the least constrained due to lower environmental risks, while steeper slopes (>15%) are ranked as the most constrained. The scoring matrix used in the topography constraint map is described in the table below.

Slope (% Rise)	Assigned Score
0%-5%	1 - Less Constrained
5.01%-15%	2 - Moderately Constrained
15.01%+	3 - Highly Constrained
TOTAL POTENTIAL SCORE	1-3

Table 1 — Topography Constraint Scoring

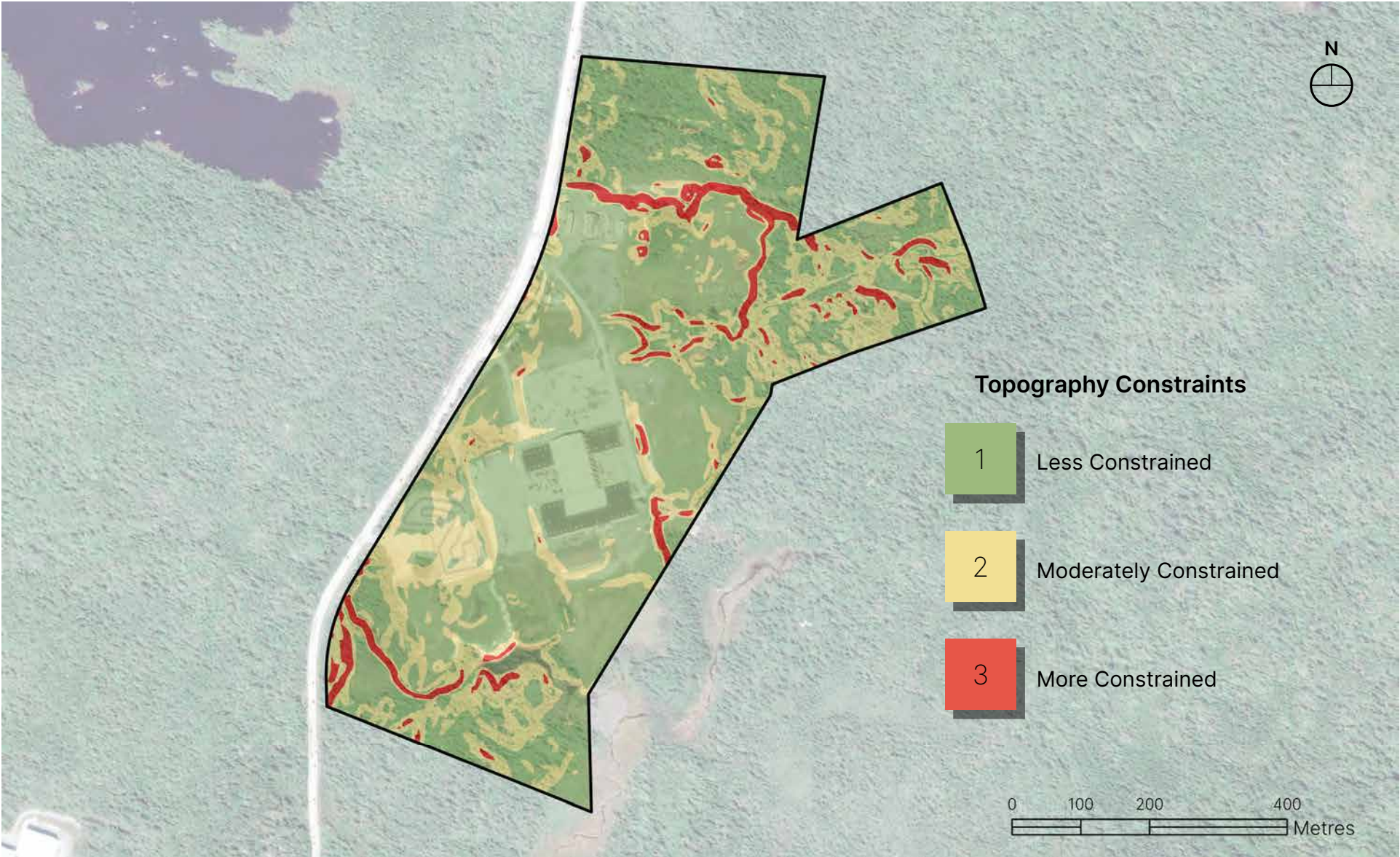


Figure 7 — Topography Constraints Map

1.3 — Soil and Geology



Figure 8 — Soil Map with data from the 2015 Ecological Land Classification for Nova Scotia

METHODS

Soil data was sourced from the Soil Survey of Halifax County ns13b (Mac Dougall, et al., 1963), which uses the Canadian System for Soil Classification, as well as the Ecological Land Classification (ELC) for Nova Scotia, which uses the Forest Ecosystem Classification (FEC) System for soil classification (Neily, et al., 2017; Neily, et al., 2023). No fieldwork was completed to confirm the results of the existing soil surveys. Surficial geology and bedrock geology data were sourced from the Province through the Nova Scotia Geographic Data Directory. All of the data was analyzed using ArcGIS Pro.

1.3.1 — SOILS

As per the 2015 Nova Scotia Ecological Land Classification (ELC), the subject property is located within the St. Margaret's Bay ecodistrict (#780). The ELC further describes soil drainage of the HEC lands as being either ICHO or WCHO. These four-letter codes are not acronyms but rather, refer to the enduring physical features (i.e., soil drainage, soil texture, topographic pattern and sometimes landform) as described in the ELC.

The ICHO designation applies to Imperfectly drained, coarse textured soils on hummocky terrain. Likewise, the WCHO designation applies to well-drained, coarse-textured soil atop hummocky terrain. Soils within ecodistrict 780 are typically are well drained sandy loams that have formed on granitic till. Soils here are largely shallow and stony with a landscape that features many large granite boulders, known as glacial erratics. According to the ELC, "Soils on this parent

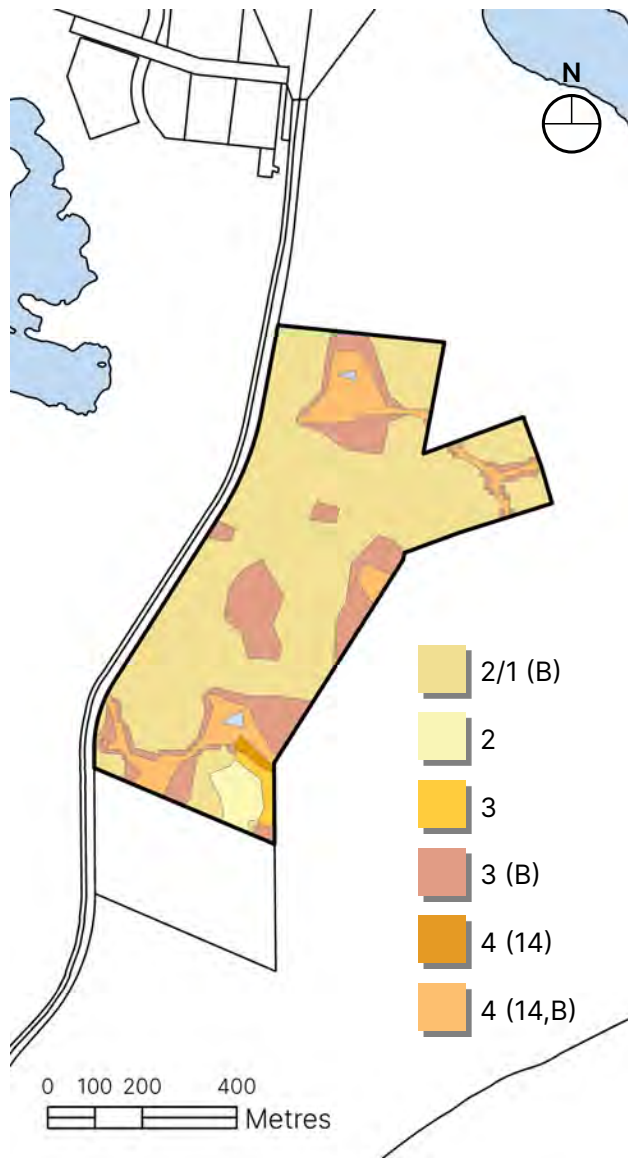


Figure 9 — Soil Type Map

material tend to be coarse to moderately coarse, well drained and commonly gravelly with abundant surface stones.” The XXWA code represents open bodies of water.

According to the 1963 Soil Survey of Halifax County, the entire HEC lands are classified as By/B-4 soil. The “By” code represents the Bayswater Soil Series which describes grayish-brown sandy loam over dark yellowish-brown sandy loam. The parent material for the Bayswater Soil Series is yellowish-brown coarse sandy loam till. Typically, properties atop this soil series have a topography that can be classified as gently undulating to gently rolling. The Bayswater Soil Series classification also indicates imperfect drainage.

The “B-4” portion of the code defines the topography and stoniness of the HEC lands. The B code corresponds to rolling topography with a slope limit of 3-8%. The 4 portion of the soil code corresponds to land that is excessively stony to the point of being non-arable.

The ELC and Forest Ecosystem Classification (FEC) system additionally have soil classification called Soil Type (ST). The ST classifications for the HEC lands are depicted in Figure 9. The ST provides additional nuance and insight into the soil on HEC lands as it takes into account the wetness of the area. As shown in Figure 9 the ST on the HEC lands roughly range from 1-3 which means dry - moist with the areas around the watercourses and wetlands characterized as ST 4 or 14. The breakdown of these classes are as follows:

- 1 = Dry - coarse textured
- 2 = Fresh - medium textured
- 3 = Moist - medium textured
- 4 = Wet - medium textured

14 = Organic

The B attached to some of the STs in Figure 7 indicates the soil phase. The boulder (B) phase is mainly associated with coarse-textured soils and is applied when a site has granite or greywacke surface boulders (rocks ≥ 60 cm in diameter) that are on average about 2m apart or less. While this phase does indicate coarser soil texture and the likelihood of surface boulders it does not mean that the soil will have severe rooting restrictions often associated with sub-surface stoniness.

Both soil classifications provide insight into the soils on the HEC lands. From them, it can be deduced that the soil is generally a well to imperfectly drained soil derived from a till parent material. The texture is typically a coarser medium textured soil with some sandy and loamy qualities.

1.3.2 — SURFICIAL GEOLOGY

The Province provides a generalized dataset of the entire province’s surficial geology while also providing more detailed maps of specific regions. The Halifax Exhibition Centre lands lies on the border of the detailed HRM surficial geology dataset, resulting in only a portion of the HEC lands being covered by the more detailed data. As a result, Figure 10 shows the detailed surficial geology data for the portions of the HEC lands that are covered and substitutes the unavailable regional data with the provincial data in the south of the HEC lands. The two datasets are separated by a dashed line shown on the map in Figure 10.

The surficial geology for the HEC lands varies considerably. The anthropogenic classification (represented by yellow on the map) indicates soil deposits that were formed and remixed by human

activity, making their original form unrecognizable. This geologic unit corresponds to regions in and around the main exhibition hall that have already been developed and infilled.

The dark green area at the north of the HEC lands represents the Till Blanket classification. Till refers to a type of unsorted glacial sediment that formed under the local ice caps that were prevalent in Nova Scotia during the ice age. These tills are characterized by a loose texture, a sandy matrix, and abundant, locally derived, angular stones and boulders. The till blanket classification specifically implies a continuous till cover thicker than 1.5m while the till veneer designation, seen elsewhere in the province, implies a less continuous cover thinner than 1.5m. This geologic classification is relatively common in the region and are the same classification as most of the Halifax Peninsula. The Alluvial designation (represented in pink) corresponds to pockets of gravel, sand, silt and clay that have been deposited by running water over time. On the HEC lands, the alluvial deposits follow the terrain and slope down towards Long Lake. These deposits are clustered around the southernmost drainage channel and the convergence of watercourses within the panhandle. It is not clear whether or not alluvium is continuing to collect as field testing of the soil and surficial geology was not performed.

Finally, Bedrock is shown on the map in purple. It is concentrated within the untouched areas of the panhandle but smaller pockets can be observed throughout the HEC lands. Based on the results of the 1963 soil survey and an observation of historic aerial photos, it is likely that the bedrock designation would have covered more of the HEC lands prior to the development of the exhibition hall and subsequent infilling.

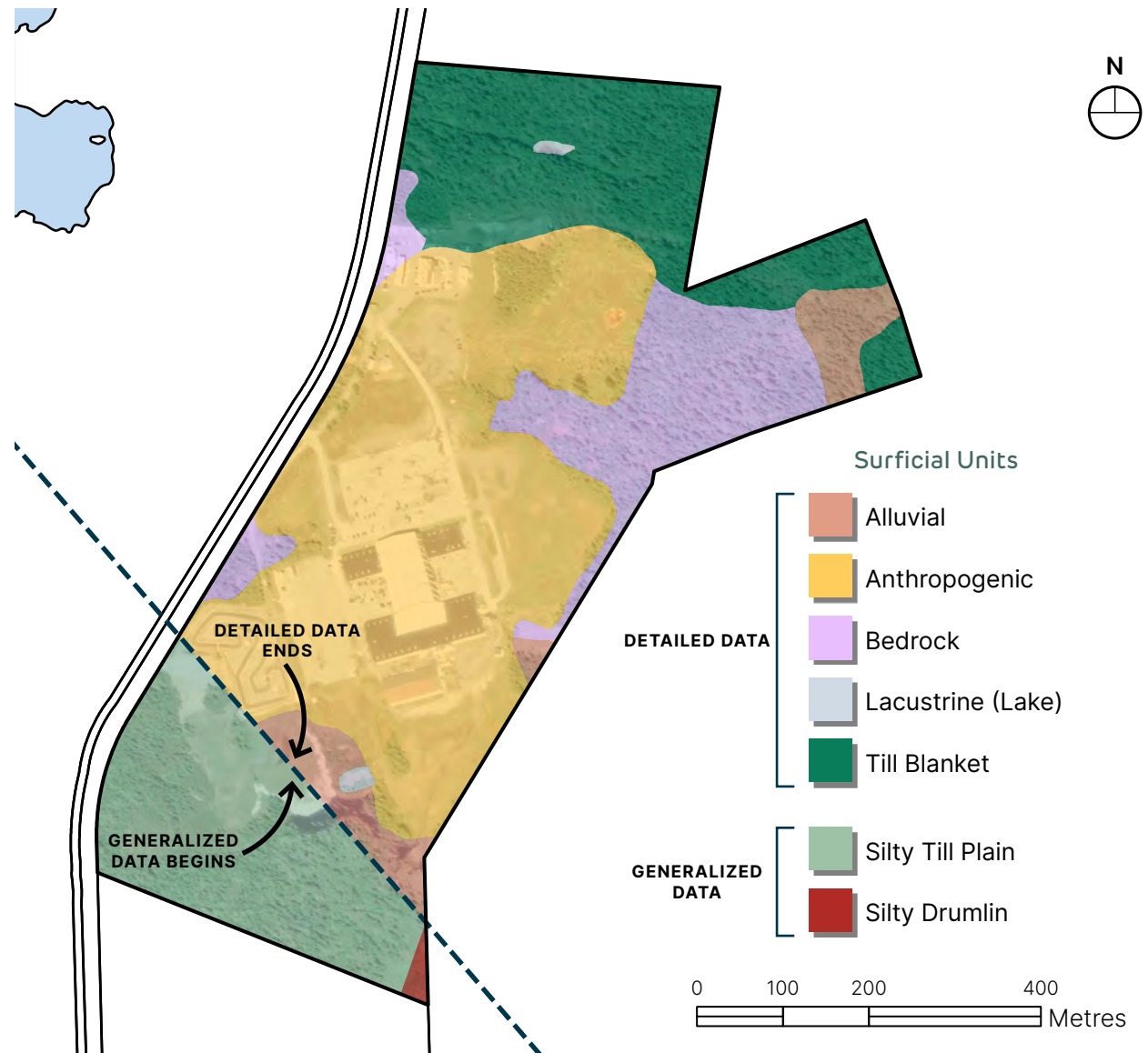


Figure 10 — Surficial Geology Map

While the names of the provincial designations vary slightly from the regional data, silty drumlins on the provincial map (represented in light green) correspond to drumlins on the regional map and silty till plains on the provincial map (represented in red) correspond to the till blanket/veneer designation from the regional map. Although not located on the HEC lands according to the detailed map, the Drumlin designation refers to hills of glacial sediment like till. These are also common in the region, with Citadel Hill being a notable example of a drumlin in Halifax.

1.3.3 — BEDROCK GEOLOGY

The entire HEC lands are located within a formation of intrusive rock spanning a large portion of southwestern Nova Scotia. Part of the igneous family, this formation was created by magma penetrating existing rock and is a part of the larger “South Mountain Batholith” within the Meguma terrane. These intrusives cover almost the entirety of the Chebucto Peninsula but are notably not found under the Halifax Peninsula. The main types of rock found in this formation are granite, granodiorite, and diorite.

Intrusives are further split into different units depending on their age and type of rock. The HEC lands are split by two of these different bedrock units; to the north, the HEC land’s bedrock geology is classified as Middle - Late Devonian Leucomonzogranite while the southern section of the HEC lands are classified as Middle - Late Devonian muscovite biotite monzogranite.

1.3.4 — ACID ROCK DRAINAGE

While there exist concerns of Acid Rock Drainage (ARD) in Nova Scotia, this issue tends to only arise in regions with sulphide-bearing rock, as is seen in the Halifax Formation of Southern Nova Scotia. Sometimes,

other types of rock (e.g., slate) can contribute to ARD. Fortunately, the igneous intrusive rocks that lie below HEC lands contain neither sulphide-bearing rocks nor slate. Additionally, Nova Scotia’s ARD interactive risk map lists regions overlaid with the intrusive rock formation to be of low risk for ARD.

1.3.5 — KARST TOPOGRAPHY

In addition to mapping on ARD, the Province also provides mapping that depicts the relative risk of encountering karst topography across Nova Scotia. Karst refers to a type of topography which is formed by the dissolution of carbonate rocks like limestone and gypsum over time. While this process can generate distinct landscapes, it is also a major contributor to sinkhole formation. Sinkholes represent a significant geohazard in some regions of Nova Scotia since their development in karst terrain can cause extensive damage to buildings, roads, and other infrastructure.

According to the Government of Nova Scotia’s Karst Risk Map, the area in which the HEC lands are located has a relatively low risk of encountering karst. While sinkholes may still occur in this region due to unmapped or near-surface soluble rocks, it is highly unlikely. Only 0.1% of the recorded sinkholes in the Nova Scotia Sinkhole Database were observed in regions with a low relative risk of encountering karst.

1.3.6 — RADON

Finally, the province also provides mapping for the risk of encountering Radon in indoor air. Radon is a colourless and odourless gas that can be naturally found within the ground in Nova Scotia. When it mixes with fresh air it is harmless but if it is able to seep from the ground and pool in indoor spaces, it can pose a serious health hazard. Most of the HEC lands is

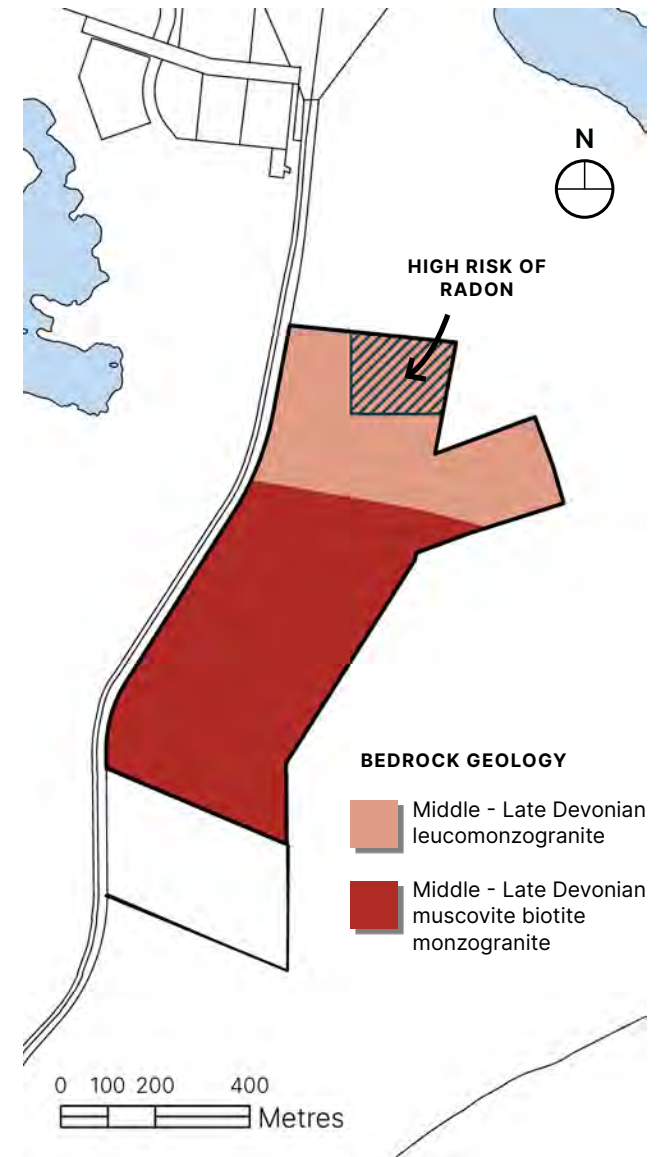


Figure 11 — Bedrock Geology and Hazards Map

described as having a moderate risk for encountering indoor radon while the northern extremity of the HEC lands highlighted in Figure 11 falls within the high risk category.

1.3.7 — DISCUSSION

Both soils surveys describe relatively standard categories of soil that are found throughout the region. The stoniness described in each survey is commonplace throughout the Chebucto Peninsula, with rocky outcroppings dotting the landscape near the HEC lands. However, the results of the soil surveys should only be interpreted in the context of the extensive infilling that has occurred on the HEC lands. The majority of the subject properties are covered in non-native soil that obscures the underlying features. The 1963 survey would have been published and reprinted before any significant infilling had taken place and the 2015 ELC was largely not granular enough to take into consideration site-specific details like infilling.

Knowing this, some of the concerns that could be potentially raised by the stony nature of the HEC lands and surrounding area can be addressed. Other areas with widespread outcroppings of bedrock may be less suitable for development due to the need for blasting or other rock removal techniques in order to make way for roads or foundations. Although mitigation strategies exist, removing these outcroppings can lead to issues with sediment runoff, the disposal of debris, dust, and the potential destruction of plant/animal habitat.

Within the HEC lands, most of the area underlaid with bedrock as the primary surficial unit is located within the panhandle. While it is recommended to conserve the lands solely based on the challenging topography, the context of the bedrock surficial unit further

supports the conservation strategy for mitigating any adverse effects on the landscape. Attempting to modify the terrain in the panhandle, especially given the steep slopes noted in Figure 4, would be likely difficult and disruptive.

The bedrock geology poses little threat to the suitability of the HEC lands for development. The lack of karst topography or rocks with ARD potential eliminates the majority of major geohazards. The moderate to high risk of radon should be monitored but on-site testing is the only reliable way to determine the levels of radon present. There exist a number of mitigation strategies to reduce the hazard posed by radon but those mainly are employed at the construction phase and have little to do with maintaining the function and health of the surrounding ecological features.

Recommended Mitigation Strategies

- Designate all of the land in the panhandle as a conservation area.
- Perform test samples of the soil and rock to confirm the findings of the soil surveys and determine radon risk.
- Identify remaining bedrock outcroppings or stony terrain that could be avoided or preserved during a development process.

1.3.8 — CONSTRAINT SCORING

The soil and geography constraint map classifies land primarily based on its geological features. The main features of concern are the risk of ARD, indoor radon, and karst topography. The land with these features is considered to be more constrained with these risks due to their implications for development. In this map the presence of ARD-producing bedrock geology, such as the Halifax Formation found throughout HRM

and medium risk of Radon contribute to the HEC lands being scored a 2 for being moderately constrained by its geology.

Features	Assigned Score
Non-ARD Producing Bedrock Geology Low Risk of Radon Low Risk of Karst Topography	1 - Less Constrained
Potential for ARD Producing Bedrock Geology Medium Risk of Radon Medium Risk of Karst Topography	2 - Moderately Constrained
ARD Producing Bedrock Geology High Risk of Radon High Risk of Karst Topography	3 - Highly Constrained
TOTAL POTENTIAL SCORE	1-3

Table 2 — Geology and Soils Constraint Scoring

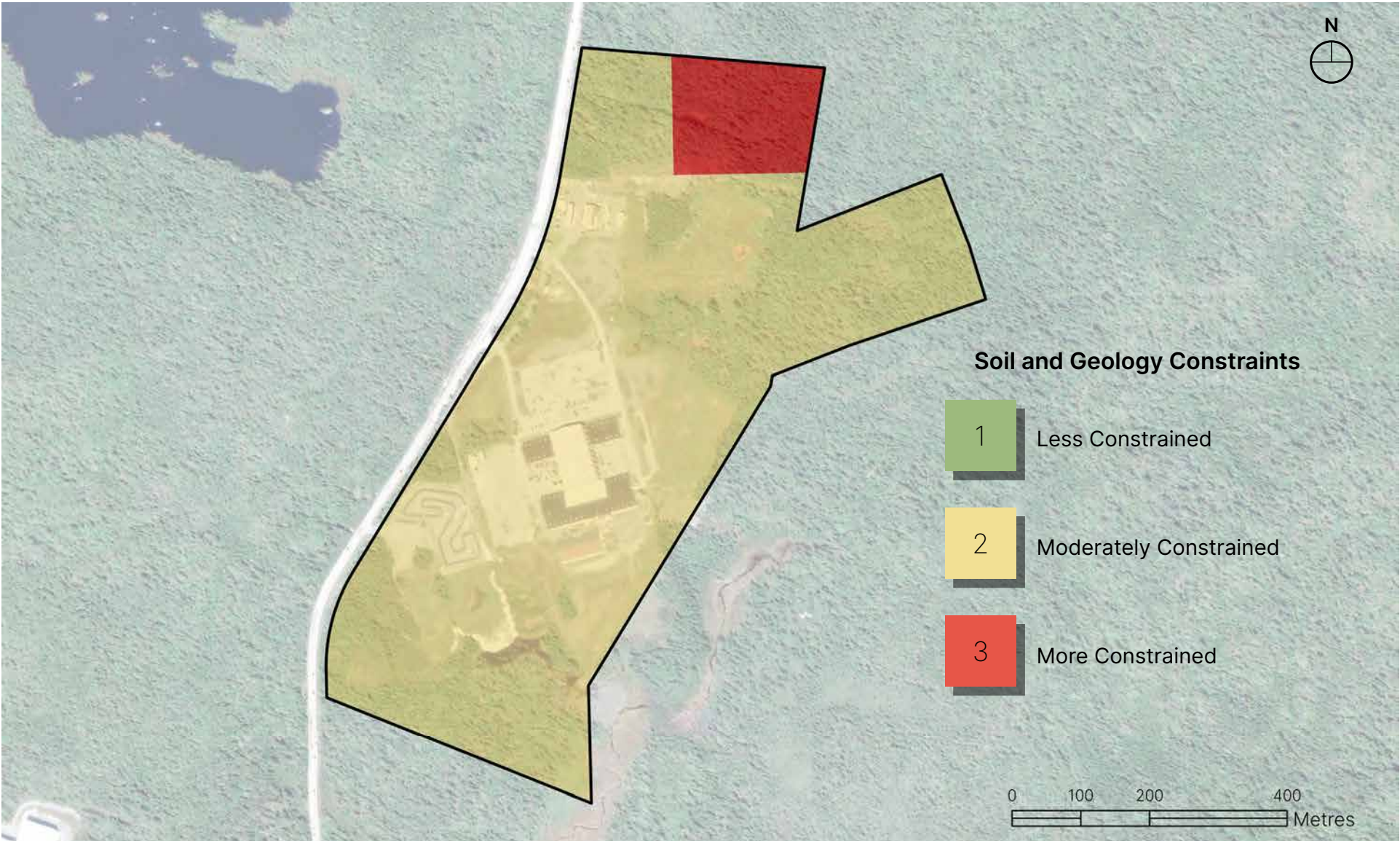


Figure 12 — Soil and Geology Constraints Map

1.4 — Hydrology

METHODS

Wetlands and watercourses were identified by an in-person delineation and assessment by Strum Consulting as well as through a desktop analysis of available wetland and watercourse data. Watercourse, water body, watershed, wetland, and Wet Areas Mapping (WAM) datasets were sourced from the Nova Scotia Geographic Data Directory. Then, the water source protection areas and inland flooding datasets were sourced from HRM open data and the Creation of Flood Hazard Maps Halifax Regional Municipality Final Report. The well data was retrieved from the NSECC Well Logs Database. All of the Hydrology data was analyzed to provide insight into the HEC land's water flows and accumulation patterns.

1.4.1 — OVERVIEW

The Halifax Exhibition Centre lands are within the **McIntosh Run Secondary Watershed**, which is apart of the Sackville River Primary Watershed (See Figure 13). The McIntosh Run Secondary Watershed flows from northwest of Long Lake to southeast of the mouth of MacIntosh Run near Herring Cove, which then drains into the Atlantic Ocean. Given the topography and hydrological network of the watershed the runoff from this HEC lands should primarily flow to Long Lake which is roughly 460m northeast of the HEC lands. From Long Lake the water flows through a series of lakes and streams to the Northwest Arm.

There are no watershed protection areas to the south of the HEC lands where HEC lands runoff is likely to drain to, however, the **Chain Lakes Water Source Protection Area** is approximately 1km north of the HEC lands.

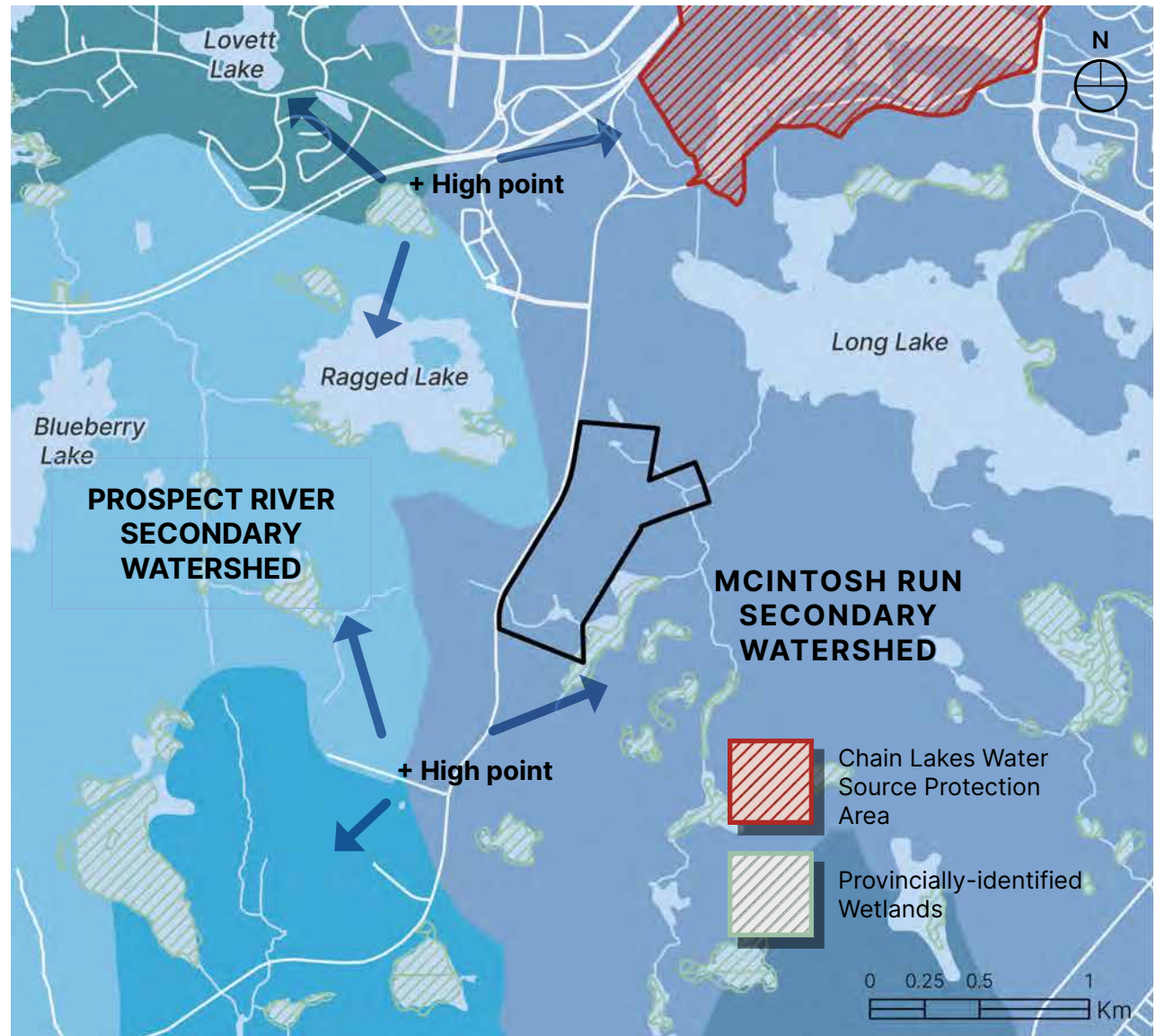


Figure 13 — Watershed and provincially-identified wetland map

1.4.2 — WETLANDS AND WATERCOURSES

The Government of Nova Scotia maintains a wetland database that contains the types and approximate boundaries of wetlands throughout the province. This database is not exhaustive nor is it the result of detailed delineations but it still provides a relatively accurate account of wetland habitat outside of the HEC land's boundaries. The wetlands on the HEC lands were delineated to assure accuracy in size and location.

The wetlands identified around the HEC lands vary, including swamps, marshes, and bogs. Figure 14 and 15 depict the widespread coverage of wetlands both around Ragged Lake as well as scattered throughout Long Lake Provincial Park. The provincial government also provides a hydrological dataset with mapped water bodies and watercourses. This dataset shows two watercourses running through the HEC lands, one running across the northeast branch to the northwest. The second watercourse runs along the bottom of the HEC lands and features an area of open water.

To verify the provincial wetland mapping findings, the wetlands on the HEC lands were assessed by specialists at **Strum Consulting** in July 2023 (See Appendix A). They delineated the wetlands on the HEC lands and performed a functional assessment of the wetlands. Through this process, they found that there were many more wetlands on the HEC lands than when were provincially mapped. As shown in Figure 14, 6 watercourses and 11 wetlands were delineated in addition to one open water pond. In total, 27,670m² of wetlands exist on the HEC lands.

The wetland biologists also completed a Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC) for the delineated wetlands in order to determine their ecological significance and

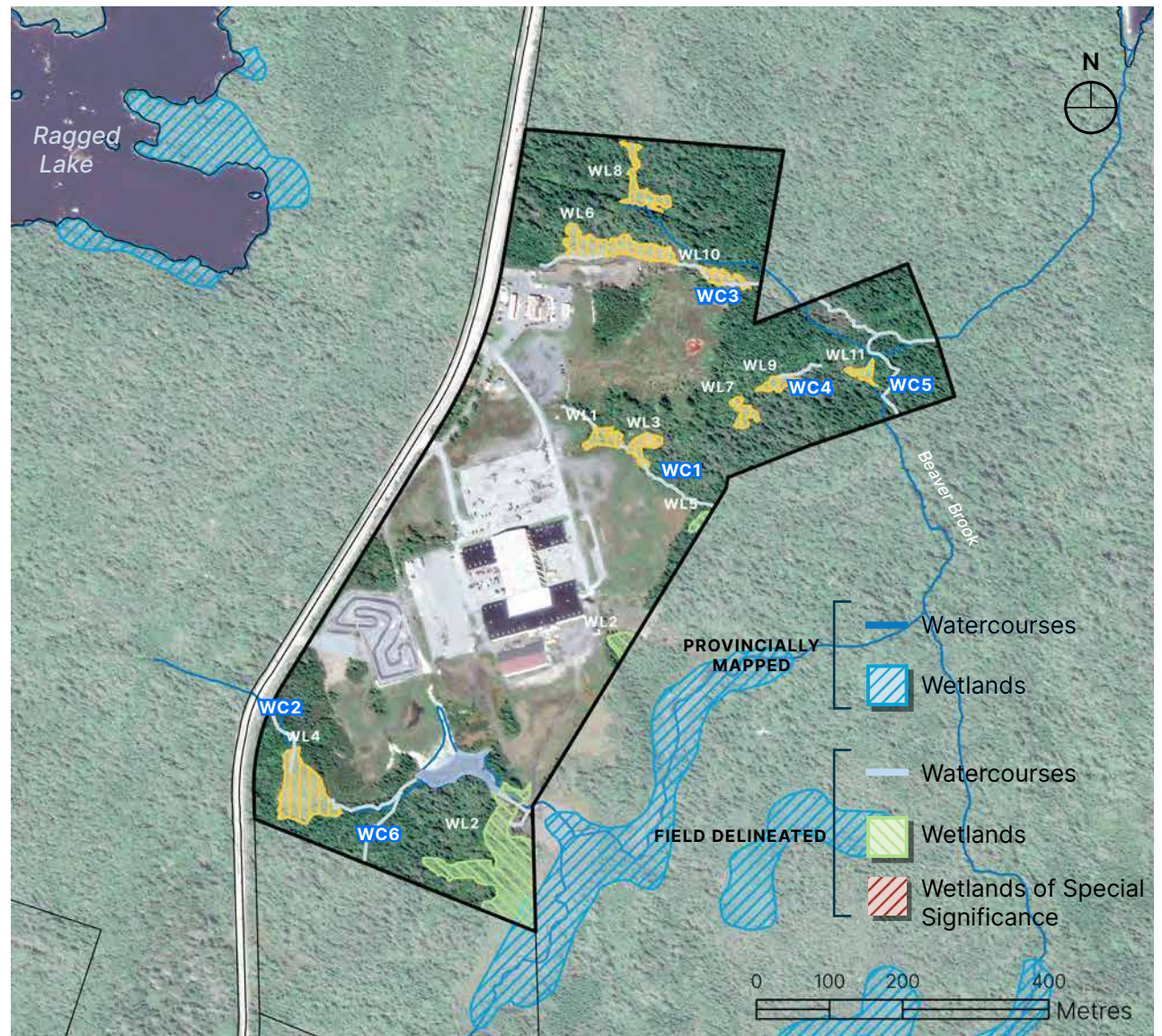
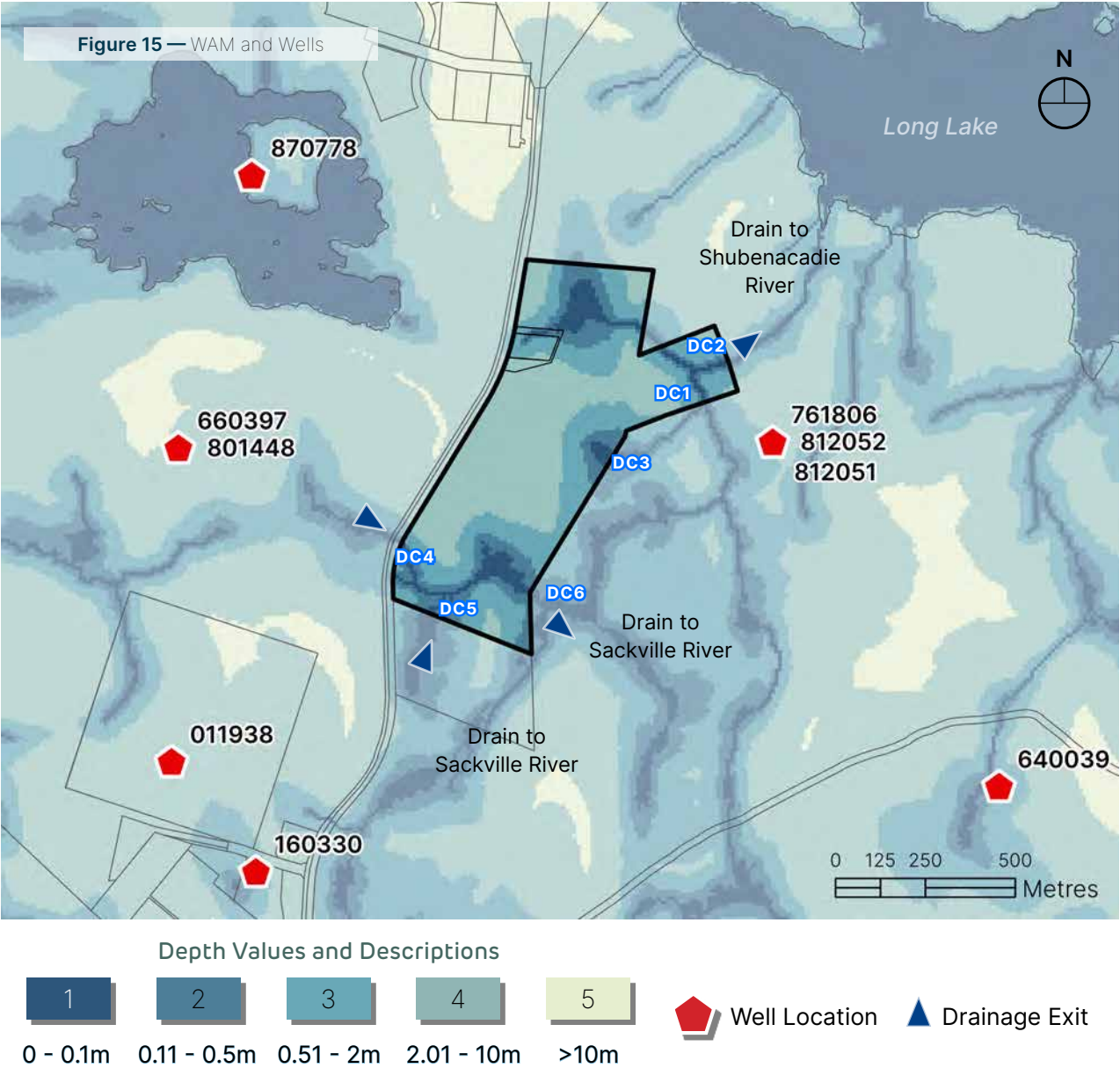


Figure 14 — Watercourse and Wetland Map

functionality (Appendix A). This process assesses and weighs many specific wetland functions and benefits to natural systems and society to evaluate the importance of the wetland. Their assessment concluded that of the identified wetlands, two of them (WL2 and WL5 in Figure 14) are considered to be Wetlands of Special Significance (WSS). Given their WSS status these wetlands can not be approved for alteration in the event of development.

Both the wetlands and the watercourse carry a number of considerations regarding the land's suitability. In the current Regional Plan for HRM, it is recommended that a 20m buffer be established around all watercourses in order to “*protect the chemical, physical and biological functions of marine and freshwater resources*” within the municipality's riparian areas. Further, the Halifax Green Network Plan and Draft Municipal Plan (2023) recommend increasing the riparian buffer to 30m. Watercourses serve a vital role in the municipality's ecosystem, providing habitat to aquatic species and providing drinking water to the residents of HRM, among other things. Riparian buffers are a common way to minimize any negative effects on watercourses caused by development and other human activity.

Similarly, wetlands provide key habitats for a range of flora and fauna while also serving to remove excess nutrients and contaminants from water. Wetlands also provide water storage that can moderate the impacts of droughts and floods. Although the Draft Regional Plan (2023) only recommends a 30m buffer for wetlands if they are contiguous with watercourses, a buffer would still be an effective preservation strategy for any wetland, regardless of the presence of watercourses.



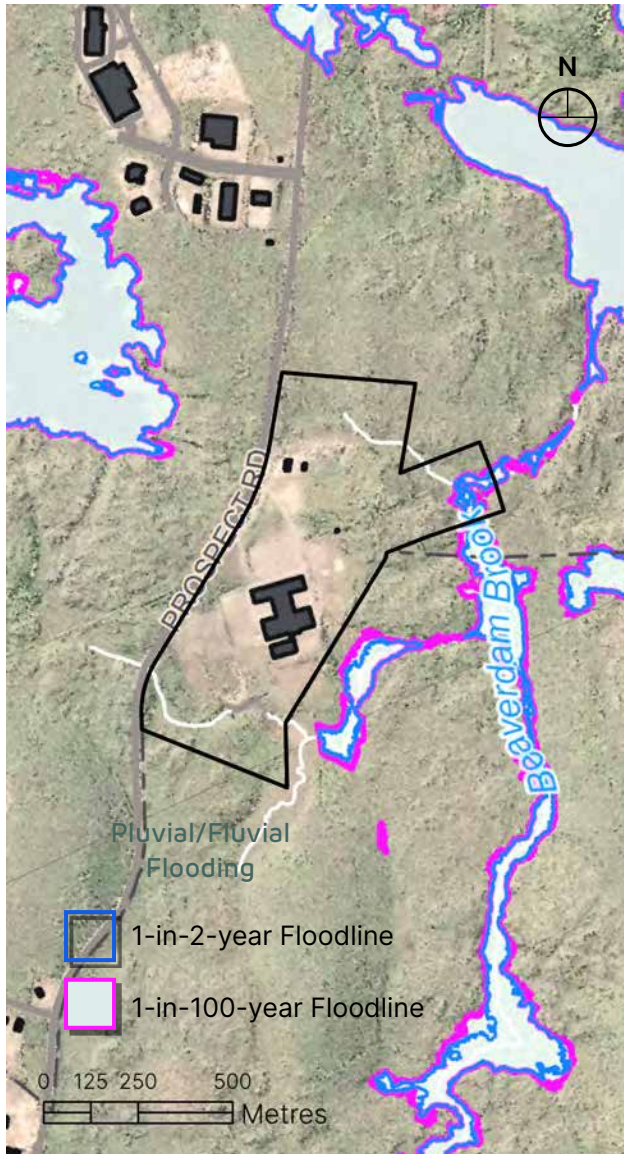


Figure 16 — Floodline Map #22 created by CBCL based on current climate conditions.

1.4.3 — WATER ACCUMULATION AND FLOODING

The provincial Wet Areas Mapping (WAM) index dataset, shown in Figure 15, predicts where water will naturally flow and/or accumulate in the landscape. The WAM model uses Digital Elevation Models (DEM) in conjunction with the known locations of water features such as streams, water bodies and wetlands. Given this, it generally aligns the elevation maps for the area. The index ranks areas from 1 to 5, with the highest rankings corresponding to areas with excellent drainage. In contrast, the highest lowest correspond to areas that are either highly prone to accumulate water or water bodies (like streams). When understanding water absorption and drainage 1 = very poor or water, 2 = imperfect to poor, 3 = moderately-well to imperfect, 4 = Well to moderately-well, and 5 = rapid to well.

The index ranks have a corresponding depth class which has ranges which correspond with depth values. It is important to note that the WAM metadata states that the depth ranges are not representative of depth to water table or groundwater but are rather a cartographically derived depth-to-water index related to where water is likely to flow and concentrate. This dataset does not take into account other factors that impact water drainage, such as soil texture or changes resulting from human activity.

The data depicted in Figure 15 reveals that water is likely to pool in and around the watercourses that across the northern and southern portions of the HEC lands along and to the east of the HEC lands around Beaver Brook. Provincially mapped wetlands are areas where water is likely to pool so they typically also correspond with the WAM dataset.

WAM data is additionally useful for reinforcing the previously identified drainage channels and areas

with more surface flows. Shown on Figure 15, the various drainage channels of the HEC lands are numbered 1 through 6. DC1, DC2, DC3, DC5 and DC6 all correspond to the channels identified in the topographic analysis while DC3 corresponds to the alluvial deposits seen in the surficial geology analysis. DCs 1-3 all meet in the off-HEC lands wetland identified in the provincial wetland mapping while DC2 follows the path of the delineated watercourse almost perfectly.

In 2024, HRM released a report prepared by CBCL on flood hazards within the municipality; this included a series of maps depicting the pluvial, fluvial and coastal flood risks around the various water bodies in HRM. Pluvial/fluvial flood risks were depicted with 1-in-2 year floodlines and 1-in-100 year floodlines, both under current climate conditions. Figure 14 shows the flood map prepared for the area showing the HEC lands. In this map, the areas on the HEC lands that lie within the predicted flood zone are the areas on either side of WC5, where Beaver Brook runs through the northeast branch of the HEC lands. Given the amount of existing watercourses and wetlands on the HEC lands it is important to plan for future flood and storms scenarios.

Currently, the majority of the middle of the HEC lands has been altered, in-filled and covered with gravel or concrete. Comprehensive stormwater management tactics should be employed to minimize future flooding or water accumulation on the HEC lands if the amount of non-permeable surfaces increases and reduce the risk of runoff related issues on in the areas around the HEC lands.

1.4.4 — DEPTH TO WATER TABLE

Water table depth is the depth to which the unsaturated zone/zone of aeration ends. In development, this is relevant as the closer the water table is to the ground surface, the greater the risk of wetlands developing or poor drainage. The WAM data in Figure 15 can provide an understanding of where these areas with poor drainage are located, however, in addition to that data the depth to of the water table can also be estimated using static water levels from existing drilled wells. It is important to note that drilled wells cannot give a precise depth to water data and can only help estimate it, as well, static water levels in wells can be affected by factors such as well use and seasons.

The wells marked in Figure 15 and their associated data shown in table 3 was sourced from the NSECC Well Logs Database (NSECC, 2022). Well logs are not always accurate or tested for their accuracy. Given

Table 3 — Well Depth to Static Water Table Values

Well Number	Depth to Static Water Level	Distance from HEC lands
870778	29.23m	780m
660397	N/A	680m
801448	N/A	680m
791806	30.45m	154m
812051	N/A	154m
812052	N/A	154m
011938	3.04m	765m
160330	N/A	832m
640039	N/A	1,351m

this, over half of the wells analyzed did not have a water table depth listed, these were marked N/A in table 3. Well #011938 had a recorded depth to water table of 3.04m, whereas well #870778 and #791806 had more similar levels with the static water level being around 30m below ground. This difference in values could be impacted by the fact that well #011938 is located at a higher elevation than that of the other wells which are at a more similar elevation to each other and to the elevation of the HEC lands.

These well depth to static water values can provide an understanding of what the water table depth on the HEC lands could be, suggesting that the water table depth on the HEC lands could be around 30m. However, it is difficult to definitively determine without ground-truthing the data.

1.4.5 — DISCUSSION

The assessment of Hydrological features the HEC lands reveals a number of wetlands and watercourses on the HEC lands. Much of these features being concentrated in the northern and southern portions of the HEC lands and along the eastern property line. This is largely due to the wetlands and watercourses to the east of the HEC lands in Long Lake Provincial Park which overlap into the HEC lands. The network of wetlands and watercourses on the HEC lands have additionally been expanded through existing development on the HEC lands, specifically infilling practices which have been ongoing on- since the building of the HEC. Without the permeable space to hold water in the middle of the HEC lands more water has accumulated along the edges.

As further development occurs on the HEC lands it is necessary to account for the impacts of development and ensuring that water can be retained on the HEC lands to not create additional changes to the surrounding natural areas. As the lands are graded

to accommodate the new roads and development, the existing drainage patterns will change as the catchments are slightly altered. However, the low-lying drainage exit at the borders of the property will not change. These are shown as blue arrows on Fig 13. These exit areas are ideally suited for stormwater management facilities. The two exit points that drain to the Long Lake via Beaver Brook are particularly important as they have a higher potential for flooding. In addition to these drainage channels where water enters and exits the HEC lands in the southern part of the HEC lands are additionally important to consider as the water from this area drains to DC6 which is where WSS WL2 is located. Increased surface flows to this area may impact the WL2 wetland.

The best way to minimize stormwater runoff for this development is to minimize the surface parking wherever possible and have areas for water retention on-site. Several iterations of the plan have relocated large swaths of surface parking below ground. At the same time, underground parking costs approximately ten times more than surface parking so it directly impacts affordability. It is important to provide a mix of surface parking to improve affordability, and underground parking to reduce runoff impacts.

The plan must address stormwater runoff at the 2 main points of entry and 4 main exit points, while employing a host of other stormwater mitigation measures through the use of green infrastructure such as bioswales, rain gardens, permeable pavements, detention basins, and other stormwater management tactics outlined in Administrative Order 2010-010-OP published by HRM.

Regarding the watercourses on the HEC lands, the best way to uphold their functions and ecological value would be to establish a riparian buffer of 30m around the area them. However, given that some of the watercourses on the HEC lands have been created through human

intervention and are a result of infilling their ecological significance may vary. Based on the results of the ARIA and WESP-AC HEC lands assessments the main watercourses of significance are WC3 and WC5. WC6 additionally holds importance as a drainage channel and due to its connection with WL2.

The ecological significance of the wetlands on the HEC lands vary, especially as some are a by-product of previous HEC lands infilling. Based on the results of the WESP-AC assessment two WSS were identified on the HEC lands, WL2 and WL5, given their importance these wetlands cannot be altered and should be maintained. Other non-recognized wetlands could be altered following provincial regulations. The storage and attenuation role of these altered wetlands will have to be considered as part of the overall stormwater management plan.

Recommended Mitigation Strategies

- Implement Green Infrastructure and Stormwater Management methods, especially those outlined in AO-2010-010-OP.
- Protect the stormwater exit points and provide attenuation and storage at these locations with stormwater management facilities.
- Preserve the area to the southern end of the HEC lands where the open water pond, and WL2 is located, along with these areas of WSS WL2 and WL5 along the eastern HEC lands boundary.
- Preserve area in the northeast branch of the HEC lands as it has the highest flood risk on-site and to ensure that Beaver Brook's integrity is not impacted as it is a key drainage pathway to Long Lake.
- Establish a minimum 30m buffer zone around the delineated watercourse in alignment with recommendations from the Draft Regional Plan and Green Network Plan.
- Prepare a detailed stormwater management plan for each phase of development to ensure balancing of pre and post runoff.
- Maintain the drainage channel that runs west to east across the southern portion of the HEC lands.

1.4.6 — CONSTRAINT SCORING

Areas without identified hydrological features in any of the mapping is the least constrained. This includes areas on the WAM value of 4 or 5.

Wetlands not designated as an WSS or a connection to a watercourse were considered of lower ecological value compared to other wetlands. Along with 30m wetlands buffers and areas with a WAM depth value of 3 were given a score of 2 marking them as moderately constrained.

Features	Assigned Score
No identified hydrological features WAM value of 4 or 5	1 - Less Constrained
Wetlands without watercourse connection or WSS status 30m Wetland Buffer WAM value of 3	2 - Moderately Constrained
Wetlands with watercourse connection or WSS status 30m Riparian Buffer WAM value of 1 or 2	3 - Highly Constrained
TOTAL POTENTIAL SCORE	1-3

Table 4 — Hydrology Constraint Scoring

The most constrained areas are within the 30m riparian buffers, lands with a WAM depth value ranging from 1 to 2, and wetlands connected to a known watercourse or WSS status.

Given the amount of other known hydrological features and the lack of accurate water table depth there were no anticipated constraints or land suitability issues relating the estimated depth to the water table.

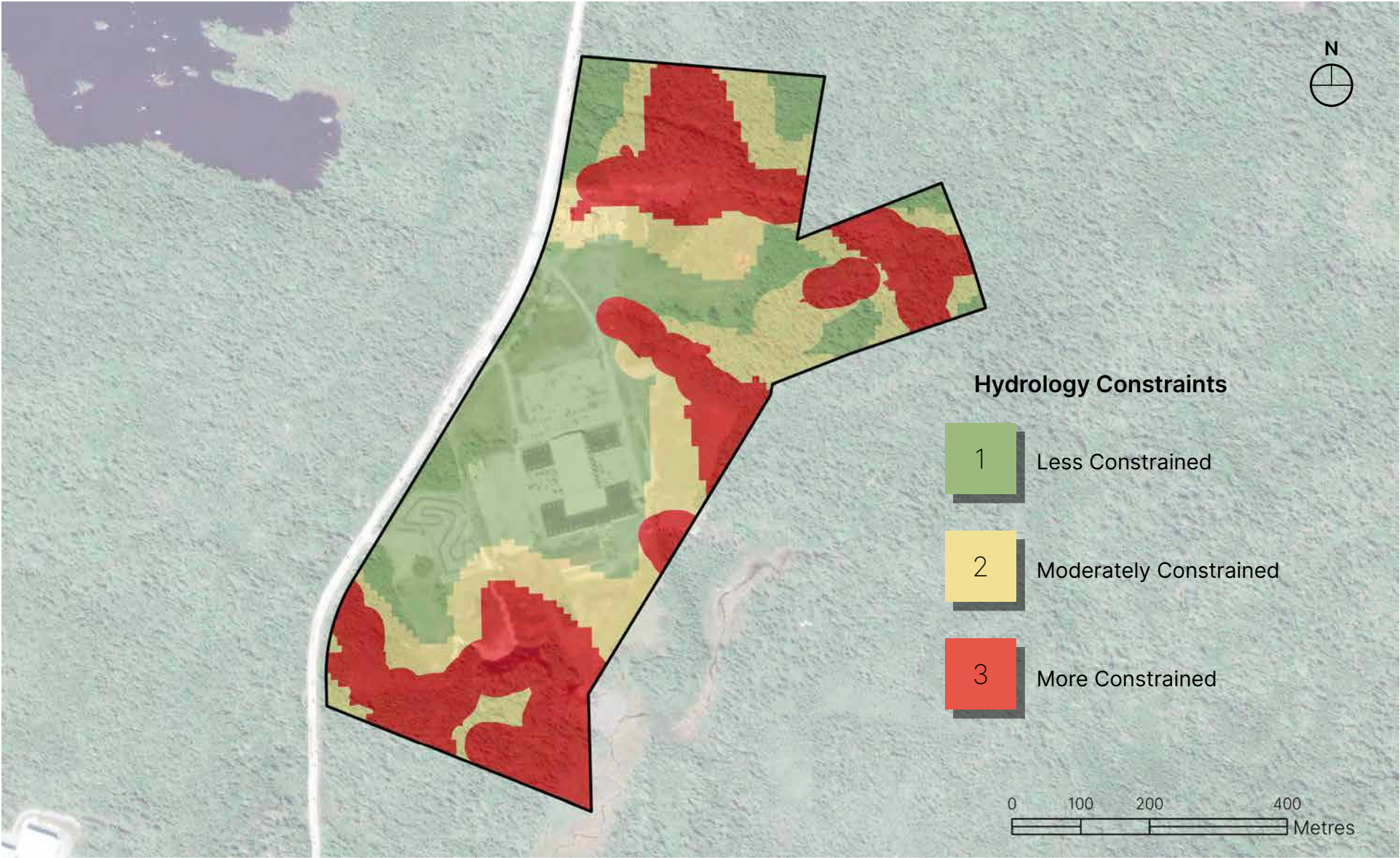


Figure 17 — Hydrology Constraints Map

1.5 — Forest Ecology

METHODS

Natural features were identified through a desktop analysis of available forestry and ecological data and planning documents. Ecological data was sourced from the 2015 Ecological Land Classification (ELC) for Nova Scotia. The Ecological land classification data helps to understand the environmental context of the HEC lands, such as the ecology and topography typically found in the area. It is important to note that given the scale of the ELC dataset, it is less HEC lands-specific, providing the more general ecosystem classifications and not always the current land use of the HEC lands. This analysis also used the Nova Scotia Department of Natural Resources and Renewables (NSDNR) Forest Inventory Database, obtained from the Nova Scotia Geographic Data Directory. The NSDNR Forest Inventory Dataset is derived from air photo interpretation and provides more location-specific details on tree species and forest growth. The reference air photos used for the HEC lands were taken in 2017. However, it is essential to note that this dataset is not ground-truthed. To ensure the accuracy of the data, the HEC lands was surveyed by drone, and a HEC lands visit was conducted. The data collected from the visit and provincial datasets was then evaluated using the Nova Scotia Forest Ecosystem Classification (FEC) system outlined in the 2022 FEC for Nova Scotia Field Guide to provide more details on the HEC land's vegetation and forestry. The landscape connectivity map used in assessing the HEC land's landscape connectivity was sourced from the Halifax Green Network Plan and georeferenced in ArcGIS for location accuracy. All of the data was analyzed using ArcGIS Pro.

1.4.7 — FORESTRY

According to the forest inventory dataset made available by the NSDNR, there are ten distinct forest stands observed on the Halifax Exhibition Centre (HEC) lands, with remaining sections of the HEC lands cleared of forests. There may be some tress or vegetation on the areas considered cleared, however, due to the disturbance there are only early regenerative species. The rocky soils and extensive infilling outlined in the accompanying ARIA report (Appendix E) limits the nutrient availability of the soils and depth, impacting the species that can grow on the clear portions of the HEC lands.

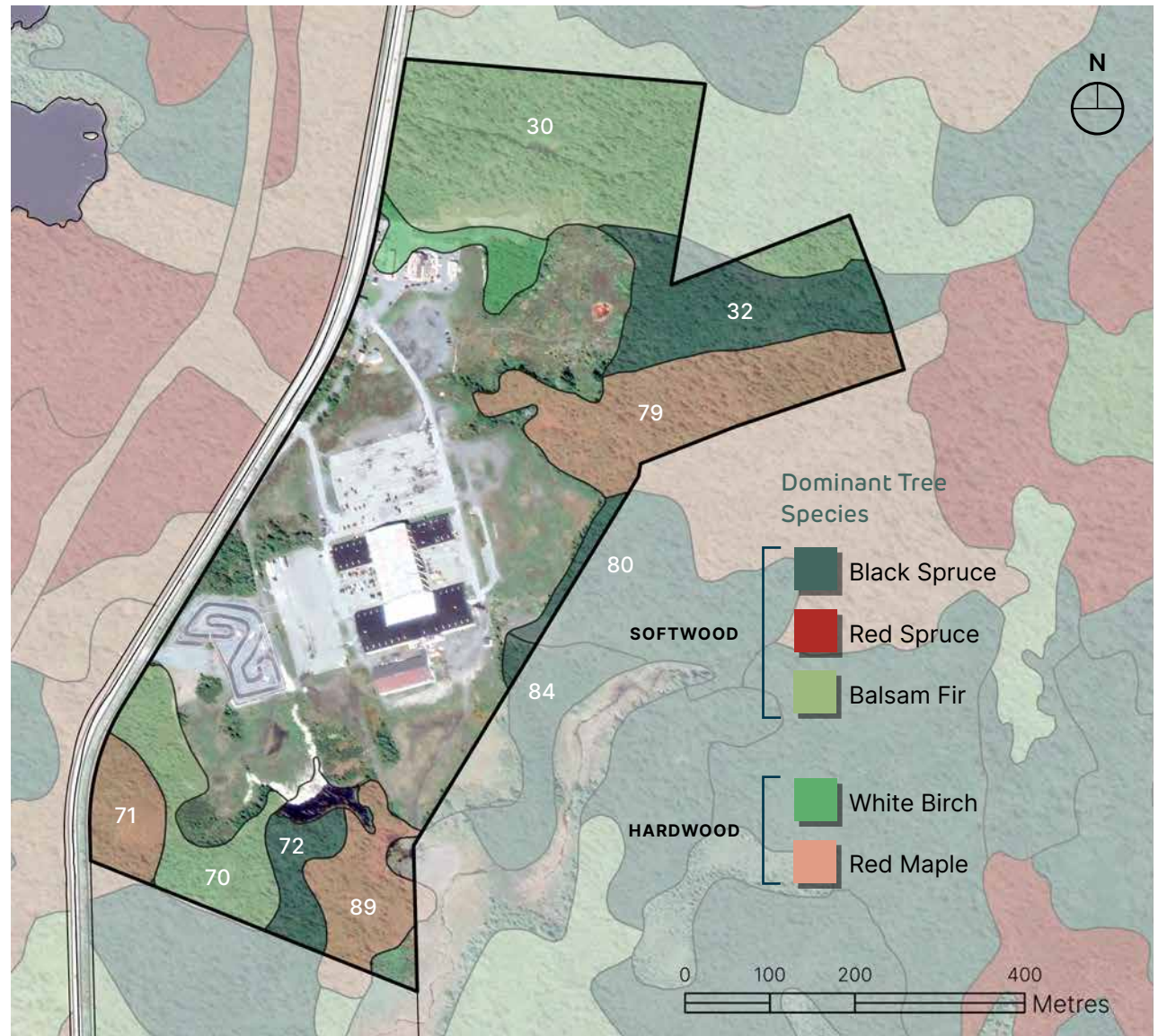


Figure 18 — Dominant tree species map with numbered tree stands

Table 5 — Forest Stands that extend into the HEC land's boundaries

Stand	Primary Species	Secondary Species	Tertiary Species	Quaternary Species	Height (m)	Development Class
30	Balsam Fir - 30%	Red Maple - 30%	Black Spruce - 20%	Red Spruce - 20%	10	Early Mature Forest
31	White Birch - 30%	Gray Birch - 30%	Balsam Fir - 20%	Black Spruce - 20%	8	Establishment / Early Mature Forest
32	Black Spruce - 30%	Balsam Fir - 30%	Red Spruce - 20%	Red Maple - 20%	10	Early Mature Forest
70	Balsam Fir - 30%	Black Spruce - 30%	Red Maple - 20%	White Birch - 20%	8	Multi-Aged / Old Forest
71	Red Maple - 30%	Balsam Fir - 30%	Black Spruce - 20%	White Birch - 20%	12	Early Mature Forest
72	Black Spruce - 50%	Balsam Fir - 20%	Red Maple 20%	Eastern Larch 10%	13	Late Mature Forest
79	Red Maple - 30%	Balsam Fir - 30%	Black Spruce - 20%	Red Spruce - 20%	10	Early Mature Forest
80	Black Spruce - 50%	Balsam Fir - 20%	Red Maple - 20%	Eastern Larch - 10%	12	Late Mature Forest
84	Black Spruce - 50%	Eastern Larch - 20%	Red Maple - 20%	Gray Birch - 10%	11	Late Mature Forest
89	Red Maple - 40%	White Birch - 40%	Eastern Larch - 10%	Black Spruce - 10%	7	Early Mature Forest

The forest stands are shown in Figure 16 and are numbered in white text based on their individual stand number that was assigned to them by the NSDNRR. These forest stands in Figure 16 have been assigned a colour based on the dominant tree species identified in each forest stand. The full breakdown of the tree species types in each stand and their prevalence can be seen in Table 5. The percentage beside each tree species name in Table 5 indicates roughly the percentage of the forest stand that each species encompasses.

The HEC lands consists mostly of a mix of hardwood and softwood tree species. The main softwood species being balsam fir (*Abies balsamea*), and black spruce (*Picea mariana*). Additionally, eastern larch (*Larix laricina*) was found mainly in the southern part of the HEC lands and red spruce (*Picea rubens*) in the northeastern part of the HEC lands. On the HEC lands hardwood was less frequently featured in the main stand species but was found throughout the HEC

lands possibly due to the wet nature of the majority of the forested areas. The most prevalent hardwood was Red Maple (*Acer rubrum*) found in most of the forest stands, then White Birch (*Betula papyrifera*), and Grey Birch (*Betula populifolia*).

The NSDNRR dataset provides information on the maturity of each forest stand, but the data is limited to internal use only. The approximate age and maturity of the forest stands can instead be inferred by examining their development class.

The forest stand in the northern portion of the HEC lands along the forest edge along the edge of the cleared area (#31), is the youngest stand on-site, being categorized as a Establishment/Early Mature Forest. Satellite imagery shows that this stand was cleared sometime before 2003 and left to regenerate. Then in 2019 the western half of the stand by Prospect Road was cleared and the Petro-Canada and Tim Hortons was built. Therefore this stand is half of the size of its boundaries depicted in Figures 16 and 20. This

mix of regeneration roughly matched its classification as Forest Establishment to Early Mature Forest encompasses three development classes with forest ages from 0-80 years. This classification means that the forest stand has a mix of characteristics. This includes new forests which are experiencing new growth after disturbance, and is dominated by diverse, short-lived, shade-intolerant pioneer species to more developed to forests with some canopy (branches and foliage at the tops of trees) development and regeneration but still lacking in understory (layer of vegetation that grows above the forest floor but beneath the forest canopy) development.

The northernmost stand and two abutting stands which cover the northeastern branch of the HEC lands (#30, #32, and #79), as well as the southwestern red maple-dominated stands (#71 and #89), are all classified as Early Mature Forests. This designation describes forests that consist of forest stands where the taller trees form a more distinct upper canopy,

with different layers of trees competing for growth underneath. Individual tree mortality creates gaps in the forest canopy, increasing the prevalence of sunlight below. This light allows the regeneration and early development of species below the forest canopy. Overtime, this light decreases as the forest canopy re-establishes itself as a result of surrounding tree growth. Early Mature Forests are approximately 41 to 80 years in age.

The development class for the eastern and southern black spruce dominated stands (#72, #80, and #84) are classified as Late Mature Forest. These forest are similar to early mature forests, however the development in the forest understory has started. These forests are roughly 81-120 years in age.

There is one stand dominated by Balsam Fir (#70) classified as a Multi-Aged/Old Forest. This forest type includes areas where the taller trees vary in both the size of their leafy tops (crowns) and how much they block sunlight. Some trees have large, full crowns, while others are smaller or more open, creating a mix of dense and patchy canopy cover. This type of forest usually has openings in the canopy that allow light to reach the forest floor, encouraging the growth of multiple layers of vegetation beneath. These forests are typically older, often 120 years or more.

Within the past few decades, the provincial government has made an increasing effort to identify and preserve the remaining old growth forestry resources. In Nova Scotia, old-growth forest is defined as late-successional forest ecosystems that have developed over long periods without significant human disturbances. These forests are characterized by features such as uneven-aged trees, multi-layered canopies, large deadwood, and minimal recent human impact. For policy purposes, an old-growth forest must have at least 20% of its basal area composed of

trees that meet or exceed specific reference ages for each forest type, reflecting the onset of old-growth conditions. The ages vary depending on the dominant species and forest type, with thresholds near 140 years for tolerant hardwood forests and 125 years for mixedwood stands.

In 2022, the provincial government legally protected approximately 30,000 hectares of land under the Old-growth Forest Policy. The closest land to the HEC that is protected under this policy is located roughly 17km to the Northeast of the HEC lands around Spider Lake. Not all areas protected under Nova Scotia's Old Growth Forest Policy necessarily contain confirmed old-growth forests. Instead, these areas are designated based on their potential to meet the old-growth forest criteria or how they to contribute to the ecological, cultural, and scientific goals of the policy.

The neither NSDNRR, ARIA report, or the Wetland Delineation by Strum revealed any unusual species of trees outside of the typical Acadian Forest inventory. Currently, no species have been found on the HEC lands that would restrict development.

1.4.8 — ELC AND FEC

The Lake Loon HEC lands lies within the Eastern Interior (440) Ecodistrict, as outlined by the 2017 Nova Scotia ELC Report (Neily, et al., 2017). Eastern Interior is the largest Ecodistrict in Nova Scotia, stretching from Halifax to Guyborough. This district generally comprises a rolling till plain, typically with gravelly and stony soils, and is underlain with rocks from the Halifax and Goldenville formations. This eco-district features drumlins scattered throughout but has three distinct drumlin groupings that align with different watersheds: the Sackville River, Tangier River, and Moser River watersheds.

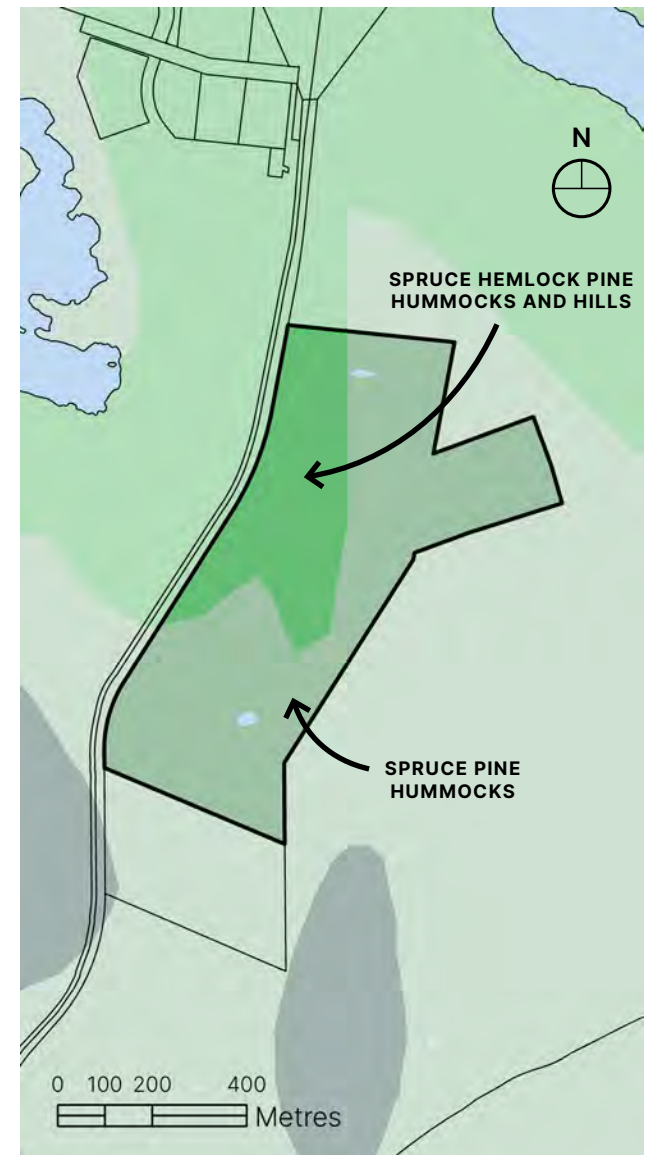
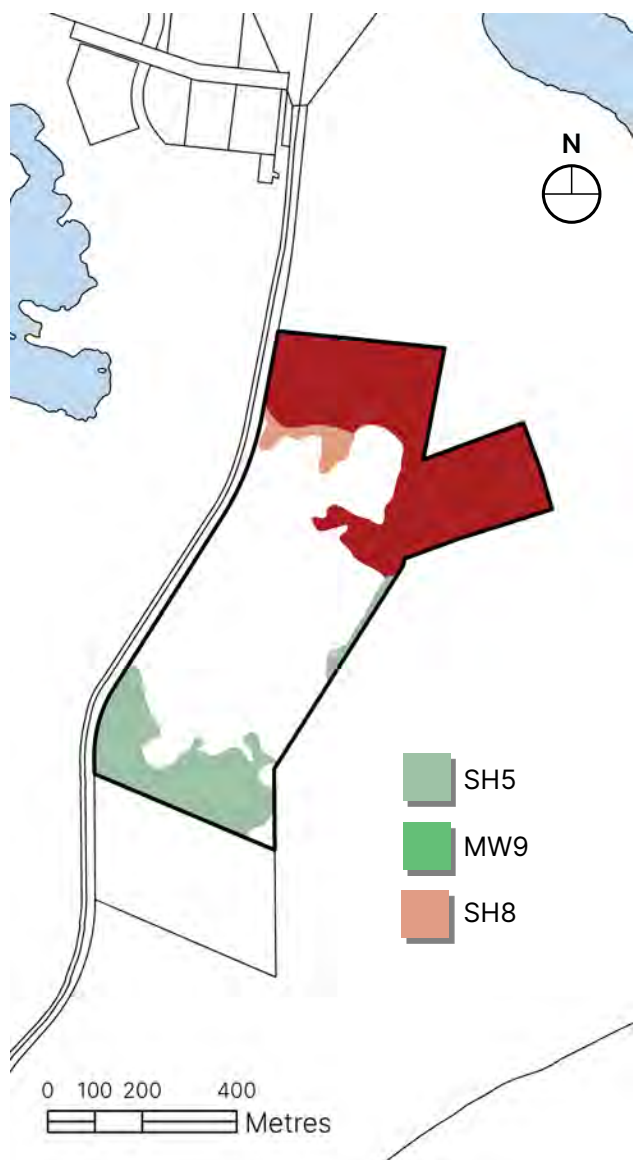


Figure 19 — Ecoelement Map



In the Eastern Interior Ecodistrict, the soil depth is strongly linked to the type of forest that will grow in the area (Neily, et al., 2017). Spruce Pine Forest Groups are typically found in areas with less nutrient-dense soils. Spruce hemlock forest groups in nutrient-medium soils and Tolerant hardwood forests in soils with fewer nutrients. Within Ecodistrict 440, the HEC is situated within the Spruce Hemlock Pine Hummocks and Hills and Spruce Pine Hummocks ecoelements (see figure 17). These elements typically refer to soft/mixedwood forests of spruce, pine, hemlock, birch and red maple), with the spruce pine on more dry to moist, nutrient poor soils and Spruce Hemlock on more fresh-moist, nutrient medium soils. Hummocky terrain is a characteristic of both elements, however the Spruce Hemlock Pine element is also characterized as being hilly.

The information from the ELC is meant to be interpreted in tandem with the Forest Ecosystem Classification (FEC) Field Guide, most recently updated in 2022. This report allows user to determine the various Vegetation Types (VTs) and Soil Types (STs) for tracts of land based on the composition of the forests, soils, and understory vegetation on the HEC lands. The VTs for the individual forest tracts of the ECGC were determined using the FEC, along with the NSDNRR forest stand data. These can be seen in Figure 18 and are as follows listed below. In addition to the VTs highlighted the VT WC2 has been included in this section as due to the many wetlands or wet areas in the forested areas on HEC lands many of the forested areas around these features have a moister environment and soils aligning more with the WC2 soil type, and thus present features characteristic of this VT.

Spruce Hemlock Type 5b (SH5b)

Red spruce – Balsam fir (Balsam fir variant)/
Schreber's moss – Stair-step moss

The SH5 (VT) is a closed canopy Acadian forest with an overstory dominated by red spruce, and varying levels of balsam fir. The SH5b variant is typically found on zonal sites across Nova Scotia, it is distinguished by a more significant presence of balsam fir, where it comprises more than 26% of the canopy.

The overstory of SH5b consists primarily of red spruce, with balsam fir, and sometimes red maple, although red maple tends to be less prevalent. Other tree species, including black spruce, white pine, white birch, and yellow birch, may appear with low cover. Hybrid spruce can be found where soil moisture and nutrient availability indicate a transition between azonal and zonal conditions. Regeneration of red spruce, balsam fir, and red maple is common, while the understory remains sparse due to low light penetration. Common upland forest flora includes wild lily-of-the-valley, goldthread, and bunchberry, and the forest floor is often covered by a needle carpet, with mosses like Schreber's moss and stair-step moss.

This VT typically develops on coarse-textured more stony fresh to moist, nutrient-medium soils of glacial origin. It is a mid-successional forest type, often originating from advanced regeneration after disturbance, or from early-successional vegetation. Red spruce's long lifespan allows it to persist in the understory, while balsam fir cycles through the canopy, creating a multi-cohort structure and enhancing habitat complexity.

SH5b supports many species the cycling of balsam fir increases vertical structure, promoting biodiversity. South-facing slopes are used by deer in winter, and sapling stages provide habitat for snowshoe hares.

Figure 20 — Vegetation Type Map

Creeping rattlesnake plantain, is the only species of conservation concern that has been documented in this VT.

Mixedwood Type 9 (MW9)

White birch – Red maple/
Lambkill – Huckleberry

The MW9 VT is dominated by black spruce in the overstory, with red maple contributing a significant portion of the canopy. This mixedwood forest has moderate canopy closure, allowing for a relatively diverse herbaceous plant community compared to other black spruce-dominated VTs. White birch, balsam fir, hybrid red/black spruce, and occasionally white pine, can also be present. The shrub layer is well-developed, featuring species like lambkill, lowbush blueberry, and regenerating black spruce and balsam fir. Herbaceous plants such as bracken, bunchberry, and sarsaparilla are common, while bryophyte cover is low due to abundant leaf litter. MW9 typically establishes after stand-replacing disturbances like fire, windthrow, or harvesting and occurs on fresh to moist, nutrient-poor soils across Nova Scotia.

This VT often forms even-aged stands shaped by nutrient limitations and disturbance regimes. In the absence of further disturbance, it may transition to softwood forests dominated by black spruce and white pine or to mixedwood forests with white pine, red maple, and red oak, particularly in western Nova Scotia. Ecologically, MW9 provides unique habitat features, such as old man's beard lichen used by northern parula and deer, and supports a broader range of species when found on slightly richer upland ecosites. Its prevalence across the province makes it an important component of Nova Scotia's forest landscapes.

Spruce Hemlock Type 8 (SH8)

Balsam fir/ Wood fern/
Schreber's moss

The SH8 VT is a closed canopy forest dominated by balsam fir, with some red maple, spruce and birch species in the overstory. The understory is sparsely developed, with balsam fir regeneration being prominent. Shrubs like mountain holly, wild raisin, and mountain ash are present, while common herb species include evergreen wood fern, starflower, wild lily-of-the-valley, bunchberry, and goldthread. The bryophyte layer is often dense, featuring species such as Schreber's moss, stair-step moss, and wavy dicranum.

SH8 is typically found on fresh to moist, nutrient-poor to medium soils of glacial origin, and is common in mainland Nova Scotia and the Cape Breton lowland. This VT is an early to mid-successional forest type where balsam fir, being shade-tolerant, persists throughout succession. It typically develops after stand-replacing disturbances like insect outbreaks, windthrow, or harvesting. Eventually, it may transition to later stages dominated by species like red spruce, white spruce, hemlock, and yellow birch. Balsam fir's short lifespan creates abundant coarse wood material, providing habitat for smaller fauna and promoting nutrient recycling. Mature forests in SH8 offer breeding and thermal habitats for various species, including important lichens like old man's beard.

Wet Coniferous Type 2 (WC2)

Black spruce/ Lambkill - Labrador tea/
Sphagnum

The WC2 Vegetation Type (VT) is a nutrient-poor, coniferous forest dominated by black spruce, found

in poorly drained, acidic soils, such as ST 14,7, and 4. This VT is characterized by low to moderate canopy cover, allowing for a dense understory of shrubs and sphagnum moss. It is the most acidic black spruce forest in Nova Scotia and persists as an edaphic climax, shaped by challenging HEC lands conditions.

The overstory is primarily black spruce, with stunted trees in wetter or younger stands. The shrub layer is thick, including lambkill, Labrador tea, rhodora, and wild raisin. Herbaceous plants like creeping snowberry and goldthread are common, while the forest floor is dominated by sphagnum moss, including species such as red fat-leaved sphagnum, which indicates poor drainage.

WC2 typically occurs on flat, poorly drained areas with low nutrients, often underlain by glacial tills or peat such as ST 14,7, and 4. These sites have minimal surface water flow and compacted soils, limiting root development. Succession in WC2 is shaped by

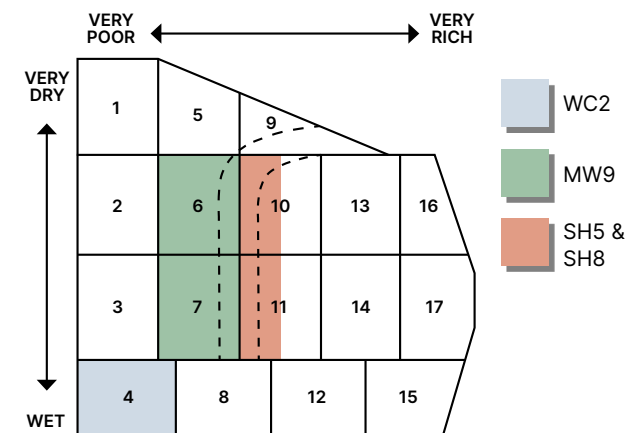


Figure 21 — Edatopic grid showing relative moisture and nutrient regimes for the Acadian Forest Macrogroup based on the VTs and STs.

HEC lands limitations like soil saturation. Windthrow and uprooting are common disturbances, with fire playing a minor role. This VT typically regenerates through vegetative layering and does not shift to other vegetation types after disturbance.

Ecosites represent the conjunction between the VT and ST, connecting them with the nutrient and moisture systems in the province identified in the ELC. The nutrient and moisture regimes associated with a particular ecosites are vital in determining what VTs can naturally grow within the bounds of that unit, providing insight into tree and plant species suitability, successional pathway prediction, wildlife habitat analysis, and biodiversity considerations. The forest habitat is a part of the Acadian Forest Macrogroup, within this macrogroup, the forest FEC ecosites identified are the azonal ecosites: AC4 Wet-Very Poor / Black spruce-Tamarack in the wet areas on HEC lands, and range from AC6 Fresh-Poor / Black spruce-White pine, AC7 Moist-Poor / Black spruce-White pine, AC10-Fresh-Medium / Red spruce-Hemlock, AC11- Moist-Medium / Red spruce-Yellow birch in the forested areas. These ecosites are shown in the Edatopic grid in Figure 19, which shows the moisture and nutrient regimes for the Acadian Forest Macrogroup.

1.4.9 — HEC LANDS VISIT

Pages 34 to 38 show HEC lands photos from a field reconnaissance that was conducted on August 28, 2023 by Davis Macintyre & Associates as apart of the Halifax Exhibition Redevelopment Archaeological Study (Appendix E). Figure 22 shows the HEC lands with aerial imagery from 2023 overlay with the forest stand outlines, wetlands and watercourses along with numbers that correlate with the approximate locations on the HEC lands that the photos on the following pages were taken.

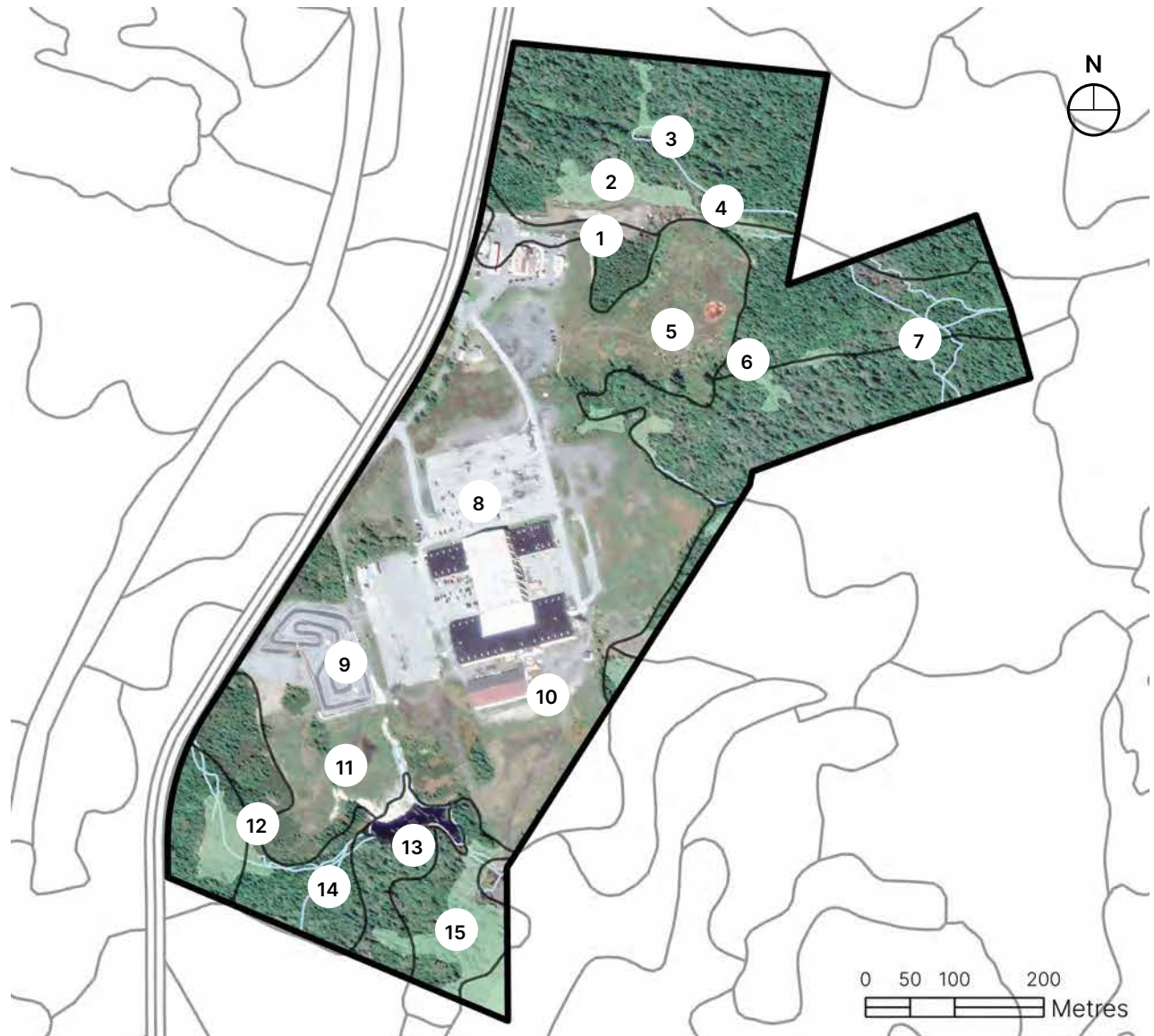
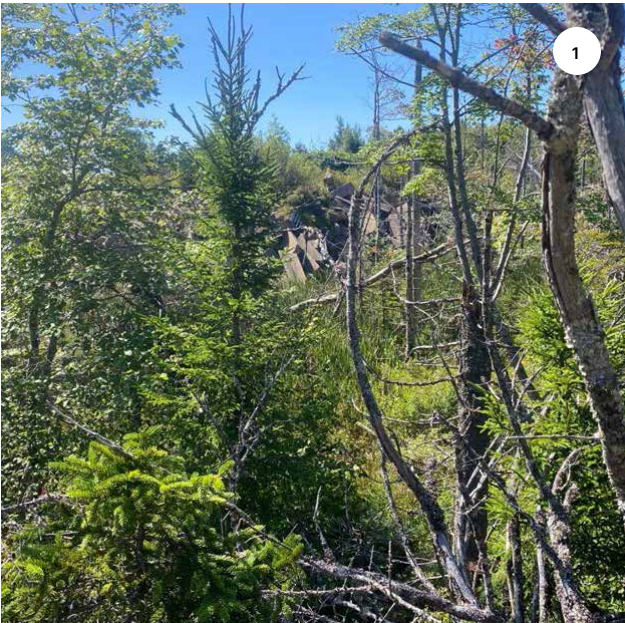


Figure 22 — HEC lands Visit Map



Large wetland created from infilling with standing water.



A mixture of not yet revegetated areas of ongoing infilling, and semi-mature to mature trees, with a mossy or shrubby understory.



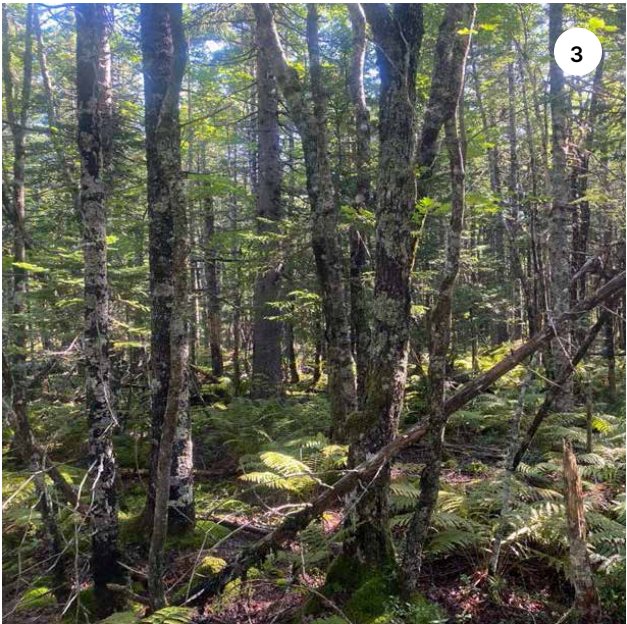
Large blowdown is also present along the edges of more open wetland areas.



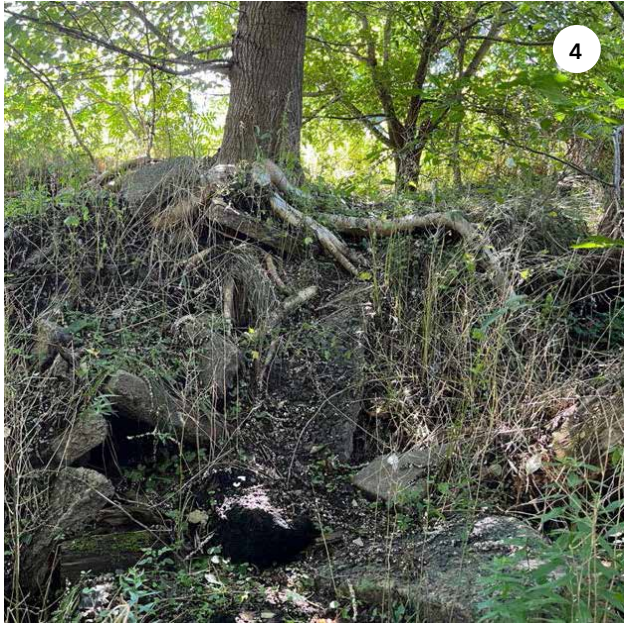
Pond with aquatic vegetation.



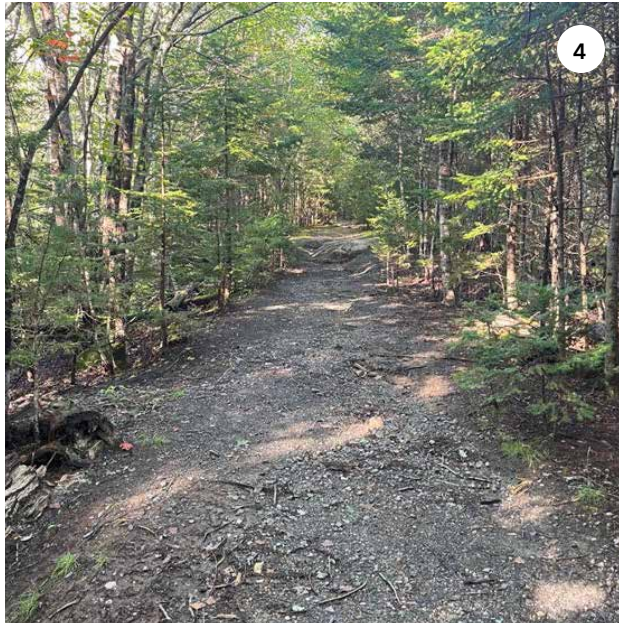
Dense patches of shrubs like rhodora and Labrador tea.



More open and mature forest with a moss or fern understory.



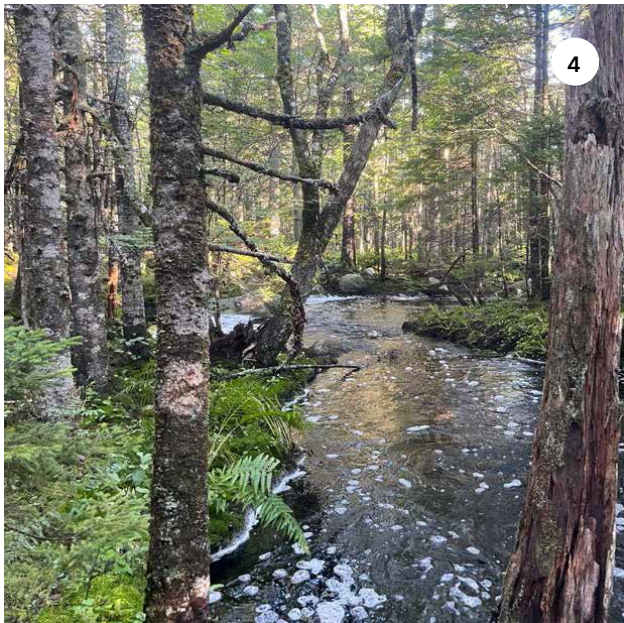
A mature tree growing on top of a pile of fill.



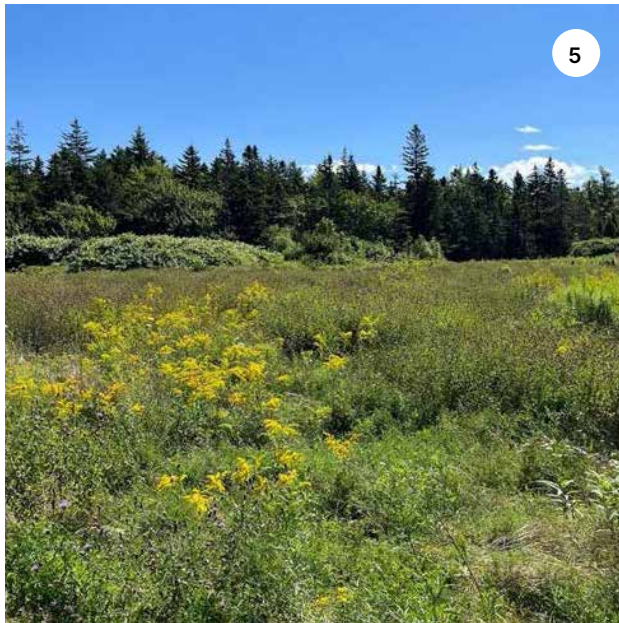
Gravel trail over a water pipeline that connects to the Long Lake Pipeline Trail.



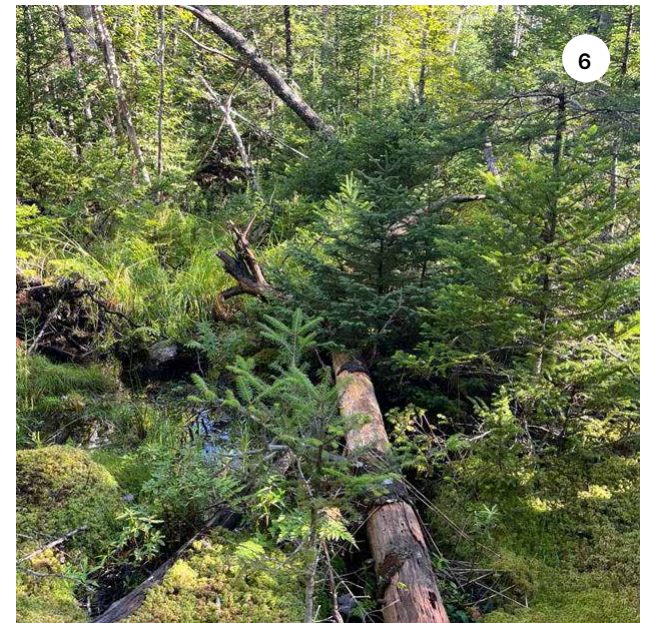
A culvert and stone-lined ditch, with some high and drier terrain around it.



Beaver Dam Brook, a watercourse that runs through the Northeast branch, with some erosion and sandy gravel noted along the bank.



Tall grass, goldenrod, and clumps of Japanese knotweed growing on top of an extensive area of fill.



Low and wet terrain, characterized by spruce, moss, ferns, with standing water and wetland.



Semi-mature to mature mixed wood forest.



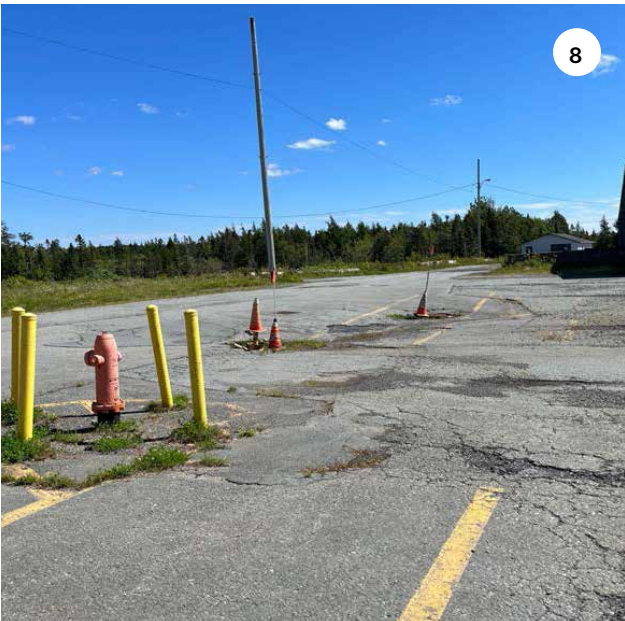
In lower areas, signs of scouring were observed, suggesting these lower areas are prone to flooding.



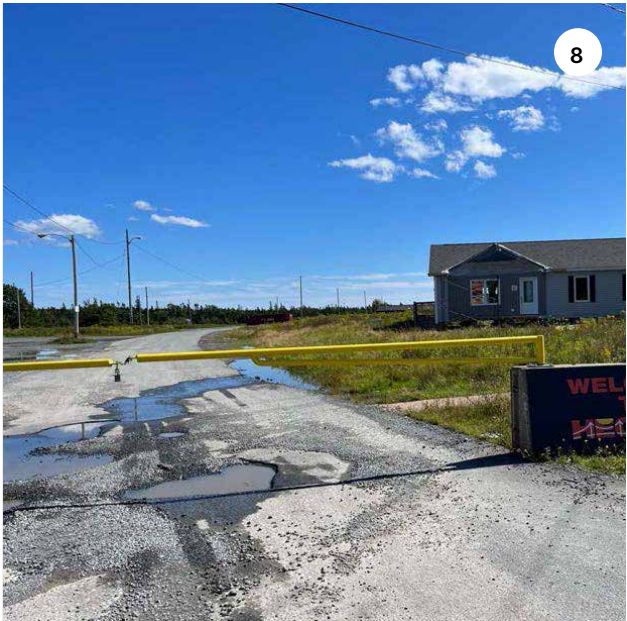
Cut granite blocks and parts of pipeline infrastructure were observable in the streambed.



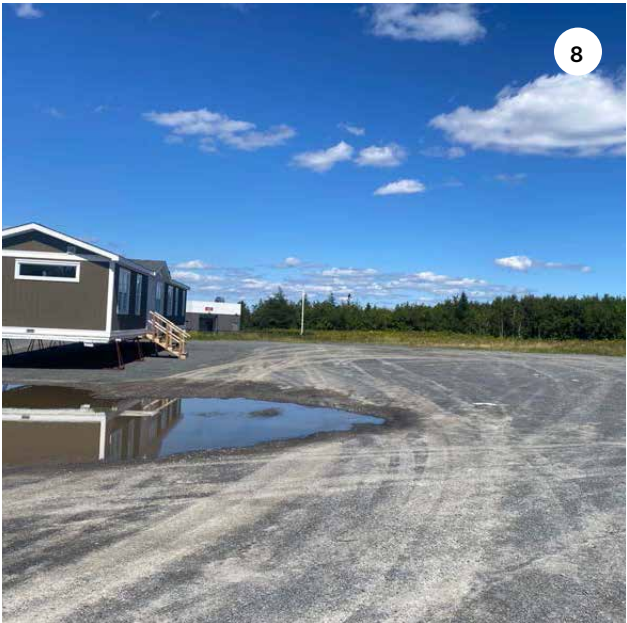
A possible stone abutment was also noted in the bank on the south side.



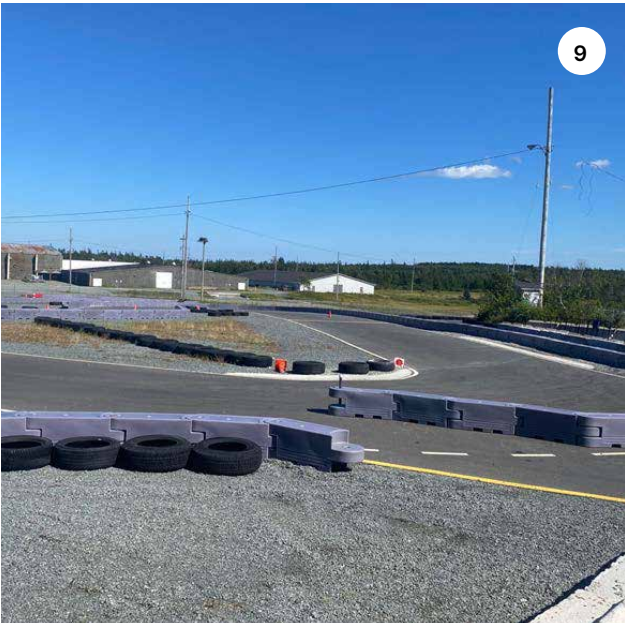
The middle contains extensive past disturbance, including infilling, standing buildings, and parking lots, along with associated utilities.



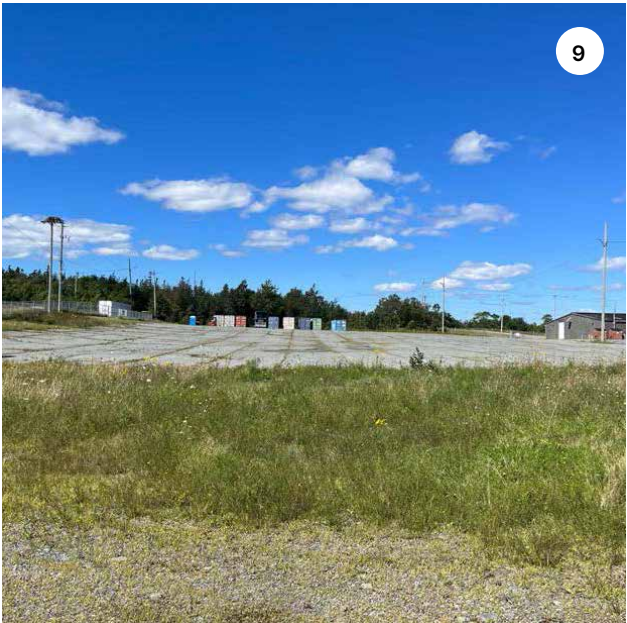
Area has been extensively disturbed and infilled. A show home is also featured on the right.



Tall grass field in the distance, a show home, and a gravel parking lot.



Fenced in racetrack to the west of the Halifax Exhibition Centre.



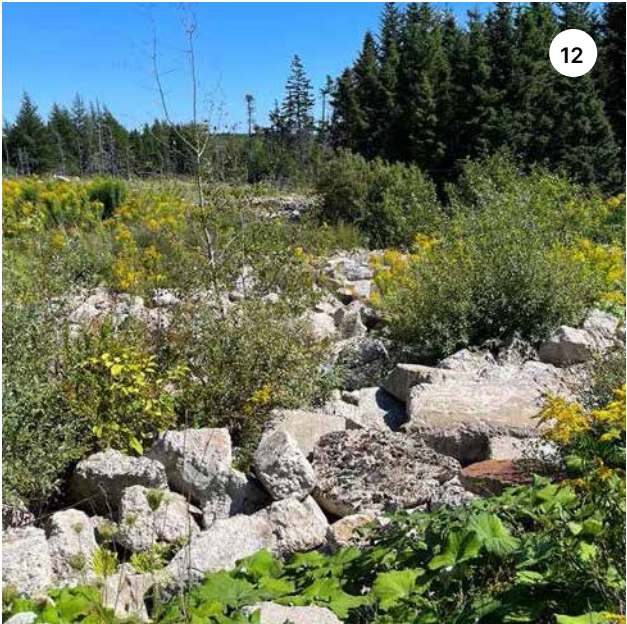
View from of the parking lot between the racetrack (left) and Halifax Exhibition Centre (right).



Large gravel parking lot and grass covered infilled area.



South of the Halifax Exhibition Centre complex is a large grass and goldenrod covered infilled area.



Large concrete block fill, with dense vegetation and goldenrod covering the fill.



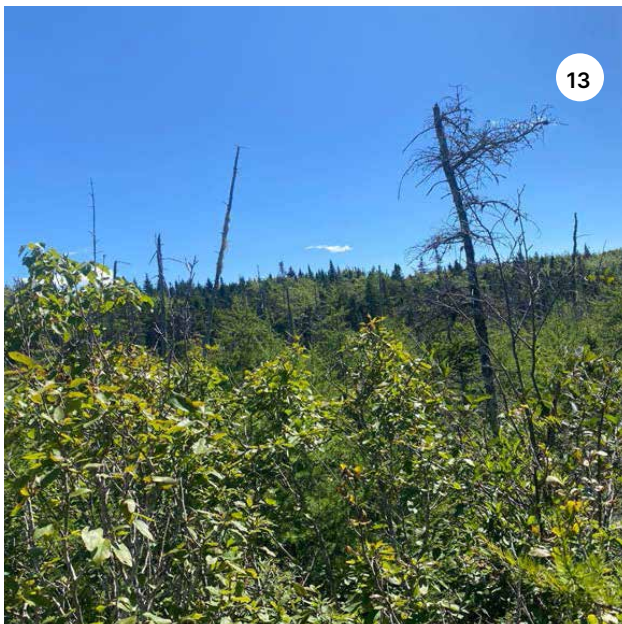
The edge of rock fill, onto a low wet spruce forest.



The steep and rocky edge of the infilling in the south end, with a wetland and drainage watercourse running along the base of the fill.



A large pond of standing water in the south end of the HEC lands.



In the southeast corner, a large bog is present, surrounded by low, wet terrain with dense shrub cover.



A recent skidder trail was present. Tree cover is young to semimature trees, with cut stumps indicating past logging activity in the area.



Part of the large wetland area in the south end of the HEC lands.

1.4.10 — THE DISCUSSION

The analysis of the forest ecology HEC lands highlights the interplay between ecological classification, vegetation diversity, and the potential impacts of development on forested areas.

Although much of the HEC lands are classified as urban or anthropogenically altered, the forested areas provide valuable ecological services, including carbon sequestration, habitat for native species, and water regulation. The ecological emphasis classification underscores the importance of responsibly preserving and managing these forested areas, especially given the HEC land’s location within a Halifax Water Source Protection Area.

Potential development impacts on forest ecosystems should be minimized through maintaining connectivity with surrounding natural areas, and incorporating buffers to reduce edge effects. Additionally, preserving older forest stands and natural regeneration processes can support biodiversity and align with regional conservation goals.

The HEC lands is a mix of disturbed and relatively undisturbed land, characterized by rocky, wet, and undulating terrain. It includes dense shrub patches (like rhodora and Labrador tea), mossy or fern-filled understory, and semi-mature to mature mixed wood forests showing signs of past logging. The area has experienced significant disturbance, including infilling, dense young regrowth, and features such as stone-lined wells, foundations, roads, and midden sites. South of these features, large wetland areas with standing water and ongoing infilling are present, with pockets of Japanese knotweed and tall grass fields in older infilled sections.

The northeastern portion is less impacted, with

forested landscapes interrupted by a gravel trail and remnants of an old water pipeline. The terrain here is low and wet, with standing water and wetland, while higher ground to the north of the Beaver Dam Brook offers drier conditions and elevated potential for archaeological resources. Erosion and scouring were observed around certain areas, particularly near the brook.

Recommended Mitigation Strategies

- Retain existing forest stands where possible.
- Incorporate green infrastructure, such as wildlife corridors and naturalized stormwater systems, to harmonize development with ecological priorities.
- Avoid clear-cutting or other intensive clearing methods that could disrupt the HEC land’s ecological balance.
- Monitor the forest health, soil conditions, and hydrological systems to identify and address potential impacts from development.
- Use adaptive management approaches to ensure long-term sustainability of the HEC land’s natural features.

1.4.11 — CONSTRAINT SCORING

The constraint scoring for the HEC lands was based on the forest ecology features used in the stands development class and land use data. As the forests are scored individually in the 2.7 - Species at Risk section for their habitat potential this constraint scoring focused on their development class. The development class was used because it provides an indication of the age of the forest stands and their possible ecological significance. Within the NSNDRR Forest Inventory Database development class dataset was used over the maturity dataset as the maturity dataset has not been made publicly available and is restricted for internal use by the NSNDRR.

Non-forested areas or new forests with an

establishment development class were considered less constrained and scored a 1. More established forests, such as early mature forests, were given a score of 2 and considered moderately constrained. Late mature and Multi-Age/Old Growth Forests were given a score of 3, indicating that they were the most constrained as they have the potential to be the most ecologically diverse and old forest stands.

Features	Assigned Score
Cleared/non-forested Establishment	1 - Less Constrained
Early Mature	2 - Moderately Constrained
Late Mature Multi-Aged/Old Forest	3 - Highly Constrained
TOTAL POTENTIAL SCORE	1-3

Table 6 — Forest Ecology Constraint Scoring

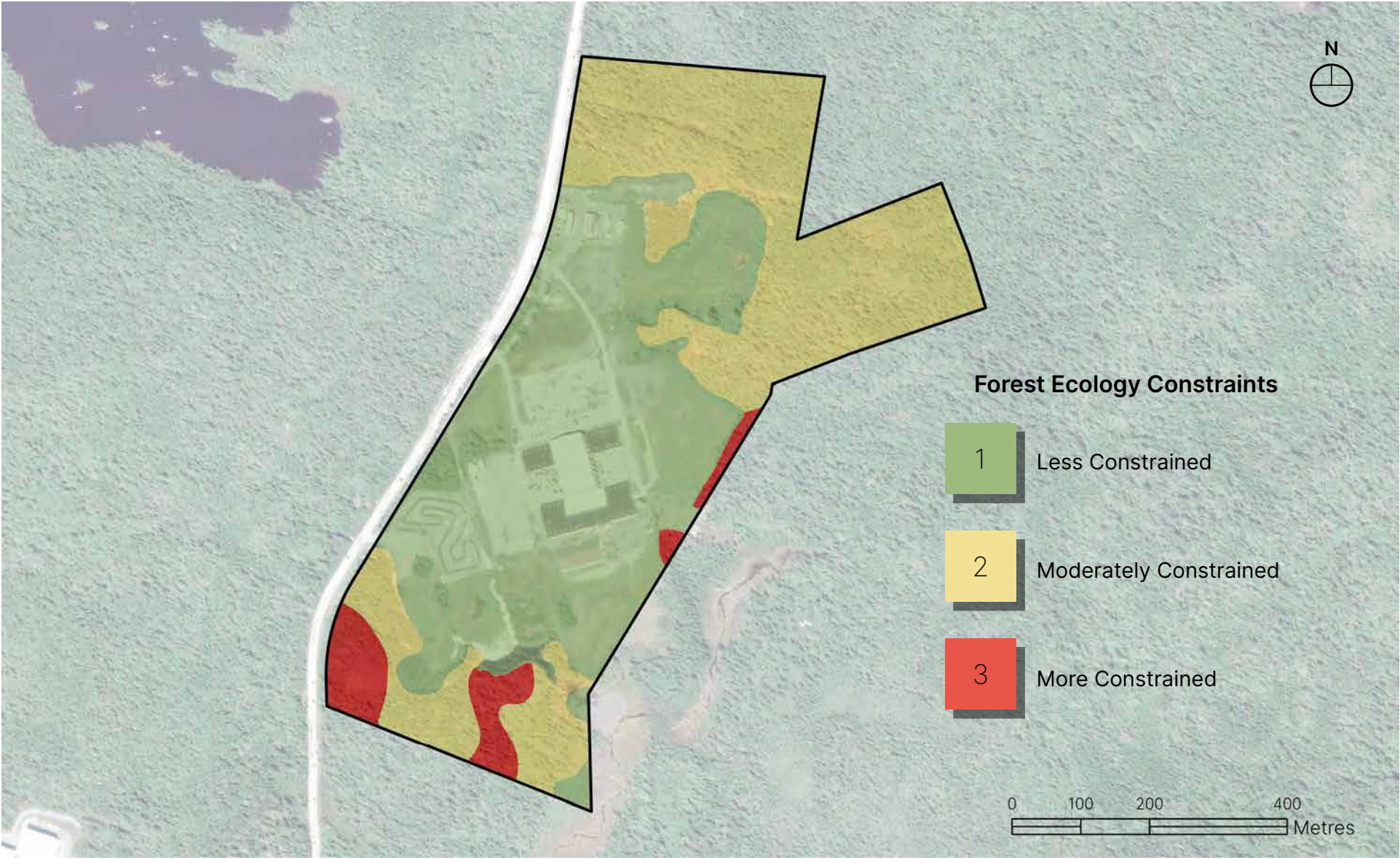


Figure 23 — Forest Ecology Constraints Map

1.6 — Species At Risk

METHODS

Species At Risk (SAR) were identified by searching through the databases maintained by the federal government under the Species At Risk Act (SARA) and the provincial government under the Nova Scotia Endangered Species Act (NS ESA). A data report was also commissioned by the Atlantic Canada Conservation Data Centre (AC CDC) to identify recorded observations of SAR in and around the HEC lands (See Appendix D). The AC CDC maintains a database of sightings and observations of rare and/or endangered species within the Maritimes. The report provides an inventory of these observations around a HEC lands, giving more context to the review of the SAR. Individual species were identified for relevance through an analysis of their range, habitat, and threats as they pertained to the HEC. In addition to the species that the AC CDC recorded near the HEC lands, other species listed in the NS ESA whose preferred habitat is similar to the habitats on the HEC lands have also been listed. Species habitat data from the Provincial Landscape Viewer, and the Critical Habitat for Species at Risk National Dataset, and other available habitat predicting datasets were also used during this process. There is a full table of all the current NS ESA species and likelihood of presence on the HEC lands in Appendix C. No biological or avian inventory of the HEC lands was completed.

1.5.1 — OVERVIEW

This section focuses on any species with a status of Special Concern, Vulnerable, Threatened, or Endangered by the Nova Scotia Endangered Species Act (NS ESA), the Federal Species at Risk Act (SARA), or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and select Species of Conservation Concern (SOCC) species. SOCC is defined as any species with an AC CDC S-rank of S1 (Critically Imperilled), S2 (Imperilled), or S3 (Vulnerable) and not otherwise defined as SAR. Tables 7 and 8 on pages 42-43 show the SAR and SOCC that have recorded sightings within the HEC lands and the surrounding area within 5km of the HEC land's boundary. This table shows the species' COSEWIC, SARA, and NS ESA ranking, as well as the AC CDC classification. Figure 22 shows this data visually and the placement of the species sightings within close

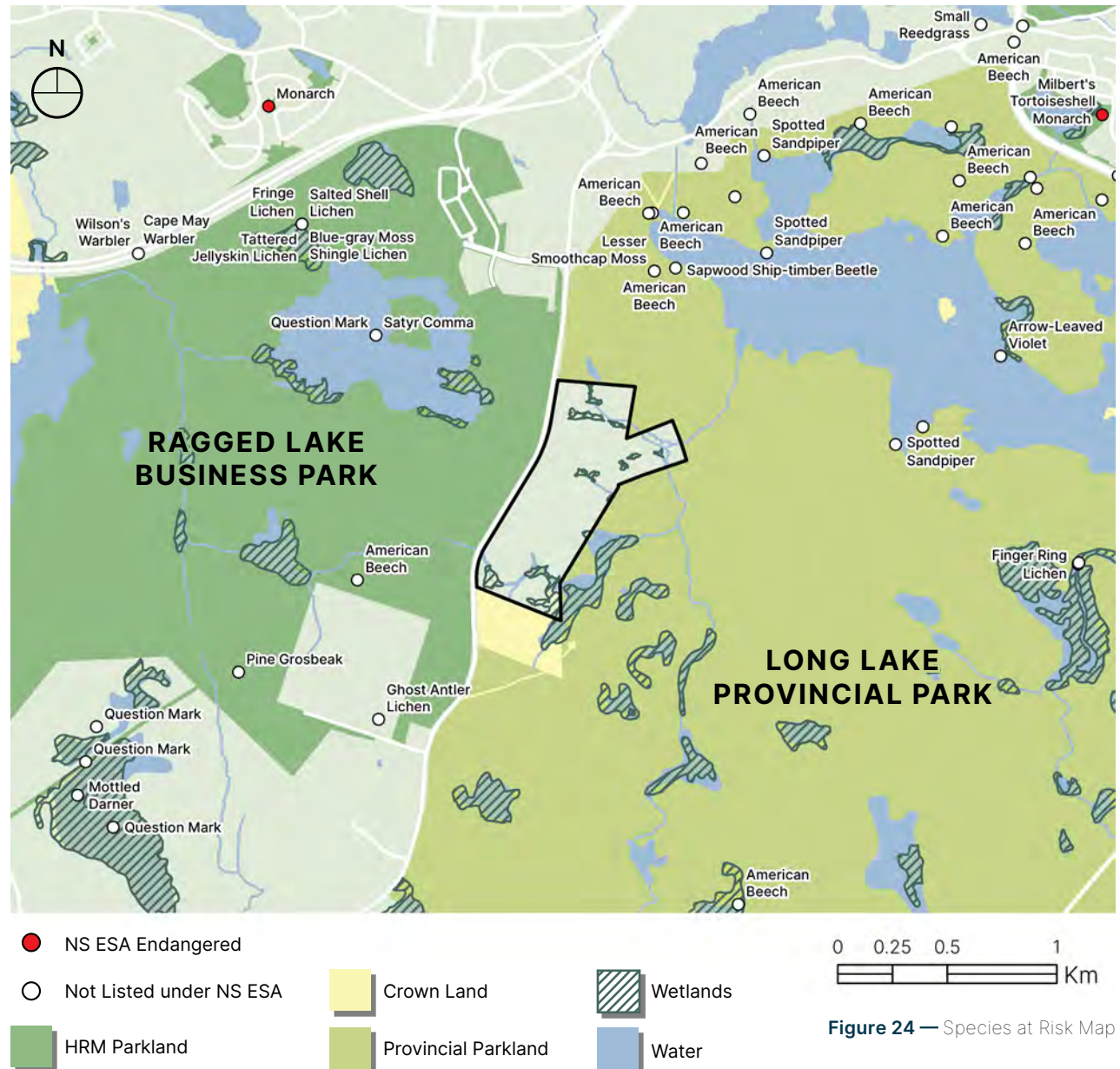


Figure 24 — Species at Risk Map

Table 7 — SAR within 5 km of the HEC lands.

Scientific Name	Common Name	COSEWIC	SARA	NS ESA	AC CDC	RANKING
<i>Anguilla rostrata</i>	American Eel	TH	Not Listed	Not Listed	S3N	EN - Endangered TH - Threatened VU - Vulnerable SC - Special Concern
<i>Riparia riparia</i>	Bank Swallow	TH	TH	EN	S2B	
<i>Hirundo rustica</i>	Barn Swallow	SC	TH	EN	S3B	
<i>Bucephala islandica</i> pop. 1	Barrow's Goldeneye - Eastern Population	SC	SC	Not Listed	S1N, SUM	
<i>Pecten plumbea</i>	Blue Felt Lichen	SC	SC	VU	S3	
<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	EN	EN	EN	S1	
<i>Cardellina canadensis</i>	Canada Warbler	SC	TH	EN	S3B	
<i>Chordeiles minor</i>	Common Nighthawk	SC	SC	TH	S3B	
<i>Chrysemys picta picta</i>	Eastern Painted Turtle	SC	SC	Not Listed	S4	
<i>Antrastomus vociferus</i>	Eastern Whip-Poor-Will	SC	TH	TH	S1?B	
<i>Contopus virens</i>	Eastern Wood-Pewee	SC	SC	VU	S3, S4B	
<i>Coccythraustes vespertinus</i>	Evening Grosbeak	SC	SC	VU	S3B, S3N, S3M	
<i>Bombus bohemicus</i>	Gypsy Cuckoo Bumble Bee	EN	EN	EN	S1	
<i>Danaus plexippus</i>	Monarch	EN	SC	EN	S2?B, S3M	
<i>Contopus cooperi</i>	Olive-sided Flycatcher	SC	SC	TH	S3B	
<i>Euphagus carolinus</i>	Rusty Blackbird	SC	SC	EN	S2B	
<i>Chelydra serpentina</i>	Snapping Turtle	SC	SC	VU	S3	
<i>Bombus terricola</i>	Yellow-banded Bumble Bee	SC	SC	VU	S3	

AC CDC SUBNATIONAL RARITY RANK OF TAXON

- S1 - Extremely rare in province
S2 - Rare in province,
S3 - Uncommon in province

SU - Unrankable currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

B - Breeding Conservation status refers to the breeding population of the species in the nation or state/province.

N - Non-breeding conservation status refers to the non-breeding population of the species in the nation or state/province.

M - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention.

? - Inexact or Uncertain

Table 8 — Location Sensitive Species

Scientific Name	Common Name	SARA	NS ESA	Know within the Study Area?
<i>Alces alces americana</i>	Moose – Mainland population	<i>Not Listed</i>	EN	Possibly
<i>Fraxinus nigra</i>	Black Ash	<i>Not Listed</i>	TH	No
<i>Emydoidea blandingii</i>	Blanding's Turtle - NS pop.	EN	EN	No
<i>Glyptemys insculpta</i>	Wood Turtle	TH	TH	Possibly
<i>Falco peregrinus</i> pop. 1	Peregrine Falcon - anatum/tundrius pop.	<i>Not Listed</i>	VU	Possibly
Bat Hibernaculum or bat species occurrence	Habitat/shelter for bat species	EN	EN	Possibly
Snake hibernaculum	Habitat/shelter for snake species	TH	TH	No

proximity to the HEC lands.

1.5.2 — SPECIES IDENTIFICATION

No species at risk were identified on the HEC lands during site visits or in the AC CDC data, therefore, this section will look at SAR identified near the HEC lands that have a similar habitat to that found on the HEC lands as well as other NS ESA species not identified by AC CDC report but that could have potential habitat on the HEC lands. This process included analyzing all 63 of the endangered species that are legally protected under the Nova Scotia Endangered Species Act (NS ESA) and classifying them based on their relevance to the HEC lands and the likelihood that they would be affected by any future development or disturbance on the HEC lands. The full list of species and their relevance to the HEC lands can be found in Appendix C.

Species listed by the AC CDC that have been recorded within 5 km of the HEC lands that have either a Federal or Provincial SAR status. These

species are listed in Table 7.

American Eel (*Anguilla rostrata*)

The American eel is found throughout the western Atlantic, from the Caribbean to Greenland and Iceland, including Canada's fresh water, estuaries, and marine waters connected to the Atlantic Ocean. These habitats include rivers, lakes, estuaries, and coastal areas, which are essential for different stages of their life cycle. The species relies on unobstructed waterways to migrate between freshwater and the ocean, a critical process for their survival.

American eels face significant threats, with habitat alteration being one of the most pressing. Dams and hydroelectric turbines disrupt their migration routes, fragmenting habitats and causing mortality. Over harvesting through fisheries also pressures the population, alongside contamination from pollutants and exposure to parasites. These combined threats have led to population declines in some areas, posing risks not only to the species itself but to the broader aquatic ecosystems where they play an important ecological role.

In Nova Scotia, the American eel population is deemed to be secure as it is not included in the NS ESA species list. Although the American eel is designated as being Threatened under the COSEWIC, this is a result of the American eel's declining population being seen elsewhere in Canada. The AC CDC database lists one observation of American eels 4.15 km to the northeast of the HEC lands. This sighting was in Horseshoe Island Park in the Halifax Northwest Arm. This population was spotted in a saltwater environment and given that the HEC lands are located inland and there are no major waterbodies or watercourses on the HEC lands it is unlikely that there are any American eel within the HEC lands.

Bank Swallow (*Riparia riparia*)

The bank swallow a small insectivorous songbird that forms colonies by excavating nesting burrows in vertical banks composed of sand or silt, often found along rivers, lakes, or artificial structures like road cuts and sand pits. Though widespread across North America, the bank swallow has experienced sharp population declines, with surveys indicating a 98% decrease over four decades due to habitat loss and

other pressures.

The species is listed as Threatened under SARA and COSEWIC, and Endangered under the NS ESA. Critical habitat includes nesting areas in steep slopes (76–1050) and adjacent foraging habitats within 200–500 meters of nesting grounds, such as wetlands, grasslands, and agricultural fields that support flying insect populations. However, erosion control projects, aggregate excavation, and agricultural land-use changes have significantly reduced suitable nesting sites. The decline in insect prey due to pesticide use and unknown threats during migration and on wintering grounds have also contributed to the bank swallow's population decline.

While critical habitat for the species has been mapped in Nova Scotia, the HEC lands do not fall within these zones. However, the AC CDC records indicate their presence within 5 km of the HEC lands, with one recording of the species 4.4 km Northwest of the HEC lands by Susies Lake. Although there are some wetland areas on the HEC lands that would support foraging for the bank swallow, the lack of sloped areas exceeding 760 (400% rise) indicate a low possibility of any bank swallow habitat being found on the HEC lands.

Barn Swallow (*Hirundo rustica*)

The barn swallow is a medium-sized aerial insectivore, that is historically known to nest in natural features like cliffs and caves. The species has adapted to human environments, favouring anthropogenic structures such as barns, garages, sheds, and bridges for nesting. This adaptation has tied its breeding success to rural and agricultural landscapes, where open habitats like fields, shorelines, and wetlands provide abundant insect prey. Despite its adaptability, the Barn Swallow has experienced population

declines, with several threats contributing to its status as Species of Special Concern under COSEWIC, Threatened under SARA, and Endangered by the NS ESA.

Key threats to the barn swallow include habitat loss, agricultural intensification, and climate change, all of which reduce the abundance and quality of flying insect prey. Pesticides and pollution further exacerbate the decline in prey populations, impacting reproductive success and survival. In addition, changes in land use on wintering grounds, including the intensification of agricultural practices, likely contribute to habitat degradation. The species also faces challenges from road and rail infrastructure and urban development, which disrupt foraging and nesting habitats.

Critical habitat has not been officially designated under SARA, though anthropogenic structures in the surrounding areas near the HEC lands could provide potential nesting sites. Two records of barn swallows were reported 4.4 km of the of the HEC lands. While their critical habitat is less known, their nesting habitat is easier to predict. Given that the HEC lands has several structures such as the Halifax Exhibition Centre, gas bar, and other smaller buildings there are many structures around the HEC lands that could be suitable habitats for a barn swallow to nest. In addition, many tall poles and large light fixtures around the buildings and parking lots offer a horizontal surface for the swallow to nest. The HEC lands also provide a habitat that this species uses for foraging, as they frequent open lands, rivers, and wetland habitats increasing the possibility of the species presence.

Barrow's Goldeneye - Eastern Population (*Bucephala islandica* pop. 1)

Barrow's goldeneye is listed as Special Concern under the SARA and COSEWIC. This medium-sized sea duck is known for its distinctive white facial patch and dark, iridescent plumage. It primarily breeds in freshwater lakes and wetlands in western Canada, with a smaller, distinct population in eastern Canada, particularly in Quebec. During the winter, Barrow's goldeneye can be found along coastal areas, including estuaries and bays.

In Nova Scotia, wintering Barrow's goldeneye are typically observed in sheltered coastal waters where they feed on mollusks, crustaceans, and other aquatic invertebrates. Suitable habitats include rocky shorelines, harbours, and shallow waters with abundant food resources.

The AC CDC database lists one observation of Barrow's goldeneye 4.15 km to the Northeast of the HEC lands in Horseshoe Island Park, in the Halifax Northwest Arm. Similar to the American eel the species likes protected coastal environments and estuaries. The HEC lands are located inland, and while it does drain to the Atlantic Ocean, without direct coastal access or connections to coastal estuaries it is not suitable breeding or wintering habitat for the species.

Blue Felt Lichen (*Degelia plumbea*)

Blue felt lichen is a large, blue-grey cyanolichen characterized by its scallop-like, ridged appearance and prominent blue-black hypothallus that extends beyond the thallus margins. As a cyanolichen, it forms a symbiotic partnership with the cyanobacterium nostoc, which provides carbohydrates and fixes atmospheric nitrogen. Reproduction occurs through the release of spores from the fruiting bodies, which

must land on a suitable substrate and encounter compatible Nostoc to establish a new lichen. This species is most commonly found on the trunks of mature hardwood trees such as maple, ash, and yellow birch in cool, humid woodlands, often near streams, lakes, or in coastal suboceanic regions. While rare in New Brunswick and Newfoundland, the lichen is relatively common in Nova Scotia, representing a significant portion of its North American range. This species is listed as vulnerable under the NS ESA and a species of special concern under by SARA and COSEWIC.

Blue felt lichen is highly sensitive to environmental changes, particularly those affecting humidity and air quality. Threats to its persistence include forestry practices that reduce forest continuity, increase light levels, and lower humidity, as well as land development and logging of riparian habitats. Although riparian buffer regulations have helped maintain some of its habitat, policy shifts toward biomass harvesting and forest clearance for energy production may exacerbate habitat loss. Additional threats include air pollution, acid rain, climate change, and reduced fog frequency along Atlantic coasts, all of which can disrupt the delicate moisture regime essential for this lichen's survival.

Blue felt lichen was recorded three times within 5 km of the HEC lands, with roughly 3.8 km away by Peers Lake. Forest stands containing red maple, especially those adjacent to wetlands or the watercourse on the HEC lands, may have an elevated likelihood of containing blue felt lichen.

Boreal Felt Lichen - Atlantic pop. *(Erioderma pedicellatum)*

Boreal felt lichen is a unique and globally rare cyanolichen, notable for its symbiotic structure that combines fungal filaments with blue-green algae. This “leafy” lichen grows on the trunks or branches of balsam fir, black spruce, white spruce, and occasionally red maple trees. The lichen is long-lived, reproducing around 30 years of age. Its spores interact with algae found in liverwort plants on tree surfaces to form new individuals, making it highly dependent on specific environmental conditions. This dependence, combined with its sensitivity to acid rain and air pollution, underscores its vulnerability and potential as an indicator species for air quality.

This lichen's distribution has been drastically reduced, with its Atlantic population now restricted to Nova Scotia. Boreal felt lichen was historically documented at 46 sites in the province, however, today 13 individual lichens are known. These species are all at just three locations which are all in Halifax County. The Atlantic population has experienced a dramatic decline of over 90% in the past two decades. Globally, the boreal felt lichen exists only in Canada, with two disjunct populations: the boreal population on the island of Newfoundland and the Atlantic population in Nova Scotia. In Canada, it is listed as Endangered under COSEWIC, SARA, and the NS ESA. Typical habitats include northerly exposed forested slopes with consistently cool and moist conditions. These environments are often shared with moisture-loving plants such as sphagnum mosses and cinnamon fern. Habitat loss through deforestation and the effects of air pollution, including acid rain, threaten the lichen's survival. The acidic bark of spruce trees, a less favourable substrate, further compromises its resilience to pollutants compared to fir trees.

The boreal felt lichen's plight has garnered international attention. Referred to as the “panda bear” of lichens, its conservation has become a symbol for protecting fragile ecosystems. Despite the threats, cooperative efforts and international advocacy have highlighted the importance of habitat protection and pollutant reduction in preserving boreal felt lichen. Given the presence of north-facing slopes, especially along watercourses/drainage channels and wetlands, paired with the presence of balsam fir, black spruce, and red maple in the forest stands, any future development on the HEC lands should take extreme care in monitoring for the presence of boreal felt lichen prior to disturbing the landscape.

It should be noted that in the widely-cited predictive model for boreal felt lichen outlined in the “Heuristic Model for Identifying The Habitats of Erioderma Pedicellatum and Other Rare Cyanolichens in Nova Scotia, Canada” written by [Cameron and Neilly in 2008](#), it was found that forest stands dominated by balsam fir, located within 30km of the coast, and located near sphagnum-dominated wetlands had a significant probability of containing boreal felt lichen. Balsam fir is found in the majority of the forest stands on the HEC lands, making up of roughly 20-30% of the forest stand compositions which include mixture of tree maturities. According to the aspect data that we have of the HEC lands has variable slopes, however, of the forested slopes much of them are eastern to south facing. Additionally, referencing the Provincial wetland open data, the wetlands around the HEC lands are classified as tall shrub-dominated not sphagnum-dominated wetlands, however an in depth analysis of the composition of the wetlands on the HEC lands could show a higher sphagnum composition which, along with the presence of balsam fir, could increase the chance of the lichen being present.

Boreal felt lichen has been recorded once within 5 km of the HEC lands, 2.9 km Northwest of the HEC lands on HRM owned parkland north of Blueberry Lake. This sighting confirms that the species is in the general area and increases the likelihood that this species is located in the forests in and around the HEC lands. However, given the extensive forests around the HEC lands and that there are no sightings in the abutting Long Lake Provincial Park presence of the species in the HEC lands are less likely.

Canada Warbler (*Cardellina canadensis*)

The Canada warbler is a small and colourful songbird that sees nearly 80% of its global population breed in Canada. The species prefers wet, mixed deciduous-coniferous forests with a well-developed shrub layer for breeding but can also be found in riparian shrub forests. Within Canada, it is often found in forests containing red maple (*Acer rubrum*) stands, cedar and spruce swamps, aspen stands, mixed aspen/birch/fir forests, riparian woodlands, and densely forested ravines.

The species is listed as a Species of Special Concern under COSEWIC, Threatened under SARA, and Endangered under the NS ESA. It is thought that habitat loss and degradation on the South American wintering range is contributing to the long-term decline in Canada warbler populations. Within its Canadian breeding range, drainage of wet forests for urban development has also contributed to population declines.

The Canada warbler has been recorded three times 4.4 km Northwest of the HEC lands by Susies Lake. Although there are no closer sightings closer to the HEC lands, the presence of red maple along with spruce species, birch and fir in the forest stands around on the HEC lands indicate the presence of

suitable habitat within the HEC lands for the Canada warbler. The Canada warbler also prefers dense shrub areas and wet grounds for nesting, so it is possible that they live in the mapped forested wetland areas and around the riparian areas.

Common Nighthawk (*Chordeiles minor*)

The common nighthawk is a medium-sized aerial insectivore and the most frequently observed member of the nightjar family, recognized for its distinctive bounding flight, white wing bars, and nasal call. Active from dusk to dawn, the common nighthawk hunts flying insects. This species breeds across Canada, the United States, and parts of Central America, wintering in the lowlands east of the Andes in South America.

This species thrives in a variety of open and semi-open habitats, including forest clearings, prairies, and disturbed areas, as well as urban settings with flat, gravel-topped roofs. The common nighthawk is threatened by the decline of aerial insect populations due to pesticide use and human alteration of their habitat. Climate change, through altered precipitation patterns and an increased occurrence of extreme weather events, has also impacted common nighthawk populations. While its status under SARA and COSEWIC has been downgraded from Threatened to Special Concern due to stabilization in decline rates, ongoing habitat and prey availability issues remain critical for its conservation. In Nova Scotia the species is still listed as Threatened under the NS ESA.

The AC CDC data search identified four records of evening grosbeak within 5 km of the HEC lands, all 4.4 km of the HEC lands by Susies lake. The presence of both cleared areas and disturbed areas with gravel covered parking lots and clearings increase the likelihood of the common nighthawk within the HEC lands. These areas can mimic some of the disturbed

or post-fire landscapes nighthawks favour, providing flat, unobstructed areas ideal for nesting or roosting.

Eastern Painted Turtle (*Chrysemys picta picta*)

The eastern subspecies of the painted turtle (*Chrysemys picta*) is a small to medium-sized freshwater turtle known for adaptability and cold-water tolerance. This turtle species is listed as Special Concern under the federal SARA but not listed under the NS ESA. It is new to COSWIC as of 2018 and listed as a species of special concern in 2021, so the NS ESA status could change in the future. Much like the snapping turtle, the eastern painted turtle likes slow-moving, shallow, well-vegetated wetlands (swamps, marshes, ponds, fens, and oxbows) and water bodies (lakes, rivers, and streams) with many basking sites. This species is more adaptable than other wetland species as it is known to be sometimes found in areas disturbed by humans, such as urban ponds, farm ponds, impoundments, and water treatment facilities. For nesting, they generally like open, often south facing, and sloped areas with sandy loam or gravel substrate, usually within 1200m of aquatic habitat. They overwinter in shallow water with deep sediment. Juvenile survival is often low due to predation, but adult survival is high eastern painted turtles are subject to many threats including, but not limited to, road mortality, habitat loss, subsidized predators, introduced plant and animal species, climate change, fisheries by-catch, pollution, disease, and collection.

The AC CDC data search identified a observation of the eastern painted turtle by Ravenscraig Drive Park roughly 3.8 km east of the HEC lands. While the HEC lands feature several wetlands and watercourses the open body of water presents the highest likelihood for presence of the species at it offers connection to watercourses, wetlands, and vegetation. Additionally,

it the most open wet area allowing for basking sites. The eastern painted turtle could be in the other watercourses, however they tend to like slow moving streams that have many basking sites and many of the watercourses on the HEC lands are forested. The archaeological assessment observed that the watercourses in the northeast of the HEC lands are were fast-moving and thus less preferable for the species.

Eastern Whip-Poor-Will (*Antrostomus vociferus*)

This nocturnal bird is named for its distinctive, repetitive call that echoes through forested landscapes during breeding season. The species is primarily found in open woodlands, especially those with sandy soils and sparse understory, which provide suitable nesting and foraging habitats.

The eastern whip-poor-will is listed as Species of Special Concern under COSEWIC and Threatened under the SARA and the NS ESA. In Nova Scotia, the eastern whip-poor-will typically inhabits open, dry deciduous or mixed forests, often with sandy or well-drained soils. They are commonly found in areas dominated by oak, pine, aspen or birch tree species as these trees often provide the open canopy structure and sparse understory that whip-poor-wills prefer for nesting and foraging. They tend to avoid dense forests, favouring areas where they can easily spot and catch flying insects at night as it relies on the presence of flying insects, such as moths and beetles, as a primary food source. Forest edges, clearings, and areas with scattered trees and shrubs also serve as ideal habitats.

The eastern whip-poor-will was recorded roughly 4 km east of the HEC lands in Mackintosh Run. While no confirmed nests have been recorded in the immediate

vicinity, potential habitat for the eastern whip-poor-will within the HEC lands, include the forest edges, and open grassy areas. However, the forests are denser and while there is some birch the other tree species that the eastern whip-poor-will prefers are not present making the forests less suitable for the species and reducing the likelihood of the species in the HEC lands.

Eastern Wood-Pewee (*Contopus virens*)

The eastern wood-pewee is a medium-sized flycatcher that is most often recognized by its distinctive, whistled “pee-ah-wee” song. Both sexes exhibit similar plumage, with greyish-olive upperparts and pale underparts, and are often seen perched upright in forested habitats. This species breeds in south-central and eastern North America, including southeastern Canada, and winters in northern South America. The eastern wood-pewee favours open forest, shrubby edges, and forest gaps in both its breeding and wintering ranges. Within Canada, it is commonly associated with the mid-canopy of mature deciduous and mixed forests, particularly in areas with canopy openings that allow for effective foraging.

Threats to the Eastern Wood-pewee are not well understood but are thought to include habitat loss and degradation on both breeding and wintering grounds, due to logging, urban expansion, climate change, forest fires, and agricultural expansion. Additionally, a decline in flying insect prey, and changes in forest structure due to over-browsing by white-tailed deer impact species populations. Other possible threats include urban development, forest management changes, and increased nest predation. This species is listed as Special Concern under COSEWIC and SARA, then Vulnerable under the NS ESA due to ongoing population declines, similar to other aerial insectivores.

AC CDC data includes two records of the eastern wood-pewee 4.4 km from the HEC lands. Although the threats to the eastern wood-Pewee are not well understood, its habitat seems to correspond to natural features found on the HEC lands, including mixed forests with mature forest stands. This species favours forest openings and edges making those areas of species importance to this species. In order to not jeopardize this species further loss of forest habitat and edge environments should be considered.

Evening Grosbeak (*Coccothraustes vespertinus*)

The evening grosbeak is listed as Special Concern under SARA and Vulnerable under NS ESA. This species typically nests in mature conifer stands and old mixed forests with a high proportion of balsam fir, white spruce, or trembling aspen. It prefers forest stands with varied structure and an open canopy as breeding habitat. evening grosbeaks are resident birds and may remain in their breeding range year-round. During winter, they are often attracted to areas abundant in seeds and berries, particularly those of Manitoba maple (*Acer negundo*), and frequently visit bird feeders stocked with sunflower seeds (*Helianthus annuus*).

Nova Scotia has 5.4% of the national evening grosbeak population. Their populations are known to fluctuate with spruce bugworm populations, which naturally go through 25-40-year cycles in Eastern Canada. Other noted threats to their populations are the reduction of mature and old-growth forests due to commercial forest management, changing climate conditions, and accidents when feeding off bird feeders and road salt.

The AC CDC data search identified one record of evening grosbeak within 5 km of the HEC lands,

roughly 3 km to the northeast of the HEC lands at Crowie Hill. The forest stands include almost all are mixed wood include balsam fir tree species which creates the potential for evening grosbeaks to nest in the area.

Gypsy Cuckoo Bumble Bee (*Bombus bohemicus*)

The gypsy cuckoo bumble bee is listed as Endangered under the SARA, COSEWIC, and NS ESA. Since 1991 the species has only been spotted in three provinces in Canada, Ontario, Quebec and Nova Scotia, with 18 specimens recorded in Nova Scotia according to the COSEWIC assessment in 2014. This species also known as the Ashton cuckoo bumble bee is an obligate social paraHEC lands, meaning it relies on other bumble bee species to complete its lifecycle. Females invade the nests of host species, particularly those in the subgenus *bombus*, such as the rusty-patched bumble bee (*Bombus affinis*) and the Yellow-banded bumble bee (*Bombus terricola*). After taking over the nest, the gypsy cuckoo bumble bee suppresses the host queen and uses the host workers to raise its own offspring.

In Nova Scotia, the presence of the gypsy cuckoo bumble bee is closely tied to the distribution and population health of its host species. Suitable habitats typically include areas with abundant flowering plants, open meadows, wetlands, and forest edges. The availability of diverse nectar and pollen sources is essential for both the host species and the adult gypsy cuckoo bumble bees.

Within the HEC lands, suitable habitat for host species may exist in forest clearings, along roadsides, and in areas with wildflowers. These environments provide foraging resources and potential nesting sites for host bumble bees, indirectly supporting the presence of

the gypsy cuckoo bumble bee.

The gypsy cuckoo bumble bee has been recorded roughly 3.7km away from the HEC lands, off Walcot Run Northeast of the HEC lands. Although no direct evidence of breeding has been reported within the HEC lands, if the presence of host species is found it would suggest the potential for the gypsy cuckoo bumble bee to occur. Conservation of host species and their habitats is critical for maintaining the population of this endangered species.

Monarch (*Danaus plexippus*)

The monarch butterfly is listed as Special Concern under the SARA and Endangered under the NS ESA. It is a migratory species that depends on milkweed plants (*Asclepias* spp.) as the sole food source for its larvae, while adults feed on nectar from a variety of flowering plants. In Nova Scotia, monarch larvae primarily feed on the introduced common milkweed (*Asclepias syriaca*) and the native swamp milkweed (*Asclepias incarnata*). Common milkweed is often found along roadsides and in sandy agricultural soils, while swamp milkweed grows in wet habitats near streams or lake shores. Both milkweed species are uncommon in Nova Scotia, with swamp milkweed being particularly rare. The monarch's distribution is therefore tied to the availability of these plants.

Suitable breeding habitat nearby or within the HEC lands would likely include rich open land such as wetlands, grasslands, and roadsides where milkweed may grow.

Monarchs have been recorded 14 times within 5 km of the HEC lands, with the closest record occurring 1.82 km to the Northwest. Clearings on the HEC lands and along the around Prospect Road in the HEC lands could also serve as feeding grounds for adult monarchs, providing access to diverse nectar sources.

These habitats may support both breeding and migratory individuals, particularly during late summer and fall migration periods, especially if milkweed is present.

Olive-sided Flycatcher (*Contopus cooperi*)

The olive-sided flycatcher is listed as Special Concern under the COSEWIC and SARA, then as Threatened under the NS ESA. Initially listed as Threatened in 2007 under the federal registries, its status was revised to Special Concern in 2018 due to a stabilization in the rate of population decline, with the SARA officially downgrading its status in 2023. In the Maritime provinces, the olive-sided flycatcher inhabits forested areas with scattered trees left after clear-cutting or fire, as well as mature stands of black spruce near bogs, fens, beaver ponds, or clearcuts. Nests are typically built in black spruce trees, taking advantage of their proximity to open areas where insects are abundant.

The AC CDC data search indicates that one olive-sided flycatcher was recorded roughly 4.4 km of the HEC lands by Susies lake. The presence of mature black spruce stands, open water, wetlands, and clearings suggests the potential for suitable nesting and foraging habitat for the Olive-sided Flycatcher within the HEC lands.

Rusty Blackbird (*Euphagus carolinus*)

The Rusty Blackbird is listed as Special Concern under the SARA and as Endangered under the NS ESA. This medium-sized songbird is primarily associated with boreal regions, with 85% of its breeding range located in Canada. Breeding habitat includes coniferous-dominated forests adjacent to wetlands, such as sedge meadows, beaver ponds, muskegs, and swamps. The species requires shallow water areas for foraging and low, open coniferous cover for nesting.

Rusty Blackbirds are typically found in remote areas and nest in isolated pairs or loose colonies near water, often within shrubs or small trees.

The AC CDC data search indicates that one observation of a Rusty Blackbird recorded roughly 4.4 km of the HEC lands by Susies lake. While wetlands within the HEC lands may provide suitable nesting habitat, with some coniferous dominant forests many are mixed wood with a strong presence of red maple and some birch. This could reduce the area's attractiveness for breeding Rusty Blackbirds. However, the wet environment around many of the wetlands and watercourses would provide a suitable environment for this species.

Snapping Turtle (*Chelydra serpentina*)

The snapping turtle is Canada's largest freshwater turtle, with males reaching up to 40 cm in carapace length and females up to 36 cm. This species is easily distinguished by its size and long tail. Snapping turtles are widespread across Canada, occurring from Nova Scotia to Saskatchewan, though populations are most abundant in eastern Canada. The species is designated as Special Concern under the SARA and Vulnerable under the NS ESA. Preferred habitats include slow-moving or still freshwater environments with soft, muddy bottoms and dense aquatic vegetation, such as ponds, marshes, and river edges. Though adaptable, they are less likely to establish populations in urbanized or highly polluted areas. Nesting occurs in diverse sites, from natural sandbanks to artificial features like road embankments, gardens, and pastures. Hatchlings typically emerge in early fall and overwinter in water, buried in debris or mud near continuously flowing streams.

Snapping turtles lay a single clutch of about 40 eggs

annually, but cool summers can hinder successful development. Adults have few predators beyond humans, while eggs and hatchlings face high predation from raccoons, red foxes, and parasitic flies. Major threats include adult mortality due to legal and illegal harvesting, road collisions during nesting migrations, and habitat loss from altering and/or removing wetlands. Other threats to the species include predation on hibernating adults from species such as otters and declines in reproductive success due to environmental contamination.

Locally, AC CDC records indicate three occurrences of snapping turtles within 5 km of the HEC lands, all around Ravenscraig Drive Park roughly 4km to the northeast of the HEC lands. The water bodies that these sightings were reported around were all much larger than the ones seen on the HEC lands. However, there is possibility of suitable habitat in the area's wetlands and slow-moving streams.

Yellow-banded Bumble Bee (*Bombus terricola*)

The yellow-banded bumble bee is a medium-sized bee characterized by its distinctive yellow and black abdominal band pattern. It plays a vital role as a pollinator for both agricultural crops and native plants. This species is found across much of eastern North America, ranging from New Jersey to Newfoundland and Labrador, and extending west to southern Northwest Territories, southeastern Yukon, and eastern British Columbia. yellow-banded bumble bees are versatile in habitat use, occupying mixed woodlands, farmlands, urban areas, meadows, prairie grasslands, and boreal habitats. The bees typically nest underground in pre-existing cavities, such as abandoned rodent burrows or decaying logs.

Historically, yellow-banded bumble bees were

common in collections in Canada, but since the 1990s, their populations have significantly declined, particularly in the southeastern parts of their range in Ontario. At many sites, they once represented over 20% of the bumble bee population, but more recent studies show they now make up less than 4%. This decline has been observed across southern and central Canada, where proportional abundance has decreased by an average of 66.5%. Although their exact decline causes remain unclear, potential threats include introduced pathogens from commercial bumble bee colonies, pesticide use (especially neonicotinoids), climate change, and habitat loss in urbanized and agriculturally intensive areas. Despite these challenges, the species remains widespread. The AC CDC data search indicates that three observations of yellow-banded bumble bee within 5 km of the HEC lands. Two of the observations were by Armdale. The other sighting was to the 2.5 km east of the HEC lands in Long Lake Provincial Park. This sighting in within Long Lake Provincial Park suggesting it could be present across the area due to its generalist foraging habits and adaptability to a range of habitats.

The AC CDC also provided a list of species that are deemed to be "Location Sensitive" as per the Department of Natural Resources. These species are listed in Table 8. Four of the six items listed (Moose, Wood Turtle, Peregrine Falcon, and Bat Hibernaculum) are listed as possibly known to fall within the HEC lands. Further, the HEC lands are coincident with one of the five mainland moose concentration areas. The details of the four location-specific species with potentially on the HEC lands and the mainland moose are as follows:

Moose - Mainland Population (*Alces alces americana*)

The eastern moose, the largest member of the Cervidae family, is an iconic species of North America's boreal and mixedwood forests. Characterized by long legs, a broad muzzle, large ears, and palmate antlers in males, adult moose can weigh up to 1,000 pounds, with calves born in late May at approximately 25 pounds. Historically, moose were a vital resource for Indigenous peoples and early European settlers, providing food, clothing, and materials. However, over hunting and habitat loss led to significant declines in mainland Nova Scotia, prompting protective measures such as the closure of hunting seasons in 1981 and a "red" status designation in 2000, identifying the species as at risk of local extinction.

Once widespread across mainland Nova Scotia, moose are now confined to fragmented habitats in areas like the Cobequid Hills, Pictou Antigonish Highlands, and the southwestern interior. They thrive in regenerating forests where young deciduous shrubs provide abundant browse, as well as wetlands with aquatic vegetation and mature conifer stands that offer winter shelter. Habitat loss, disease, and illegal hunting remain significant threats, compounded by increased road access from forestry operations that facilitate poaching. Parasites such as *Parelaphostrongylus tenuis*, a brainworm carried by white-tailed deer, are a major cause of mortality, alongside potential risks from climate change and heavy metal contamination. Conservation efforts focus on habitat protection, population monitoring through pellet counts and aerial surveys, and restricting road access in critical areas. Despite these measures, the population, currently estimated at 1,000 – 1,200 individuals, remains vulnerable, requiring

continued vigilance and adaptive management.

The species is currently designated as Endangered under the NS ESA but is not listed under the COSEWIC or SARA registry. Even though no specific observations are recorded within the AC CDC database, the location of the HEC lands within a Mainland Moose concentration area, proximity to Long Lake Provincial Park and the presence of wetlands and mix-wood forests on the HEC lands could indicate a possibility of Moose in the area.

Wood Turtle (*Glyptemys insculpta*)

The wood turtle is a medium-sized freshwater turtle found across eastern North America, including parts of Canada such as Nova Scotia, New Brunswick, Quebec, and Ontario. Adults weigh about 1 kg, with carapace lengths ranging from 16 to 25 cm. These turtles are semiaquatic, frequenting meandering rivers and streams with sandy or gravelly substrates. They are also highly terrestrial, venturing into adjacent riparian habitats and upland areas during their active season, from May to September. Nesting occurs between late May and early July, with females preferring open, sunlit areas like sandbanks or gravel pits. Wood turtles demonstrate strong HEC lands fidelity, often returning to the same areas annually and ranging up to several kilometers from their hibernation sites, typically located in rivers or streams.

The species faces significant threats from agricultural practices and transportation corridors, which lead to habitat loss, fragmentation, and increased mortality from machinery or vehicle collisions. Predation by raccoons, coyotes, and other animals further impacts eggs, juveniles, and adults, while illegal collection poses a serious risk to localized populations. Wood turtles mature late—between 11 and 22 years of age depending on latitude—and their generation time

is estimated at 35 years, making them particularly vulnerable to adult mortality. Although protected as Threatened under both the COSEWIC, SARA, and NS ESA, ongoing conservation challenges include mitigating habitat degradation, preventing poaching, and addressing anthropogenic impacts. The presence of watercourses and wetlands on the HEC lands and the proximity of the HEC lands to the Long Lake may contribute to a higher likelihood of wood turtles being present within the HEC lands boundaries, particularly in WL2 which has an open water body and could provide basking sites.

Peregrine Falcon - *anatum/tundrius* Population (*Falco peregrinus anatum/tundrius*)

The peregrine falcon (*anatum/tundrius* population) is a large, fast-flying bird of prey found across North America, including parts of Canada such as Nova Scotia, New Brunswick, Quebec, and Ontario. Adults typically weigh between 600 and 1,300 grams, with a wingspan ranging from 91 to 112 cm. They are renowned for their remarkable hunting speed, often reaching over 300 km/h during their characteristic hunting stoop. Peregrine falcons are adaptable and can be found in diverse habitats, including coastal cliffs, mountains, and urban areas where tall buildings provide nesting sites.

During the breeding season, which generally spans from March to July, peregrine falcons prefer nesting on high ledges or cliff faces with clear views of surrounding areas. They do not construct nests but instead lay eggs in simple scrapes on gravel or ledges. Urban populations often utilize tall buildings and bridges for nesting. Falcons primarily hunt birds, such as pigeons and waterfowl, using their exceptional speed and aerial agility.

Significant threats to the peregrine falcon include habitat disturbance, pesticide exposure, and collisions with human-made structures. Historically, the widespread use of DDT severely impacted populations, leading to reproductive failure. Although the banning of DDT and active recovery efforts have allowed populations to rebound, ongoing conservation measures remain crucial. Climate change and urban development also pose risks to suitable nesting and foraging habitats.

The species was listed under the SARA as a Species of Special Concern, however in the 2017 species assessment the atlatl/tundrus population's status was changed to not at risk. Although in Nova Scotia the species holds that Vulnerable status under the NS ESA registry. Management strategies include protecting known nesting sites, reducing disturbance from recreational activities, and monitoring population health. Given the peregrine falcon's presence across various landscapes, including coastal cliffs and urban centers, maintaining these habitats is essential for supporting stable populations. Due to this species' variety of habitats there is a possibility that this species has habitat within or frequents the HEC lands.

Bat Hibernaculum or Bat Species Occurrence

Although listed under the "Location Sensitive Species" category in the AC CDC report, a bat hibernaculum is not a species, but rather, a HEC lands where one or more bats hibernate over the winter. A hibernaculum may be used intermittently, and its lack of use in a given year does not indicate abandonment. These sites, often found in caves, rock crevices, cliffs, or abandoned mines, provide stable, cold temperatures and protection from predators and weather. Suitable rock features for bat hibernation are rare and often host multiple species simultaneously.

Human disturbances such as noise or changes in HEC lands conditions can awaken hibernating bats, depleting their limited energy reserves and potentially causing starvation. Secure hibernacula are crucial for protecting bats from white-nose syndrome, a disease caused by the fungus *Pseudogymnoascus destructans* (Pd), which has devastated bat populations across North America since 2006. Mortality rates in affected hibernacula have reached 90-95% for little brown myotis and up to 98% for Northern myotis.

Although the data report asserts that bat hibernacula can be found nearby the HEC, no precise location is provided. Moseley (2007) provides a list of known bat hibernacula within the province, with many of the caves and mines being located in and around Central Nova Scotia. These caves and mines are consistent with the karst topography risk map as the evaporite rocks (e.g. gypsum, anhydrite, salt) or carbonate rocks (e.g. limestone, dolostone) are soluble and therefore, more susceptible to dissolution which leaves behind caves and other rock features that could house bat species.

The HEC is not underlain by any soluble rock nor does it have a high risk of encountering karst topography, making the presence of cave systems suitable for bat hibernacula less likely. However, the presence of a bat hibernaculum within the AC CDC database should still come into consideration when determining the risk of disturbance for bat species for any future development on the HEC lands.

There were also some notable species that are not found within a 5m radius of the HEC lands according to the AC CDC database but are still present on the NS ESA list of endangered species. These species

were deemed to be of interest to the HEC due to their risk status within Nova Scotia and potential link(s) to the land and environment present at the HEC lands. Given the AC CDC listing potential for Bat Hibernaculum on the HEC lands the following bat species listed under the NS ESA registry are listed. These species are as follows.

Chimney Swift (*Chaetura pelagica*) ENDANGERED (NESA), THREATENED (COSEWIC/SARA)

The chimney swift is a small aerial insectivore, notable for its cigar-shaped body, long pointed wings, and short spiny tail. Once reliant on large hollow trees for nesting and roosting, chimney swifts adapted to human-altered landscapes by using masonry chimneys. However, the widespread loss of both natural and artificial roosting sites has led to significant declines in their population. Chimney swifts nest in urban and rural areas where chimneys and abundant aerial insects are present, while wintering habitats range from riparian forests to urban zones in South America. Despite their adaptability, the species faces numerous threats, including the demolition or modification of chimneys, loss of natural nesting sites due to forestry practices, and declines in aerial insect prey from habitat degradation and pollution. Human activities, such as chimney use during the breeding season, and broad-scale ecosystem changes from climate change, pose additional risks. This species is found in human-altered landscapes adapting where they nest, therefore they could potentially nest on structures on the HEC lands. Additionally, mature forest stands nearby could potentially support natural roosting sites through the provision of hollow trees and the species is known to frequent open fields, meadows, and wetlands for catching flying insects. Although the lack of chimney swift records within 5 km of the HEC lands and the uncertainty of specific

sightings suggest limited habitat suitability within the area.

Little Brown Myotis (*Myotis lucifugus*)

ENDANGERED (NSES/COSEWIC/SARA)

and

Northern Myotis (*Myotis septentrionalis*)

ENDANGERED (NSES/COSEWIC/SARA)

and

Tri-coloured Bat (*Perimyotis subflavus*)

ENDANGERED (NSES/COSEWIC/SARA)

The Little Brown Myotis, Northern Myotis, and Tri-coloured Bat are small, brown-pelaged, insectivorous bats of the family Vespertilionidae. Each species provides essential ecological services, particularly as predators of insects, including agricultural and forestry pests. Among them, the Little Brown Myotis is the most recognizable to the public, often roosting in buildings and foraging in areas such as lakeshores and streetlights. Northern Myotis are most common in forested environments, while Tri-coloured Bats, though rarer, utilize a variety of habitats. Despite their ecological value, public concerns regarding zoonotic diseases (e.g., rabies) and hygiene have led to periodic destruction of roosts and colonies, exacerbating pressures on these already vulnerable species.

The Little Brown and Northern Myotis are widespread in Canada, ranging from Newfoundland to British Columbia and as far north as Labrador, the Northwest Territories, and the Yukon. The Tri-coloured Bat's range is more restricted, found mainly in Nova Scotia, New Brunswick, Quebec, and Ontario. All three species rely heavily on cold, humid caves or mines as overwintering hibernacula, where they gather in large numbers during winter. Summer habitats vary, with the Little Brown Myotis favouring buildings, bridges,

and canopy tree cavities for maternity colonies, the Northern Myotis using large trees, and Tri-coloured Bats preferring arboreal lichens or, occasionally, buildings. Foraging occurs in diverse environments, including water bodies, forest edges, and gaps, but large open areas like agricultural fields and clear-cuts are generally avoided.

The arrival of White-nose Syndrome (WNS) in Canada has devastated populations of these three bat species. This disease, caused by the fungus *Pseudogymnoascus destructans* (Pd), affects hibernating bats and has resulted in catastrophic population declines, particularly in Eastern Canada. Declines at hibernacula have reached over 90% for the little brown and northern myotis and up to 94% for tri-coloured bats in certain provinces.

Other threats include habitat loss from forest clearing, chemical contamination, disturbance of hibernacula, and wind turbine collisions, although the latter has had a lesser impact compared to migratory species. Efforts to conserve these bats focus on protecting critical habitats, such as hibernacula and maternity roosts, and mitigating human disturbances. While there is hope that some bats may possess genetic resistance to WNS, the slow reproductive rates of these species mean recovery will take decades, if not longer.

The AC CDC data does not include any bat sightings within 5 km of the HEC lands but do indicate that bats may be present near the HEC lands. Information regarding these bat hibernacula sites are listed as area sensitive in the AC CDC data, meaning that no information is publicly available regarding the type of habitat present or which bat species are present. As mentioned in the discussion on bat hibernacula, the geology of the HEC lands are not conducive to the formation of caves. There is also no evidence to indicate that underground mine workings ever took

place on the HEC lands. Consequently, it is unlikely that the HEC lands provides suitable hibernacula for these three bat species, though some areas of the HEC lands may be suitable for foraging activity as there is much open clearing and forest edge habitat on the HEC lands.

Wrinkled Shingle Lichen (*Pannaria lurida*) THREATENED (NSEA/COSEWIC/SARA)

The wrinkled shingle lichen is a distinctive leafy lichen characterized by its brownish-grey, wrinkled upper surface. It forms patches or rosettes that can grow up to 10 cm across, typically on the trunks of mature deciduous trees. The lichen is found primarily in Atlantic Canada, with 90% of its Canadian population located in Nova Scotia. Over the past thirty years, the species is believed to have declined by 30%, with forest harvesting being the primary threat, followed by land development, climate change, and air pollution.

The lichen is most commonly found on red maple trees in habitats that are close to but not within imperfectly drained areas such as treed swamps or floodplains. Unusual occurrences have been noted in Newfoundland, where the lichen grows on white spruce on cliffs near the sea, and in Prince Edward Island, where it has been found on cedar trees.

The main threat to the wrinkled shingle lichen is forest harvesting, which results in the loss of host trees and alters the microclimate, making it more difficult for the lichen to survive. Forests typically need to reach 50 years of age before they develop the rough bark suitable for colonization, and the increasing rate of hardwood harvesting in Nova Scotia and New Brunswick exacerbates this issue. Other threats include climate change, which could lead to drier conditions and reduced fog, potentially harming the lichen, as well as road construction and land



Figure 25 — HGNP Ecology Map, Zoomed View (Top) and Regional View (Bottom)

development that alter local humidity levels. The lichen is also sensitive to air pollution, particularly sulfur dioxide and acid rain, which can make the tree bark too acidic for the lichen to thrive. Given the presence of red maple trees on the HEC lands along with the wet environment in the wetlands on the HEC lands this species was considered during the SAR risk mapping of the HEC lands.

1.5.3 — Landscape Connectivity

Landscape connectivity refers to the ability of natural habitats to facilitate the movement of wildlife and ecological flows, both locally and regionally. Maintaining connectivity is essential for sustaining biodiversity, promoting ecosystem resilience, and adapting to environmental changes. After reviewing the HEC land's hydrology, forest ecology, and potential SAR, an examination of the HEC land's importance in regional and local connectivity was undertaken. The Halifax Green Network Plan (HGPN) served as the basis for most of the analyses regarding landscape connectivity.

Within the HGPN, the HEC lands are depicted on various maps relating to the five themes of the report: Ecology, Working Landscapes, Community Shaping, Outdoor Recreation, and Cultural Landscapes. The HEC lands do not score particularly high on any of the maps pertaining to working landscapes, outdoor recreation, or cultural landscapes, although the middle of the HEC lands assigned as medium social-cultural value due to Halifax Exhibition Centre building which was built in the 1980s. The rest of the HEC has not had much activity to not on it to score it higher in other areas. Under the has not had much activity on it was largely as a result of the lack of any significant human activity on the HEC lands in the past.

The HGPN ecology map shown in Figure 26 shows

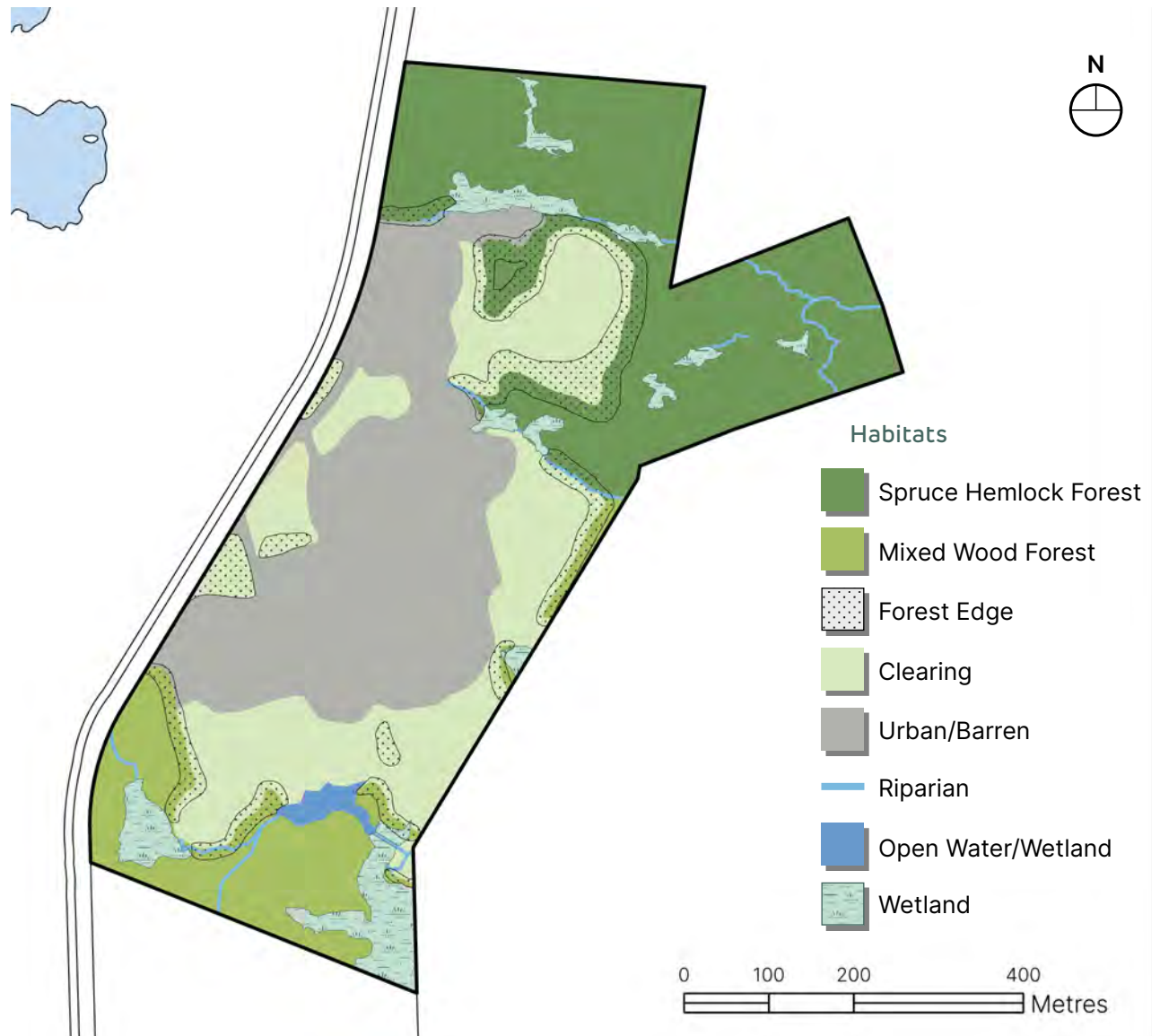


Figure 26 — Dominant tree species map with numbered tree stands

a mix of land classifications on the HEC lands from Minimal Value to Regional Green Networks to Core Areas and Corridors. In this map the centre of the HEC lands where the HEC building is designated as minimal Value to Regional Green Networks this is largely because this area is developed and contains a large building which does little to support the surrounding ecological areas. The area around the centre which is largely covered in gravel and parking lot is then classified as Core Areas and Corridors. These core areas are identified as being “Large, well-connected patches of natural vegetation and wildlife habitat surrounded by more altered landscapes” that provide a series of essential functions including the protection of biodiversity, soil, and water. The GNP goes on to advise against reducing the size of these core areas, warning that their loss could lead to “substantial impacts and loss of overall regional landscape function”. While maintaining forest connectivity and biodiversity is essential, additional development has taken place in these areas of the HEC lands since the GNP was created. Since 2018, a go-kart track, gas bar, and restaurant have all been constructed in portions of the HEC lands highlighted as Core Areas and Corridors. In addition, much of the HEC lands has been used for vehicle and trailer parking while other portions have housed seasonal carnivals and fairs. The rest of the HEC lands are designated as Areas of High Environmental Value Overlap or Protected Areas. Some of these areas especially along the HEC lands boundaries are forested and thus are more connected to surrounding forests increasing their ecological importance. The HEC lands are surrounded by protected parkland which is likely to contain high biodiversity and species. In terms of regional ecological connectivity of the area development of the HEC lands would not be greatly impacted since the links between regions are still preserved outside

the north and south boundaries of the HEC lands. However, regardless of the ecological integrity of the natural features on the HEC lands consideration needs to be made to creating natural buffers and areas to ensure that the protected areas around the HEC lands are not negatively impacted by development.

1.5.4 — Habitat Regions

To assist with the constraint mapping, the HEC lands have been categorized into distinct habitats based on the prevailing habitat present. The NSDNRR forestry data, wetland delineation results and recent satellite images were used in completing this task. The habitat map can be seen in Figure 24.

1.5.5 — DISCUSSION

Following the review of the 26 species of interest sourced from the AC CDC report and SARA/NS ESA registry, two of the species were not deemed relevant to the Halifax Exhibition Centre lands. These species included the American eel, which relies on larger unobstructed streams for spawning and general habitat. While there is an open water body in the south of the HEC lands, the species has not been recorded in other lakes or water bodies in the surrounding area, only being known to live in Horseshoe Island Park in the Halifax Northwest Arm, which makes the likelihood of their presence on the HEC lands possible, however, unlikely. Similarly, the Barrow’s goldeneye has been spotted in Horseshoe Island Park in the Halifax Northwest Arm rather than any inland location. Since the Barrow’s goldeneye is a shorebird, it was not deemed to be threatened by development on the HEC lands.

A further seven species were deemed to have some relevance to the HEC lands, but only in the form of potential foraging habitat or the hypothetical correct

conditions for habitat. For example, the bank swallow, eastern whip-poor-will, little brown myotis, northern myotis, chimney swift, and tri-coloured bat were all determined to possibly forage on the HEC lands. Still, none of their critical habitats were identified within the HEC land’s boundaries. For example, the wip-poor-will likes nesting in open forest stands with sparse understoreys and birch trees. While some forest stands on the HEC lands have birch trees, they are not a key component of the forest stands, and the forests generally have a developing or more developed understory. So, while there is a possibility of the species on the HEC lands, the likelihood is lower than other species whose habitat better aligns with that on the HEC lands.

Similarly, boreal felt lichen could potentially be found on the HEC lands, but since it requires mature balsam fir trees on northern slopes and sphagnum-dominated wetlands, its habitat is more specific, making its selection and the areas where it pops up more specific. Therefore, the likelihood of this species being found on the HEC lands is less significant than elsewhere in the region.

While these seven species may have some relevance to the suitability of the HEC lands for development, they were ultimately not considered in the constraint mapping due to the uncertain nature of their relation to the HEC lands. Any future development and mitigation strategies should still keep them in mind, but there are several species that face much more concrete risks from the prospect of development on the HEC lands. The 17 remaining species can be seen in Table 9 alongside the habitat units of the HEC lands they could inhabit. Since habitat loss is the primary threat for many of these species, it will be important for future development to preserve key habitats on the HEC lands, where possible. In doing so, this also

Species		Potentially-Inhabited Units							
Scientific Name	Common Name	Open Water	Riparian	Wetland	MW Forest	SH Forest	Forest Edge	Clearing	Urban/Barren
<i>Fraxinus nigra</i>	Barn Swallow	No	Yes	Yes	No	No	No	Yes	Yes
<i>Degelia plumbea</i>	Blue Felt Lichen	No	No	No	Yes	Yes	No	No	No
<i>Cardellina canadensis</i>	Canada Warbler	No	Yes	Yes	Yes	Yes	No	No	No
<i>Chaetura pelagica</i>	Chimney Swift	No	No	Yes	Yes	No	No	Yes	Yes
<i>Chordeiles minor</i>	Common Nighthawk	No	No	No	No	No	No	Yes	Yes
<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Yes	No	No	No	No	No	No	No
<i>Contopus virens</i>	Eastern Wood-Pewee	No	No	No	Yes	Yes	Yes	Yes	No
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	No	No	No	Yes	Yes	No	No	No
<i>Bombus bohemicus</i>	Gypsy Cuckoo Bumble Bee	No	No	No	No	No	No	Yes	No
<i>Danaus plexippus</i>	Monarch	No	No	No	No	No	No	Yes	No
<i>Alces alces americana</i>	Moose - Mainland Population	No	No	Yes	Yes	No	No	No	No
<i>Contopus cooperi</i>	Olive-sided Flycatcher	No	Yes	Yes	No	No	Yes	Yes	No
<i>Euphagus carolinus</i>	Rusty Blackbird	No	Yes	Yes	No	Yes	No	No	No
<i>Chelydra serpentina</i>	Snapping Turtle	Yes	Yes	Yes	No	No	No	No	No
<i>Glyptemys insculpta</i>	Wood Turtle	Yes	Yes	Yes	No	No	No	No	No
<i>Pannaria lurida</i>	Wrinkled Shingle Lichen	No	Yes	No	Yes	Yes	No	No	No
<i>Bombus terricola</i>	Yellow Banded Bumble Bee	No	No	No	Yes	No	No	Yes	No

Table 9 — Relevant Species at Risk (SAR) and their applicable Habitat Units

includes supporting and maintaining some known and potential ecological corridors, such as those areas highlighted as Core Areas and Corridors, Areas of High Environmental Value Overlap, and Regulated Areas within the HGNP. However, it is important that given the use of the HEC lands since the HGNP was written, the location of these areas for preservation is informed by the findings of the whole land suitability analysis and supporting documents, and not just referencing the maps from the HGNP.

While the wetland and riparian zones are not always categorized as Core Areas and Corridors in the HGNP, they are significant for local connectivity, supporting small to medium-sized wildlife species. The WSS, along with the forested areas along the HEC lands boundary, provide key habitat and buffer the HEC lands from the surrounding protected wildlife. Though the golf course's cleared areas limit wildlife movement, the interface between the forest and grasslands offers some ecological value. As noted, with the species at risk, many like edge habitats, so ensuring future connectivity will help reduce strain on species that may use the HEC lands.

The results of the habitat constraint scoring shown in Figure 25 show that the most constrained areas on the HEC lands and around the urban area in the middle of the HEC lands. A variety of factors, such as the presence of wetlands, watercourses, mixed-wood forests, clearings, and edge habitats, impact this output. The Mixed-wood VT forests scored higher than the Spruce Hemlock forests to the North of the HEC lands because more species had preferences for mixed-wood forest types. In addition, wetlands scored high as many species liked wet environments or wetlands, if not for nesting, then foraging. Many NS ESA species are foraging species, which prefer forest

edge habitats, wetlands, or clearings for catching small prey or insects. Given the popularity of edge habitat by many species for foraging, the edge habitat areas and clearings ranked highly in the final SAR constraint map. The edge designation is why the small patches of vegetation along Prospect Road scored a three even though, with context, it can be deduced that it may not be the most ecologically significant of areas on the HEC lands.

A major takeaway from the results of the final map is the importance of not only the wetlands and forested areas, which are understood to be of significance to species but that of edge and clearing areas. In developing the HEC lands, thinking about these foraging areas and edge habitats should be incorporated into the HEC lands design with consideration for buffer zones between forested areas and development. There is much forested land around the HEC lands. However, the amount of cleared habitat and habitat transition zones on-site separates the HEC lands and makes them unique from the surrounding landscape. Therefore, to ensure that the HEC lands' distinctive features are not lost, development should consider incorporating intentional buffers to keep that unique habitat and ensure that species are not losing potentially necessary habitat.

Recommended Mitigation Strategies

- Where possible, the development of the Halifax Exhibition Centre lands should see the retention of wooded areas and green spaces, particularly along the HEC land's boundaries to maintain existing ecological connectivity.
- In conjunction with Objective 4.1.3.3 of the HGNP, a buffer of at least 30m should be established around the delineated watercourse.
- Designate a wildlife corridor or retain forest stands in the

Northeast branch of the HEC lands to maintain species movement across the section that protrudes out into Long Lake Provincial Park.

- Prior to clearcutting any additional forest, an arborist or other similar professional should walk the HEC lands in an attempt to identify any potetial occurrences of Blue Felt Lichen (*Degelia plumbea*) or Wrinkled Shingle Lichen (*Pannaria lurida*).
- Maintain forest edge areas in the event of development to serve as key grazing and feeding grounds for certain species.
- Implement reforestation projects on cleared or infilled sections of the HEC lands to improve habitat quality.

1.5.6 — CONSTRAINT SCORING

The primary constraint within the species at risk section is the potential presence of different SAR within the various habitat units of the HEC lands, as seen in Table 10. If there were any confirmed observations of SAR or critical habitat, the applicable habitat units would fall within the highest constraint category.

Features	Assigned Score
Habitat Potentially used by 0-4 SAR	1 - Less Constrained
Habitat Potentially used by 5-7 SAR	2 - Moderately Constrained
Habitat Potentially used by 8+ SAR	3 - Highly Constrained
TOTAL POTENTIAL SCORE	1-3

Table 10 — Species at Risk Constraint Scoring

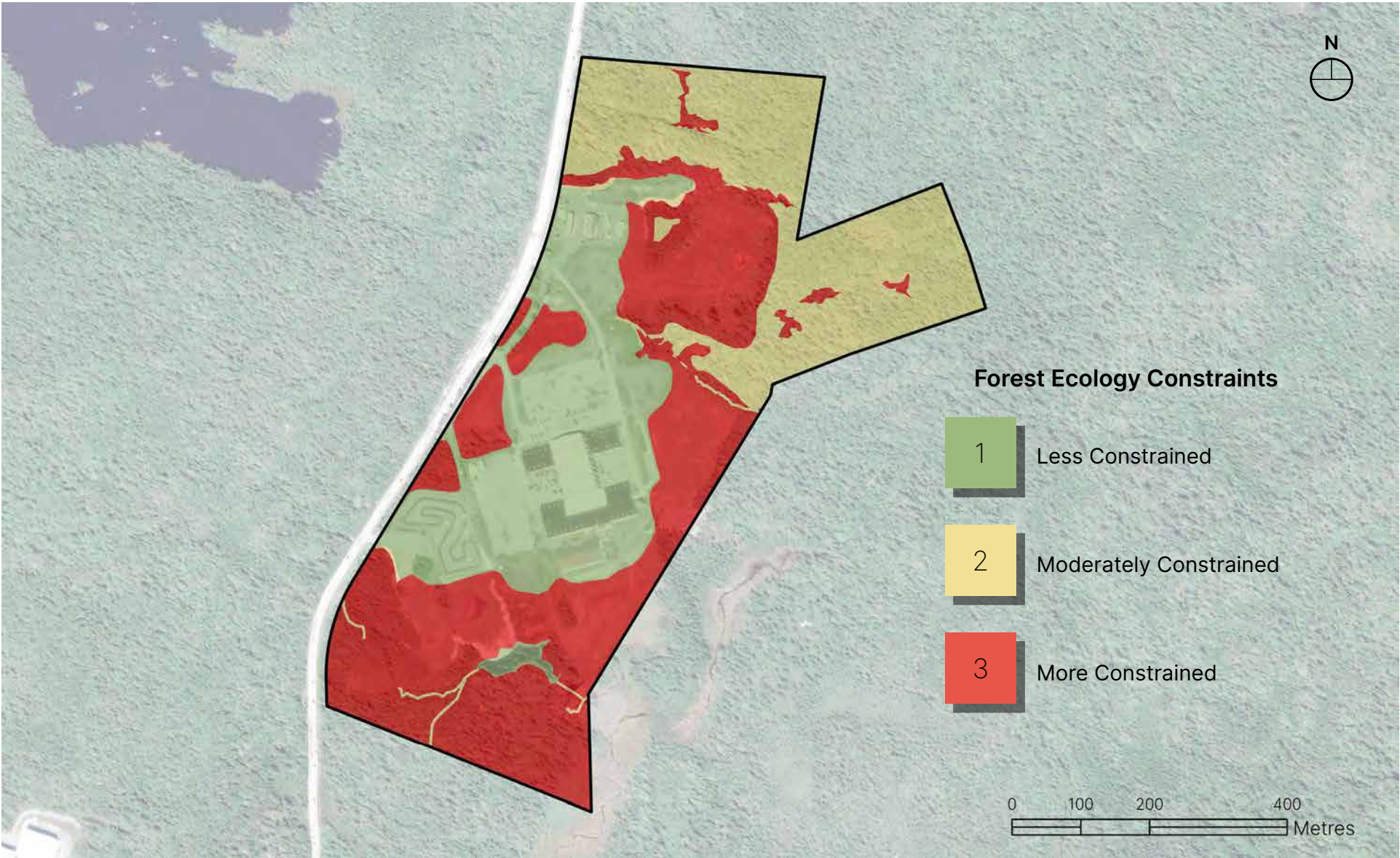


Figure 27 — Species at Risk Constraints Map

1.7 — Heritage and Cultural Significance

METHODS

An archaeological assessment was undertaken by Davis MacIntyre and Associates that included both desktop and field research to determine the depth and breadth of the HEC land's history, cultural inventory, and potential heritage significance. This was accompanied by an additional desktop study to provide more context to the recent history of the HEC lands and to list nearby heritage resources.

1.7.1 — Archaeological Assessment and L'nuk Resources

Prior to colonialism, the Mi'kmaq and their ancestors had inhabited what is known today as Nova Scotia for at least 13,000 years. This impact and legacy can be felt through both the existing Mi'kmaq communities in Nova Scotia as well as the various artifacts and imprints left on the physical environment by these people groups.

The archaeological assessment of the HEC lands, performed by Davis MacIntyre and Associates in August 2023 (and revised in January 2024) discusses the longstanding Mi'kmaq presence in Nova Scotia and the potential for artifacts or other L'nuk heritage resources to be found on the HEC lands.

To assess the likelihood of finding heritage resources, archaeological consultants conducted predictive modelling. This approach focuses on identifying areas of potential past activity, especially near known watercourses, by applying buffer zones that indicate varying probabilities of encountering L'nuk heritage resources. The modelling is supported by in-person field reconnaissance, where archaeologists systematically walk the entire HEC lands to verify and supplement the predictions.

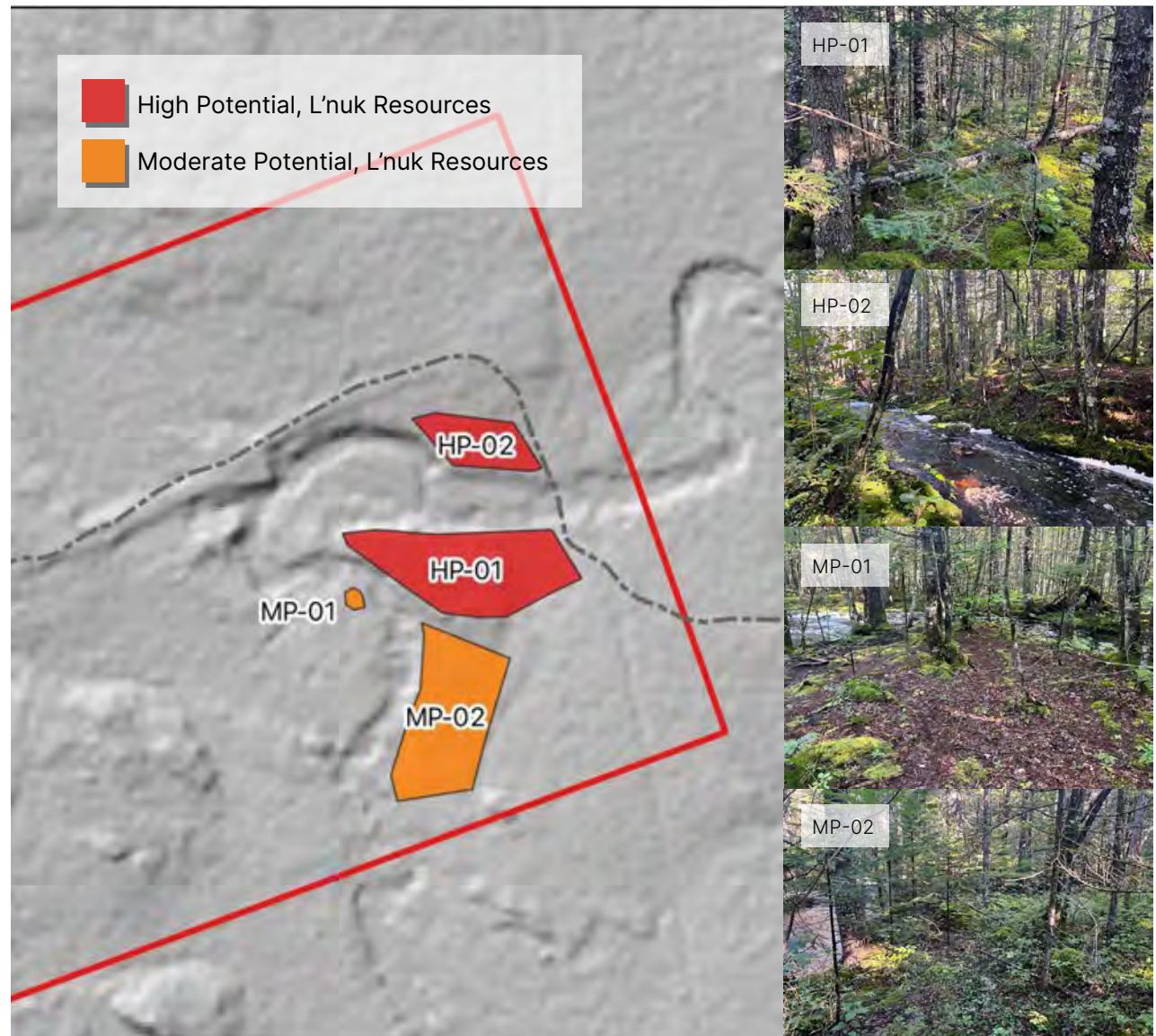


Figure 28 — Figure 6-1 from the Archaeological Report showing the areas of potential L'nuk Resources



Figure 29 — A view of the main exhibition hall with its previous name (left) and a poster for the first Atlantic Winter Fair (right)

The results of the predictive modelling revealed four areas in the easternmost extremity of the HEC lands that had either a moderate or high potential for L'nuk heritage resources. These identified areas are located near a fast-moving non-navigable brook that connects Long Lake to the interior. This brook would have been a potential source of freshwater during hunting or resource gathering activities. Though no artifacts were found in this area, the high potential for resources to be present is significant enough to warrant leaving the area untouched.

The in-person assessment of the HEC lands also resulted in the identification of a well and two foundations from approximately the mid-20th century but potentially earlier. No cultural or heritage significance was assigned to these features in the report but it was still advised that at 30m monitoring buffer should be established around them. More information about these features can be found in

the attached ARIA report in Appendix E.

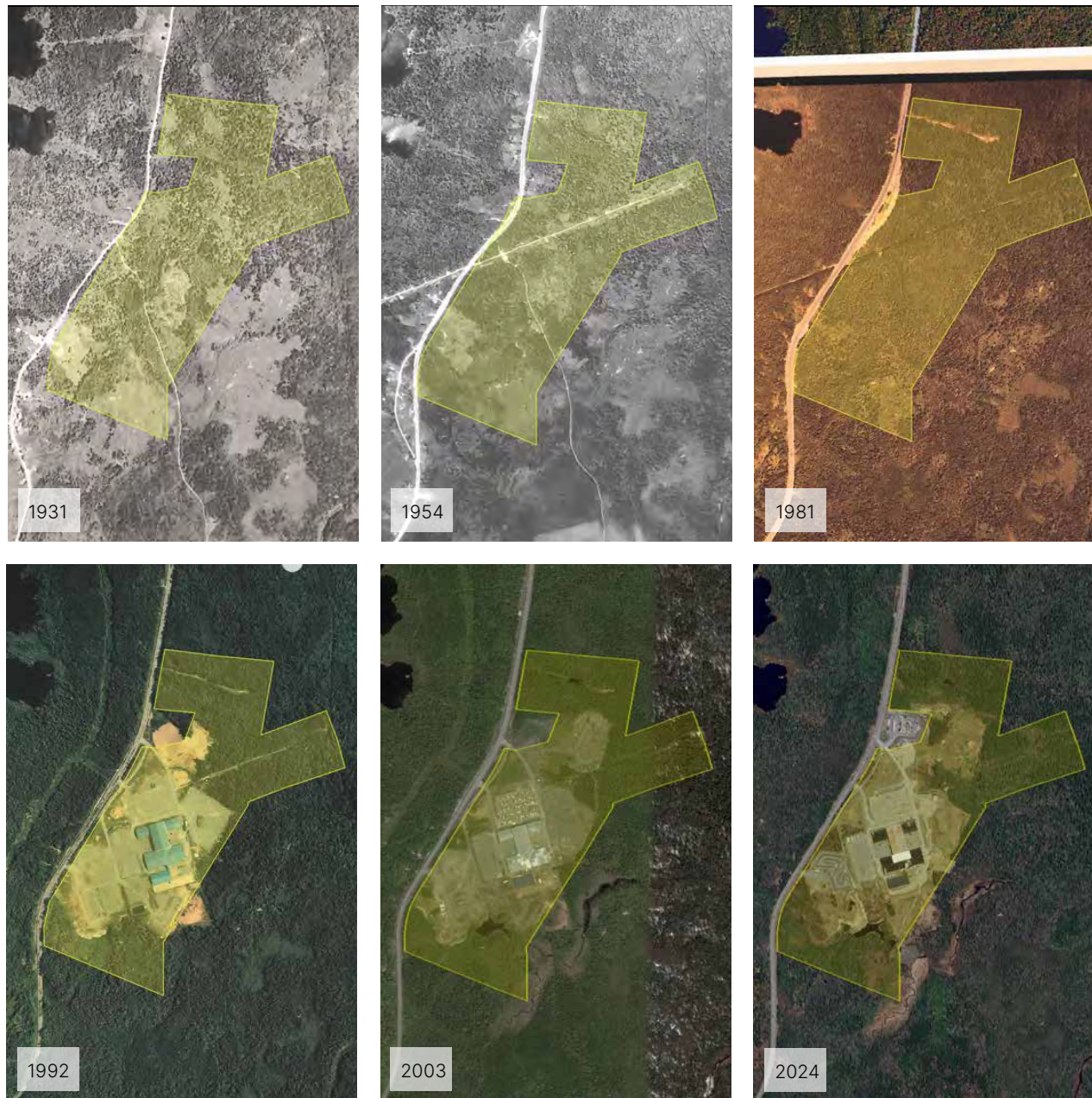
1.7.2 — Post-Colonial History

The inland communities of the Chebucto Peninsula were primarily settled by discharged Royal Naval Soldiers starting as far back as 1773. The lands of the HEC, located in the community of Beechville, sat outside the boundaries of the city of Halifax until amalgamation in 1996. For many years, the region surrounding the HEC lands was largely rural and unincorporated; Prospect Road wasn't paved until 1951 and before that, most of the nearby communities were isolated fishing villages. Figure 26 shows several historic aerial photos of the HEC lands spanning from 1931 to 2024. In the earlier photos, some unknown roads and structures that no longer exist can be seen. Also, a linear clearcut can be observed in the 1954 aerial photo, representing a water pipeline that had been built.

The main Exhibition structure was built in the mid-80s and was owned by the provincial government until 2015. While the HEC lands hosted dozens of different annual conventions and events, the convention that was most associated with the HEC lands was the annual Atlantic Winter Fair (AWF) (later renamed the Maritime Fall Fair).

The AWF ran yearly at different exhibition grounds from 1963 onward. The event primarily involved the exhibition of agricultural goods and livestock, attracting visitors from across the region. In the early 1980s, a search for a permanent home for the AWF began and eventually concluded with the construction of the HEC (then known as Exhibition Park). The fair remained popular throughout the 1980s and 90s, seeing more than 85,000 visitors at the 1992 exhibition.

The main exhibition building was closed in 2015



after a maintenance overview found that the building needed millions in repairs to remain operational. After analyzing the feasibility of repairing and maintaining the HEC lands, the provincial government opted to sell the HEC lands to a private developer who proceeded to repair and renovate the complex. The HEC lands reopened in 2016 as the Halifax Exhibition Centre and continues to host events and conventions.

1.7.3 — Nearby Heritage

There are no heritage properties on the HEC lands or within the immediate vicinity of the HEC lands; the nearest registered heritage property is the Beechville Baptist Church which is a 3.1km drive to the north of the subject properties. The church is known for its significance within the African Nova Scotian community of Beechville, being one of the first meeting places of Black refugees who escaped slavery in the United States following the war of 1812. The church was first erected in 1844, marking a presence in the community that has lasted over 180 years.

In addition to the church, several archaeological sites from the Maritime Archaeological Resource Inventory were noted to the north and northeast of the HEC lands. These include sites BdCw-12 to BdCw-15 which represent four stone features, including three residences, that are believed to have been built by War of 1812 Black refugees who formed the community of Beechille (then known as “Refugee Hill” or “Beech Hill”). A full excavation of the residence at HEC lands BdCw-12 provided evidence that the dwelling was

Figure 30 — Historic aerial photos of the HEC lands from six different years

occupied in the early 19th century, before it burned between 1832 and 1840.

The nearest geoheritage HEC lands in the provincial database is a section of roadcuts 2.3km to the north of the HEC lands. The roadcuts (Geoheritage ID 1109) are an “exceptional example” of Cambro-Ordovician turbites. However, it appears that these road cuts were destroyed in 2019 to make way for an expansion of a highway on/off ramp.

1.7.4 — Discussion

Since the archaeological assessment identified several areas of elevated archaeological potential, there are several considerations for the Heritage and Cultural Significance constraint map.

For the areas of high and moderate potential for L’nuk resources, avoidance is the preferred method of mitigation. Given their location in the easternmost forested extremity of the HEC lands, it is unlikely that any development would ever be planned near these areas to begin with.

As the age of the well is unclear it is recommended that monitoring of any ground disturbance is conducted within a 30m buffer. The remaining features (estimated to be from the mid-20th century) have been evaluated to be of low archaeological significance and therefore, there are no further recommendations for these features.

Though the aerial photos reveal some past disturbance in the first-half of the twentieth century, no artifacts or physical features remain of this presence, resulting

in a low archaeological value for the remaining areas of the HEC lands. The lack of any heritage buildings or sites within the property boundaries of the HEC lands or nearby also indicate a relatively low cultural and heritage value.

Recommended Mitigation Strategies

- Leave the areas of moderate to high potential for L’nuk resources untouched.
- Monitor any ground disturbance is conducted within a 30m of the abandoned well.

1.7.5 — Constraint Scoring

The Cultural Significance feature was scored based on the results of the recommendations map on page 62 of the ARIA (See Appendix E). Areas of moderate potential for L’nuk resources map were considered moderately constrained, then areas highlighted are having high potential for L’nuk resources were scored to highly constrain development.

Features	Assigned Score
Area of Low Archaeological Potential - No Further Assessment Required	1 - Less Constrained
Area of Moderate Archaeological Potential - Archaeological Monitoring Recommended	2 - Moderately Constrained
Area of High Archaeological Potential - Archaeological Monitoring Required	3 - Highly Constrained
TOTAL POTENTIAL SCORE	1-3

Table 11 — Cultural Significance Constraint Scoring

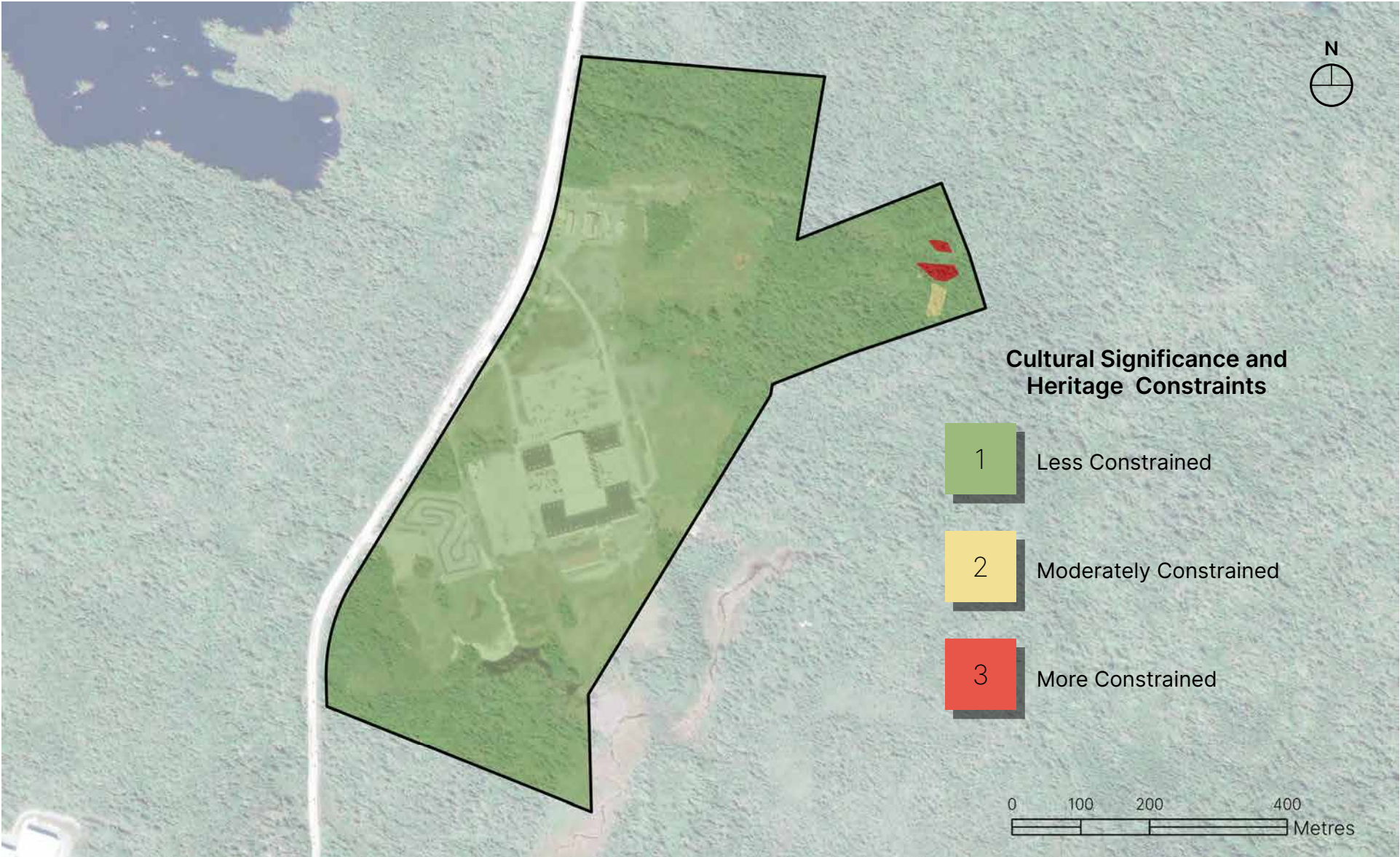


Figure 31 — Cultural Significance and Heritage Constraints Map

1.8 — Contaminated Sites

METHODS

Publicly-available and government-regulated records, aerial imagery, and ARIA were assessed to identify any potential contaminants in the HEC land's past. Additional records were accessed through a FOIPOP request from the provincial government.

1.8.1 — Overview

Before any development can occur on the HEC lands, it is essential to identify and address potential contaminants to ensure they are safely removed. Common contaminants on greenfield or rural/agricultural sites may include pesticides, heavy metals, and human or animal waste. In contrast, brownfield or infill sites are often associated with petroleum hydrocarbons (PHCs), volatile organic compounds (VOCs), asbestos, and various industrial by-products.

Given the presence of developed land and (relatively) untouched forests, both sets of contaminants need to be considered when investigating the potential for contamination on the HEC lands.

Within the developed areas of the HEC lands, some current and past uses present the possibility of contamination. The first and perhaps most obvious is the gas bar located along Prospect Road. Although not technically part of the HEC lands, the gas bar is abutted on three sides by the HEC lands and therefore should be considered in a holistic assessment of potential contamination.

The gas bar was built in 2019 and has retained its approval under the Nova Scotia Environment Act to operate as a motive fuel retailer every year since it was built. The facility has three registered petroleum storage tanks in use. Two of the tanks are gasoline with capacities of 65,000L and 30,000L, while the remaining tank is diesel with a capacity of 35,000L. All

of the tanks are double wall tanks made of fibreglass-reinforced plastic, and all are located underground. Gas bars are some of the most common sources of soil and ground contamination in urban areas, though the standards for modern gas bar design is considerably safer than older standards.

As outlined in the ARIA (Appendix E), there are many remnants of human activity on the HEC lands. For example, a water pipeline was constructed through the HEC lands between 1867 and 1868 and then expanded between 1931 and 1947. This pipeline can be seen clearly in the historical photos of the HEC lands from 1954 to 1992 in Figure 30. It is identifiable by the straight clear cut line through the forest and HEC lands from east to west. Given the activity of building and maintaining the pipeline, and the risk of soil contamination, the strip of land around the pipeline has been highlighted as a possible site of contamination.

Further, the Halifax Exhibition Centre has held dozens of events throughout the years that have drawn a significant number of vehicles to the HEC lands. This includes heavy-duty carnival equipment, RVs, camper-vans for camping exhibitions, heavy machinery for the yearly agricultural fairs, as well as the thousands of personal vehicles that have visited the HEC lands during its 40+ years of operation. The prevalence of different types of vehicles on the HEC lands increases the chance of PHCs, tire wear particles (TWPs), and other vehicle-related contaminants.

Significant infilling has occurred on the site from previous on-site activities, such as the building of the water pipeline and the HEC. Given this, the soil itself has been raised as a contamination concern due to its origins. The the most prevalent surficial geological unit found on the HEC lands is the “anthropogenic”

unit, indicating that the fill originated from another location. Since this fill is not native to the HEC lands, it should be tested in the event of development. The entire developed portion of the HEC lands, including the main exhibition hall, go-kart track, and parking lot, are underlain by this anthropogenic fill, representing a potential concern for contamination.

The development of this land offers an opportunity to clean up any potential contaminants once more detailed EIAs are performed at the building permit stage.

1.8.2 — Regulatory Request Review

In addition to reviewing previous uses, a request was made to the Nova Scotia Department of Environment and Climate Change (NSECC) regarding any information on the HEC lands. Examples of items within the NSECC records include regulatory infractions, environmental investigations, tank registrations, or applications for approval to use harmful chemicals or explosives.

Six relevant records in the NSECC Environmental Registry were identified through the request. Though initially redacted, a subsequent FOIPOP request revealed the details of the records. The files and their details are described in the following paragraphs.

Environmental Registry Files

File #94400-35-BED-4570703

Municipal Solid Waste Investigation/Enforcement File

- Details the unauthorized disposal of construction material on the buffer property (PID 41457987) and the primary HEC property (PID 40600728)

File #92100-30-BED-2018-2516291

Industrial File

- Details the motive fuel retailer operations of the gas bar on PID 41432642.

File #33000-30-BED-2006_2007-1480M**Contaminated Sites File**

- Details a mineral oil spill from a Nova Scotia Power transformer on the HEC lands in 2006.

File #95100-30-BED-2024-3578190**Water Approval File**

- Details an application by the landowner for a watercourse alteration.

File #95100-40-BED-5923997**Water Resources Complaint File**

- Details the unauthorized infilling of a wetland on the eastern boundary of the primary HEC property (PID 40600728).

File #95100-40-BED-5866804**Water Resources Complaint File**

- Details the unauthorized infilling of a wetland in the south of the primary HEC property (PID 40600728).

Mineral Oil Spill

In April 2006, approximately 300L of mineral oil leaked from an electrical transformer on site, triggering a cleanup effort led by Nova Scotia Power (See Figure 32). The cleanup involved digging up and removing contaminated soil, as well as testing both the soil and groundwater to check for pollution.

Approximately 1.66 tonnes (or 1,660 kilograms) of soil were dug up and sent for testing, along with about 3,182 litres of groundwater. These samples were tested for petroleum-based chemicals, especially looking for two things:

- **BTEX:** A group of chemicals (benzene, toluene, ethylbenzene, and xylene) found in petroleum. They evaporate easily and can be harmful if breathed in or consumed.
- **mTPH (modified Total Petroleum Hydrocarbons):** This includes a wide range of petroleum compounds (carbon numbers C₆ to C₃₂) but excludes BTEX. It represents the bulk of oil-related contamination.

Testing was done according to Tier 1 screening levels from the *Atlantic RBCA* system. These are standard guidelines developed by environmental regulators to decide if a site needs cleanup based on potential risks to human health under typical conditions (e.g., type of land use, soil type, groundwater usage).

The test results showed that none of the soil or water samples exceeded the Tier 1 safety levels for BTEX or mTPH, meaning they didn't pose an immediate risk based on standard conditions. However, mTPH levels in groundwater did exceed the Tier 1 limits, but not the more flexible Tier 2 criteria. These Tier 2 levels take into account specific features of the site, such as the fact that groundwater at this location is not used for drinking and the soil is coarse (which reduces risk from vapour exposure).

Tests under the building's foundation (sub-slab vapour sampling) detected small amounts of toluene, xylene, and other petroleum-related vapours. While these levels weren't ideal for direct breathing, they did not pose a significant risk for indoor air quality based on the type of building and commercial use. The risk calculations also included a safety margin assuming that any vapours would be diluted by at least 50 times before entering the building.

After reviewing all the results, the Nova Scotia Department of Environment and Labour concluded that the contamination had been adequately addressed. They officially closed the environmental case in June 2008, meaning no further cleanup was required.

Construction Material Disposal

In June 2021, a complaint was filed with Nova Scotia's Department of the Environment (NSE) about illegal dumping of debris behind a gas station near the Halifax Exhibition Centre (See Figure 33). An inspector



Figure 32 — Google Earth Aerial Imagery of approximate location of the 2006 mineral oil spill

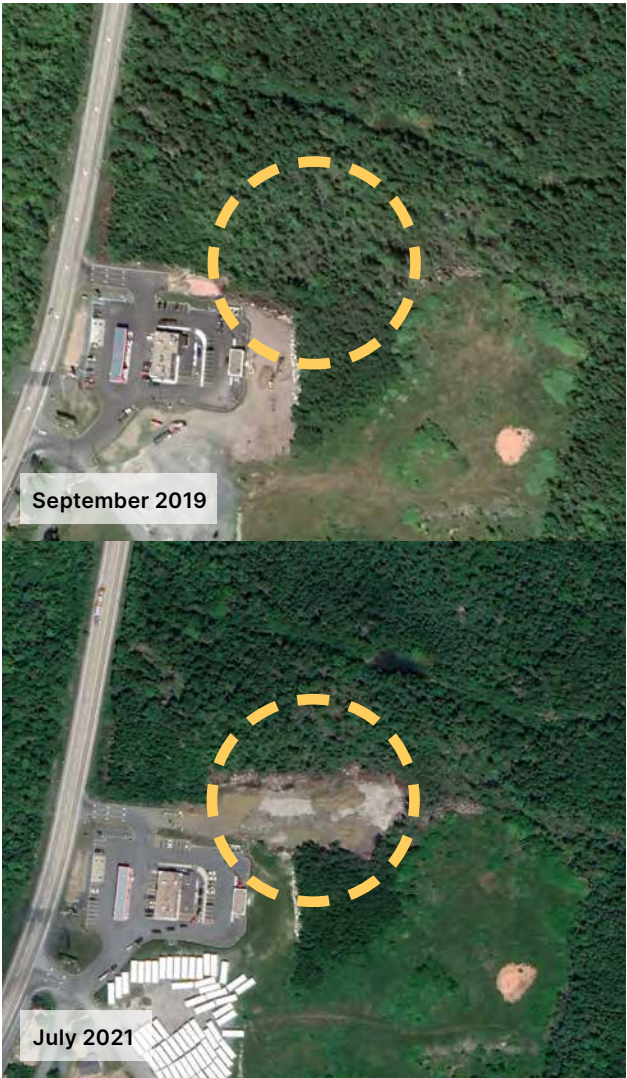


Figure 33 — Google Earth Aerial Imagery of the construction material dumped in the north of the HEC lands



Figure 34 — Google Earth Aerial Imagery of infilling of the body of water in the southern section of the HEC lands



Figure 35 — Google Earth Aerial Imagery of infilling on WL2 in the southern section of the HEC lands

visited the site the same day and observed trucks dumping concrete debris, including construction and demolition materials, municipal solid waste, and potentially sulphide-bearing slate. There was also suspected unauthorized filling of a wetland and signs of contamination in standing water.

As a result of the inspector's observations, the NSE issued two directives to the landowner. The first required hiring an environmental consultant to assess the dumped materials and recommend disposal methods while the second required a site professional to determine whether the site needed to be reported under the Contaminated Sites Regulations.

By July 19, the landowner had retained OCL Group to manage the response. Their letter acknowledged four key issues: illegal dumping, non-hazardous sulphide-bearing materials, misclassified demolition debris (which was partially removed), and a commitment to avoid wetland disturbance. By September 2021, NSE deemed the first directive's requirements fulfilled. However, the second directive, concerning contamination assessment, remained unaddressed. Lab results showed no petroleum contamination in surface water, but concerns about metals in construction waste remained.

In April 2022, OCL proposed further excavation and disposal of metal-laden concrete. NSE clarified that metal-containing debris was not inert and must be disposed of at a certified facility. In April 2023, a new directive was issued requiring a qualified site professional to properly assess contamination risks, particularly regarding metals.

Unauthorized Wetland Infilling

There was a complaint filed to NSECC regarding an unauthorized watercourse alteration on the HEC lands, outlined in a letter by Strum Consulting

(See Appendix B). Fathom Studio is collaborating with Strum Consulting to mediate this issue and will provide more information on the process as it unfolds. The letter by Strum Consulting explains that in 2024, NSECC Environment Officers completed a site visit at 200 Prospect Road, in which the NSECC officers noted a pond on the southern portion of the property had been altered, with evidence of heavy machinery disturbance along the watercourse banks. The NSECC officers also collected rock material from the HEC lands to test for suspected sulphide bearing materials. Per test results with the Mineral Engineering Centre (Dalhousie University), the material was deemed sulphide bearing and subject to the Sulphide Bearing Material Disposal Regulations. NSECC issued an inspection notice that required a watercourse alteration application for the removal of infill material and obtaining the services of a site professional to oversee the removal of the sulphide bearing materials.

In response, Englobe submitted a watercourse alteration application to NSECC on August 7, 2024, for the removal of infill material and restoration of the impacted waterbody in compliance with this inspection report.

NSECC Environment officers completed an additional inspection of the property on July 31, 2024, in relation to a wetland alteration complaint. During this visit they noted two areas of wetland infill, both extending into Long Lake Provincial Park, which per the Nova Scotia Wetland Conservation Policy, any wetland that is located within a provincial park is designated as a Wetland of Special Significance (WSS)(See Figures 34 and 35). Sulphide bearing materials were also confirmed in both areas of wetland infilling.

After this inspection, a follow-up inspection report was issued that required an assessment of the watercourse that has been altered by Infill 1, another

assessment and delineation of the full wetland boundaries of the two WSS, and the removal and proper disposal of Sulphide Bearing Material (For more details on the inspection report requirements see Appendix B). In response Strum requested an extension to comply with the requests to allow for more favourable in-season assessments in June 2025 to obtain a more accurate assessment of wetlands and watercourses. As such, NSECC has issued a compliance update that requires the outstanding items to be addressed by June 30, 2025. Upon completion of the June assessments, Strum will draft and submit a report addressing the compliance items related to wetland alterations.

By examining aerial imagery of the noted wetlands and watercourses on the HEC lands, it seems that area one along the open water body was infilled between August 2018 and September 2019. The northern arm of the water body was filled in, and the bank was moved inwards. This caused the waterbody to extend out westwards a bit to make up for the changed water boundary. This water body additionally has been extended into the western corner of the waterbody between 2021 and 2024, potentially after the watercourses and wetlands were delineated. This is hypothesized since the waterbody boundary delineated in July of 2023 better aligns with the outline of the waterbody from the 2021 aerial imagery than that shown in the 2024 aerial imagery.

The second instance of infill noted was in area two. This infilling took in area that was apart of WL2 and extended into Long Lake Provincial Park. This infilling seems to have happened between October 2020 and June 2021. This was before the wetlands on the HEC lands were delineated, and thus, the infilled area was left out of the WL2 boundary. This is a WSS, and so this wetland will need to be restored.

Discussion

Due to the long-standing presence of vehicles and heavy machinery onsite as well as previous construction activities involving anthropogenic fill and pipeline development, the majority of the HEC lands should be considered for potential contamination in the event of development. Testing should be considered on the anthropogenic fill to determine its origin as well as under parking areas to test for PHCs.

Similarly, addition attention should be paid to the site of the mineral oil spill and the construction debris disposal. Though both cases have been addressed through remediation efforts, lingering contamination is still possible and should be tested for.

The areas of most concern are the two infilled wetlands in the south of the site. Due to the presence of sulphide-bearing material and the ongoing remediation process, the ecological health and integrity of these wetlands needs to be considered in any future developments on the HEC lands

Recommended Mitigation Strategies

- Test the soil in the area of anthropogenic fill, within the former pipeline's path, around the site of the oil spill, and around the site of the construction debris disposal.
- Continue to follow the directives issued by the NSECC involving the removal of sulphide bearing material, a delineation and verification of waterbody boundaries, and post-removal monitoring.
- Erect permanent fencing and signage to prevent accidental disturbance during restoration or future site use.
- Replant disturbed zones with native wetland species to promote habitat recovery and prevent erosion.

Constraint Scoring

The HEC lands have had much human activity on them in the past, which poses risks for site contamination. The HEC lands were scored based risk for contamination, areas without known risks where considered less constrained while areas with know constraints were scored highly constrained. Areas with an “anthropogenic” surficial geology unit, as well as lands around the water pipeline, gas bar and go-kart track were considered moderately constrained due to the potential risk of contamination. Then, the two infilled areas in Figure 36 were listed as highly constrained due to confirmation of sulphide bearing materials in the infill material. Scoring for the Contaminated Sites constraint indicator may change when files are received from the NSECC and an inspection report is completed for the infilled areas.

Features	Assigned Score
No known contamination risks	1 - Less Constrained
Infilled soil, more risk for contamination	2 - Moderately Constrained
Known contamination	3 - Highly Constrained
TOTAL POTENTIAL SCORE	1-3

Table 12 — Contaminated Sites Constraint Scoring

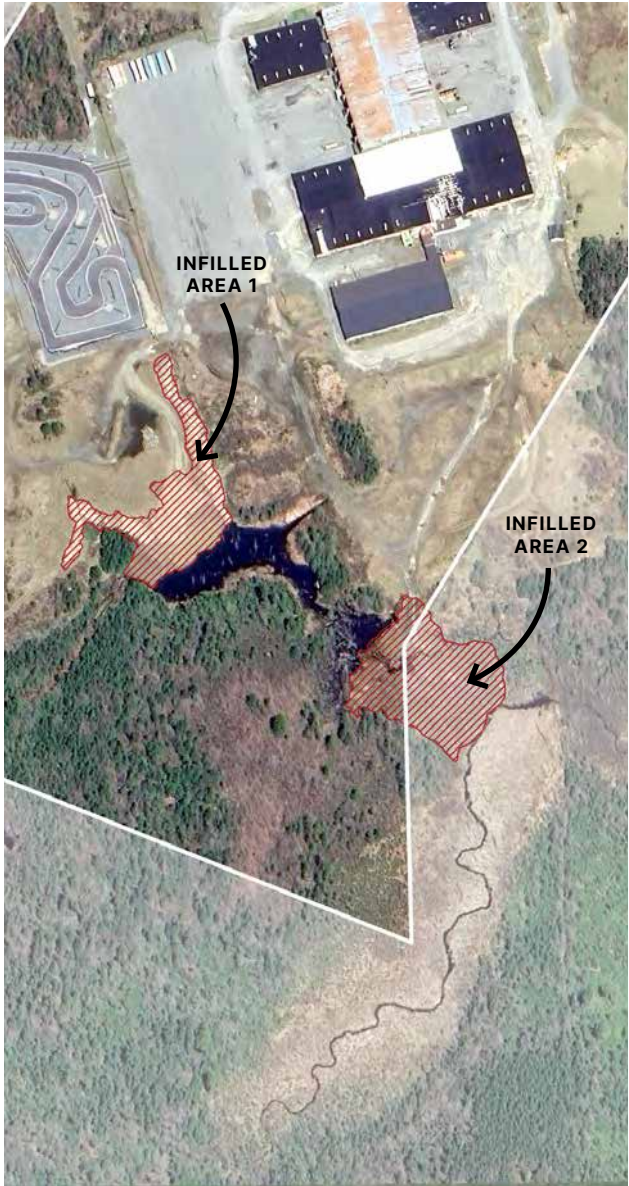


Figure 36 — Google Earth Aerial Imagery from October 2024 with the areas of infilling highlighted.

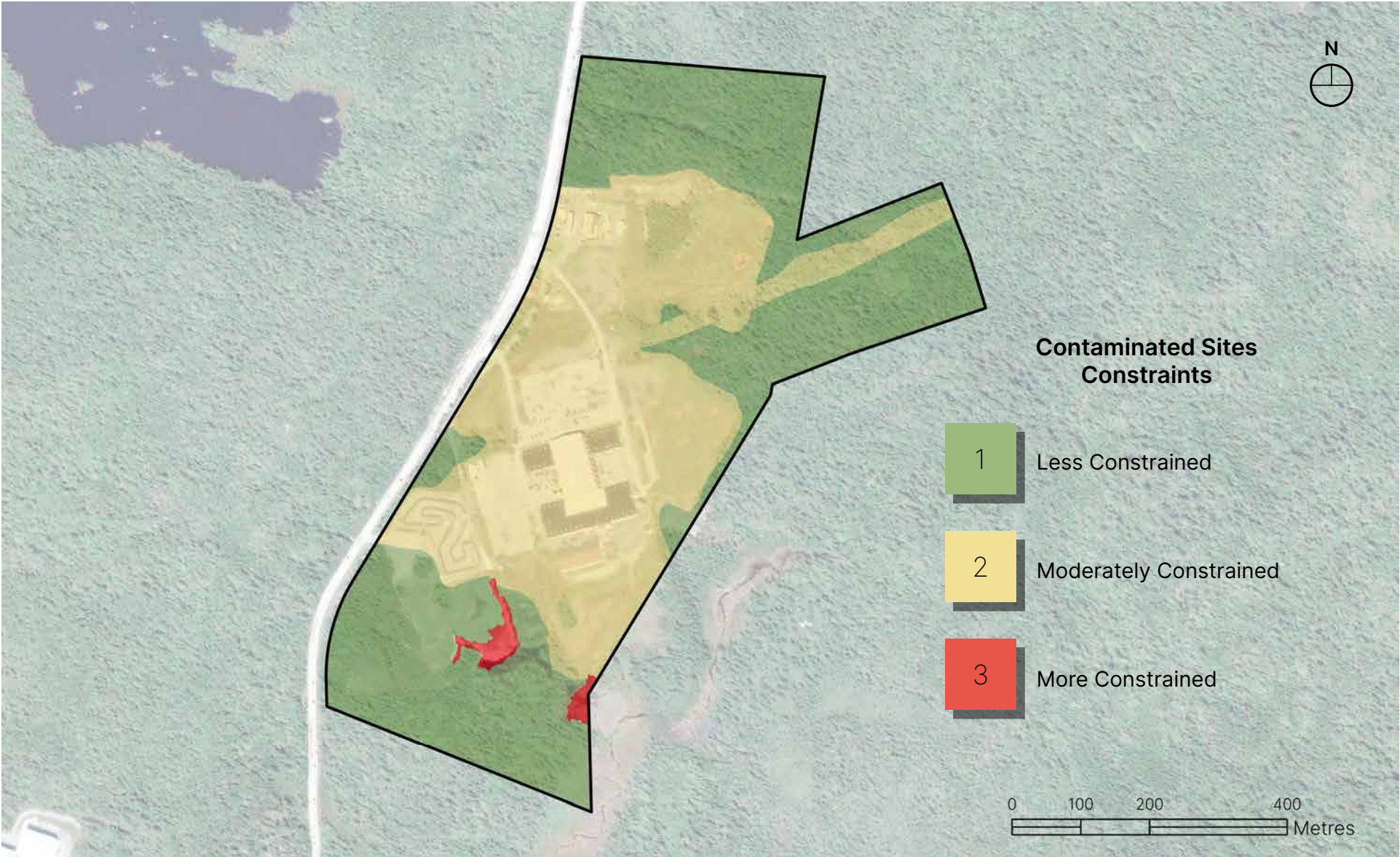


Figure 37 — Contaminated Sites Constraints Map

1.9 — Cumulative Constraint Mapping

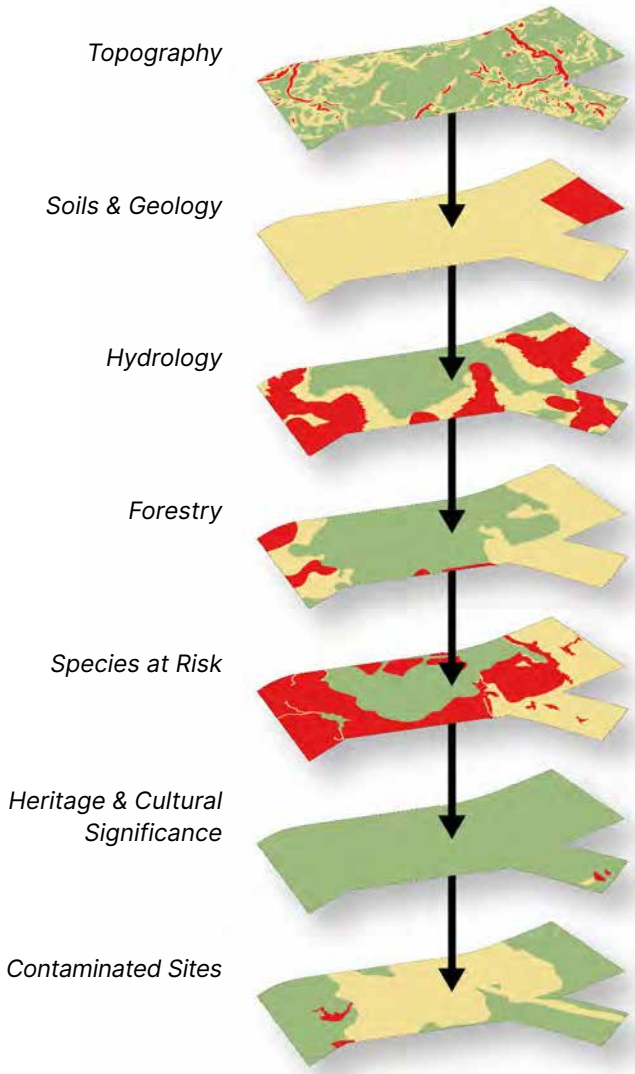


Figure 38 — The seven constraint maps

1.9.1 — ALL INDICATORS

To determine the final suitability scores for the different parts of the HEC lands, the values of the constraint mapping were overlaid on each other and summed to provide a cumulative constraint score. Since the seven constraint maps were classified on a scale from 1 to 3, the final constraint scores had a possible range of 7 to 21. The minimum score of 7 occurs when all seven indicators score 1, while the maximum score of 21 occurs when all seven score 3. The results of this exercise can be seen in Figure 39. The breakdown of the final constraint scoring is as

Overall Constraint Value	Constraint Level
7-11	Less Constrained
12-16	Moderately Constrained
17-21	Highly Constrained

Table 13 — Overall Constraint Scoring follows.

1.9.2 — DISCUSSION

Overall, the constraint mapping revealed that the HEC lands are relatively suitable for development, but additional provisions should be made for the protection and preservation of the HEC land's forested areas and Wetlands of Special Significance. The northern and southern ends of the site and the section along the eastern site boundary have more established forest, riparian, and wetland habitats. These forest stands are connected to Long Lake Provincial Park, increasing the potential habitats for species at risk.

The final map shows many of the infilled areas as more

moderately constrained. This score may lead to these areas interpreted as less suitable given the context of the constraints overplayed. However, it is essential to consider that areas that have already altered significantly may not score higher because of their ecological significance to the local ecosystem. Still, the risks to the areas are due to their past anthropogenic uses. If these areas are to be developed, then more soil tests would be done to ensure the area's suitability for residential uses, and soil de-contamination processes would be perused before development to ensure site safety.

Therefore, while altered areas on the HEC lands may have constraints attached to them, areas that are cleared or already developed are the most suitable for development, lacking any existing significant ecological features that would raise concerns in the event of their loss.

The results of the land suitability analysis suggest that proper forestry management practices and strategically placed conservation areas would help retain the important ecological services provided by the natural areas in the HEC lands. These conservation practices, coupled with the utilization of green infrastructure and low-impact development practices, would allow for future development on the HEC lands to proceed, ensuring that the site's ecological significance and rare and/or valuable habitats are not jeopardized.

It should be noted that the indicators presented in this report are not exhaustive, and future examinations of the HEC land's suitability with additional indicators may yield different results.

The indicators in this report were all weighted equally during the final analysis, but different indicator weights could also change the conclusions of the assessment.

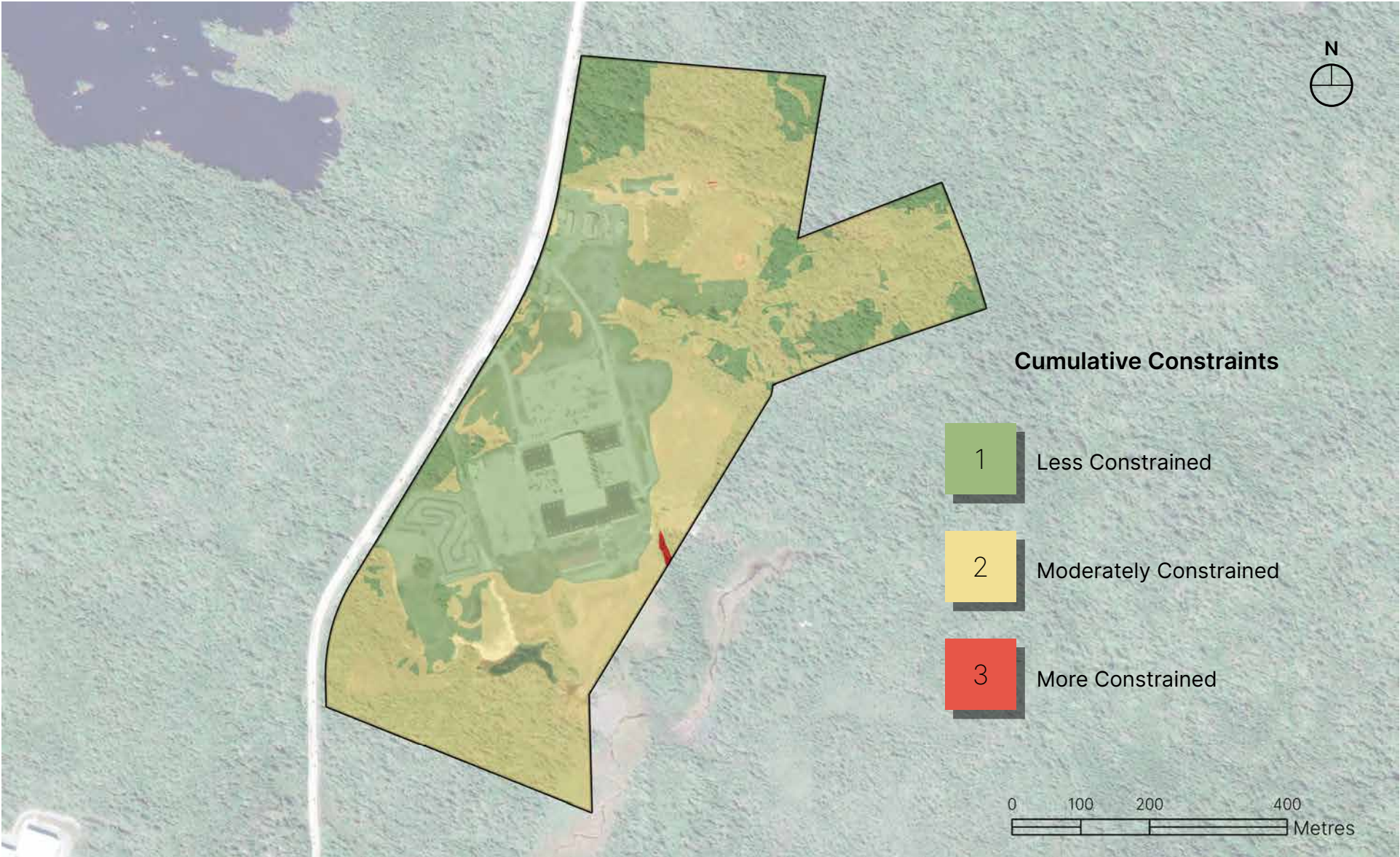


Figure 39 — Contaminated Sites Constraints Map

1.10 — LSA Dataset Sources

Topography

- [Elevation Explorer](#)

Soils and Geology

- [Ecological Land Classification](#)
- [Soil Survey of Halifax County](#)
- [Surficial Geology of the Halifax Metropolitan and Surrounding Areas](#)
- [Bedrock Geology of Nova Scotia](#)
- [Karst Topography Risk Map](#)
- [Indoor Radon Risk Map](#)
- [Acid Rock Drainage Risk Map](#)

Hydrology

- [Secondary Watersheds](#)
- [CBCL Flood Maps](#)
- [Wetlands](#)
- [Hydrological Basemap](#)
- [Wet Area Mapping \(WAM\)](#)
- [Well Log Database](#)

Forest Ecology

- [NSDNRR Forest Dataset](#)
- [Ecological Land Classification for Nova Scotia Guide](#)
- [Forest Ecosystem Classification for Nova Scotia Guide](#)

Species at Risk

- [NS ESA List of Species at Risk](#)
- [SARA Registry](#)
- [Heuristic Model for Identifying The Habitats of Erioderma Pedicellatum and Other Rare Cyanolichens in Nova Scotia, Canada](#)

Contaminated Sites

- [Nova Scotia Environmental Registry](#)

Heritage and Cultural Significance

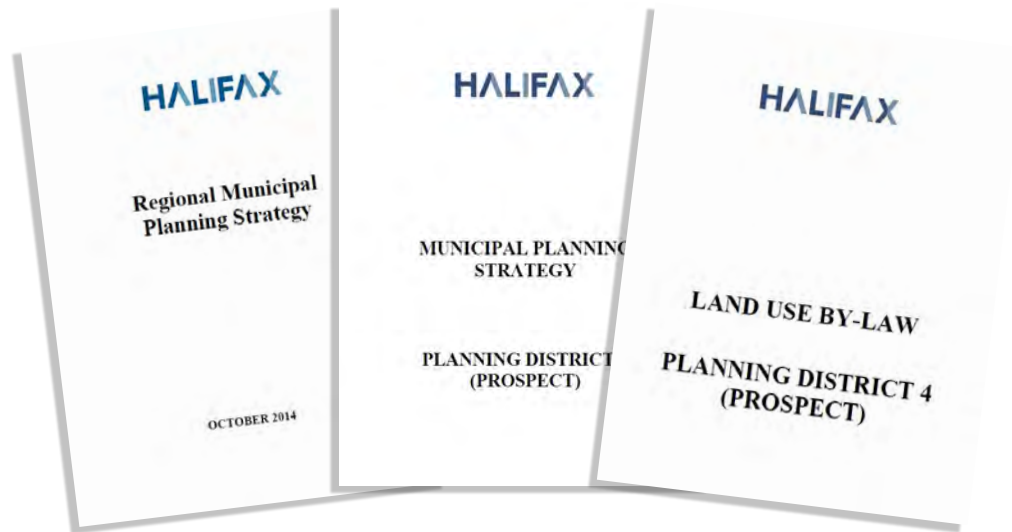
- [HRM Heritage Properties](#)
- [Geoheritage Sites of Nova Scotia](#)



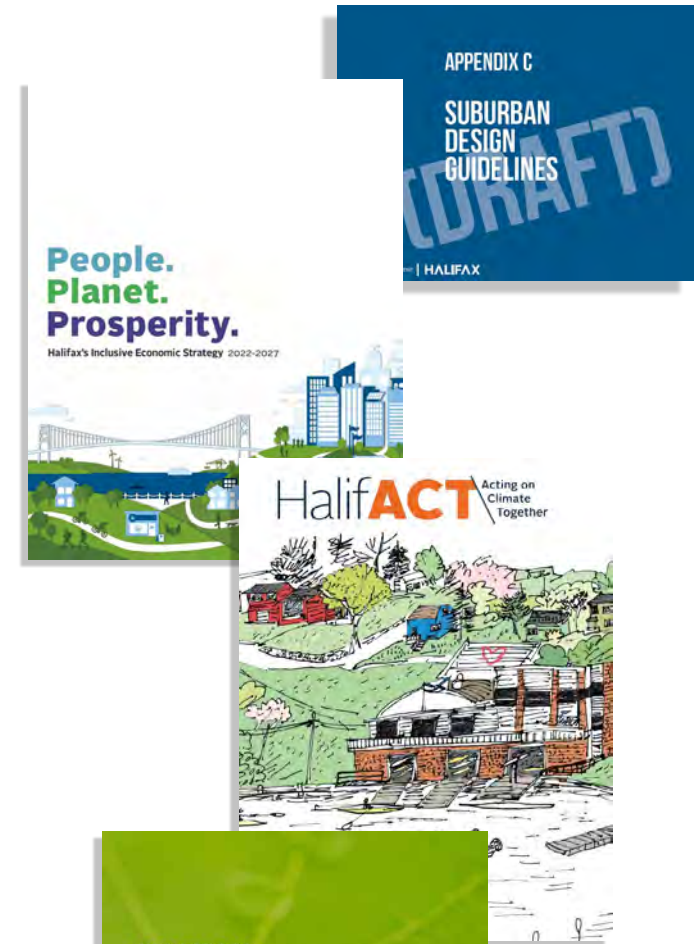
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POLICY ANALYSIS

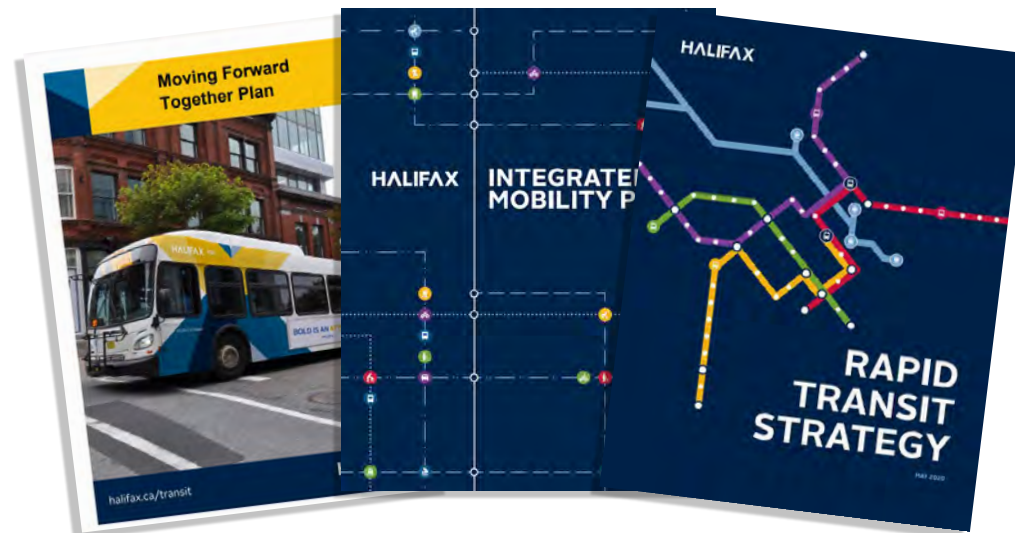
2.1 — Plans Reviewed



REGIONAL AND LOCAL PLANNING DOCUMENTS



MUNICIPAL PRIORITY PLANS



TRANSPORTATION PLANNING DOCUMENTS



2.2 — Regional Plan (2014)

The Regional Municipal Planning Strategy, also referred to as the Regional Plan, establishes long-range, region-wide planning policies pertaining to the growth and development of the Halifax Regional Municipality (HRM) from the present day up until 2031. The plan aims to improve the quality of life for those in HRM by “fostering the growth of healthy and vibrant communities, a strong and diverse economy, and sustainable environment.”

The plan lists a series of objectives organized across eight different themes. Some of these objectives have less relevance to the development of Halifax Exhibition Centre (HEC) lands; for example, objectives related to growth in the Regional Centre do not strongly pertain to the subject properties located outside of Halifax.

The Regional Plan establishes a growth target to have 25% of new housing starts located within the rural communities of HRM (where HEC lands are located). Further, the Regional Plan also establishes a series of “Growth Centres” across HRM; these are areas in which the municipality wants to concentrate growth and development in the future. The HEC lands lay directly south of the Clayton Park West and West End Mall centres, indicating the desire of the municipality to concentrate development in this portion of the municipality.

Looking at the West End Mall growth node specifically, the area is classified as a “Regional District Growth Centre” indicating a higher level of density and development wanted by HRM. Plans to develop the HEC lands are proceeding as of 2023 and will see thousands of new units built less than 7km from the HEC lands. Given its proximity to this massive new development as well as the Bayer’s Lake commercial area and Ragged Lake business park, it’s reasonable to assume that The HEC lands will benefit from the influx of new residents and subsequent demand for

new housing that could follow. This is supported by the fact that, unlike most other rural areas in Halifax, The HEC lands are serviced by Halifax Water. This meets the goal in the Regional Plan that stipulates the municipality’s intent to focus new growth in centres where supporting services and infrastructure are already available.

Beyond its strategic location, the HEC lands also benefits from being designated as an HEC lands by the Regional Plan. This designation was established in the second Regional Plan Review and pertains to large parcels of land that may be suitable for mixed-use developments. This designation specifically mentions the significant demand for housing in HRM as a motivator to develop these Opportunity Sites.

Under the Opportunity Sites lands designation, the sites are subject to a variety of considerations that may influence the municipality’s decision to approve or deny development. According to policy S-13A, development on the HEC lands should feature a mixture of units, a range of housing types, adequate public parks/open spaces, and plans to coordinate growth with the Ragged Lake Business Park, among other considerations.

Another consideration that council considers in regard to Opportunity Sites is public participation. Specifically, policy S-13A(b) states that council shall consider “that a public participation program provides diverse and inclusive opportunities for public engagement during the planning process” when reviewing a development proposal for Exhibition Park. The development of the HEC lands will likely involve an iterative and in-depth public engagement process that will document community feedback and integrate it into the overall design wherever it aligns with overarching policy objectives, therefore meeting the intent of the Regional Plan concerning public

participation.

The Regional Plan also established the Urban Transit Service Boundary (UTSB). This Boundary includes all contiguous communities in HRM which currently have both municipal water and municipal sewer and where homes are generally closer together. The goal of the UTSB was to focus investment in areas where transit could operate most efficiently while also setting clear expectations for future expansion. As a result, Halifax Transit does not plan to add or increase transit service outside of the UTSB. Unfortunately, the HEC lands lies within the UTSB, making future transit expansions less likely than in other parts of HRM. However, policy T-10 of the Regional Plan stipulates that “HRM may consider programs to encourage and assist communities with developing their own community based transit services in the areas outside the Urban Transit Service Boundary” meaning that future expansions are still possible.

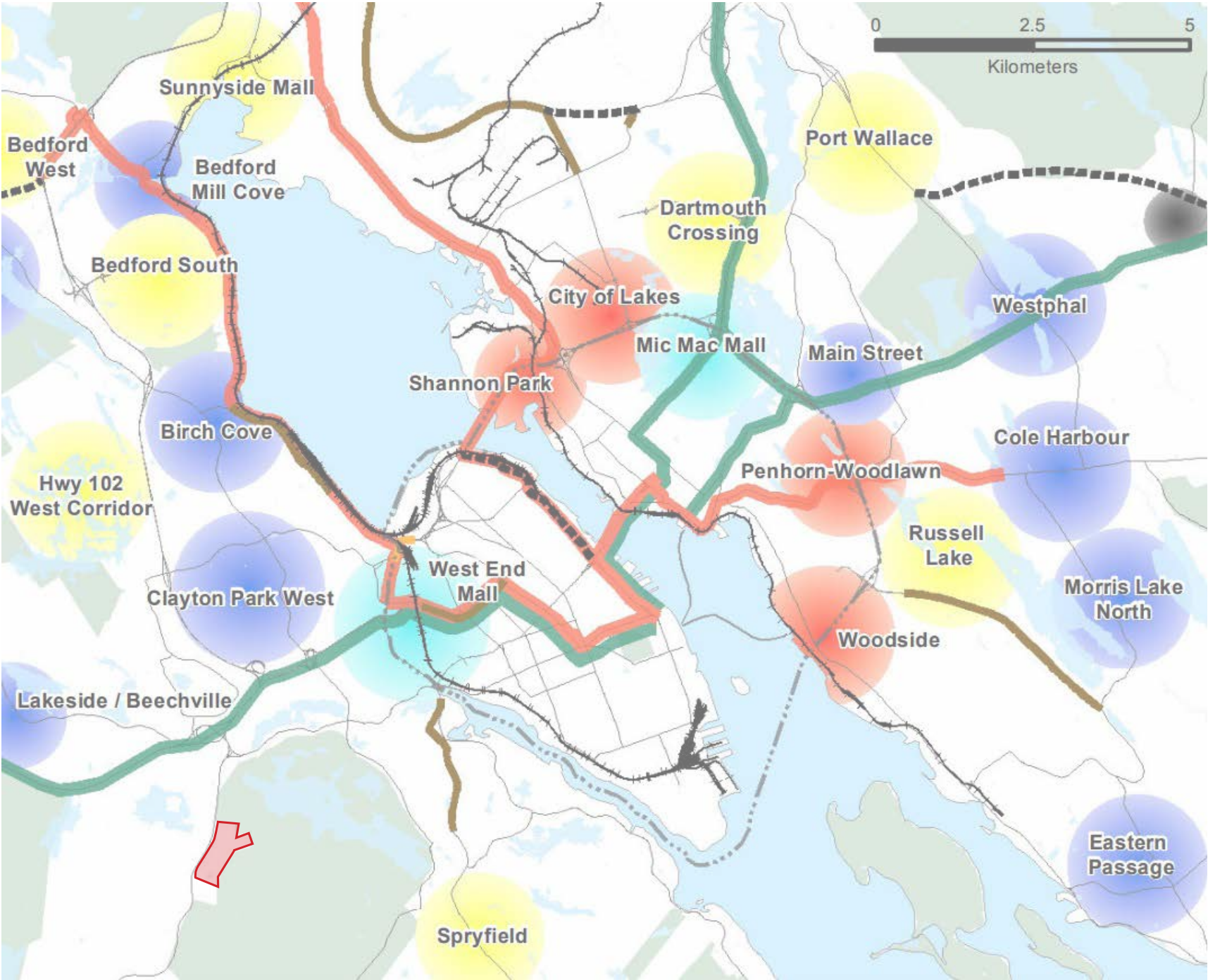


Figure 40 — Regional Plan Map 1: Settlement and Transportation

*Colourful circles represent Growth Centres

2.3 — Regional Plan (Phase 3 Draft, June 2023)

The second five-year review of the Regional Municipal Planning Strategy (MPS) began in 2020 and although the updated plan has yet to be adopted, the draft document for community engagement was released in June 2023. The updated plan includes a series of new policies and visions aimed at guiding the growth of the municipality towards an eventual population of one million people. While there are a significant number of changes in this document compared to its predecessor, many of the policies in the Draft Regional MPS support the development of the Halifax Exhibition Centre lands.

Two of the main principles listed in chapter one are the need to direct housing and employment to strategic locations in the municipality as well as the need to increase housing supply across HRM to meet the needs of a diverse population. The development of Exhibition Centre would more than meet both of these goals. The HEC lands are situated near a growing industrial hub (Ragged Lake Business Park) as well as the commercial and industrial areas around Bayer's Lake. The HEC lands are also situated near the intersections of Highways 102 and 103, giving the HEC lands easy access to the rest of the municipality, further added to its strategic location. At the same time, development of the HEC lands will take the form of a variety of different housing types, enabling residents from a diverse array of incomes and backgrounds to inhabit the HEC lands, further meeting the principles of the plan.

Under the Draft Regional Plan, the Halifax Exhibition Centre lands fall under the "Rural Commuter" designation for land use. This term refers to areas within the regional municipality that are within commuting distance of the Regional Centre but still located in rural areas that benefit protecting existing

natural resources and preserving the traditional rural community character. Within this designation the plan seeks to focus development in a series of rural clusters. While The HEC lands are not named as one of the rural clusters, many of the principles of these clusters are still relevant to its development.

Rural centres are areas in which compact development patterns can support village main streets and a range of mobility options, including active transportation and public transit. The conceptual plan for the HEC lands contains a variety of dense forms of housing alongside pedestrian and active transit links to both the neighbouring provincial park and Prospect Road. Additionally, the history of public transit service to the HEC lands paired with the dense nature of the proposed community may serve as justification to re-extend transit service to the HEC lands. The importance of the rural clusters is further emphasized in chapter eight of the plan when discussing economic prosperity.

The draft plan also introduces a chapter with policies specific to community infrastructure like parks. The proposed development features a large central community park that will be handed over to the municipality following construction as well as a series of smaller private parks that will still be publicly-accessible. The HEC lands will also feature a number of conservation areas abutting Long Lake Provincial Park with some having direct access to the park. This spectrum of green and open spaces is important for community wellness and active living, as described by the draft regional plan. The proposed park network meets a series of the goals outlined in this chapter, including policy CL-1.

The significant development potential of the Halifax

Exhibition Centre Lands has not gone unnoticed by HRM and as with the existing Regional Plan, the HEC lands are classified as an Opportunity Sites under the Draft Regional MPS. It is one of two suburban Opportunity Sites located within the municipality and is subject a series of criteria prior to the undertaking of the neighbourhood planning process.

2.4 — Planning District 4 LUB and MPS

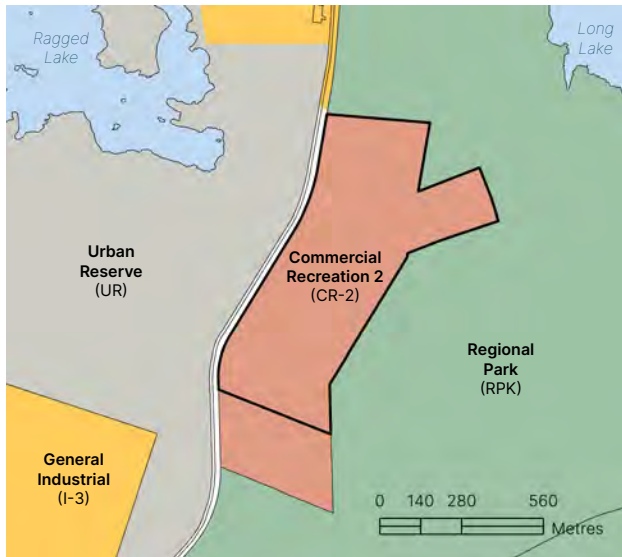


Figure 42 — Current Zoning

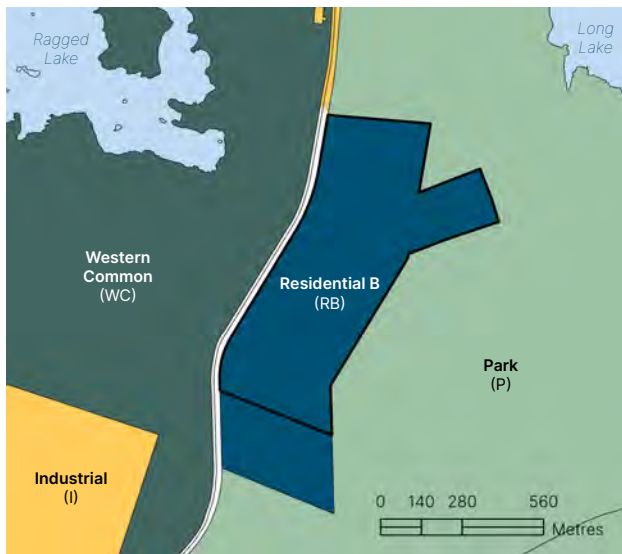


Figure 41 — Generalized Future Land Use Map

District 4 Municipal Planning Strategy

The Halifax Exhibition Centre lands are designated Residential B under the Generalized Future Land Use Map of the Municipal Planning Strategy (MPS) for Planning District 4. This designation relates to the land use intent for the area rather than the current zone or use of the HEC lands. Within this designation, the MPS recognizes that the surrounding area contains a mixture of low-density residential, commercial, industrial, resource, and community facility uses. The MPS also acknowledges that a more suburban style of development has been occurring gradually over the years. The document goes on to state that the intention of the Residential B designation is to support the continuation of residential development while providing support for the traditional mix of land use activities. The MPS also expresses the desire for more affordable and mixed housing types within the Residential B designation, enabling two-unit and auxiliary-unit dwellings via policy RB-2, for example.

Policy RB-12 of the MPS explicitly mentions the HEC lands when discussing future commercial recreation uses in District 4. The policy establishes the Commercial Recreation 2 (CR-2) zone which permits the development of exhibition parks, animal and vehicle racing tracks, rifle ranges, amusement parks, drive-in theatres, and bowling alleys. The four PIDs of the HEC lands are the only properties zoned as CR-2 in HRM, demonstrating the existing precedent of HEC lands-specific policies for Exhibition Park.

Policy IM-11 of the District 4 MPS outlines the general criteria considered when reviewing a development agreement or amendment to the plan. The policy cites conformity with planning documents, the adequacy of on-site sewer services, the adequacy of road networks, and potential conflicts with nearby uses as examples of the criteria considered.

District 4 Land Use By-Law

The Halifax Exhibition Centre lands are currently zoned CR-2 under the Planning District 4 Land Use By-Law (LUB). This designation does not allow residential development as-of-right, instead permitting a series of commercial recreation uses. The HEC lands borders the Halifax Mainland Plan Area in the west and is surrounded by the Regional Park (RPK) designation on all other sides.

2.5 — Integrated Mobility Plan

In 2017, Halifax Regional Council passed the Integrated Mobility Plan (IMP) which guides investment in active transportation, transit, transportation demand management, goods movement and the roadway network in Halifax while also establishing goals and visions to guide future development up until 2031.

Transit Connectivity

The HEC lands are not directly serviced by any public transit route. In the past, the 22 local bus route used to have a stop at the HEC lands as well as a park-and-ride lot but they have since been cut from service. This is in spite of the fact that there is significant demand for transit in the area; the report detailing the first round of consultation for the IMP lists over a dozen comments asking for improved transit service and cycling infrastructure along prospect road.

The closest bus stop (#8807) is 1.1km up Prospect Road in the Ragged Lake Business Park. Although the walk would take less than 15 minutes to complete, the lack of sidewalks along prospect road would make this walk challenging. Further, the 22 bus line only services the Chain Lake - Armdale region of Halifax, meaning that commuters will need to transfer in order to travel elsewhere in the municipality. We expect with this project fully built-out, the 22 loop would likely extend down to this HEC lands and we have designed the new collector loop to accommodate future bus service.

Rural Considerations

According to both the IMP and the Regional Plan, the HEC lands are located within an area that is classified as rural. This designation carries a series of considerations in regard to the mobility and land use planning of the HEC lands.

The IMP explains how the cost and trip duration of transit increases as destinations become more

dispersed and farther from major population centres. Similarly, the population density in rural areas is often too low to support frequent urban-style transit service. However, the plan also explains the various solution that can be implemented in rural areas to mitigate these issues.

Section 1.2.4 of the IMP discusses planning for improved mobility in rural areas. It recommends clustering development into denser rural centres in order to improve opportunities for active transportation, enable easier service from dial-a-ride vans, and make car- and ride-sharing easier. The development of the HEC lands would likely result in a dense, clustered rural community that would be able to utilize many of these transportation alternatives.

Additionally, the IMP establishes mode-share targets for the different urban designations in Halifax. Although the plan doesn't specifically list a target for rural areas, it lists a goal of 10% of all trips being taken by transit and 4% of all trips being completed via active transportation by 2031 for outer suburban areas. Similarly, it establishes the goal of having 16% of all trips being taken by transit and 14% of all trips being completed via active transportation across the entire HRM by 2030. While this goal may be difficult to meet in other rural areas, the HEC lands has a much bigger transportation advantage than other rural areas in HRM.

Prospect Road is included in the Halifax bicycle network, featuring bi-directional paved shoulders that link the HEC lands to the rest of Halifax's cycling network. Additionally, sections 3.1.5 c) and 3.1.5 d) of the IMP describe the need to expedite the planning, design and construction of the regional network of multi-use pathways and the need to expand active transit connections in rural communities. The existing infrastructure as well as the clear policy

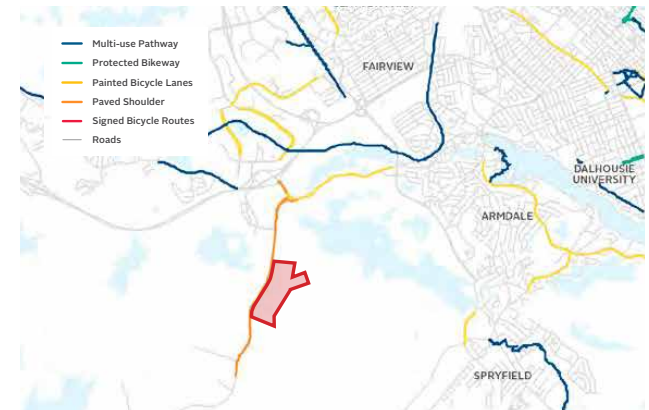


Figure 44 — IMP Existing Bicycling Infrastructure Map

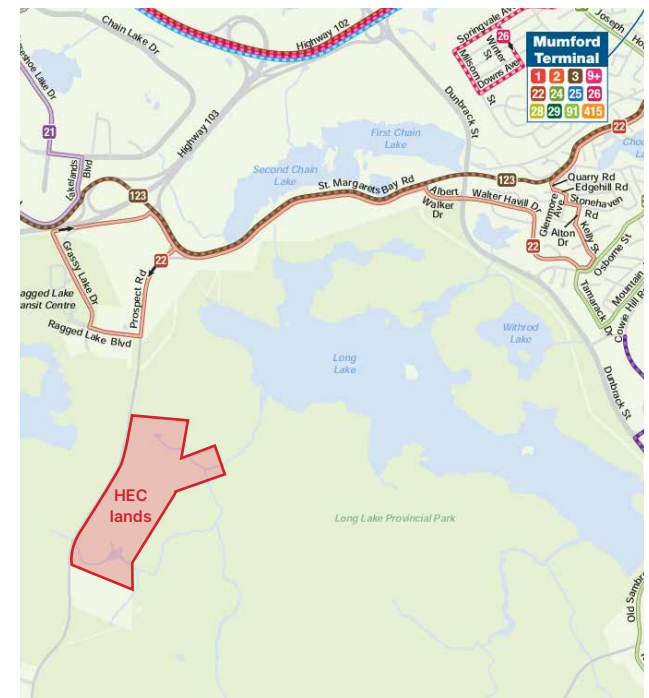


Figure 43 — Map of Local Bus Routes

intent to improve rural transportation mean that the development of the HEC lands could act as a catalyst to improve mobility in and around the communities along Prospect Road.

Complete Streets

Section 2.3 of the IMP discusses complete streets and their importance in improving both mobility and sense of place within the municipality. The principles of complete streets include actions like prioritizing pedestrians/cyclists, requiring street trees, promoting placemaking, and promoting human-scaled design.

The development of the HEC lands will likely require the construction of new on-site streets and roads. Where possible, the principles of complete streets will be implemented in the design of the HEC land's roads in order to promote the goals of the IMP. The plan shows a loop road around the village green which includes on-street parking and sidewalks on both sides of the street. These intersections are proposed in the location of the two existing driveways.

Transportation Demand Management

The IMP outlines a series of Transportation Demand Management (TDM) strategies to reduce peak-hour congestion by providing people with choices in how and when they commute. Examples include promoting working from home, utilizing active transportation, carpooling, or leaving an hour earlier for work.

Rural areas like the HEC lands rarely have access to the same number of TDM strategies available to residents of urban areas. However, the HEC lands stands out as a potential rural community with an array of TDM options not present in other nearby rural areas. The nearby cycling infrastructure gives commuters another transportation option besides driving, potentially reducing congestion. Additionally, the HEC

lands lies in one of the few rural areas of HRM that is still serviced by the ride-hailing app Uber, enabling the potential future residents of the HEC lands to travel longer distances without needing a personal vehicle.

As a mixed use development, we anticipate that the commercial uses in this development will help to reduce vehicle trips by providing daily commercial services on-site.

2.6 — Moving Forward Together Plan

Approved by council in 2016, the Moving Forward Together Plan (MFTP) was created to kickstart the restructuring of the transit network and act as a guide for future service improvements. With the goal of improving the appeal and efficiency of the Halifax Transit network, the plan outlines changes such as increasing the frequency of service, extending the service day, and enhancing the reliability of service in key high transit ridership corridors.

As a part of the plan's implementation, the MFTP dictates that an annual service plan shall be created each year to detail the service and route changes that were created in accordance with the policies and visions of the MFTP. These one-year action plans are very similar to the annual service plans put out by MetroTransit in previous years. The HEC lands used

to have a stop from the 22 local bus route but service was cut in the 2017/18 annual service plan. This was following an earlier service cut that saw the HEC lands excluded from evening bus service in the 2013/14 annual service plan. The service cut was directly mentioned in the MFTP's section on reallocating resources to high-ridership routes. It appears that low ridership was the driving force behind Exhibition Park's exclusion from the 22 bus route.

The MFTP affirms the stance of HRM to keep all transit investment within the Urban Transit Service Boundary (UTSB). Since the HEC lands lies outside of this boundary, it would not be possible to reinstate or expand service to the HEC lands without expanding the boundary to include the subject properties. Since its creation, the UTSB has not been expanded.

Additionally, the few existing routes that lie outside the UTSB were all established before its creation. The MFTP also stipulates that upgrades to routes that extend beyond the UTSB can only occur in the portions of these routes that are within the boundary.

Along with the IMP, the MFTP also advocates for the use of transit priority measures to provide transit vehicles with competitive time advantages over private vehicles. Since the development of the HEC lands would also likely see the construction of new roads on-site, future road and intersection construction could see transit priority measures implemented to improve transit service in the area should it ever be expanded to cover the HEC lands.

2.7 — Rapid Transit Strategy

In May 2020, Halifax Regional Council unanimously endorsed the Rapid Transit Strategy (RTS) which was designed to bring rapid transit to Halifax in the form of increased ferry service and new Bus Rapid Transit (BRT) routes. The plan proposed three new ferry lines and four new BRT lines that would stretch as far north as Mill Cove and as far south as Spryfield. Unfortunately, none of the proposed BRT stops are located near Exhibition Park; the nearest stop being proposed is 6km away and a commute by bus to reach this BRT stop could take more than an hour. Further investments in transit spurred by the development of the HEC lands may be required to better integrate the HEC lands into the transportation network.

Beyond the proposed rapid transit routes, the RTS discusses the need for transit-supportive land uses to

accompany investments in transit. Transit-supportive developments are typically dense, walkable, and linear in order to maximize the number of people who can be served in an efficient manner. The HEC lands stretch linearly along prospect road and would likely see the establishment of a dense and walkable community; this potential built form would be ideal for buses and could help to justify expanded transit service into the surrounding communities.

2.8 — Halifax’s Inclusive Economic Strategy

Every five years, the Halifax Regional Municipality publishes an economic strategy in collaboration with The Halifax Partnership. In effect from 2022 to 2027, the current Inclusive Economic Strategy outlines a series of visions, goals, and targets pertaining to growing Halifax’s economy into the future.

One main vision described by the Inclusive Economic Strategy is to grow HRM’s population to 650,000 by 2037. The strategy also describes the need to increase access to housing options in HRM, citing homelessness and affordability as two key concerns identified by residents. As a result, the strategy established “Increasing Housing Stock” as a 5-year strategic objective aimed at promoting/maximizing growth and increasing the municipality’s GDP. The

development of a HEC lands at the scale of the HEC lands would likely result in the construction of hundreds of new units, helping to achieve many of these objectives outlined in the Inclusive Economic Strategy.

Further, the strategy goes on to explain the importance and impact of “Major Projects” in driving economic growth. These developments are a significant source of investment, spurring growth in construction and manufacturing while also promoting the creation of new infrastructure. This infrastructure makes it easier for businesses to operate more effectively in Halifax and across the province, driving economic growth even further.

The strategy cites a number of examples of major

projects as per the Atlantic Provinces Economic Council’s (APEC) Major Project Inventory including the Seton Ridge development, Port Wallace development, Cogswell Interchange redevelopment, and King’s Wharf waterfront redevelopment. All of these projects are comparable in scope and scale to a potential development of Exhibition Park, indicating the potential for significant economic growth if the HEC lands we to be developed.

2.9 — HalifACT 2050

In June 2020, Halifax Regional Council unanimously adopted HalifACT, a plan that details the municipality’s pathway to achieve a net-zero economy by 2050. HalifACT outlines a series of actions and policies aimed at decarbonizing Halifax in an attempt to meet the global emissions reduction targets necessary to limit global warming to 1.5°C above pre-industrial levels.

Among the many actions that are detailed in HalifACT, a handful specifically pertain to new developments within the municipality. Section 5.2.1 of the plan discusses the need for more efficient buildings now and in the future. Buildings accounted for approximately 70% of total energy use in Halifax in 2016, and 77% of total emissions. HalifACT details how retrofitting existing buildings and ensuring that new buildings are more efficient are necessary components

of a successful energy transition for Halifax. Where possible, new buildings in the HEC lands may be built without many of the inefficiencies found in older structures.

HalifACT also goes on to explain the importance of natural areas and green infrastructure in reducing the effects of anthropogenic climate change. Among other things, natural areas and green infrastructure increase water infiltration, reduce surface runoff, reduce the heat island effect, and sequester carbon. If development of the HEC lands are pursued the development would include natural spaces and limited surface parking to align with the ethos of HalifACT. In providing natural space the ecological significance of natural areas and their benefits to surrounding ecosystems as well as future residents will be considered in the HEC lands design.

2.10 — Green Network Plan

Created with the intention of providing land management and community design direction to promote the long-term sustainability of the Region, the Halifax Green Network Plan (HGNP) establishes an interconnected open space network, outlines ecosystem functions and values, and provides strategies to manage open space. Within the HGNP, there are five themes which define the importance and function of open spaces in the region; Ecology, Working Landscapes, Community Shaping, Outdoor Recreation and Cultural Landscapes.

The landscape of the HEC lands are classified by the HGNP as having low to high ecological value, minimal working value, and medium socio-cultural value. When summed, the total landscape value for the majority of the HEC lands are medium, as per Map 4 (Figure 37) of the HGNP. This designation is higher than most areas within urban Halifax and largely stems from the nearby provincial and municipal protected park areas as well as the cultural significance of the exhibition centre. While the development of the HEC lands could lower the HEC land's socio-cultural value through the loss of the Halifax Exhibition Centre, the development will also likely include the creation of public and open spaces that enable community-building, recreation, wellbeing, and active transportation, therefore increasing the overall landscape value of the HEC lands in other categories.

Additionally, the HGNP identifies the area in and around the HEC lands as parks with an important corridor running through the Western Common. This “important corridor” designation applies to areas that connect natural habitats. Thankfully, no important or essential corridors run across the HEC lands. Additionally, the Western Common and Long Lake Provincial Park meet both north and south of THE HEC lands, making the risk of disconnecting the landscape through development low.

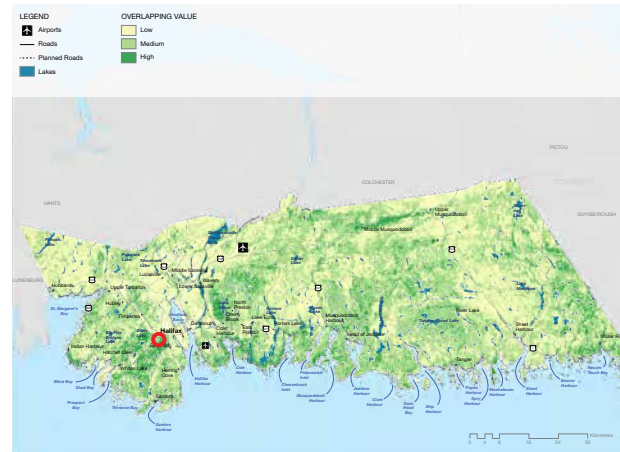


Figure 46 — HGNP Map 4: Summed Values

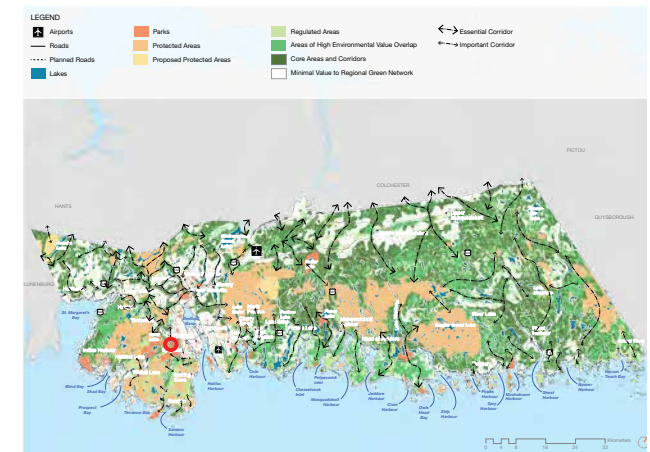


Figure 47 — HGNP Map 5: Green Network Ecology Map

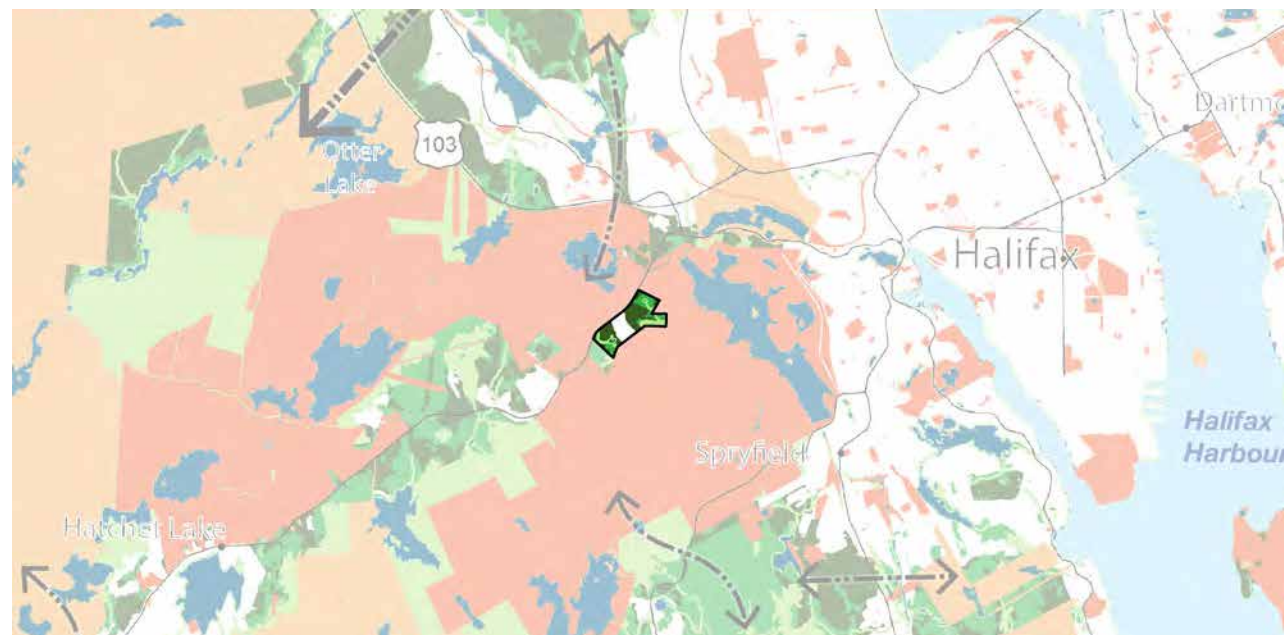


Figure 45 — HGNP Map 5: Green Network Ecology Map (zoomed in)

2.11 — Draft Suburban Design Guidelines

In addition to the nine plans listed above, the draft Suburban Design Guidelines (SDG) from the Regional Plan review were also reviewed. Being only a draft document, the various ways in which the SDG support the development of the HEC lands should be taken lightly as they are subject to change in the future.

The conceptual plan for the HEC lands are compliant with criteria 4 and 5 from the HEC lands Planning and Design section of the draft SDG document. Criterion 4 explains that buildings and open spaces should be located in a way that optimizes pedestrian comfort related to weather both on and around the HEC lands while criterion 5 promotes locating utilities, services, and parking in ways that mitigate negative impacts on the public realm and neighbouring properties. All of the mid-rise and high-rise buildings in the conceptual plans for the HEC lands feature setbacks and recesses that mitigate the effects of downdrafts and other harsh winds, thus improving the overall pedestrian experience. The conceptual HEC lands plan also places parking lots and underground parking entrances in the rear of most buildings in order to protect the experience within the public realm along

the right-of-ways.

The proposed plan for the HEC lands additionally meets a number of criteria from the section regarding open space design. Criterion 3 promotes open spaces that are used as amenity spaces and designed to optimize pedestrian comfort and interaction. Further, criterion 4 promotes open spaces that are designed to incorporate sustainable landscape practices. Exhibition Park's conceptual plan features a variety of large landscaped open spaces and trails that meet various needs of both residents and the surrounding area including outdoor recreation and stormwater management.

3.0

MASTER PLAN AND BUILT FORM



3.1 — Master Plan

3.1.1 — Context

On October 23, the Province of NS released its five-year housing plan, “Our Homes, Action for Housing”. The plan represents a projected \$1-billion investment and highlights targets to create the conditions for more than 40,000 new housing units from one end of the province to the other. Housing new and existing residents in the province represents one of the greatest challenges for the next decade and one of the biggest limiting factors to achieve the province’s goal for doubling its population to 2 million people by 2060.

In response to the need to accommodate the substantial growth needed in HRM, the Municipality is considering a wide range of potential future growth nodes around the municipality. This is one of those growth nodes. The HEC lands are very close to municipal water and sewer services, it is on a major collector highway, it is close it is adjacent to the Ragged Lake Urban Reserve in the new Regional Plan, and it has no surrounding single family homes that would be impacted by it. In short, this is an ideal area for future development.

3.1.2 — Master Plan

The master plan for this 109 acre HEC lands includes a broad range of unit types including townhomes, stacked townhomes, a cluster development, multi-unit housing and ground floor commercial uses. The low density uses are found to the very north of the HEC lands with 2 road connections to the Provincially owned land to the north. These connections could be used for trailheads into the Provincial Park, or they could extend as residential development at some point in the future. The low density area to the north will be accessible via the already constructed intersection for the PetroCan Station.

The higher density core for this new development is found in the vicinity of the existing Exhibition Centre building. A looped collector road is proposed around the existing building allowing the Exhibition Centre to operate until which time it is removed and replaced with high density multi-unit towers. A modern 5.25 acre 'village square' is located in the geographic centre of the development surrounded by mixed use towers ranging in height from 12-storeys to 24 storeys. This park will be dedicated to HRM as part of the parkland dedication. The parkland represents 5% of the overall property size, though almost 20 acres of the 109 acre HEC lands will be reserved for conservation.

The ground floor of some of the buildings surrounding the village square will be commercial to provide local commercial services to people within the development and the to the surrounding communities of Goodwood and Hatchet Lake. A looped collector road encircles the village square and will include on-street parking and sidewalks on both sides of the street. The intersection of the new looped road is in the general vicinity of the existing driveways into the Exhibition Centre. The looped road will likely be used by transit in the future once the development is partially built out.

Figure 48 — Pro Forma

Exhibition Park - Pro Forma

Plate Efficiency 80%
Avg Unit Size 80 m²

Building	Comm GFA	Sched Height Max (m)	Total Storeys	Lowrise (4-storeys)		Midrise (6-storeys)		Towers				Total Res GFA (m ²)	Units	Height (m)
				Storeys	Lowrise GFA	Storeys	Midrise GFA	Storeys	Tower 1 GFA	Storeys	Tower 2 GFA			
A		25	8	4	2166	4	1846					16,048	160	25.5
B		25	8	4	5224	4	4519					38,972	390	25.5
C		19	6	3	1055	3	877					5,796	58	19.5
D		19	6	4	1928	2	1643					10,998	110	19.5
E		19	6	4	1928	2	1643					10,998	110	19.5
F		19	6	4	1928	2	1643					10,998	110	19.5
G		25	8	4	2728	4	2243					19,884	199	25.5
H		25	8	4	1928	4	1643					14,284	143	25.5
I		19	6	3	1850	3	1550					10,200	102	19.5
J		25	8	4	1928	4	1643					14,284	143	25.5
K		25	8	4	2028	4	1828					15,424	154	25.5
L		50	14	4	2473	2	1967	8	900			21,026	210	43.5
M	1154 m ²	50	14	4	4615	2	3757	8	900	6	900	38,574	386	43.5
N	706 m ²	50	14	4	2825	2	2325	8	900			23,150	232	43.5
O		99	20	4	2650	2	900	14	900			25,000	250	61.5
P		50	14	4	1500	2	1300	8	900			15,800	158	43.5
Q		50	14	4	2688	2	2480	8	900			22,912	229	43.5
R		99	24	4	2610	2	2410	18	900			31,460	315	73.5
S		99	24	4	2610	2	2410	18	900			31,460	315	73.5
T	706 m ²	99	20	4	2825	2	2325	14	900			28,550	286	61.5
U	706 m ²	99	20	4	2825	2	2325	14	900			28,550	286	61.5
V	706 m ²	99	14	4	2825	2	2325	8	900			23,150	232	43.5
W		99	20	4	2650	2	900	14	900			25,000	250	61.5
X		50	14	4	2688	2	2480	8	900			22,912	229	43.5
Y		25	8	4	1728	4	1528					13,024	130	25.5
Z		25	8	4	1928	4	1643					14,284	143	25.5
AA		25	8	4	2728	4	1588					17,264	173	25.5
BB		50	16	4	2157	4	1500	8	900			21,828	218	49.5
Townhomes		10										4,560	38	
Stacked Townhomes		10										10,800	108	
Total	3979 m²											587,190	5,867	

Total Lot Area	4,752,396 m ²	109.08 acres
Density	44.2 UPA	
Conservation	69,636 m ²	17.21 acres
Linear Park	2,600 m ²	0.64 acres
Village Square	23,800 m ²	5.88 acres
Total Park Area	26,400 m ²	6.52

Value of Development	
Buildings @ \$3500/sm	\$ 2,055,165,000.00
Roads (3.1km)	\$ 15,000,000.00
Underground parking garages	\$ 154,008,750.00
Parks	\$ 6,000,000.00
Total	\$ 2,230,173,750.00

The anticipated buildout for this development will include:

- 5867 units including 146 townhomes, and 5721 multi-units
- A total park area of 6.52 areas (6% parkland)
- Approximately 4,000 m² of ground floor commercial
- 17 acres of conservation land
- An overall density of 44 units per acre.
- The value of the development in 2023\$ will be about 2.2 billion.

This chapter will be more further advanced once the LSA chapters are adopted.





4.0

APPENDICES

4.1 — Appendix A: Wetland Delineation and WESP-AC Report

strum

CONSULTING



**SUPPLEMENTAL INFORMATION
FUNCTIONAL ASSESSMENTS
PID 40600728
Beechville, NS**

November 25, 2024

November 25, 2024

Mr. Basim Halef
BANC Group

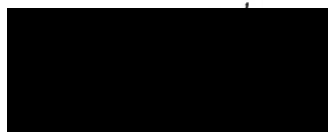
Dear Mr. Halef,

Re: Supplemental Information - Functional Assessments
PID 40600728, Beechville, NS

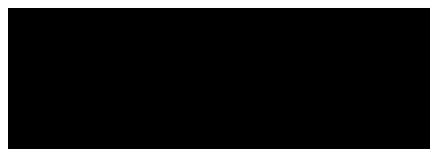
Attached is the Supplemental Information report regarding functional assessments conducted at PID 40600728, Beechville, NS.

The report documents our observations, findings, and recommendations.

We trust this to be satisfactory at this time. Once you have had an opportunity to review this correspondence, please contact us to address any questions you may have.



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rgardinder@strum.com

EXECUTIVE SUMMARY

Strum Consulting was retained by BANC Group to complete Wetland Ecosystem Service Protocol – Atlantic Canada (WESP-AC) functional assessments on wetlands previously delineated at 200 Prospect Road, Beechville, Nova Scotia. The Study Area comprised of Property Identification number (PID) 40600728 was found to contain 11 wetlands. Functional assessments were performed in June 2023.

Wetland characterization and completion of a functional assessment within the wetlands (WL1-WL11) resulted in the following conclusions:

- None of the wetlands identified are designated as a Wetland of Special Significance (WSS) as described by the Wetland Conservation Policy.
- None of the wetlands identified satisfy the Habitat, Support, or Habitat/Support Hybrid rules that may support determination of a WSS, as per the WESP-AC tool.

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1.0 INTRODUCTION

Strum Consulting was retained by BANC Group to complete Wetland Ecosystem Service Protocol – Atlantic Canada (WESP-AC) functional assessments on wetlands previously delineated at 200 Prospect Road, Nova Scotia. The Study Area comprised of Property Identification number (PID) 40600728 was found to contain 11 wetlands (Drawing 1, Appendix A). Functional assessments were performed in June 2023.

1.1 Project Property Information

The Study Area is on private property, details are provided in Table 1.2.

Table 1.1: Property Details

PID	Owner	Civic Address
40600728	Halifax Exhibition Centre Inc.	200 Prospect Road, Beechville, NS

1.2 Project Team

A Study Team was assembled for the completion of the wetland application. The team was selected based on their level of proficiency in their respective roles. The team members and their individual roles are presented in Table 1.3.

Table 1.2: Project Team

Team Member	Role
Ryan Gardiner, BSc.	Project Management, Senior Review
Darcy Kavanagh, MREM	Desktop Review, Reporting
Manminder Singh, BSc.	Functional Assessments

Curriculum Vitae for the above-mentioned team members is provided in Appendix B.

2.0 METHODOLOGY

This section outlines the methodologies followed for the determination of Wetlands of Special Significance (WSS).

2.1 Wetland of Special Significance

The Wetland Conservation Policy was developed by Nova Scotia Environment and Climate Change (NSECC) in 2019 (previously known as Nova Scotia Environment). Its mandate is to provide a framework for the conservation of wetlands. The document provides a framework for the identification of WSS. According to this document (2019, p.11-12), the following criteria define WSS:

- All salt marshes.
- Wetlands or portions thereof that are within a designated RAMSAR site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Area or lands owned or legally protected by non-government charitable conservation land trusts.

- Intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the Nova Scotia Eastern Habitat Joint Venture (NS-EHJV).
- Wetlands known to support at-risk species designated as endangered or threatened under the federal *Species at Risk Act (SARA)* or the *Endangered Species Act, S.N.S., 1998, c.11 (ESA)*.
- Wetlands in designated protected water areas as described within Section 106 of the *Environment Act*.

Furthermore, the Wetland Conservation Policy states that the Government is in the process of developing a system for classifying additional wetlands or wetland types as WSS (NSE, 2019). Among the wetland characteristics, functions, and services to be considered during the process are whether the area:

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

A province-wide framework for determination of WSS using Wetland Ecosystem Services Protocol - Atlantic Canada (WESP-AC) has recently been developed (see Section 2.2 for more detail).

2.2 Wetland Ecosystem Services Protocol – Atlantic Canada

The WESP-AC process involves the completion of three forms; a desktop review portion that examines the landscape level aerial conditions to which the wetland is situated, and two field forms identifying biophysical characteristics of the wetland (field form) and stressors within the wetland (stressors form). The process serves as a rapid method for assessing individual wetland functions and values. WESP-AC addresses 17 specific functions wetlands may provide (Table 2.1).

The specific wetland functions are individually allocated into grouped wetland functions and measured for “functional” and “benefit” scores. Wetland function relates to what a wetland does naturally (i.e., water storage), whereas wetland benefits are benefits of the function, whether it is ecological, social, or economic. The highest functioning wetlands are those that have both high ‘function’ and ‘benefit’ scores for a given function. WESP-AC enables a comparison to be made between individual wetlands within a province to gain a sense of the importance each has in providing ecosystem services.

Table 2.1: WESP-AC Wetland Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Aquatic Support	Aquatic Invertebrate Habitat
	Stream Flow Support
	Organic Nutrient Export
	Water Cooling
Water Quality	Sediment Retention & Stabilization
	Phosphorus Retention
	Nitrate Removal & Retention
	Carbon Sequestration
Aquatic Habitat	Anadromous Fish Habitat
	Resident Fish Habitat
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian and Turtle Habitat
Terrestrial Habitat	Songbird, Raptor, & Mammal Habitat
	Pollinator Habitat
	Native Plant Habitat

In addition to the grouped wetland functions above, WESP-AC also measures the following groups, however, these are only evaluated by their benefit scores:

- Wetland Condition
- Wetland Risk

The following individual functions are assessed to determine the benefit scores associated with each wetland:

- Public Use & Recognition
- Wetland Sensitivity
- Wetland Ecological Condition
- Wetland Stressors

For each wetland evaluated, the WESP-AC process calculates the overall score for the seven grouped wetland functions and the 17 specific wetland functions listed in Table 2.1. One score each is provided for function and benefit. Scores are ranked as 'Lower', 'Moderate', or 'Higher', allowing for analysis of the wetland as compared to baseline wetland scores in Nova Scotia. A 'Higher' WESP-AC score means that wetland has a greater capacity to support those processes as compared to other wetlands in the province. A 'Higher' WESP-AC score in both the function and benefits category means the wetland supports the natural ecosystem functions and provides services potentially important to society.

Functional assessments were performed in October 2024. WESP-AC scores are provided in Appendix B.

3.0 RESULTS

This section outlines the WSS determination results.

3.1 Wetland of Special Significance

The wetlands identified within the Study Area are not designated as WSS according to the identification framework laid out by NSECC in the Wetland Conservation Policy (2019). Note that portions of two of the delineated wetlands (WL2 and WL5) extend into Long Lake Provincial Park. However, based on recent clarification from NSECC on WSS designation (CBC, 2023), only the portions of the wetlands that overlap with provincial park area are considered WSS. Therefore, the extent of WL2 and WL5 within the Study Area are not designated as WSS.

3.2 WESP-AC Interpretation Tool Result

The WESP-AC interpretation tool (provided by NSECC) was used to determine the function-benefits score and category for each wetland as well as the WSS status. The results of this tool are outlined in Tables 3.1 below.

None of the wetlands within the Study Area satisfy the Habitat, Support, or Habitat/Support Hybrid rules that may support the determination of a WSS, as per the WESP-AC tool. All WESP-AC scores can be found in Appendix C.

Table 3.1: WESP Function-Benefit Products Summary

WL ID	Support Supergroup - Hydrologic		Support Supergroup - Water Quality Support		Support Supergroup - Aquatic Support		Habitat Supergroup - Aquatic Habitat		Transitional - Habitat Group		Functional WSS Determination		
	FBP Score	FBP Score Category	FBP Score	FBP Score Category	FBP Score	FBP Score Category	FBP Score	FBP Score Category	FBP Score	FBP Score Category	Habitat Rule Satisfied	Support Rule Satisfied	Habitat/Support Hybrid Rule Satisfied
1	18.56571	Low	23.16832	Low	44.56276	Low	41.75053	Low	79.25719	Moderate	No	No	No
2	54.71822	Moderate	37.07090	Low	17.05140	Low	42.51609	Low	52.16678	Low	No	No	No
3	20.83653	Low	18.18117	Low	39.45831	Low	52.46022	Low	54.57070	Low	No	No	No
4	8.36430	Low	17.43833	Low	58.79573	Low	40.42240	Low	58.56628	Low	No	No	No
5	31.35007	Low	28.88645	Low	2.741247	Low	4.054836	Low	76.18041	Low	No	No	No
6	12.84810	Low	15.26318	Low	42.60042	Low	52.55258	Low	86.67974	Moderate	No	No	No
7	28.25922	Low	20.29514	Low	3.549026	Low	4.686071	Low	69.35895	Low	No	No	No
8	45.73668	Moderate	30.35325	Low	22.52565	Low	50.90473	Low	78.89265	Moderate	No	No	No
9	32.80969	Low	22.17795	Low	3.088404	Low	4.513684	Low	68.79703	Low	No	No	No
10	11.65136	Low	15.50404	Low	42.75221	Low	52.84897	Moderate	86.67974	Moderate	No	No	No
11	9.652482	Low	12.26828	Low	40.57512	Low	37.45481	Low	82.12065	Moderate	No	No	No

4.0 SUMMARY

None of the wetlands identified within the Study Area were determined to be WSS as described in the Wetland Conservation Policy (NSE, 2019). Further, none of the wetlands were found to satisfy the Habitat, Support, or Habitat/Support Hybrid rules that may support determination of a WSS, as per the WESP-AC tool.

5.0 STATEMENT OF QUALIFICATIONS AND LIMITATIONS

This Report (the “Report”) has been prepared by Strum Consulting (“Consultant”) for the benefit of BANC Group (“Client”) in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the “Agreement”).

The information, data, recommendations, and conclusions contained in the Report (collectively, the “Information”):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the “Limitations”)
- represents Consultant’s professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to Consultant which has not been independently verified
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued
- must be read as a whole and sections thereof should not be read out of such context
- was prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental, or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

Consultant shall be entitled to rely upon the accuracy and completeness of information that was provided and has no obligation to update such information. Consultant accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental, or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

Consultant agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but Consultant makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

The Report is to be treated as confidential and may not be used or relied upon by third parties, except:

- as agreed in writing by Consultant and Client
- as required by law
- for use by governmental reviewing agencies

Consultant accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss, or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information ("improper use of the Report"), except to the extent those parties have obtained the prior written consent of Consultant to use and rely upon the Report and the Information. Any damages arising from improper use of the Report or parts thereof shall be borne by the party making such use.

This Statement of Qualifications and Limitations forms part of the Report and any use of the Report is subject to the terms hereof.

Should additional information become available, Strum requests that this information be brought to our attention immediately so that we can re-assess the conclusions presented in this report. This report was prepared by Darcy Kavanagh, MREM, Environmental Scientist and reviewed by Ryan Gardiner, BSc., Senior Project Manager.

6.0 REFERENCES

CBC. (2023). Environmentalists question “routine clarification” of Nova Scotia’s wetlands policy. Retrieved from <https://www.cbc.ca/news/canada/nova-scotia/wetlands-environment-species-at-risk-tim-halman1.6983094#:~:text=%22If%20a%20wetland%20was%20designated,be%20altered%20in%20any%20way.>

Nova Scotia Environment. (2019). Nova Scotia Wetland Conservation Policy. Retrieved from: <https://novascotia.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf>.

APPENDIX A

DRAWING



Wetland and Watercourse Delineation Results

Halifax Exhibition Center
PID 40600728



PID40600728

Ephemeral Watercourse

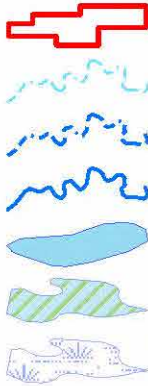
Intermittent Watercourse

Perennial Watercourse

Field Delineated Waterbody

Field Delineated Wetland

NSECC Mapped Wetland
(Adjusted to match field observations)



Coordinate System: NAD83 UTM Zone 20N

Sources: Google Basemaps, GeoNOVA, SNSIS, NSNRR, ACCDC, IBA Canada, CNWI, HERE, Garmin, USGS

Date: Nov 2024

Project #: 24-10880

Scale: 1:5,000

Drawn By: P. Opra

Checked By: R. Gardiner

Drawing #:

1

strum
CONSULTING

APPENDIX B

CURRICULUM VITAE

AREAS OF SPECIALIZATION

- Surface Water Quality Sampling Programs
- Surface Water Quantity Monitoring Programs
- Wetland and Watercourse Delineation
- Biophysical Assessments
- Bat surveys
- Flora, Fauna and Habitat Field Surveys
- Construction Monitoring
- Sediment and Erosion Control Management Plans
- Provincial Regulatory Applications

RELEVANT EXPERIENCE

Mr. Gardiner has worked in biology related environmental consulting since 2011. He has worked on both research related field assessments and project related field assessments in Nova Scotia, New Brunswick, Newfoundland, Ontario, Saskatchewan, Alberta, and Honduras. At Strum, Mr. Gardiner completes biophysical assessments, which include flora and fauna surveys including acoustic bat surveys and analysis, fish and terrestrial habitat assessments, water quality and hydrologic flow volume surveys, and conducts wetland and watercourse delineations and functional assessments. Mr. Gardiner also develops and coordinates field monitoring programs, and communicates field survey results and methodologies for Environmental Assessments and other provincial regulatory applications. Project tasks include the development of Post Construction Monitoring Plans in wetland habitat, surface water quality/quantity sampling programs, species at risk assessments, and sediment and erosion management plans.

EDUCATION

- Bachelor of Science Dalhousie University, Halifax, NS (2011)

TRAINING

- Standard First Aid, AED, CPR (A) (2023)
- Watercourse Alteration Certification, New Brunswick (2018)
- Bat Acoustics Training (Techniques and Analysis) (2017)
- Wetland Ecosystem Services protocols (Freshwater, Tidal) – Nova Scotia/New Brunswick (2016)
- Watercourse Alteration Certification for Sizers – Nova Scotia (2016)
- Watercourse Alteration Certification for Installers – Nova Scotia (2016)
- Wetland Delineator's course – Nova Scotia/New Brunswick (2014)

REPRESENTATIVE PROJECTS AND ROLES

Wetland and Watercourse Alteration Applications, 2016-Present – Project Coordinator/ Project Manager:

Completing desktop and field assessments on wetlands and watercourses including the completion of wetland data determination forms, WESP-AC functional assessments, and species at risk surveys to support wetland and watercourse alteration applications for 100+ small and medium scale projects. Authoring wetland and watercourse alteration applications to support residential, commercial, and industrial developments across Nova Scotia.

Biophysical Assessments, Touquoy Gold Mine, 2017 to Present – Project Coordinator/ Project Manager:

Completing and coordinating biophysical assessments to comply with post approval conditions to support mine development in Mooseland, Nova Scotia including long term wetland monitoring, moose surveys, watercourse volume discharge monitoring, and avian surveys, complete with the submission of annual reports and meetings with NSECC to review results.

Bat Acoustic Monitoring and Reporting, 2018-Present – Project Coordinator/Project Manager: Designing bat acoustic monitoring programs in support of Wind Power development projects ranging from 3 to 50+ turbines for multiple projects across Saskatchewan, Alberta, New Brunswick, and Nova Scotia. Coordinating equipment maintenance and data quality assurance and collection. Analysis of acoustic bat data and preparation of report to support the submission of Environmental Assessments.

Water Quality and Quantity Assessments, 2018-Present – Project Coordinator: Designing and coordinating the collection of baseline and post construction surface water monitoring programs to collect high quality volume discharge measurements and water quality samples from natural surface water features in support of quarry and mining development in Nova Scotia. Quality control of field data prior to submission to support Environmental Assessments or post approval conditions.

Post Construction Wetland Monitoring, Highway 104 Twinning Project, 2022-Present – Project Coordinator/ Project Manager: Coordinating the collection of post-construction wetland monitoring data in 67 wetlands partially altered by the Hwy 104 twinning project in Nova Scotia. Authoring the annual report for submission to NSECC in compliance with approval conditions.

Wetland and Watercourse Assessments, Goldboro Gold Mine, 2022 to 2023 – Project Coordinator/ Project Manager: Completing and coordinating desktop and field assessments on wetlands and watercourses, including the completion of wetland data determination forms, WESP-AC functional assessments, and species at risk surveys to support wetland and watercourse alteration applications for a proposed gold mine. Primary author in the submission of one of the largest wetland alteration applications (n=127 wetlands) to Nova Scotia Environment and Climate Change (NSECC) as well as 23 watercourse alteration applications in support of mine development in Goldboro Nova Scotia. Developed a multi-year wetland monitoring program in consultation with NSECC to comply with approval conditions.

Wetland and Watercourse Assessments, Route 332 Widening Project, 2020-2021 – Project Coordinator/ Project Manager: Completing and coordinating desktop and field assessments on wetlands and watercourses including the completion of wetland data determination forms, WESP-AC functional assessments, and species at risk surveys to support wetland alteration applications for both freshwater and tidal wetlands. Was the primary author in the submission of a tidal and freshwater wetland alteration application to NSECC inclusive of the development and implementation of a multi-year wetland monitoring program to comply with approval conditions.

Construction and Environmental Approval Compliance Monitoring, 2011-2020 – Project Coordinator: Conducting environmental audits to ensure compliance with environmental approval conditions on the Muskrat Falls Transmission Line development in Newfoundland and Labrador as well as various other smaller developments in New Brunswick and Nova Scotia. Compliance measures included coordinating spill and contamination clean-up, development and implantation of sediment and erosion control plans, species at risk surveys, avian nesting surveys, construction monitoring and watercourse and wetland identification. Coordinated with project managers to ensure compliance was met and mitigation measures were implemented. Provided daily, weekly, and annual reports to track compliance and update stakeholders and regulatory authorities.

Wetland Ecosystem Services Protocol – Atlantic Canada Calibration Study, 2017 – Field Evaluator: Completed necessary field and desktop assessments to support baseline studies on 125 wetlands across Nova Scotia to implement a new wetland functional assessment technique (WESP-AC) for the nova Scotia regulatory process.

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment
- Wetland Delineation & Functional Assessment
- Wildlife Surveying and Assessment
- Environmental Reporting and Permitting
- Baseline Study Data Collection & Interpretation

RELEVANT EXPERIENCE

Mr. Kavanagh joined Strum in 2022, having just completed a master's degree in Resource and Environmental Management at Dalhousie University. While studying at Dalhousie University, Mr. Kavanagh specialized in freshwater resource management, wetland alteration/compensation, and stormwater management. He also obtained his diploma of engineering in 2016 and Bachelor of Science degree in 2018, from Saint Mary's University. While there, he completed an honours thesis focused on enhancing the effectiveness of wind power source assessment, responding to the need of having a measure of the relationship of wind speed and its consistency.

Throughout his academic career, Mr. Kavanagh has had the opportunity to partake in a number of research initiatives, including collecting and processing water chemistry data, the remediation of trampled pollinator habitat, an assessment of the carbon sequestration capabilities of species mixes within the boreal forest, and an evaluation of the acid rock drainage potential within the watersheds of Nova Scotia. Further, for the final project of his graduate studies, Darcy assessed the climate resiliency of wetland compensation projects within the province of Nova Scotia, providing a series of research-backed recommendations to continue working towards the provincial goal of no net loss of wetland structure and function, while also ensuring a net gain of climate resiliency.

Mr. Kavanagh has proven critical thinking and problem-solving skills through collaboration with multiple real-world organizations. This includes a partnership with the Atlantic First Nations Water Authority to analyze the biophysical, socio-political, and law & policy related dimensions associated with the self-determination of water resources in First Nations communities, as well as aiding the District of Argyle in their efforts to mitigate their localized mosquito problem through a series of research tactics including a literature review, policy review, jurisdictional scan, and feasibility analysis. For the internship portion of his graduate degree, Mr. Kavanagh worked with a consulting company where he was involved with various tasks including soil, sediment, and surface water sampling, wetland delineation, electrofishing, watercourse assessment, and air quality monitoring.

Mr. Kavanagh is active in conducting numerous field surveys to fulfill baseline studies, environmental permits, and conditions of approval, as well as any relative complementary desktop research. Further, Mr. Kavanagh is well practiced in working in remote areas, along with ATV, snowmobile, and 4x4 use.

REPRESENTATIVE PROJECTS AND ROLES

Wind Power Environmental Assessments, 2022-Present– Environmental Scientist/Field Coordinator: Providing coordination and field work on several 100 MW+ wind farms in Nova Scotia. Responsible for conducting field assessments and environmental assessment report writing for multiple prospective wind farm locations in NS. Field

EDUCATION

- Master of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2022)
- Bachelor of Science (Honours in Environmental Science) - Saint Mary's University, Halifax, NS (2018)
- Diploma of Engineering - Saint Mary's University, Halifax, NS (2016)

TRAINING

- Nova Scotia Watercourse Alteration for Sizers (2023)
- Nova Scotia Watercourse Alteration for Installers (2023)
- Wetland Ecosystem Services Protocol - Atlantic Canada (WESP-AC) Training – Maritime College of Forest Technology (2022)
- Wetland Delineation Training – Maritime College of Forest Technology (2022)
- Backpack Electrofishing – Canadian Rivers Institute (2022)
- Wilderness First Aid – Saint John Ambulance (2022)
- ATV Training – Canada Safety Council (2022)
- WET-Pro Certification (2018)

surveys were conducted for terrestrial flora & fauna, herpetofauna, avifauna, fish & fish habitat, wetlands, and watercourses. Other methods of data collection included snowshoe expeditions, ATV driving, and trail camera, acoustic monitor, and ultrasonic monitor deployment. Environmental assessment documentation included field data compilation and interpretation to inform effects assessments, mitigation measures, and monitoring strategies.

Wetland Monitoring, NS (2022 – Present) – Environmental Scientist: Responsible for conducting field assessments and report writing for a wetland and wetland fish & fish habitat monitoring program to be completed 2022 – 2027 to facilitate the dewatering of the reservoir necessary for capital upgrades. Field assessments included wetland delineation & functional assessment, monitor well installment, vegetation plot monitoring, and in-situ water chemistry sampling.

Nesting Bird Searches, NS (2022 – Present) – Environmental Scientist: Surveyed prospective project areas for the presence of nesting birds. Collected field data related to any observed species and reported on the findings. Flagged buffer areas for any identified species.

Wetland Delineation and Permitting, NS (2021 – Present) – Environmental Scientist: Completed wetland delineation, functional assessments, and permitting submissions at numerous sites around Nova Scotia. Projects include pre-construction and post-construction monitoring, compensation planning, contingency planning, and erosion and sedimentation control planning.

Environmental Assessment EverWind Point Tupper Green Hydrogen/Ammonia Project - Phase 1, NS, 2022 – Environmental Scientist: Completed field studies and key reporting requirements for the submission of an EA Registration Document for a green ammonia/hydrogen facility located in Cape Breton, NS. This was the first green ammonia/hydrogen facility to be approved in both Nova Scotia and Canada.

Transmission Line, NS (2022) – Environmental Scientist: Participated in wetland and watercourse assessments, wildlife surveys, and rare plant and lichen surveys along the linear corridor spanning 100 km.

Liquified Natural Gas (LNG) Project, NS (2021) – Environmental Scientist: Undertook soil and water sampling, stream flow monitoring, and avian surveys to satisfy conditions for environmental permits and approvals for the construction of an LNG facility. Soil samples were taken along the perimeter of the study area in order to delineate the presence of contaminants associated with historic gold mining. Water samples were analyzed in a lab for parameters including total & dissolved metals, dissolved organic carbon, and total suspended solids. Surveys included MBBA-style early morning passerine surveys, nighttime nocturnal surveys following the *Nova Scotia Nocturnal Owl Survey* sampling methodology, as well as circumnavigating multiple waterbodies and conducting waterfowl nest surveys. Other tasks included the periodic maintenance and data extraction of both acoustic avian monitors and ultrasonic bat monitors.

Highway Connector Road Project, NS (2021) – Environmental Scientist: Responsible for conducting field surveys and aiding in the reporting for birds and bats to inform science-based decision making within the project laydown area. Surveys included acoustic monitoring, point-count surveys, and nighttime nocturnal surveys. Other tasks included the periodic maintenance and data extraction of ultrasonic bat monitors, as well as aiding in the development of a wildlife crossing plan to mitigate wildlife-vehicle collisions.

Historic Mine Remediation Project, NS (2021) – Environmental Scientist: Flow monitoring was conducted at eight locations within and around a historic gold mine site in tandem with a surface water sampling program. Eight transducers were submerged (one per sample site), along with an additional datalogger nearby to measure air pressure. A discharge transect was also completed for each sample site using a handheld flow meter. Surface water samples were analyzed in a lab for parameters including total & dissolved metals, dissolved organic carbon, and total suspended solids. This program was conducted as part of an ecological risk assessment for the remediation of the contaminated tailings area.

DustTrak Air Monitoring Program, NS (2021) – Environmental Scientist: Responsible for conducting direct-read real time sampling in response to periodic elevated dust levels at a gold mine site to better understand the reasons for the elevated dust levels. TSI DustTrak instruments were used to strategically perform monitoring upwind and downwind of known areas of concern. During the monitoring, record was taken of any mining activities occurring, localized weather conditions, and any other potential dust sources in the area. This program was useful for providing a relative comparison of on-site dust levels, offering a good indication of whether compliance with the IA could be achieved.

AREAS OF SPECIALIZATION

- Industrial Approvals
- Environmental Approvals
- Wetlands and Watercourse Assessment and Delineations
- Wildlife Surveys
- Flow Monitoring and Fish Habitat Assessments
- GIS Data Analysis
- Water Quality and Water Quantity Data Collection and Monitoring
- Mapping and Spatial Analyses (QGIS)
- Acoustics – Radar, Bat and Bird Monitors

RELEVANT EXPERIENCE

Manminder Singh is a recent graduate in the field of environmental engineering. He possesses diversified knowledge in the fields of environmental, plant pathology, agriculture, and botany. Mr. Singh has supported projects related to water quality monitoring, wildlife surveys, wetland delineation, watercourse delineation, fish and fish habitat assessments, vegetation surveys, and general observation surveys. He has experience in statistical data analysis and a background in mycology, bacteriology, and virology.

Mr. Singh is active in conducting numerous field surveys and report writing to contribute to a variety of environmental assessments. He has conducted significant fieldwork across large projects in remote locations, in Nova Scotia, and is well practiced in ATV, snowmobile, and 4x4 use. Further, Mr. Singh has experience managing several different types of projects and ensuring regulatory compliance and successful approvals.

Mr. Singh is also responsible for the maintenance and calibration of YSI's, turbidity meters pen probes and additional devices such as electro fishers and flow meters etc. This includes performing repairs on all these devices and maintaining accurate records of calibrations and repairs. Additionally, Mr. Singh manages the inventory orders to ensure all necessary supplies and replacement parts are available.

REPRESENTATIVE PROJECTS AND ROLES

Wetland Delineation and Alteration Permitting, NS (2023 – Present) – Environmental Scientist: Coordinated and completed wetland delineation, functional assessments, and permitting submissions at numerous sites around Nova Scotia.

Surface Water Sampling and Surface Flow Measurements, NS (2023 – Present) – Environmental Scientist: Coordinated and completed the collection of baseline and post construction surface water monitoring programs to collect high quality volume discharge measurements and water quality samples from natural surface water features in support of quarry and mining development in Nova Scotia.

Groundwater Sampling and Well Log Analysis, NS (2023 – Present) – Environmental Scientist: Ongoing groundwater monitoring work (following approval of the groundwater monitoring plan), including developing groundwater wells, groundwater sampling, aquifer testing, and analysis. The purpose of the monitoring plan is to avoid/mitigate potential impacts to nearby environmental receptors throughout the lifespan of the Project.

EDUCATION

- Bachelor of Engineering Technology (Environmental Studies), Cape Breton University, Sydney, NS (2023)
- Master of Science (Plant Pathology), Lovely Professional University, India (2020)
- Bachelor of Science (hons.) Agriculture, Lovely Professional University, India (2018)

TRAINING

- Wetland and Watercourse Delineation (2023)
- Wetland Ecosystem Services Protocols Training (Freshwater, Tidal) – Nova Scotia (2023)
- Bear Awareness and Avoidance
- Emergency First Aid (Level C CPR/AED- 2023)
- Standard First Aid (2023)
- Erosion & Sediment Control (2024)
- JOHSC Committee Training - Construction Safety Nova Scotia (2023)

Avian Radar Studies, NS and NB (2023 – Present) – Environmental Scientist: Continuously deploying, retrieving and monitoring RADAR's and Bat and Bird Monitors in different parts of Nova Scotia and New Brunswick. Performing monthly maintenance on all the acoustic monitors.

Green Freight Assessment, NS, Ontario, Alberta etc. (2023 – Present) – Environmental Scientist: Coordinating and writing green freight assessment reports that help fleets reduce their fuel consumption and greenhouse gas emissions through fleet energy assessments, fleet retrofits, engine repowers, logistical best-practice implementation, and the purchase of low carbon vehicles.

Environmental Assessment, Trafalgar, NS, 2023 – Field Technician: Acted as a field technician for a provincial gold mine Environmental Assessment in Trafalgar, NS. The scope of work included fish collection, water quality sampling, moose surveys, flow monitoring, and detailed fish habitat assessment.

Highway Twinning Project, Glasgow to Antigonish, NS, 2023 – Field Technician: Acted as a field technician for a highway twinning project along Highway 104 from New Glasgow to Antigonish. The scope of work included completing various sized fish rescues, detailed fish habitat assessment, and turtle surveys.

APPENDIX C

WESP-AC DATASHEETS

Assessment Area (AA) Results:						
Wetland ID: WL1						
Date: June 16, 2023						
Observer: MS						
Latitude & Longitude (decimal degrees): 44.6187837, -63.6638322						
Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.						
Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	2.33	Lower	7.95	Higher	3.69	3.53
Stream Flow Support (SFS)	2.24	Moderate	6.60	Moderate	1.81	4.39
Water Cooling (WC)	4.79	Moderate	1.92	Lower	3.19	1.04
Sediment Retention & Stabilisation (SR)	2.94	Lower	2.11	Moderate	4.49	1.03
Phosphorus Retention (PR)	4.54	Moderate	2.50	Moderate	6.59	1.94
Nitrate Removal & Retention (NR)	3.29	Moderate	7.50	Higher	5.15	7.50
Carbon Sequestration (CS)	3.18	Lower			6.70	
Organic Nutrient Export (OE)	10.00	Higher			6.57	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	7.50	Higher	4.82	Moderate	6.55	3.84
Amphibian & Turtle Habitat (AM)	7.00	Higher	6.90	Higher	6.79	7.44
Waterbird Feeding Habitat (WBF)	6.87	Higher	10.00	Higher	5.23	10.00
Waterbird Nesting Habitat (WBN)	5.42	Moderate	10.00	Higher	3.93	10.00
Songbird, Raptor, & Mammal Habitat (SBM)	8.15	Higher	10.00	Higher	7.10	10.00
Pollinator Habitat (POL)	9.40	Higher	10.00	Higher	7.79	10.00
Native Plant Habitat (PH)	3.18	Lower	8.30	Higher	5.17	8.30
Public Use & Recognition (PU)			3.15	Moderate		2.46
Wetland Sensitivity (Sens)			10.00	Higher		5.52
Wetland Ecological Condition (EC)			2.75	Lower		6.53
Wetland Stressors (STR) (higher score means more stress)			10.00	Higher		5.93
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	2.33	Lower	7.95	Higher	3.69	3.53
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	4.02	Moderate	5.77	Moderate	6.22	5.50
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	8.07	Higher	5.52	Moderate	5.55	3.74
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	5.43	Moderate	7.69	Higher	4.99	7.74
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	8.16	Higher	9.72	Higher	7.24	9.72
WETLAND CONDITION (EC)			2.75	Lower		6.53
WETLAND RISK (average of Sensitivity & Stressors)			10.00	Higher		5.73
NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.						

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	18.56571084	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	23.16832449	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	44.56276901	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	41.75053914	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	79.25719813	Moderate

Habitat Rule Satisfied?

NO

Support Rule Satisfied?

NO

Habitat/Support Hybrid Rule Satisfied?

NO

CONCLUSION:

Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL2

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 44.6162294, -63.6631778

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	5.47	Moderate	10.00	Higher	6.03	4.80
Stream Flow Support (SFS)	0.61	Lower	0.00	Lower	0.49	0.00
Water Cooling (WC)	6.35	Higher	0.00	Lower	4.23	0.00
Sediment Retention & Stabilisation (SR)	10.00	Higher	2.35	Moderate	10.00	1.15
Phosphorus Retention (PR)	1.02	Lower	2.59	Moderate	4.38	2.01
Nitrate Removal & Retention (NR)	10.00	Higher	5.83	Moderate	10.00	5.83
Carbon Sequestration (CS)	1.92	Lower			6.10	
Organic Nutrient Export (OE)	7.13	Moderate			4.66	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	6.02	Higher	4.21	Moderate	5.95	3.51
Amphibian & Turtle Habitat (AM)	5.87	Moderate	6.56	Higher	6.20	7.17
Waterbird Feeding Habitat (WBF)	7.51	Higher	10.00	Higher	5.72	10.00
Waterbird Nesting Habitat (WBN)	4.62	Moderate	10.00	Higher	3.35	10.00
Songbird, Raptor, & Mammal Habitat (SBM)	6.66	Moderate	10.00	Higher	5.79	10.00
Pollinator Habitat (POL)	6.18	Moderate	10.00	Higher	5.12	10.00
Native Plant Habitat (PH)	0.16	Lower	6.97	Moderate	3.97	6.97
Public Use & Recognition (PU)			2.24	Moderate		1.83
Wetland Sensitivity (Sens)			5.56	Moderate		3.75
Wetland Ecological Condition (EC)			3.04	Lower		6.67
Wetland Stressors (STR) (higher score means more stress)			9.00	Higher		4.50
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	5.47	Moderate	10.00	Higher	6.03	4.80
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	7.87	Higher	4.71	Moderate	8.81	4.42
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	6.08	Higher	2.80	Lower	4.89	2.34
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	5.55	Moderate	7.66	Higher	4.63	7.72
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	5.49	Moderate	9.50	Higher	5.38	9.50
WETLAND CONDITION (EC)			3.04	Lower		6.67
WETLAND RISK (average of Sensitivity & Stressors)			7.28	Higher		4.13

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	54.71822566	Moderate
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	37.07090523	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	17.05140204	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	42.51609771	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	52.16678742	Low

Habitat Rule Satisfied?

Support Rule Satisfied?

Habitat/Support Hybrid Rule Satisfied?

CONCLUSION:

NO

NO

NO

Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL3

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 44.6187334, -63.6629136

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	2.58	Lower	8.06	Higher	3.87	3.58
Stream Flow Support (SFS)	1.72	Moderate	6.67	Moderate	1.39	4.44
Water Cooling (WC)	2.54	Moderate	1.94	Lower	1.69	1.05
Sediment Retention & Stabilisation (SR)	3.36	Lower	2.11	Moderate	4.82	1.03
Phosphorus Retention (PR)	3.77	Moderate	2.50	Moderate	6.10	1.94
Nitrate Removal & Retention (NR)	3.71	Moderate	6.33	Moderate	5.45	6.33
Carbon Sequestration (CS)	3.24	Moderate			6.73	
Organic Nutrient Export (OE)	9.20	Higher			6.01	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	6.70	Higher	4.63	Moderate	6.22	3.74
Amphibian & Turtle Habitat (AM)	9.28	Higher	5.63	Higher	7.98	6.40
Waterbird Feeding Habitat (WBF)	6.46	Higher	10.00	Higher	4.92	10.00
Waterbird Nesting Habitat (WBN)	7.26	Higher	10.00	Higher	5.26	10.00
Songbird, Raptor, & Mammal Habitat (SBM)	4.92	Moderate	10.00	Higher	4.28	10.00
Pollinator Habitat (POL)	7.42	Moderate	10.00	Higher	6.15	10.00
Native Plant Habitat (PH)	0.00	Lower	6.81	Moderate	3.64	6.81
Public Use & Recognition (PU)			3.15	Moderate		2.46
Wetland Sensitivity (Sens)			8.29	Higher		4.54
Wetland Ecological Condition (EC)			0.00	Lower		1.67
Wetland Stressors (STR) (higher score means more stress)			9.88	Higher		4.92
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	2.58	Lower	8.06	Higher	3.87	3.58
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	3.64	Moderate	4.99	Moderate	6.25	4.72
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	7.12	Higher	5.54	Moderate	5.03	3.76
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	6.94	Higher	7.56	Higher	5.81	7.64
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	5.76	Moderate	9.47	Higher	5.42	9.47
WETLAND CONDITION (EC)			0.00	Lower		1.67
WETLAND RISK (average of Sensitivity & Stressors)			9.09	Higher		4.73

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	20.83653835	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	18.18117198	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	39.45831842	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	52.46022851	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	54.57070609	Low

Habitat Rule Satisfied?

Support Rule Satisfied?

Habitat/Support Hybrid Rule Satisfied?

CONCLUSION:

NO

NO

NO

Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL4

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 44.6146803, -63.6688121

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	0.84	Lower	10.00	Higher	2.57	4.88
Stream Flow Support (SFS)	10.00	Higher	6.87	Moderate	8.39	4.57
Water Cooling (WC)	10.00	Higher	4.89	Moderate	21.86	2.65
Sediment Retention & Stabilisation (SR)	2.08	Lower	2.84	Moderate	3.82	1.39
Phosphorus Retention (PR)	1.37	Lower	4.38	Higher	4.60	3.40
Nitrate Removal & Retention (NR)	3.42	Moderate	7.50	Higher	5.24	7.50
Carbon Sequestration (CS)	1.97	Lower			6.13	
Organic Nutrient Export (OE)	10.00	Higher			10.81	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	7.19	Higher	4.20	Moderate	6.43	3.50
Amphibian & Turtle Habitat (AM)	6.95	Higher	6.08	Higher	6.76	6.77
Waterbird Feeding Habitat (WBF)	5.98	Moderate	10.00	Higher	4.55	10.00
Waterbird Nesting Habitat (WBN)	5.47	Moderate	10.00	Higher	3.96	10.00
Songbird, Raptor, & Mammal Habitat (SBM)	6.61	Moderate	10.00	Higher	5.75	10.00
Pollinator Habitat (POL)	6.61	Moderate	10.00	Higher	5.48	10.00
Native Plant Habitat (PH)	3.88	Moderate	7.08	Moderate	5.45	7.08
Public Use & Recognition (PU)			1.23	Lower		1.14
Wetland Sensitivity (Sens)			7.81	Higher		4.40
Wetland Ecological Condition (EC)			6.52	Higher		8.33
Wetland Stressors (STR) (higher score means more stress)			8.85	Higher		4.43
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	0.84	Lower	10.00	Higher	2.57	4.88
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	2.81	Moderate	6.20	Moderate	5.54	5.80
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	9.65	Higher	6.09	Moderate	16.87	4.07
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	5.31	Moderate	7.61	Higher	4.91	7.68
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	6.16	Moderate	9.51	Higher	5.66	9.51
WETLAND CONDITION (EC)			6.52	Higher		8.33
WETLAND RISK (average of Sensitivity & Stressors)			8.33	Higher		4.41

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	8.36430431	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	17.43833877	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	58.79573649	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	40.42240288	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	58.56628524	Low

Habitat Rule Satisfied?

Support Rule Satisfied?

Habitat/Support Hybrid Rule Satisfied?

CONCLUSION:

NO

NO

NO

Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL5

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 44.6178752, -63.6618219

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	7.83	Higher	4.00	Moderate	7.79	1.78
Stream Flow Support (SFS)	0.00	Lower	0.00	Lower	0.00	0.00
Water Cooling (WC)	0.00	Lower	0.00	Lower	0.00	0.00
Sediment Retention & Stabilisation (SR)	3.31	Lower	1.42	Moderate	4.78	0.69
Phosphorus Retention (PR)	3.72	Moderate	1.34	Moderate	6.07	1.04
Nitrate Removal & Retention (NR)	10.00	Higher	5.00	Moderate	10.00	5.00
Carbon Sequestration (CS)	3.90	Moderate			7.04	
Organic Nutrient Export (OE)	8.79	Higher			5.74	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	8.43	Higher	0.63	Lower	6.93	1.58
Amphibian & Turtle Habitat (AM)	2.91	Lower	3.87	Moderate	4.65	4.95
Waterbird Feeding Habitat (WBF)	0.00	Lower	0.00	Lower	0.00	0.00
Waterbird Nesting Habitat (WBN)	0.00	Lower	0.00	Lower	0.00	0.00
Songbird, Raptor, & Mammal Habitat (SBM)	5.56	Moderate	10.00	Higher	4.84	10.00
Pollinator Habitat (POL)	9.27	Higher	10.00	Higher	7.68	10.00
Native Plant Habitat (PH)	5.05	Moderate	7.51	Moderate	5.92	7.51
Public Use & Recognition (PU)			1.63	Moderate		1.42
Wetland Sensitivity (Sens)			10.00	Higher		6.33
Wetland Ecological Condition (EC)			8.84	Higher		9.44
Wetland Stressors (STR) (higher score means more stress)			7.50	Higher		3.79
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	7.83	Higher	4.00	Moderate	7.79	1.78
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	7.62	Higher	3.79	Moderate	8.49	3.62
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	6.55	Higher	0.42	Lower	5.05	1.05
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	1.75	Lower	2.32	Moderate	2.79	2.97
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	7.95	Higher	9.58	Higher	6.91	9.58
WETLAND CONDITION (EC)			8.84	Higher		9.44
WETLAND RISK (average of Sensitivity & Stressors)			8.75	Higher		5.06

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	31.35007654	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	28.88645089	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	2.741247754	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	4.054836136	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	76.18041865	Low

Habitat Rule Satisfied?NO

Support Rule Satisfied?NO

Habitat/Support Hybrid Rule Satisfied?NO

CONCLUSION:Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL6

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 45.6211219, -63.6632227

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	1.28	Lower	10.00	Higher	2.90	4.80
Stream Flow Support (SFS)	1.41	Lower	6.68	Moderate	1.14	4.44
Water Cooling (WC)	3.75	Moderate	1.93	Lower	2.50	1.05
Sediment Retention & Stabilisation (SR)	1.39	Lower	2.93	Moderate	3.28	1.44
Phosphorus Retention (PR)	2.16	Lower	2.77	Higher	5.10	2.15
Nitrate Removal & Retention (NR)	3.65	Moderate	6.17	Moderate	5.41	6.17
Carbon Sequestration (CS)	2.31	Lower			6.29	
Organic Nutrient Export (OE)	9.34	Higher			6.11	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	7.51	Higher	5.80	Moderate	6.56	4.37
Amphibian & Turtle Habitat (AM)	8.91	Higher	7.14	Higher	7.79	7.65
Waterbird Feeding Habitat (WBF)	7.13	Higher	10.00	Higher	5.43	10.00
Waterbird Nesting Habitat (WBN)	7.54	Higher	10.00	Higher	5.47	10.00
Songbird, Raptor, & Mammal Habitat (SBM)	8.63	Higher	10.00	Higher	7.51	10.00
Pollinator Habitat (POL)	10.00	Higher	10.00	Higher	8.95	10.00
Native Plant Habitat (PH)	4.42	Moderate	8.82	Higher	5.67	8.82
Public Use & Recognition (PU)			1.93	Moderate		1.62
Wetland Sensitivity (Sens)			5.93	Moderate		3.86
Wetland Ecological Condition (EC)			8.84	Higher		9.44
Wetland Stressors (STR) (higher score means more stress)			8.22	Higher		4.13
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	1.28	Lower	10.00	Higher	2.90	4.80
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	3.02	Moderate	5.06	Moderate	5.65	4.71
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	7.42	Higher	5.74	Moderate	5.32	3.86
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	6.81	Higher	7.71	Higher	5.76	7.76
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	8.84	Higher	9.80	Higher	8.17	9.80
WETLAND CONDITION (EC)			8.84	Higher		9.44
WETLAND RISK (average of Sensitivity & Stressors)			7.07	Higher		3.99

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	12.84810875	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	15.26318353	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	42.60042719	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	52.55258247	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	86.67974802	Moderate

Habitat Rule Satisfied?NO

Support Rule Satisfied?NO

Habitat/Support Hybrid Rule Satisfied?NO

CONCLUSION:Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL7

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 44.6191751, -63.6611249

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	7.83	Higher	3.61	Lower	7.79	1.60
Stream Flow Support (SFS)	0.00	Lower	0.00	Lower	0.00	0.00
Water Cooling (WC)	0.00	Lower	0.00	Lower	0.00	0.00
Sediment Retention & Stabilisation (SR)	3.31	Lower	1.36	Moderate	4.78	0.67
Phosphorus Retention (PR)	3.72	Moderate	1.29	Moderate	6.07	1.00
Nitrate Removal & Retention (NR)	10.00	Higher	3.33	Lower	10.00	3.33
Carbon Sequestration (CS)	3.93	Moderate			7.06	
Organic Nutrient Export (OE)	8.36	Higher			5.47	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	7.89	Higher	0.86	Lower	6.71	1.71
Amphibian & Turtle Habitat (AM)	3.17	Lower	4.11	Moderate	4.78	5.15
Waterbird Feeding Habitat (WBF)	0.00	Lower	0.00	Lower	0.00	0.00
Waterbird Nesting Habitat (WBN)	0.00	Lower	0.00	Lower	0.00	0.00
Songbird, Raptor, & Mammal Habitat (SBM)	6.26	Moderate	10.00	Higher	5.45	10.00
Pollinator Habitat (POL)	8.26	Higher	10.00	Higher	6.84	10.00
Native Plant Habitat (PH)	4.19	Moderate	7.43	Moderate	5.57	7.43
Public Use & Recognition (PU)			2.29	Moderate		1.87
Wetland Sensitivity (Sens)			10.00	Higher		5.93
Wetland Ecological Condition (EC)			8.84	Higher		9.44
Wetland Stressors (STR) (higher score means more stress)			4.62	Moderate		2.40
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	7.83	Higher	3.61	Lower	7.79	1.60
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	7.62	Higher	2.66	Lower	8.49	2.50
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	6.21	Higher	0.57	Lower	4.88	1.14
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	1.90	Lower	2.47	Moderate	2.87	3.09
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	7.25	Higher	9.57	Higher	6.40	9.57
WETLAND CONDITION (EC)			8.84	Higher		9.44
WETLAND RISK (average of Sensitivity & Stressors)			7.31	Higher		4.17

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	28.25922392	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	20.29514454	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	3.549026781	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	4.686071632	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	69.35895547	Low

Habitat Rule Satisfied?

Support Rule Satisfied?

Habitat/Support Hybrid Rule Satisfied?

CONCLUSION:

NO

NO

NO

Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL8

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 44.6218009, -63.6629347

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	5.71	Moderate	8.01	Higher	6.21	3.55
Stream Flow Support (SFS)	0.56	Lower	0.00	Lower	0.45	0.00
Water Cooling (WC)	2.92	Moderate	0.00	Lower	1.94	0.00
Sediment Retention & Stabilisation (SR)	10.00	Higher	2.04	Moderate	10.00	1.00
Phosphorus Retention (PR)	4.35	Moderate	1.93	Moderate	6.47	1.50
Nitrate Removal & Retention (NR)	10.00	Higher	4.33	Moderate	10.00	4.33
Carbon Sequestration (CS)	4.04	Moderate			7.11	
Organic Nutrient Export (OE)	7.44	Moderate			4.86	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	5.25	Moderate	5.89	Moderate	5.64	4.41
Amphibian & Turtle Habitat (AM)	6.31	Moderate	7.80	Higher	6.43	8.19
Waterbird Feeding Habitat (WBF)	8.59	Higher	10.00	Higher	6.54	10.00
Waterbird Nesting Habitat (WBN)	7.58	Higher	10.00	Higher	5.49	10.00
Songbird, Raptor, & Mammal Habitat (SBM)	9.22	Higher	10.00	Higher	8.03	10.00
Pollinator Habitat (POL)	8.68	Higher	10.00	Higher	7.19	10.00
Native Plant Habitat (PH)	3.06	Lower	8.41	Higher	5.12	8.41
Public Use & Recognition (PU)			2.29	Moderate		1.87
Wetland Sensitivity (Sens)			10.00	Higher		5.64
Wetland Ecological Condition (EC)			6.52	Higher		8.33
Wetland Stressors (STR) (higher score means more stress)			4.96	Moderate		2.57
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	5.71	Moderate	8.01	Higher	6.21	3.55
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	8.55	Higher	3.55	Moderate	9.20	3.31
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	5.74	Higher	3.92	Lower	4.43	2.94
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	6.54	Higher	7.78	Higher	5.12	7.82
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	8.10	Higher	9.73	Higher	7.40	9.73
WETLAND CONDITION (EC)			6.52	Higher		8.33
WETLAND RISK (average of Sensitivity & Stressors)			7.48	Higher		4.10

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	45.73668502	Moderate
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	30.35325401	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	22.52565221	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	50.90473567	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	78.89265336	Moderate

Habitat Rule Satisfied?

Support Rule Satisfied?

Habitat/Support Hybrid Rule Satisfied?

CONCLUSION:

NO

NO

NO

Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL9

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 44.6195333, -63.6602958

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	8.56	Higher	3.83	Moderate	8.33	1.70
Stream Flow Support (SFS)	0.00	Lower	0.00	Lower	0.00	0.00
Water Cooling (WC)	0.00	Lower	0.00	Lower	0.00	0.00
Sediment Retention & Stabilisation (SR)	4.73	Moderate	1.36	Moderate	5.89	0.67
Phosphorus Retention (PR)	3.87	Moderate	1.29	Moderate	6.17	1.00
Nitrate Removal & Retention (NR)	10.00	Higher	3.33	Lower	10.00	3.33
Carbon Sequestration (CS)	8.02	Higher			8.99	
Organic Nutrient Export (OE)	7.30	Moderate			4.77	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	7.34	Higher	0.84	Lower	6.49	1.70
Amphibian & Turtle Habitat (AM)	3.04	Lower	4.12	Moderate	4.72	5.16
Waterbird Feeding Habitat (WBF)	0.00	Lower	0.00	Lower	0.00	0.00
Waterbird Nesting Habitat (WBN)	0.00	Lower	0.00	Lower	0.00	0.00
Songbird, Raptor, & Mammal Habitat (SBM)	6.28	Moderate	10.00	Higher	5.47	10.00
Pollinator Habitat (POL)	8.06	Higher	10.00	Higher	6.68	10.00
Native Plant Habitat (PH)	4.66	Moderate	7.38	Moderate	5.76	7.38
Public Use & Recognition (PU)			1.35	Lower		1.23
Wetland Sensitivity (Sens)			10.00	Higher		6.15
Wetland Ecological Condition (EC)			7.10	Higher		8.61
Wetland Stressors (STR) (higher score means more stress)			4.68	Moderate		2.43
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	8.56	Higher	3.83	Moderate	8.33	1.70
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	8.33	Higher	2.66	Lower	8.88	2.50
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	5.50	Moderate	0.56	Lower	4.65	1.13
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	1.83	Lower	2.47	Moderate	2.83	3.09
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	7.19	Higher	9.56	Higher	6.32	9.56
WETLAND CONDITION (EC)			7.10	Higher		8.61
WETLAND RISK (average of Sensitivity & Stressors)			7.34	Higher		4.29

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	32.80969822	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	22.17795174	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	3.088404024	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	4.513684342	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	68.79703153	Low

Habitat Rule Satisfied?

Support Rule Satisfied?

Habitat/Support Hybrid Rule Satisfied?

CONCLUSION:

NO

NO

NO

Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL10

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 44.6208692, -63.6615333

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	1.17	Lower	10.00	Higher	2.82	4.80
Stream Flow Support (SFS)	1.41	Lower	6.69	Moderate	1.14	4.45
Water Cooling (WC)	3.75	Moderate	1.93	Lower	2.50	1.05
Sediment Retention & Stabilisation (SR)	1.15	Lower	3.31	Higher	3.10	1.62
Phosphorus Retention (PR)	2.12	Lower	3.13	Higher	5.07	2.43
Nitrate Removal & Retention (NR)	3.29	Moderate	6.83	Higher	5.15	6.83
Carbon Sequestration (CS)	2.31	Lower			6.29	
Organic Nutrient Export (OE)	9.34	Higher			6.11	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	7.60	Higher	5.83	Moderate	6.59	4.39
Amphibian & Turtle Habitat (AM)	8.94	Higher	7.18	Higher	7.81	7.68
Waterbird Feeding Habitat (WBF)	7.26	Higher	10.00	Higher	5.53	10.00
Waterbird Nesting Habitat (WBN)	7.54	Higher	10.00	Higher	5.47	10.00
Songbird, Raptor, & Mammal Habitat (SBM)	8.63	Higher	10.00	Higher	7.51	10.00
Pollinator Habitat (POL)	10.00	Higher	10.00	Higher	8.95	10.00
Native Plant Habitat (PH)	4.42	Moderate	8.82	Higher	5.67	8.82
Public Use & Recognition (PU)			1.93	Moderate		1.62
Wetland Sensitivity (Sens)			6.57	Moderate		4.04
Wetland Ecological Condition (EC)			8.84	Higher		9.44
Wetland Stressors (STR) (higher score means more stress)			8.22	Higher		4.13
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	1.17	Lower	10.00	Higher	2.82	4.80
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	2.75	Moderate	5.63	Moderate	5.60	5.23
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	7.43	Higher	5.75	Moderate	5.34	3.87
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	6.85	Higher	7.72	Higher	5.79	7.77
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	8.84	Higher	9.80	Higher	8.17	9.80
WETLAND CONDITION (EC)			8.84	Higher		9.44
WETLAND RISK (average of Sensitivity & Stressors)			7.39	Higher		4.09

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	11.65136379	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	15.50404383	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	42.75221246	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	52.848976	Moderate
HABITAT SUPERGROUP - TRANSITION HABITAT	86.67974802	Moderate

Habitat Rule Satisfied?

Support Rule Satisfied?

Habitat/Support Hybrid Rule Satisfied?

CONCLUSION:

NO

NO

NO

Site is not a WSS

Assessment Area (AA) Results:

Wetland ID: WL11

Date: June 16, 2023

Observer: MS

Latitude & Longitude (decimal degrees): 45.6197027, -63.6592215

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed.

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	2.63	Lower	3.67	Lower	3.91	1.63
Stream Flow Support (SFS)	1.29	Lower	6.35	Moderate	1.04	4.22
Water Cooling (WC)	7.00	Higher	0.65	Lower	4.67	0.35
Sediment Retention & Stabilisation (SR)	2.33	Lower	1.61	Moderate	4.01	0.79
Phosphorus Retention (PR)	3.92	Moderate	1.70	Moderate	6.20	1.32
Nitrate Removal & Retention (NR)	3.89	Moderate	4.17	Moderate	5.59	4.17
Carbon Sequestration (CS)	3.67	Moderate			6.93	
Organic Nutrient Export (OE)	9.91	Higher			6.48	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	5.75	Higher	4.60	Moderate	5.84	3.72
Amphibian & Turtle Habitat (AM)	5.92	Moderate	6.96	Higher	6.23	7.50
Waterbird Feeding Habitat (WBF)	6.29	Moderate	10.00	Higher	4.79	10.00
Waterbird Nesting Habitat (WBN)	4.98	Moderate	10.00	Higher	3.61	10.00
Songbird, Raptor, & Mammal Habitat (SBM)	8.86	Higher	10.00	Higher	7.71	10.00
Pollinator Habitat (POL)	9.20	Higher	10.00	Higher	7.62	10.00
Native Plant Habitat (PH)	4.95	Moderate	8.44	Higher	5.88	8.44
Public Use & Recognition (PU)			1.70	Moderate		1.47
Wetland Sensitivity (Sens)			7.25	Higher		4.24
Wetland Ecological Condition (EC)			8.84	Higher		9.44
Wetland Stressors (STR) (higher score means more stress)			6.15	Higher		3.14
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	2.63	Lower	3.67	Lower	3.91	1.63
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	3.69	Moderate	3.33	Moderate	6.31	3.13
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	7.95	Higher	5.11	Moderate	5.49	3.49
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	4.87	Moderate	7.70	Higher	4.58	7.75
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	8.43	Higher	9.74	Higher	7.39	9.74
WETLAND CONDITION (EC)			8.84	Higher		9.44
WETLAND RISK (average of Sensitivity & Stressors)			6.70	Higher		3.69

NOTE: A score of 0 does not mean the function or benefit is absent from the wetland. It means only that this wetland has a capacity that is equal or less than the lowest-scoring one, for that function or benefit, from among all the NS calibration wetlands that were assessed previously.

NOVA SCOTIA - Functional WSS Interpretation Tool

Function-Benefit Product (FBP)	FBP SCORE	FBP SCORE CATEGORY
SUPPORT SUPERGROUP - HYDROLOGIC	9.652482485	Low
SUPPORT SUPERGROUP - WATER QUALITY SUPPORT	12.26828076	Low
SUPPORT SUPERGROUP - AQUATIC SUPPORT	40.57512355	Low
HABITAT SUPERGROUP - AQUATIC HABITAT	37.45481151	Low
HABITAT SUPERGROUP - TRANSITION HABITAT	82.12065977	Moderate

Habitat Rule Satisfied?

Support Rule Satisfied?

Habitat/Support Hybrid Rule Satisfied?

CONCLUSION:

NO

NO

NO

Site is not a WSS

4.2 — Appendix B: NSECC Inspection and Compliance Progress Letter

March 28, 2025

Re: Halifax Exhibition Centre Illegal Dumping – NSECC Inspection and Compliance Progress

On May 13, 2024, Nova Scotia Environment and Climate Change (NSECC) Environment Officers completed a site visit at 200 Prospect Road in Goodwood, Nova Scotia, in response to a complaint filed to NSECC in regard to a watercourse alteration on the property. During the site visit, the NSECC officers noted a pond on the southern portion of the property had been altered, with evidence of heavy machinery disturbance along the watercourse banks. The NSECC officers also collected rock material from the site to test for suspected sulphide bearing materials. Per test results with the Mineral Engineering Centre (Dalhousie University), the material was deemed sulphide bearing and subject to the Sulphide Bearing Material Disposal Regulations. NSECC issued an inspection notice that required a watercourse alteration application for the removal of infill material and obtaining the services of a site professional to oversee removal of the sulphide bearing materials.

Englobe submitted a watercourse alteration application to NSECC on August 7, 2024, for the removal of infill material and restoration of the impacted waterbody in compliance with this inspection report.

On July 31, 2024, NSECC Environment Officers completed an additional inspection of the property in relation to a complaint of wetland alterations within the property and into the neighbouring property, Long Lake Provincial Park. The Environment Officers noted two areas of wetland infill, both extending into Long Lake Provincial Park, which per the Nova Scotia Wetland Conservation Policy, any wetland that is located within a provincial park is designated as a Wetland of Special Significance (WSS). Sulphide bearing materials were also confirmed in both areas of wetland infilling. Additionally in one area of wetland infill along the southern portion of the property, a watercourse was observed to be altered in the form of bed and bank alterations and change to direction of flow. After this inspection, a follow-up inspection report was issued that required the following.

1. Obtain the services of a qualified professional (professional engineer or hydrogeologist) experienced in watercourse alteration to conduct an assessment of the watercourse that has been altered by Infill 1. The assessment shall include a description of any adverse effects caused by the watercourse alteration and provide recommendations for remediation of the watercourse.
2. Obtain the services of a qualified Wetland Specialist recognized by NSECC to assess and delineate the full wetland boundaries as per Department and industry standards for the wetlands mentioned above in the Inspection Report that occupy or partially occupy the Halifax Exhibition Centre property. A report shall be submitted with the results of the assessment and

delineation. The report shall determine the total areas of wetlands that have been altered or infilled, and provide recommendations for wetland remediation/reclamation and/or recommendations for wetland compensation.

3. Obtain the services of a Site Professional to oversee the removal and proper disposal of Sulphide Bearing Material observed at the locations mentioned above in the Inspection Report and assess the infill materials at the wetlands above in the Inspection Report. Additionally, the Site Professional shall determine if notification of contamination is required in accordance with Contaminated Sites Regulations.

In consultation with NSECC, Strum has requested an extension to comply with items 1 and 2 listed above. The request was made to allow for more favourable in-season assessments in June 2025 to obtain a more accurate assessment of wetlands and watercourses. As such, NSECC has issued a compliance update that requires the above items to be addressed by June 30, 2025. Upon completion of the June assessments, Strum will draft and submit a report to address the compliance items related to wetland alterations.

Through the submission of the response to the NSECC inspection report it will be recommended that all sulphide bearing materials be disposed of in an appropriate facility (e.g. Halifax Port Authority) to address compliance item 3 listed above.

Please don't hesitate to contact the undersigned with any questions you may have.

Sincerely,

Ryan Gardiner
Senior Project Manager
Strum Consulting
rgardiner@strum.com

4.3 — Appendix C: Nova Scotia Endangered Species Act Species List

Scientific Name	Common Name	NS ESA	Relevance to HEC	Notes
<i>Martes americana</i>	American Marten	Endangered	Low	Mostly found in Cape Breton, Mainland Population Extirpated. ¹
<i>Coregonus huntsmani</i>	Atlantic Whitefish	Endangered	Low	Only found in the Tusket and Petite Riviere watersheds. ¹
<i>Riparia riparia</i>	Bank Swallow	Endangered	Mod.	Prefers nesting in vertical banks, so less suitable for nesting, but they like open fields, meadows, or wetlands for catching flying insects. ¹
<i>Hirundo rustica</i>	Barn Swallow	Endangered	High	Nests on artificial structures such as barns, often in open areas like meadows and wetlands where they forage for insects. ^{1 2}
<i>Catharus bicknelli</i>	Bicknell's Thrush	Endangered	Low	Restricted to high-altitude forests in Cape Breton. ¹
<i>Fraxinus nigra</i>	Black Ash	Threatened	Low	This species requires poorly drained soils and wet areas like riverbanks. While it thrives in swampy mixed woodlands, the HEC land's conditions do not match its primary habitat. No white ash which it is often associated with. ¹
<i>Anzia colpodes</i>	Black Foam Lichen	Threatened	Mod.	Prefers high moisture and increased light in forests, often on mature trees like red maple. Its specific habitat conditions are not met on-site as the swampy area is early-mature stage and spruce dominated, but fits the VT. ³
<i>Emydoidea blandingii</i>	Blanding's Turtle	Endangered	Low	Mostly found near Kejimikujik National Park, the HEC land's wetland conditions could support this species, which prefers fens, shallow lake coves, and slow-moving streams. ¹
<i>Pectenaria plumbea</i>	Blue Felt Lichen	Vulnerable	High	Found on mature broad-leaved trees (maple, ash, and birch) in moist habitats near streams and lakes. Less likely on-site but could be in the forests near the HEC lands. ¹
<i>Dolichonyx oryzivorus</i>	Bobolink	Vulnerable	Low	Favours grassy habitats but is more common in northern Nova Scotia. ¹
<i>Erioderma pedicellatum</i>	Boreal Felt Lichen	Endangered	Low	Boreal felt lichen is most commonly in Coastal Forests than Acadian forest types. It also prefers north-facing mature balsam fir trees and cool, moist habitats. ¹
<i>Alasmodonta varicosa</i>	Brook Floater	Threatened	Low	Prefers freshwater streams and rivers with moderate to high water flow and a rocky, cobbled bottom. ¹
<i>Lynx canadensis</i>	Canada Lynx	Endangered	Low	Restricted to Cape Breton, they inhabit mountainous and hilly areas with dense forests. ¹
<i>Cardellina canadensis</i>	Canada Warbler	Endangered	High	Likes wet deciduous forests with a dense under-story, such as those found in marshy areas. ^{1 4}
<i>Chaetura pelagica</i>	Chimney Swift	Endangered	High	Prefers nesting in chimneys or similar structures, and forages in open areas with abundant insects, such as wetlands. ¹
<i>Chordeiles minor</i>	Common Nighthawk	Threatened	High	Typically inhabits open, disturbed habitats. While it can occasionally be found in meadows or grasslands, it prefers environments that offer unobstructed aerial foraging opportunities. Golf courses can mimic some of the disturbed or post-fire landscapes nighthawks favour, providing flat, unobstructed areas ideal for nesting or roosting. ¹
<i>Baccharis hamifolia</i>	Eastern Baccharis	Threatened	Low	Typically found in salt marshes along the extreme southwest of Nova Scotia. ¹

Scientific Name	Common Name	NS ESA	Relevance to HEC	Notes
<i>Lilaeopsis chinensis</i>	Eastern Lilaeopsis	Vulnerable	Low	Grows in narrow estuaries at the mouths of large rivers. ¹
<i>Geum peckii</i>	Eastern Mountain Avens	Endangered	Low	Only found on Digby Neck and Brier Island. ¹
<i>Thamnophis sauritus</i>	Eastern Ribbonsnake	Threatened	Low	Found in slow-flowing wetlands with abundant vegetation in the southwestern part of NS. ¹
<i>Peltigera hydrothyria</i>	Eastern Waterfan	Threatened	Low	Only 6 occurrences in NS. Typically found in partially shaded streams often near white ash. ¹
<i>Antrostomus vociferus</i>	Eastern Whip-poor-will	Threatened	Mod.	This species avoids dense forests, favouring semi-open or patchy forest areas with clearings. ¹
<i>Thuja occidentalis</i>	Eastern White Cedar	Vulnerable	Low	Typically found on the coast around the Digby area. ¹
<i>Contopus virens</i>	Eastern Wood-Pewee	Vulnerable	High	Prefers deciduous and mixed wood forest edges and clearings (with sugar maple, oak and poplar tree species); often near lakes, rivers or wetlands. ¹
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Vulnerable	High	Prefers mature mixed and softwood boreal forests with abundant fir or spruce trees. ⁵
<i>Lophiola aurea</i>	Golden-crest	Vulnerable	Low	Found in fens and along shorelines of lakes, typically in more undisturbed, wetland habitats further West in NS. ¹
<i>Bombus bohemicus</i>	Gypsy Cuckoo Bumble Bee	Endangered	Mod.	Occurs in a variety of open habitats like meadows. It lays its eggs in nests made by other bumble bees so it mainly relies on the distribution and abundance of host bees. Has not been found in NS in over 20 years. ⁶
<i>Historonicus historonicus</i>	Harlequin Duck	Endangered	Low	Prefers coastal habitats, typically found along rocky shorelines or tidal flats. ¹
<i>Salix candida</i>	Hoary Willow	Endangered	Low	Typically found in calcareous fens, which are specialized wetland habitat. Known occurrences in Inverness County, Cape Breton. ¹
<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Mod.	A bat species that roosts in buildings and mature trees with cavities. They forage along forested edges, fields, and near water. ¹
<i>Scirpus longii</i>	Long's Bulrush	Vulnerable	Low	Found in southwestern NS's peatland and lakeshore habitats. ¹
<i>Epeoloides pilosulus</i>	Macropis Cuckoo Bee	Endangered	Mod.	Prefers open wetlands with specific plants like swamp candle and fringed loosestrife. This species is reliant on the host bee species <i>Macropis nudarequire</i> sandy, well-drained soils nearby to create tunnelled nests. ¹
<i>Danaus plexippus</i>	Monarch	Endangered	Mod.	Found in open fields and meadows rich with wildflowers, including roadsides and gardens. ^{1 7}
<i>Alces alces americana</i>	Moose (Mainland Population)	Endangered	Mod.	Found in boreal and mixed wood forests near wetlands, favouring areas with abundant food sources like young deciduous trees. The HEC lands are close but not in the mainland moose population concentration area. ¹
<i>Juncus caesariensis</i>	New Jersey Rush	Vulnerable	Low	Restricted to bogs and fens in Cape Breton. ¹
<i>Myotis septentrionalis</i>	Northern Myotis	Endangered	Mod.	This bat prefers mature forests with large trees containing cavities, and roosts in both deciduous and coniferous forests, often near streams and water. ¹

Scientific Name	Common Name	NS ESA	Relevance to HEC	Notes
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	High	Prefers forest edges, wetlands, and bogs, often found in disturbed areas such as post-fire landscapes. ¹
<i>Falco peregrinus anatum</i>	Peregrine Falcon	Vulnerable	Mod.	Known to nest on cliffs or tall structures near open areas such as wetlands, meadows, and coastlines. ¹
<i>Coreopsis rosea</i>	Pink Coreopsis	Endangered	Low	Found on the shorelines of specific lakes in Yarmouth County. ¹
<i>Charadrius melodus</i>	Piping Plover	Endangered	Low	Prefers coastal sand or pebble beaches, and tidal flats. ¹
<i>Sabatia kennedyana</i>	Plymouth Gentian	Endangered	Low	Specific to the shorelines in the Tusket River watershed. ¹
<i>Isoetes prototypes</i>	Prototype Quillwort	Vulnerable	Low	Requires deep, nutrient-poor, spring-fed lakes. ¹
<i>Cypripedium arietinum</i>	Ram's-Head Lady Slipper	Endangered	Low	Known to occur in gypsum bedrock areas with sinkholes and steep slopes in Hants and Cumberland counties. ¹
<i>Calidris canutus rufa</i> subspecies	Red Knot	Endangered	Low	Found in coastal areas with large sandflats or mudflats. ¹
<i>Lachnanthes caroliana</i>	Redroot	Vulnerable	Low	Occurs along the shores of lakes in southwestern NS. ¹
<i>Helianthemum canadense</i>	Rockrose (Canada Frostweed)	Endangered	Low	Prefers sand barren habitats. ¹
<i>Sterna dougallii</i>	Roseate Tern	Endangered	Low	Requires coastal islands free of dense vegetation for nesting. ¹
<i>Euphagus carolinus</i>	Rusty Blackbird	Endangered	High	Known to breed in wetlands, including coniferous wooded streams, swamps, and bogs. ¹
<i>Lasioglossum sablense</i>	Sable Island Sweat Bee	Threatened	Low	This species is found exclusively on Sable Island. ¹
<i>Chelydra serpentina</i>	Snapping Turtle	Vulnerable	Mod.	Found in freshwater lakes, streams, and wetlands, they prefer slow-moving water with aquatic vegetation. ^{1 8}
<i>Potamogeton pulcher</i>	Spotted Pondweed	Vulnerable	Low	Prefers still or slow-moving freshwater lakes with specific bottom types. ¹
<i>Clethra alnifolia</i>	Sweet Pepperbush	Vulnerable	Low	Typically grows on shrubby lakeshore banks in southwestern NS. ¹
<i>Rhynchospora macrostachya</i>	Tall beakrush	Endangered	Low	Prefers lakeshore environments. ¹
<i>Drosera filiformis</i>	Thread-leaved Sundew	Endangered	Low	Found in bogs at the southwestern point of NS. ¹
<i>Coccinella transversoguttata</i>	Transverse Lady Beetle	Endangered	Low	A generalist that can be found in many habitat types, reliant on seasonal aphid populations and appropriate vegetation. ⁹
<i>Perimyotis subflavus</i>	Tri-colored Bat	Endangered	Mod.	Roosts in lichen clumps, typically in forests or edge habitats with water bodies. ¹
<i>Eleocharis tuberculosa</i>	Tubercled Spikerush	Vulnerable	Low	Occurs on lakeshores in southwestern NS, preferring undisturbed wetlands or lake environments. ¹
<i>Erioderma mollissimum</i>	Vole Ears Lichen	Endangered	Low	Prefers foggy, humid, cool, coniferous or mixed forests, especially near coastal areas with high rainfall. ¹

Scientific Name	Common Name	NS ESA	Relevance to HEC	Notes
<i>Hydrocotyle umbellata</i>	Water Pennywort	Endangered	Low	Known to occur in Southwest NS. The species is found on the shorelines of lakes and streams in wetland habitats ¹ .
<i>Clemmys insculpta</i>	Wood Turtle	Threatened	Mod.	Found in rivers and tributaries with clear, slow-moving water and riparian vegetation. They nest in sandy bars or gravel areas ¹ .
<i>Pannaria lurida</i>	Wrinkled Shingle Lichen	Threatened	High	Found on mature deciduous tree species, often red maple trees, in imperfectly drained habitats near swamps or floodplains. ¹⁰
<i>Lampsilis cariosa</i>	Yellow Lampmussel	Threatened	Low	Only known in specific lakes, such as Potter Lake in Cape Breton and lower Saint John River in New Brunswick ¹ .
<i>Bombus terricola</i>	Yellow-banded Bumble Bee	Vulnerable	Mod.	Found in mixed woodlands and boreal habitats. It relies on a variety of plants for pollen and nectar and typically nests underground in pre-existing cavities. ¹¹

*Species **Bold** are in the species AC CDC recorded within 2km of the HEC lands.

STATUS CATEGORIES

Endangered	a species facing imminent extirpation or extinction
Threatened	a species likely to become endangered if limiting factors are not reversed
Vulnerable	a species of special concern because of characteristics that make it particularly sensitive to human activities or natural events
Extirpated	a species that no longer exists in the wild in the Province but exists in the wild outside the Province
Extinct	a species that no longer exists

References

- ¹ Mersey Tobeatic Research Institute (MTRI). (2015). Species at Risk in Nova Scotia Identification & Information Guide 2nd Edition. – eds Megan Crowley. <https://sarguide.speciesatrisk.ca/sites/sarguide.speciesatrisk.ca/files/SAR%20Guide.pdf>
- ² COSEWIC. (2021). COSEWIC assessment and status report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 60 pp. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>
- ³ COSEWIC. 2015. COSEWIC assessment and status report on the Black-foam Lichen *Anzia colpodes* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 47 pp. http://www.registrelep-sararegistry.gc.ca/default_e.cfm
- ⁴ COSEWIC. (2020). IN PRESS. COSEWIC assessment and status report on the Canada Warbler *Cardellina canadensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 54 pp. https://wildlife-species.az.ec.gc.ca/species-risk-registry/virtual_sara/files//cosewic/sr_Canada_Warbler_2020_e.pdf
- ⁵ COSEWIC. (2016). COSEWIC assessment and status report on the Evening Grosbeak *Coccothraustes vespertinus* in Canada. Committee on the Status of Endangered Wildlife in Canada.

Ottawa. xi + 64 pp. <http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1>

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4.4 — Appendix D: AC CDC Data Report

DATA REPORT 8212: Halifax Exhibition Centre, NS

Prepared 9 September 2024
by K.Tenwolde,
Conservation Data Analyst

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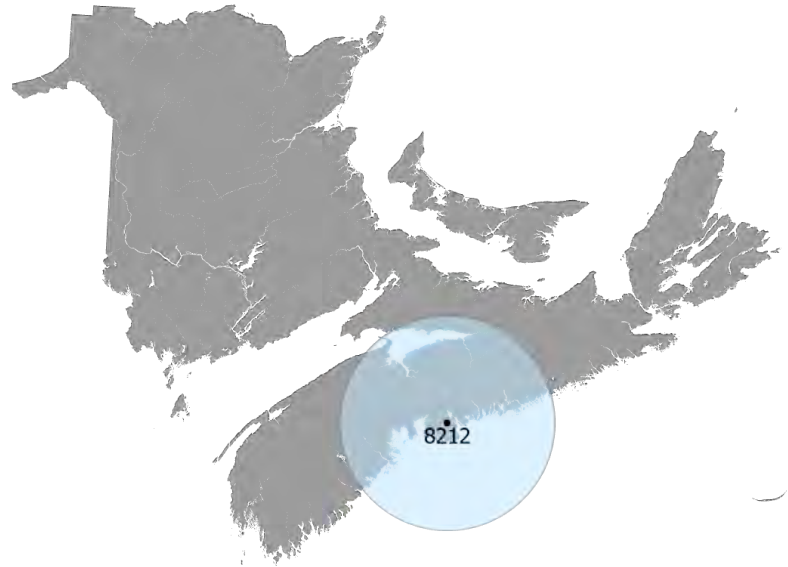
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Map 1. A 100 km buffer around the study area

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

HalifaxExhibNS_8212ob.xls

HalifaxExhibNS_8212ob100km.xls

HalifaxExhibNS_8212msa.xls

Contents

Rare or legally-protected Flora and Fauna in your study area

A list of Rare and legally protected Flora and Fauna within 100 km of your study area

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 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
(506) 364-2658
sean.blaney@accdc.ca

Animals (Fauna)

John Klymko
Zoologist
(506) 364-2660
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Charity Robicheau
Senior Conservation Data Analyst
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Billing

Jean Breau
Financial Manager / Executive Assistant
(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
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Eastern: Elizabeth Walsh
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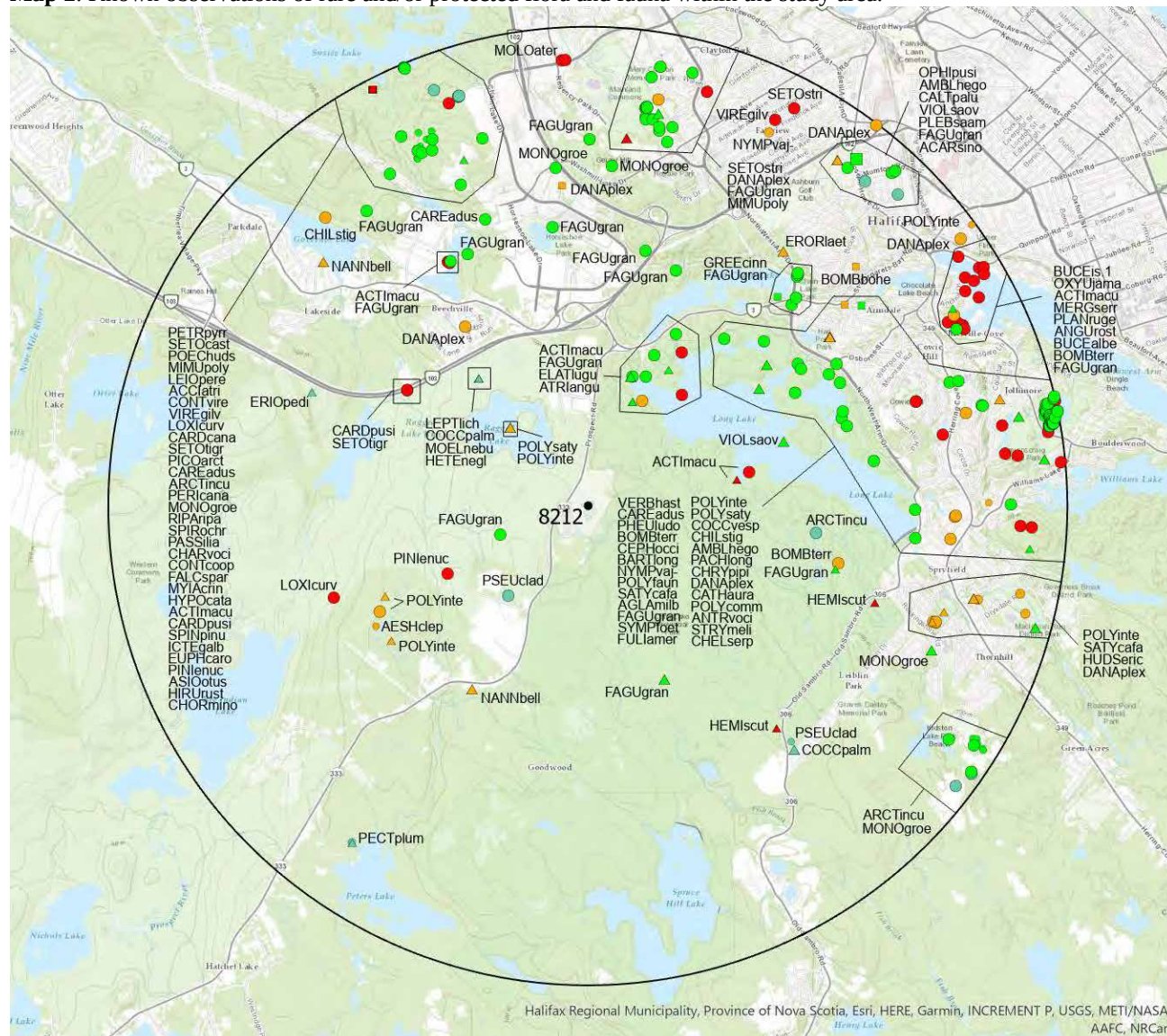
For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.1 FLORA

2.2 FAUNA

The study area contains 95 records of 44 vertebrate and 105 records of 19 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List), excluding 'location-sensitive species'. 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.



- 1.0 = Within 10s of metres
- 1.7 = Within 50s of metres
- 2.0 = Within 100s of metres
- △ 2.7 = Within 500s of metres
- △ 3.0 = Within kilometres
- 3.7 = Within 5s of kilometres
- 4.0 = Within 10s of kilometres
- 4.7 = Within 50s of kilometres

- Vertebrate fauna
- Invertebrate fauna
- Vascular flora
- Nonvascular flora

3.0 SPECIAL AREAS

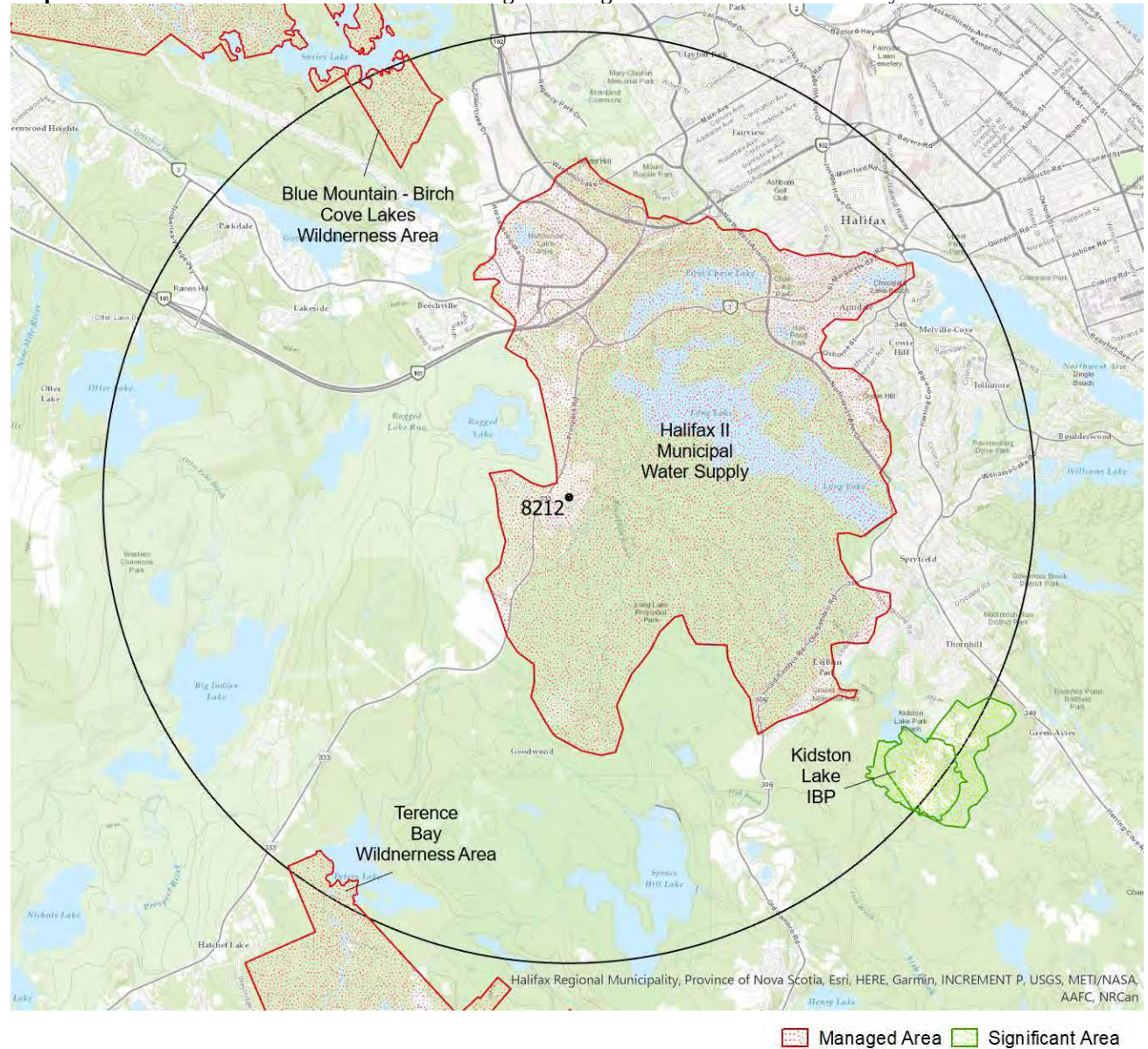
3.1 MANAGED AREAS

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 2 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *msa.xls).

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 ($\pm$ the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	2	3.1 $\pm$ 0.5
N	<i>Pectenium plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	3	4.3 $\pm$ 0.01
N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk			S2S3	3	1.3 $\pm$ 0.22
N	<i>Acarospora sinopica</i>	a cracked lichen				S1S3	2	4.5 $\pm$ 0.2
N	<i>Hypotrachyna catawbiensis</i>	Powder-tipped Antler Lichen				S2	2	4.6 $\pm$ 0.01
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S2?	1	1.2 $\pm$ 0.53
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen				S2S3	2	1.7 $\pm$ 0.6
N	<i>Scytinium lichenoides</i>	Tattered Jellyskin Lichen				S3	1	1.7 $\pm$ 0.6
N	<i>Arctoparmelia incurva</i>	Finger Ring Lichen				S3S4	10	2.4 $\pm$ 0.01
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S3S4	2	1.7 $\pm$ 0.6
N	<i>Heterodermia neglecta</i>	Fringe Lichen				S3S4	1	1.7 $\pm$ 0.6
P	<i>Hudsonia ericoides</i>	Pinebarren Golden Heather				S2	1	4.8 $\pm$ 1.77
P	<i>Caltha palustris</i>	Yellow Marsh Marigold				S2S3	3	4.7 $\pm$ 0.01
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	3	3.2 $\pm$ 0.2
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	1	4.6 $\pm$ 50.0
P	<i>Mononeuria groenlandica</i>	Greenland Stitchwort				S3	41	3.5 $\pm$ 0.6
P	<i>Plantago rugelii</i>	Rugel's Plantain				S3	1	4.3 $\pm$ 0.5
P	<i>Cephalanthus occidentalis</i>	Common Buttonbush				S3	3	4.9 $\pm$ 0.28
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S3?	1	4.0 $\pm$ 0.2
P	<i>Fagus grandifolia</i>	American Beech				S3S4	94	1.0 $\pm$ 0.2
P	<i>Verbena hastata</i>	Blue Vervain				S3S4	1	4.0 $\pm$ 0.2
P	<i>Viola sagittata</i> var. <i>ovata</i>	Arrow-Leaved Violet				S3S4	2	2.1 $\pm$ 1.7
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S3S4	7	4.9 $\pm$ 0.2
P	<i>Greeneochloa coarctata</i>	Small Reedgrass				SH	1	2.9 $\pm$ 6.0

4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S2B	1	4.9 $\pm$ 7.07
A	<i>Anguilla rostrata</i>	American Eel	Threatened			S3N	1	4.8 $\pm$ 0.2
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1?B	1	4.6 $\pm$ 0.15
A	<i>Bucephala islandica</i> pop. 1	Barrow's Goldeneye - Eastern Population	Special Concern	Special Concern		S1N,SUM	1	4.8 $\pm$ 0.2
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	1	4.9 $\pm$ 7.07
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	3	4.5 $\pm$ 0.2
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Endangered	S3B	2	4.9 $\pm$ 7.07
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Endangered	S3B	3	4.9 $\pm$ 7.07
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	4	4.9 $\pm$ 7.07
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	2	4.9 $\pm$ 7.07
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	1	3.6 $\pm$ 0.2
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	2	4.9 $\pm$ 7.07
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern	Special Concern		S4	1	4.4 $\pm$ 0.2
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1B	1	3.8 $\pm$ 0.2
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk			S3	2	3.0 $\pm$ 0.5
A	<i>Accipiter atricapillus</i>	American Goshawk	Not At Risk			S3S4	1	4.9 $\pm$ 7.07

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B	1	4.8 ± 0.2
A	<i>Bartramia longicauda</i>	Upland Sandpiper				S1B	1	4.4 ± 0.2
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S1B	1	4.9 ± 7.07
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S1B	2	3.9 ± 2.51
A	<i>Vireo gilvus</i>	Warbling Vireo				S1B,SUM	3	4.5 ± 0.15
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S2B	2	4.7 ± 0.2
A	<i>Asio otus</i>	Long-eared Owl				S2S3	1	4.9 ± 7.07
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B	1	4.9 ± 7.07
A	<i>Cathartes aura</i>	Turkey Vulture				S2S3B,S4S5M	2	4.5 ± 0.2
A	<i>Icterus galbula</i>	Baltimore Oriole				S2S3B,SUM	1	4.9 ± 7.07
A	<i>Perisoreus canadensis</i>	Canada Jay				S3	4	4.4 ± 0.2
A	<i>Poecile hudsonicus</i>	Boreal Chickadee				S3	2	4.9 ± 7.07
A	<i>Spinus pinus</i>	Pine Siskin				S3	2	4.9 ± 7.07
A	<i>Charadrius vociferus</i>	Killdeer				S3B	3	4.9 ± 7.07
A	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak				S3B	1	3.6 ± 0.2
A	<i>Falco sparverius</i>	American Kestrel				S3B,S4S5M	1	4.9 ± 7.07
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S4S5N,S5M	7	4.3 ± 0.2
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3B,S5M	2	4.5 ± 0.2
A	<i>Cardellina pusilla</i>	Wilson's Warbler				S3B,S5M	3	2.2 ± 0.15
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S3B,S5N,S5M	3	1.6 ± 0.2
A	<i>Setophaga tigrina</i>	Cape May Warbler				S3B,SUM	4	2.2 ± 0.15
A	<i>Picoides arcticus</i>	Black-backed Woodpecker				S3S4	2	4.9 ± 7.07
A	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	2	2.8 ± 0.15
A	<i>Setophaga castanea</i>	Bay-breasted Warbler				S3S4B,S4S5M	1	4.9 ± 7.07
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B,S5M	10	1.5 ± 0.2
A	<i>Leiothlypis peregrina</i>	Tennessee Warbler				S3S4B,S5M	2	4.9 ± 7.07
A	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B,S5M	2	4.9 ± 7.07
A	<i>Bucephala albeola</i>	Bufflehead				S3S4N	2	4.2 ± 0.2
I	<i>Bombus bohemicus</i>	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	1	3.7 ± 5.0
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	14	2.3 ± 0.2
I	<i>Bombus terricola</i>	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	3	2.7 ± 0.2
I	<i>Erora laeta</i>	Early Hairstreak				S1	1	3.3 ± 1.0
I	<i>Pachydiplax longipennis</i>	Blue Dasher				S1	1	3.8 ± 0.2
I	<i>Polygonia comma</i>	Eastern Comma				S1?	6	3.1 ± 2.5
I	<i>Polygonia satyrus</i>	Satyr Comma				S1?	5	1.1 ± 2.5
I	<i>Nymphalis l-album j-album</i>	Compton Tortoiseshell				S2S3	4	3.1 ± 1.0
I	<i>Aglais milberti</i>	Milbert's Tortoiseshell				S2S3	2	3.1 ± 1.0
I	<i>Elatroides lugubris</i>	Sapwood Ship-timber Beetle				S3	1	1.2 ± 0.2
I	<i>Chilocorus stigma</i>	Twice-stabbed Lady Beetle				S3	2	3.8 ± 0.2
I	<i>Satyrrium calanus falacer</i>	Falacer Hairstreak				S3	9	3.1 ± 2.5
I	<i>Strymon melinus</i>	Gray Hairstreak				S3	1	3.1 ± 1.0
I	<i>Polygonia interrogationis</i>	Question Mark				S3B	39	1.1 ± 2.5
I	<i>Amblyscirtes hegona</i>	Pepper and Salt Skipper				S3S4	7	3.1 ± 1.0
I	<i>Polygonia faunus</i>	Green Comma				S3S4	2	3.1 ± 2.5
I	<i>Aeshna clepsydra</i>	Mottled Darner				S3S4	1	2.5 ± 0.01
I	<i>Nannothemis bella</i>	Elfin Skimmer				S3S4	5	2.3 ± 1.0
I	<i>Icaricia saepiolus amica</i>	Greenish Blue				SH	1	4.4 ± 2.5

4.3 LOCATION SENSITIVE SPECIES

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

Nova Scotia

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Alces alces americana</i>	Moose – Mainland population		Endangered	YES
<i>Fraxinus nigra</i>	Black Ash		Threatened	No
<i>Emydoidea blandingii</i>	Blanding's Turtle - Nova Scotia pop.	Endangered	Endangered	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	YES
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.		Vulnerable	YES
<i>Bat Hibernaculum</i> or bat species occurrence		[Endangered] ¹	[Endangered] ¹	YES
<i>Snake hibernaculum</i>		[Threatened] ²	[Threatened] ²	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.

² *Thamnophis sauritus* (Eastern Ribbonsnake) is Threatened under the Federal Species at Risk Act (SARA) and the Nova Scotia Endangered Species Act. Occurrences between October 15 – April 15 are considered location sensitive.

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.

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 45109 records of 164 vertebrate and 2187 records of 69 invertebrate fauna; 11282 records of 282 vascular and 3101 records of 197 nonvascular flora (attached: *ob100km.xls).

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

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Coregonus huntsmani</i>	Atlantic Whitefish	Endangered	Endangered	Endangered	S1	166	76.3 $\pm$ 1.0	NS
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	338	10.3 $\pm$ 0.1	NS
A	<i>Myotis septentrionalis</i>	Northern Myotis	Endangered	Endangered	Endangered	S1	31	39.8 $\pm$ 0.1	NS
A	<i>Perimyotis subflavus</i>	Tricolored Bat	Endangered	Endangered	Endangered	S1	36	39.8 $\pm$ 0.1	NS
A	<i>Salmo salar pop. 1</i>	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered		S1	33	26.3 $\pm$ 0.5	NS
A	<i>Salmo salar pop. 6</i>	Atlantic Salmon - Nova Scotia Southern Upland population	Endangered			S1	41	13.8 $\pm$ 0.5	NS
A	<i>Emydoidea blandingii pop. 1</i>	Blanding's Turtle - Nova Scotia population	Endangered			S1	2545	100.0 $\pm$ 0.01	NS
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	1136	11.0 $\pm$ 0.1	NS
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1B	65	21.4 $\pm$ 0.15	NS
A	<i>Dermochelys coriacea pop. 2</i>	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered		S1S2N	3	29.3 $\pm$ 5.0	NS
A	<i>Morone saxatilis pop. 2</i>	Striped Bass - Bay of Fundy population	Endangered			S2S3B,S2S3N	4	37.2 $\pm$ 0.5	NS
A	<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	Endangered	Threatened		SNA	2	88.0 $\pm$ 0.2	NS
A	<i>Protonotaria citrea</i>	Prothonotary Warbler	Endangered	Endangered		SNA	2	18.4 $\pm$ 0.2	NS
A	<i>Icteria virens</i>	Yellow-Breasted Chat	Endangered	Endangered		SNA	5	15.8 $\pm$ 0.2	NS
A	<i>Lasionycteris noctivagans</i>	Silver-haired Bat	Endangered			SUB,S1M	12	10.9 $\pm$ 0.2	NS
A	<i>Lasiurus borealis</i>	Eastern Red Bat	Endangered			SUB,S1M	1	69.4 $\pm$ 0.1	NS
A	<i>Lasiurus cinereus</i>	Hoary Bat	Endangered			SUB,S1M	31	17.4 $\pm$ 0.5	NS
A	<i>Asio flammeus</i>	Short-eared Owl	Threatened	Special Concern		S1B	35	12.6 $\pm$ 0.15	NS
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2	915	100.0 $\pm$ 0.1	NS
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S2B	1439	10.2 $\pm$ 1.0	NS
A	<i>Thamnophis saurita pop. 3</i>	Eastern Ribbonsnake - Atlantic population	Threatened	Threatened	Threatened	S2S3	456	72.4 $\pm$ 1.0	NS
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	1029	10.0 $\pm$ 0.05	NS
A	<i>Limosa haemastica</i>	Hudsonian Godwit	Threatened			S2S3M	105	17.2 $\pm$ 0.2	NS
A	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	Threatened			S2S3N	12	46.5 $\pm$ 0.5	NS
A	<i>Hydrobates leucorhous</i>	Leach's Storm-Petrel	Threatened			S3B	31	19.1 $\pm$ 0.2	NS
A	<i>Tringa flavipes</i>	Lesser Yellowlegs	Threatened			S3M	966	16.8 $\pm$ 0.2	NS
A	<i>Anguilla rostrata</i>	American Eel	Threatened			S3N	145	11.8 $\pm$ 0.2	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened		SHB	3	14.5 ± 0.33	NS
A	<i>Melanerpes lewis</i>	Lewis's Woodpecker	Threatened	Threatened		SNA	2	17.1 ± 0.2	NS
A	<i>Parkesia motacilla</i>	Louisiana Waterthrush	Threatened	Threatened		SNA	2	18.7 ± 0.2	NS
A	<i>Ixobrychus exilis</i>	Least Bittern	Threatened	Threatened		SUB	3	7.8 ± 0.2	NS
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened		SUB	34	44.2 ± 7.07	NS
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1?B	13	14.3 ± 0.15	NS
A	<i>Passerculus sandwichensis princeps</i>	Ipswich Sparrow	Special Concern	Special Concern		S1B	36	13.7 ± 0.2	NS
A	<i>Bucephala islandica pop. 1</i>	Barrow's Goldeneye - Eastern Population	Special Concern	Special Concern		S1N,SUM	30	10.7 ± 0.2	NS
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	220	13.0 ± 7.07	NS
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S2N	77	16.1 ± 0.2	NS
A	<i>Balaenoptera physalus pop. 1</i>	Fin Whale - Atlantic population	Special Concern	Special Concern		S2S3	1	58.1 ± 0.49	NS
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	12	17.4 ± 0.5	NS
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	611	10.2 ± 0.2	NS
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Endangered	S3B	1095	10.0 ± 0.15	NS
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Endangered	S3B	1005	10.7 ± 0.01	NS
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	548	10.1 ± 0.01	NS
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	790	10.2 ± 0.1	NS
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Special Concern	Threatened	Vulnerable	S3B	638	18.3 ± 7.07	NS
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	608	12.8 ± 0.2	NS
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern	Special Concern		S3N,SUM	33	21.2 ± 0.2	NS
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	900	10.4 ± 0.01	NS
A	<i>Phocoena phocoena pop. 1</i>	Harbour Porpoise - Northwest Atlantic Population	Special Concern			S4	17	12.5 ± 7.1	NS
A	<i>Chrysemys picta</i>	Painted Turtle	Special Concern	Special Concern		S4	14	53.8 ± 0.02	NS
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern	Special Concern		S4	933	10.0 ± 5.0	NS
A	<i>Calidris subruficollis</i>	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	53	16.8 ± 0.2	NS
A	<i>Zonotrichia querula</i>	Harris's Sparrow	Special Concern			SNA	2	10.0 ± 0.2	NS
A	<i>Anarhichas lupus</i>	Atlantic Wolffish	Special Concern	Special Concern		SNR	5	17.2 ± 0.89	NS
A	<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	Special Concern	Special Concern			1	88.5 ± 0.2	NS
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	33	12.3 ± 0.2	NS
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1B	49	10.1 ± 0.2	NS
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S1B	2	32.6 ± 0.2	NS
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Not At Risk		Vulnerable	S1B,SUM	84	11.3 ± 0.2	NS
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S2?B,SUM	4	51.0 ± 7.07	NS
A	<i>Lynx canadensis</i>	Canada Lynx	Not At Risk		Endangered	S2S3	1	68.1 ± 5.0	NS
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk			S2S3	3	19.8 ± 0.2	NS
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk			S3	39	11.3 ± 0.5	NS
A	<i>Megaptera novaeangliae</i>	Humpback Whale	Not At Risk			S3	2	13.8 ± 0.2	NS
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B	335	10.0 ± 0.2	NS
A	<i>Sialia sialis</i>	Eastern Bluebird	Not At Risk			S3B	64	35.2 ± 7.07	NS
A	<i>Buteo lagopus</i>	Rough-legged Hawk	Not At Risk			S3N	4	16.8 ± 0.21	NS
A	<i>Accipiter atricapillus</i>	American Goshawk	Not At Risk			S3S4	128	12.8 ± 0.2	NS
A	<i>Glaucomys volans</i>	Southern Flying Squirrel	Not At Risk			S3S4	8	25.1 ± 2.56	NS
A	<i>Lagenorhynchus acutus</i>	Atlantic White-sided Dolphin	Not At Risk			S3S4	5	16.9 ± 2.17	NS
A	<i>Ammospiza nelsoni</i>	Nelson's Sparrow	Not At Risk			S3S4B	159	17.1 ± 0.2	NS
A	<i>Calidris canutus rufa</i>	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	649	17.1 ± 0.2	NS
A	<i>Morone saxatilis</i>	Striped Bass	E,SC			S2S3B,S2S3N	30	17.0 ± 0.2	NS
A	<i>Gadus morhua</i>	Atlantic Cod	E,SC,DD			SNR	11	13.4 ± 0.2	NS
A	<i>Salmo salar</i>	Atlantic Salmon	E,T,SC			S1B,S1N	14	29.2 ± 0.26	NS
A	<i>Alces alces americana</i>	Moose			Endangered	S1	29	0.5 ± 0.2	NS
A	<i>Sorex dispar kirklandi</i>	a long-tailed shrew				S1	2	88.7 ± 0.5	NS
A	<i>Alces alces</i>	Moose				S1	6	11.6 ± 0.26	NS
A	<i>Uria aalge</i>	Common Murre				S1?B	12	13.8 ± 0.27	NS
A	<i>Passerina cyanea</i>	Indigo Bunting				S1?B,SUM	24	15.8 ± 0.2	NS
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B	20	10.8 ± 0.2	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Gallinula galeata</i>	Common Gallinule				S1B	8	12.1 ± 0.2	NS
A	<i>Bartramia longicauda</i>	Upland Sandpiper				S1B	7	4.4 ± 0.2	NS
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S1B	29	16.3 ± 7.07	NS
A	<i>Cistothorus palustris</i>	Marsh Wren				S1B	4	16.8 ± 0.2	NS
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S1B	97	10.2 ± 0.28	NS
A	<i>Toxostoma rufum</i>	Brown Thrasher				S1B	20	17.5 ± 7.07	NS
A	<i>Charadrius semipalmatus</i>	Semipalmated Plover				S1B,S4M	1957	10.4 ± 0.2	NS
A	<i>Calidris minutilla</i>	Least Sandpiper				S1B,S4M	1389	13.6 ± 0.2	NS
A	<i>Anas acuta</i>	Northern Pintail				S1B,SUM	86	10.1 ± 0.2	NS
A	<i>Vireo gilvus</i>	Warbling Vireo				S1B,SUM	22	16.3 ± 7.07	NS
A	<i>Vespertilionidae sp.</i>	bat species				S1S2	234	11.8 ± 0.1	NS
A	<i>Poocetes gramineus</i>	Vesper Sparrow				S1S2B,SUM	24	25.6 ± 7.07	NS
A	<i>Vireo philadelphicus</i>	Philadelphia Vireo				S2?B,SUM	38	14.4 ± 0.15	NS
A	<i>Alca torda</i>	Razorbill				S2B	33	16.7 ± 0.2	NS
A	<i>Fratercula arctica</i>	Atlantic Puffin				S2B	44	24.6 ± 0.2	NS
A	<i>Empidonax traillii</i>	Willow Flycatcher				S2B	30	11.5 ± 0.15	NS
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S2B	163	10.5 ± 0.2	NS
A	<i>Somateria mollissima</i>	Common Eider				S2B,S2N,S4M	1002	10.0 ± 0.2	NS
A	<i>Spatula clypeata</i>	Northern Shoveler				S2B,SUM	33	10.2 ± 0.2	NS
A	<i>Mareca strepera</i>	Gadwall				S2B,SUM	43	10.1 ± 0.2	NS
A	<i>Piranga olivacea</i>	Scarlet Tanager				S2B,SUM	51	14.5 ± 7.07	NS
A	<i>Calidris alba</i>	Sanderling				S2N,S3M	1496	13.6 ± 0.24	NS
A	<i>Melanitta perspicillata</i>	Surf Scoter				S2N,S4M	80	11.3 ± 12.5	NS
A	<i>Melanitta deglandi</i>	White-winged Scoter				S2N,S4M	65	11.1 ± 0.2	NS
A	<i>Martes americana</i>	American Marten			Endangered	S2S3	3	32.2 ± 0.2	NS
A	<i>Asio otus</i>	Long-eared Owl				S2S3	21	16.4 ± 0.15	NS
A	<i>Rallus limicola</i>	Virginia Rail				S2S3B	21	28.1 ± 0.15	NS
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S2S3B	19	24.6 ± 0.2	NS
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B	235	13.0 ± 7.07	NS
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2S3B,S2S3N	83	10.2 ± 0.2	NS
A	<i>Cathartes aura</i>	Turkey Vulture				S2S3B,S4S5M	131	11.6 ± 0.2	NS
A	<i>Setophaga pinus</i>	Pine Warbler				S2S3B,S4S5M	48	10.9 ± 0.2	NS
A	<i>Icterus galbula</i>	Baltimore Oriole				S2S3B,SUM	109	10.6 ± 0.2	NS
A	<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	264	17.4 ± 0.5	NS
A	<i>Numenius phaeopus hudsonicus</i>	Whimbrel				S2S3M	289	16.1 ± 0.2	NS
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S2S3M	4	17.4 ± 0.5	NS
A	<i>Perisoreus canadensis</i>	Canada Jay				S3	517	13.0 ± 7.07	NS
A	<i>Poecile hudsonicus</i>	Boreal Chickadee				S3	479	11.0 ± 0.01	NS
A	<i>Spinus pinus</i>	Pine Siskin				S3	442	10.6 ± 0.2	NS
A	<i>Salvelinus fontinalis</i>	Brook Trout				S3	136	10.4 ± 0.98	NS
A	<i>Salvelinus namaycush</i>	Lake Trout				S3	1	42.9 ± 0.5	NS
A	<i>Sorex maritimensis</i>	Maritime Shrew				S3	1	75.9 ± 1.0	NS
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3	1	88.7 ± 0.5	NS
A	<i>Pekania pennanti</i>	Fisher				S3	9	44.8 ± 0.2	NS
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S3?N,SUM	13	13.7 ± 0.25	NS
A	<i>Spatula discors</i>	Blue-winged Teal				S3B	71	10.2 ± 0.2	NS
A	<i>Charadrius vociferus</i>	Killdeer				S3B	581	11.5 ± 0.15	NS
A	<i>Tringa semipalmata</i>	Willet				S3B	1912	13.5 ± 0.2	NS
A	<i>Sterna paradisaea</i>	Arctic Tern				S3B	71	13.5 ± 0.2	NS
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B	46	18.3 ± 7.07	NS
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3B	217	18.3 ± 7.07	NS
A	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak				S3B	378	12.0 ± 0.2	NS
A	<i>Alosa pseudoharengus</i>	Alewife				S3B	40	13.5 ± 0.2	NS
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S3B,S4M	2146	10.7 ± 0.2	NS
A	<i>Falco sparverius</i>	American Kestrel				S3B,S4S5M	236	14.5 ± 7.07	NS
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S4S5N,S5M	390	10.0 ± 0.2	NS
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3B,S5M	571	10.2 ± 0.2	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3B,S5M	149	10.4 ± 0.15	NS
A	<i>Cardellina pusilla</i>	Wilson's Warbler				S3B,S5M	87	13.0 ± 7.07	NS
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S3B,S5N,S5M	133	1.6 ± 0.2	NS
A	<i>Setophaga tigrina</i>	Cape May Warbler				S3B,SUM	139	11.1 ± 0.2	NS
A	<i>Branta bernicla</i>	Brant				S3M	4	13.6 ± 0.2	NS
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3M	2081	13.7 ± 0.2	NS
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	815	10.4 ± 1.55	NS
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3M	1721	13.6 ± 0.05	NS
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S3M	362	16.8 ± 0.2	NS
A	<i>Limnodromus griseus</i>	Short-billed Dowitcher				S3M	1319	16.8 ± 0.2	NS
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S3N	40	10.1 ± 0.2	NS
A	<i>Picoides arcticus</i>	Black-backed Woodpecker				S3S4	150	12.3 ± 0.15	NS
A	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	248	10.2 ± 0.01	NS
A	<i>Botaurus lentiginosus</i>	American Bittern				S3S4B,S4S5M	183	13.1 ± 0.2	NS
A	<i>Setophaga castanea</i>	Bay-breasted Warbler				S3S4B,S4S5M	339	13.0 ± 7.07	NS
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B,S5M	798	1.5 ± 0.2	NS
A	<i>Leiothlypis peregrina</i>	Tennessee Warbler				S3S4B,S5M	371	10.6 ± 0.15	NS
A	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B,S5M	85	10.4 ± 0.15	NS
A	<i>Bucephala albeola</i>	Bufflehead				S3S4N	307	10.0 ± 0.2	NS
A	<i>Calidris maritima</i>	Purple Sandpiper				S3S4N	212	11.3 ± 12.5	NS
A	<i>Lanius borealis</i>	Northern Shrike				S3S4N	4	31.3 ± 0.2	NS
A	<i>Morus bassanus</i>	Northern Gannet				SHB	73	10.7 ± 4.78	NS
A	<i>Aythya americana</i>	Redhead				SHB	10	10.0 ± 0.2	NS
A	<i>Leucophaeus atricilla</i>	Laughing Gull				SHB	16	13.7 ± 0.2	NS
A	<i>Progne subis</i>	Purple Martin				SHB	3	18.3 ± 0.2	NS
A	<i>Eremophila alpestris</i>	Horned Lark				SHB,S4S5N,S5M	33	18.2 ± 0.2	NS
I	<i>Bombus bohemicus</i>	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	25	3.7 ± 5.0	NS
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	1064	2.3 ± 0.2	NS
I	<i>Barnea truncata</i>	Atlantic Mud-piddock	Threatened	Threatened		S1	11	75.8 ± 0.2	NS
I	<i>Bombus suckleyi</i>	Suckley's Cuckoo Bumble Bee	Threatened			SH	4	49.7 ± 5.0	NS
I	<i>Alasmodonta varicosa</i>	Brook Floater	Special Concern	Special Concern	Threatened	S3	5	51.0 ± 0.1	NS
I	<i>Bombus terricola</i>	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	157	10.7 ± 0.2	NS
I	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle	Special Concern		Endangered	SH	3	43.5 ± 2.5	NS
I	<i>Gomphurus ventricosus</i>	Skillet Clubtail	Special Concern	Endangered		SH	2	35.2 ± 1.0	NS
I	<i>Erora laeta</i>	Early Hairstreak				S1	1	3.3 ± 1.0	NS
I	<i>Ophiogomphus anomalus</i>	Extra-Striped Snaketail				S1	6	94.5 ± 0.05	NS
I	<i>Pachydiplax longipennis</i>	Blue Dasher				S1	55	3.8 ± 0.2	NS
I	<i>Polygonia comma</i>	Eastern Comma				S1?	25	3.1 ± 2.5	NS
I	<i>Polygonia satyrus</i>	Satyr Comma				S1?	7	1.1 ± 2.5	NS
I	<i>Somatochlora brevicincta</i>	Quebec Emerald				S1S2	1	30.3 ± 0.1	NS
I	<i>Satyrrium acadica</i>	Acadian Hairstreak				S2	4	92.0 ± 2.5	NS
I	<i>Coenagrion resolutum</i>	Taiga Bluet				S2	2	21.2 ± 1.0	NS
I	<i>Margaritifera margaritifera</i>	Eastern Pearlshell				S2	64	41.6 ± 1.0	NS
I	<i>Pantala hymenaea</i>	Spot-Winged Glider				S2?B	7	5.2 ± 1.0	NS
I	<i>Nymphalis l-album j-album</i>	Compton Tortoiseshell				S2S3	19	3.1 ± 1.0	NS
I	<i>Aglais milberti</i>	Milbert's Tortoiseshell				S2S3	22	3.1 ± 1.0	NS
I	<i>Somatochlora kennedyi</i>	Kennedy's Emerald				S2S3	3	13.2 ± 1.0	NS
I	<i>Enallagma geminatum</i>	Skimming Bluet				S2S3	4	45.4 ± 0.2	NS
I	<i>Stylurus scudderii</i>	Zebra Clubtail				S2S3	6	36.4 ± 0.5	NS
I	<i>Alasmodonta undulata</i>	Triangle Floater				S2S3	22	11.1 ± 0.3	NS
I	<i>Strophiona nitens</i>	Chestnut Bark Long-horned Beetle				S3	3	7.0 ± 0.2	NS
I	<i>Psephenus herricki</i>	Herrick's Water Penny Beetle				S3	8	52.1 ± 0.2	NS
I	<i>Lebia ornata</i>	Ornate Harp Ground Beetle				S3	1	88.7 ± 0.2	NS
I	<i>Carabus serratus</i>	Serrated Ground Beetle				S3	1	89.6 ± 0.2	NS
I	<i>Hippodamia parenthesis</i>	Parenthesis Lady Beetle				S3	3	12.6 ± 0.05	NS
I	<i>Disonycha pensylvanica</i>	Pennsylvania Flea Beetle				S3	1	80.1 ± 0.2	NS
I	<i>Omophron americanum</i>	American Round Sand Beetle				S3	5	62.0 ± 0.01	NS

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I	<i>Naemia seriata</i>	Seaside Lady Beetle				S3	37	18.6 ± 0.54	NS
I	<i>Pachyrhinus elegans</i>	Elegant Broad-nosed Weevil				S3	1	88.7 ± 0.2	NS
I	<i>Elateroides lugubris</i>	Sapwood Ship-timber Beetle				S3	1	1.2 ± 0.2	NS
I	<i>Chilocorus stigma</i>	Twice-stabbed Lady Beetle				S3	11	13.3 ± 0.2	NS
I	<i>Myzia pullata</i>	Streaked Lady Beetle				S3	7	12.0 ± 0.2	NS
I	<i>Monochamus marmorator</i>	Balsam Fir Sawyer				S3	3	21.4 ± 0.2	NS
I	<i>Dicerca tuberculata</i>	Swollen Jewel Beetle				S3	1	16.6 ± 9.73	NS
I	<i>Astylopsis sexguttata</i>	Six-speckled Long-horned Beetle				S3	2	21.2 ± 0.25	NS
I	<i>Satyrium calanus falacer</i>	Falacer Hairstreak				S3	74	3.1 ± 2.5	NS
I	<i>Callophrys lanoraieensis</i>	Bog Elfin				S3	27	9.1 ± 0.2	NS
I	<i>Strymon melinus</i>	Gray Hairstreak				S3	17	3.1 ± 1.0	NS
I	<i>Ophiogomphus aspersus</i>	Brook Snaketail				S3	2	25.0 ± 0.1	NS
I	<i>Ophiogomphus mainensis</i>	Maine Snaketail				S3	7	76.3 ± 0.2	NS
I	<i>Ophiogomphus rupinsulensis</i>	Rusty Snaketail				S3	31	36.4 ± 0.05	NS
I	<i>Epitheca princeps</i>	Prince Baskettail				S3	16	17.7 ± 4.29	NS
I	<i>Somatochlora forcipata</i>	Forcinate Emerald				S3	4	6.3 ± 1.0	NS
I	<i>Enallagma vernale</i>	Vernal Bluet				S3	5	14.3 ± 1.0	NS
I	<i>Polygonia interrogationis</i>	Question Mark				S3B	171	1.1 ± 2.5	NS
I	<i>Lepturoptis biforis</i>	Two-spotted Long-horned Beetle				S3S4	2	52.6 ± 0.34	NS
I	<i>Cecropterus pylades</i>	Northern Cloudywing				S3S4	5	88.9 ± 2.5	NS
I	<i>Amblyscirtes hegon</i>	Pepper and Salt Skipper				S3S4	28	3.1 ± 2.5	NS
I	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	27	7.5 ± 0.2	NS
I	<i>Argynnis aphrodite winni</i>	Aphrodite Fritillary				S3S4	37	17.2 ± 0.1	NS
I	<i>Polygonia faunus</i>	Green Comma				S3S4	14	3.1 ± 2.5	NS
I	<i>Oeneis jutta ascerta</i>	Jutta Arctic				S3S4	7	33.5 ± 1.0	NS
I	<i>Aeshna clepsydra</i>	Mottled Darner				S3S4	11	2.5 ± 0.01	NS
I	<i>Aeshna constricta</i>	Lance-Tipped Darner				S3S4	25	5.3 ± 0.2	NS
I	<i>Boyeria grafiana</i>	Ocellated Darner				S3S4	11	17.0 ± 0.2	NS
I	<i>Gomphaeschna furcillata</i>	Harlequin Darner				S3S4	20	6.0 ± 0.2	NS
I	<i>Somatochlora franklini</i>	Delicate Emerald				S3S4	2	35.2 ± 1.0	NS
I	<i>Erythrodiplex berenice</i>	Seaside Dragonlet				S3S4	7	19.8 ± 0.2	NS
I	<i>Nannothemis bella</i>	Elfin Skimmer				S3S4	20	2.3 ± 1.0	NS
I	<i>Sympetrum danae</i>	Black Meadowhawk				S3S4	4	39.6 ± 0.2	NS
I	<i>Enallagma vesperum</i>	Vesper Bluet				S3S4	4	39.1 ± 0.2	NS
I	<i>Amphiagrion saucium</i>	Eastern Red Damsel				S3S4	2	88.4 ± 1.0	NS
I	<i>Sphaerophoria pyrrhina</i>	Violaceous Globetail				SH	1	87.2 ± 5.0	NS
I	<i>Icaricia saepiolus amica</i>	Greenish Blue				SH	1	4.4 ± 2.5	NS
I	<i>Polygonia gracilis</i>	Hoary Comma				SH	1	89.0 ± 2.5	NS
N	<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1	24	34.9 ± 0.01	NS
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	255	3.1 ± 0.5	NS
N	<i>Peltigera hydrothyrja</i>	Eastern Waterfan	Threatened	Threatened	Threatened	S1	25	60.5 ± 0.2	NS
N	<i>Pannaria lurida</i>	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S2S3	275	29.3 ± 1.0	NS
N	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened	Threatened	Threatened	S3	48	29.4 ± 0.7	NS
N	<i>Fuscopannaria leucosticta</i>	White-rimmed Shingle Lichen	Threatened			S3	44	8.6 ± 0.01	NS
N	<i>Heterodermia squamulosa</i>	Scaly Fringe Lichen	Threatened			S3	64	61.0 ± 0.5	NS
N	<i>Pectenaria plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	257	4.3 ± 0.01	NS
N	<i>Sclerophora peronella</i> (Atlantic pop.)	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S3S4	31	7.6 ± 0.01	NS
N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk			S2S3	18	1.3 ± 0.22	NS
N	<i>Fissidens exilis</i>	Pygmy Pocket Moss	Not At Risk			S3	15	51.4 ± 1.5	NS
N	<i>Aloina brevirostris</i>	Short-Beaked Rigid Screw Moss				S1	2	48.2 ± 2.5	NS
N	<i>Sematophyllum demissum</i>	a Moss				S1	2	22.8 ± 2.5	NS
N	<i>Blennothallia crispa</i>	Crinkled Jelly Lichen				S1	1	71.7 ± 0.05	NS
N	<i>Umbilicaria vellea</i>	Grizzled Rocktripe Lichen				S1	1	18.2 ± 5.0	NS
N	<i>Usnea perplexans</i>	Powdered Beard Lichen				S1	1	71.7 ± 0.4	NS
N	<i>Scytinium dactylinum</i>	Brown-buttoned Jellyskin Lichen				S1	1	95.9 ± 0.34	NS
N	<i>Lathagrium cristatum</i>	Fingered Jelly Lichen				S1	3	55.9 ± 0.05	NS

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N	<i>Ephebe perspinulosa</i>	Thread Lichen				S1	1	95.7 ± 1.33	NS
N	<i>Fuscopannaria praetermissa</i>	Moss Shingles Lichen				S1	1	52.6 ± 0.05	NS
N	<i>Scytinium schraderi</i>	Wrinkled Jellyskin Lichen				S1	1	70.4 ± 0.05	NS
N	<i>Lichina confinis</i>	Marine Seaweed Lichen				S1	4	18.4 ± 0.01	NS
N	<i>Polychidium muscicola</i>	Eyed Mossthorns Woollybear Lichen				S1	1	85.9 ± 0.2	NS
N	<i>Pseudevernia consocians</i>	Common Antler Lichen				S1	1	67.6 ± 0.05	NS
N	<i>Sticta limbata</i>	Powdered Moon Lichen				S1	4	32.0 ± 3.9	NS
N	<i>Peltigera lepidophora</i>	Scaly Pelt Lichen				S1	7	51.4 ± 0.2	NS
N	<i>Bryoria nitidula</i>	Tundra Horsehair Lichen				S1	2	16.7 ± 0.6	NS
N	<i>Hypogymnia hultenii</i>	Powdered Honeycomb Lichen				S1	14	30.7 ± 1.3	NS
N	<i>Calypogeia neogaea</i>	Common Pouchwort				S1?	3	71.2 ± 0.01	NS
N	<i>Jubula pennsylvanica</i>	a liverwort				S1?	2	42.2 ± 0.2	NS
N	<i>Aloina rigida</i>	Aloe-Like Rigid Screw Moss				S1?	3	48.2 ± 2.5	NS
N	<i>Imbricbryum muehlenbeckii</i>	Muehlenbeck's Bryum Moss				S1?	2	60.8 ± 0.01	NS
N	<i>Conardia compacta</i>	Coast Creeping Moss				S1?	1	23.9 ± 2.0	NS
N	<i>Tortula obtusifolia</i>	a Moss				S1?	3	81.0 ± 0.01	NS
N	<i>Didymodon tophaceus</i>	Olive Beard Moss				S1?	2	71.4 ± 4.0	NS
N	<i>Grimmia laevigata</i>	a Moss				S1?	2	44.0 ± 0.34	NS
N	<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss				S1?	1	83.2 ± 0.2	NS
N	<i>Paludella squarrosa</i>	Tufted Fen Moss				S1?	3	50.0 ± 0.1	NS
N	<i>Physcomitrium immersum</i>	a Moss				S1?	2	83.5 ± 0.38	NS
N	<i>Schistostega pennata</i>	Luminous Moss				S1?	2	47.7 ± 0.2	NS
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss				S1?	1	94.7 ± 0.2	NS
N	<i>Enchylium limosum</i>	Lime-loving Tarpaper Lichen				S1?	2	71.4 ± 4.0	NS
N	<i>Scytinium intermedium</i>	Forty-five Jellyskin Lichen				S1?	1	71.4 ± 4.0	NS
N	<i>Melanelia culbersonii</i>	Appalachian Camouflage Lichen				S1?	1	34.7 ± 0.05	NS
N	<i>Porella pinnata</i>	Pinnate Scalewort				S1S2	1	89.3 ± 0.2	NS
N	<i>Arrhenopterum heterostichum</i>	One-sided Groove Moss				S1S2	3	48.2 ± 2.5	NS
N	<i>Hypnum pratense</i>	Meadow Plait Moss				S1S2	1	91.2 ± 3.0	NS
N	<i>Mnium thomsonii</i>	Thomson's Leafy Moss				S1S2	1	53.6 ± 2.0	NS
N	<i>Tortula acaulon</i>	Cuspidate Earth Moss				S1S2	3	88.8 ± 0.2	NS
N	<i>Plagiothecium latebricola</i>	Alder Silk Moss				S1S2	2	44.6 ± 5.0	NS
N	<i>Platydictya confervoides</i>	a Moss				S1S2	1	51.5 ± 0.01	NS
N	<i>Sematophyllum marylandicum</i>	a Moss				S1S2	2	23.0 ± 3.0	NS
N	<i>Timmia megapolitana</i>	Metropolitan Timmia Moss				S1S2	2	90.3 ± 1.6	NS
N	<i>Tortula mucronifolia</i>	Mucronate Screw Moss				S1S2	1	90.1 ± 3.0	NS
N	<i>Pseudotaxiphyllum distichaceum</i>	a Moss				S1S2	1	70.3 ± 0.01	NS
N	<i>Haplocladium microphyllum</i>	Tiny-leaved Haplocladium Moss				S1S2	1	79.0 ± 5.0	NS
N	<i>Rhynchostegium serrulatum</i>	Dark Beaked Moss				S1S2	1	31.0 ± 2.0	NS
N	<i>Enchylium bachmanianum</i>	Bachman's Jelly Lichen				S1S2	2	56.1 ± 0.05	NS
N	<i>Placidium squamulosum</i>	Limy Soil Stipplescale Lichen				S1S2	1	80.0 ± 6.0	NS
N	<i>Pilophorus cereolus</i>	Powdered Matchstick Lichen				S1S2	1	92.1 ± 3.0	NS
N	<i>Rhizoplaca subdiscrepans</i>	Scattered Rock-posy Lichen				S1S2	1	35.9 ± 1.4	NS
N	<i>Parmotrema reticulatum</i>	Netted Ruffle Lichen				S1S2	4	66.0 ± 0.05	NS
N	<i>Parmeliella parvula</i>	Poor-man's Shingles Lichen				S1S2	9	36.9 ± 0.1	NS
N	<i>Umbilicaria polyrhiza</i>	Ballpoint Rocktripe Lichen				S1S3	1	74.8 ± 0.01	NS
N	<i>Lecanora polytropia</i>	a lichen				S1S3	2	18.3 ± 1.0	NS
N	<i>Acarospora sinopica</i>	a cracked lichen				S1S3	2	4.5 ± 0.2	NS
N	<i>Heterodermia galactophylla</i>	Branching Fringe Lichen				S1S3	2	35.9 ± 0.05	NS
N	<i>Xylopsora friesii</i>	a Lichen				S1S3	2	5.1 ± 0.2	NS
N	<i>Peltigera neckeri</i>	Black-saddle Pelt Lichen				S1S3	3	92.5 ± 0.01	NS
N	<i>Stereocaulon grande</i>	Grand Foam Lichen				S1S3	1	100.0 ± 0.5	NS
N	<i>Stereocaulon intermedium</i>	Pacific Brain Foam Lichen				S1S3	5	6.1 ± 0.01	NS
N	<i>Anacamptodon splachnoides</i>	a Moss				S2	2	6.1 ± 30.0	NS
N	<i>Sphagnum platyphyllum</i>	Flat-leaved Peat Moss				S2	2	26.5 ± 3.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Sphagnum subnitens</i>	Lustrous Peat Moss				S2	1	62.5 ± 2.0	NS
N	<i>Usnea flavocardia</i>	Blood-splattered Beard Lichen				S2	1	9.7 ± 4.5	NS
N	<i>Cystocoleus ebeneus</i>	Rockgossamer Lichen				S2	6	8.7 ± 0.2	NS
N	<i>Hypotrachyna catawbiensis</i>	Powder-tipped Antler Lichen				S2	7	4.6 ± 0.01	NS
N	<i>Scytinium imbricatum</i>	Scaly Jellyskin Lichen				S2	3	64.7 ± 0.05	NS
N	<i>Nephroma arcticum</i>	Arctic Kidney Lichen				S2	1	11.2 ± 1.7	NS
N	<i>Nephroma resupinatum</i>	a lichen				S2	13	13.8 ± 0.01	NS
N	<i>Placynthium flabelliforme</i>	Scaly Ink Lichen				S2	2	48.4 ± 17.5	NS
N	<i>Moerckia flotoviana</i>	Flotow's Ruffwort				S2?	1	72.2 ± 0.01	NS
N	<i>Riccardia multifida</i>	Delicate Germanderwort				S2?	3	46.9 ± 0.2	NS
N	<i>Anomodon viticulosus</i>	a Moss				S2?	1	90.2 ± 0.2	NS
N	<i>Weissia muhlenbergiana</i>	a Moss				S2?	5	53.6 ± 1.2	NS
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S2?	3	1.2 ± 0.53	NS
N	<i>Ptychostomum pendulum</i>	Drooping Bryum				S2?	1	48.2 ± 2.5	NS
N	<i>Drepanocladus polygamus</i>	Polygamous Hook Moss				S2?	4	22.8 ± 2.5	NS
N	<i>Pseudocampylum radicale</i>	Long-stalked Fine Wet Moss				S2?	1	91.2 ± 3.0	NS
N	<i>Climacium americanum</i>	American Tree Moss				S2?	1	94.0 ± 0.2	NS
N	<i>Dicranum condensatum</i>	Condensed Broom Moss				S2?	3	21.5 ± 0.01	NS
N	<i>Ditrichum rhynchostegium</i>	a Moss				S2?	1	8.9 ± 1.4	NS
N	<i>Fontinalis hypnoides</i>	a moss				S2?	1	96.2 ± 0.2	NS
N	<i>Grimmia anomala</i>	Mountain Forest Grimmia				S2?	1	55.0 ± 1.5	NS
N	<i>Kiaeria starkei</i>	Starke's Fork Moss				S2?	1	50.3 ± 10.0	NS
N	<i>Orthotrichum anomalum</i>	Anomalous Bristle Moss				S2?	1	54.1 ± 2.0	NS
N	<i>Philonotis marchica</i>	a Moss				S2?	2	95.3 ± 0.01	NS
N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2?	1	52.8 ± 0.01	NS
N	<i>Cyrtomnium hymenophylloides</i>	Short-pointed Lantern Moss				S2?	1	9.2 ± 5.0	NS
N	<i>Platylomella lescurii</i>	a Moss				S2?	9	33.3 ± 0.7	NS
N	<i>Phyliscum demangeonii</i>	Black Rock-wafer Lichen				S2?	5	52.5 ± 0.05	NS
N	<i>Oxyrrhynchium hians</i>	Light Beaked Moss				S2S3	4	18.9 ± 5.0	NS
N	<i>Platydictya subtilis</i>	Bark Willow Moss				S2S3	1	99.7 ± 3.2	NS
N	<i>Scorpidium revolvens</i>	Limprichtia Moss				S2S3	3	24.2 ± 2.0	NS
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen				S2S3	48	1.7 ± 0.6	NS
N	<i>Moelleropsis nebulosa ssp. frullaniae</i>	Blue-gray Moss Shingle Lichen				S2S3	3	60.8 ± 0.5	NS
N	<i>Ramalina thrausta</i>	Angelhair Ramalina Lichen				S2S3	11	21.8 ± 5.0	NS
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2S3	99	8.4 ± 1.5	NS
N	<i>Usnea ceratina</i>	Warty Beard Lichen				S2S3	2	67.5 ± 0.05	NS
N	<i>Usnea hirta</i>	Bristly Beard Lichen				S2S3	3	20.5 ± 5.32	NS
N	<i>Usnea rubicunda</i>	Red Beard Lichen				S2S3	5	43.7 ± 0.01	NS
N	<i>Ahtiana aurescens</i>	Eastern Candlewax Lichen				S2S3	19	13.9 ± 0.01	NS
N	<i>Usnocetraria oakesiana</i>	Yellow Band Lichen				S2S3	12	13.2 ± 0.21	NS
N	<i>Cetraria muricata</i>	Spiny Heath Lichen				S2S3	1	8.8 ± 0.01	NS
N	<i>Cladonia incrassata</i>	Powder-foot British Soldiers Lichen				S2S3	1	42.2 ± 0.2	NS
N	<i>Cladonia mateocyatha</i>	Mixed-up Pixie-cup				S2S3	6	6.4 ± 5.5	NS
N	<i>Cladonia parasitica</i>	Fence-rail Lichen				S2S3	3	22.9 ± 0.24	NS
N	<i>Scytinium tenuissimum</i>	Birdnest Jellyskin Lichen				S2S3	7	8.6 ± 0.01	NS
N	<i>Melanohalea septentrionalis</i>	Northern Camouflage Lichen				S2S3	1	71.8 ± 0.6	NS
N	<i>Myelochroa aurulenta</i>	Powdery Axil-bristle Lichen				S2S3	1	75.8 ± 2.3	NS
N	<i>Parmelia fertilis</i>	Fertile Shield Lichen				S2S3	9	60.8 ± 0.6	NS
N	<i>Hypotrachyna minarum</i>	Hairless-spined Shield Lichen				S2S3	3	55.0 ± 0.05	NS
N	<i>Parmeliopsis ambigua</i>	Green Starburst Lichen				S2S3	2	5.3 ± 0.6	NS
N	<i>Racodium rupestre</i>	Rockhair Lichen				S2S3	4	18.3 ± 1.2	NS
N	<i>Umbilicaria polyphylla</i>	Petalled Rocktripe Lichen				S2S3	2	15.3 ± 0.2	NS
N	<i>Usnea cavernosa</i>	Pitted Beard Lichen				S2S3	4	71.7 ± 0.4	NS
N	<i>Usnea mutabilis</i>	Bloody Beard Lichen				S2S3	1	71.7 ± 0.25	NS
N	<i>Fuscopannaria sorediata</i>	a Lichen				S2S3	8	14.3 ± 0.01	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Stereocaulon condensatum</i>	Granular Soil Foam Lichen				S2S3	4	8.1 ± 0.2	NS
N	<i>Physcia subtilis</i>	Slender Rosette Lichen				S2S3	2	15.2 ± 0.2	NS
N	<i>Dimelaena oreina</i>	Golden Moonglow Lichen				S2S3	2	10.3 ± 0.62	NS
N	<i>Hypotrachyna revoluta</i>	Granulating Loop Lichen				S2S3	1	94.2 ± 0.2	NS
N	<i>Cetraria arenaria</i>	Sand-loving Icelandmoss Lichen				S2S3	13	52.4 ± 0.4	NS
N	<i>Cladonia coccifera</i>	Eastern Boreal Pixie-cup Lichen				S2S3	2	17.0 ± 2.0	NS
N	<i>Cladonia deformis</i>	Lesser Sulphur-cup Lichen				S2S3	2	53.7 ± 4.0	NS
N	<i>Cladonia phyllophora</i>	Felt Lichen				S2S3	2	87.2 ± 4.5	NS
N	<i>Usnea flammea</i>	Coastal Bushy Beard Lichen				S2S3	1	18.3 ± 1.0	NS
N	<i>Ephemerum serratum</i>	a Moss				S3	5	55.2 ± 5.0	NS
N	<i>Fissidens taxifolius</i>	Yew-leaved Pocket Moss				S3	14	48.2 ± 2.5	NS
N	<i>Anomodon tristis</i>	a Moss				S3	7	59.4 ± 15.0	NS
N	<i>Sphagnum contortum</i>	Twisted Peat Moss				S3	4	70.9 ± 4.0	NS
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S3	3	62.5 ± 2.0	NS
N	<i>Rostania occultata</i>	Crusted Tarpaper Lichen				S3	1	95.2 ± 0.2	NS
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	42	26.6 ± 0.01	NS
N	<i>Solorina saccata</i>	Woodland Owl Lichen				S3	11	52.0 ± 2.0	NS
N	<i>Fuscopannaria ahlneri</i>	Roughened Shingle Lichen				S3	77	9.2 ± 0.01	NS
N	<i>Scytinium lichenoides</i>	Tattered Jellyskin Lichen				S3	33	1.7 ± 0.6	NS
N	<i>Leptogium milligranum</i>	Stretched Jellyskin Lichen				S3	19	49.9 ± 0.2	NS
N	<i>Nephroma bellum</i>	Naked Kidney Lichen				S3	6	9.7 ± 4.5	NS
N	<i>Placynthium nigrum</i>	Common Ink Lichen				S3	1	81.0 ± 0.05	NS
N	<i>Platismatia norvegica</i>	Oldgrowth Rag Lichen				S3	1	63.4 ± 0.7	NS
N	<i>Punctelia appalachensis</i>	Appalachian Speckleback Lichen				S3	75	63.9 ± 0.01	NS
N	<i>Viridothelium virens</i>	a lichen				S3	4	21.6 ± 2.0	NS
N	<i>Ephebe lanata</i>	Waterside Rockshag Lichen				S3	4	48.4 ± 17.5	NS
N	<i>Phaeophyscia adiastrata</i>	Powder-tipped Shadow Lichen				S3	1	6.9 ± 0.2	NS
N	<i>Phaeophyscia pusilloides</i>	Pompom-tipped Shadow Lichen				S3	10	7.1 ± 0.05	NS
N	<i>Peltigera collina</i>	Tree Pelt Lichen				S3	6	42.2 ± 0.5	NS
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss				S3?	3	6.5 ± 0.2	NS
N	<i>Calliergon giganteum</i>	Giant Spear Moss				S3?	2	46.0 ± 3.0	NS
N	<i>Drummondia prorepens</i>	a Moss				S3?	1	51.9 ± 5.0	NS
N	<i>Elodium blandowii</i>	Blandow's Bog Moss				S3?	5	14.3 ± 7.5	NS
N	<i>Mnium stellare</i>	Star Leafy Moss				S3?	3	49.2 ± 0.01	NS
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S3?	1	76.3 ± 0.01	NS
N	<i>Sphagnum riparium</i>	Streamside Peat Moss				S3?	3	17.2 ± 0.2	NS
N	<i>Cladonia stygia</i>	Black-footed Reindeer Lichen				S3?	8	11.0 ± 0.01	NS
N	<i>Anomodon rugelii</i>	Rugel's Anomodon Moss				S3S4	2	89.7 ± 0.6	NS
N	<i>Dichelyma capillaceum</i>	Hairlike Dichelyma Moss				S3S4	3	19.0 ± 3.0	NS
N	<i>Dicranum leioneuron</i>	a Dicranum Moss				S3S4	1	22.7 ± 0.01	NS
N	<i>Encalypta ciliata</i>	Fringed Extinguisher Moss				S3S4	2	90.2 ± 3.0	NS
N	<i>Splachnum ampullaceum</i>	Cruet Dung Moss				S3S4	1	51.4 ± 0.01	NS
N	<i>Thamnobryum alleghaniense</i>	a Moss				S3S4	5	71.9 ± 0.2	NS
N	<i>Tomentypnum nitens</i>	Golden Fuzzy Fen Moss				S3S4	4	50.1 ± 0.2	NS
N	<i>Schistidium agassizii</i>	Elf Bloom Moss				S3S4	3	55.0 ± 1.5	NS
N	<i>Hylocomiastrum pyrenaicum</i>	a Feather Moss				S3S4	1	5.6 ± 0.5	NS
N	<i>Bryoria pseudofuscescens</i>	Mountain Horsehair Lichen				S3S4	4	16.6 ± 1.0	NS
N	<i>Enchylium tenax</i>	Soil Tarpaper Lichen				S3S4	10	50.0 ± 0.01	NS
N	<i>Sticta fuliginosa</i>	Peppered Moon Lichen				S3S4	65	9.3 ± 0.5	NS
N	<i>Arctoparmelia incurva</i>	Finger Ring Lichen				S3S4	98	2.4 ± 0.01	NS
N	<i>Scytinium teretiusculum</i>	Curly Jellyskin Lichen				S3S4	9	28.8 ± 0.01	NS
N	<i>Leptogium acadense</i>	Acadian Jellyskin Lichen				S3S4	28	6.2 ± 0.2	NS
N	<i>Scytinium subtile</i>	Appressed Jellyskin Lichen				S3S4	29	27.2 ± 0.2	NS
N	<i>Cladonia floerkeana</i>	Gritty British Soldiers Lichen				S3S4	4	17.0 ± 0.05	NS
N	<i>Vahlia leucophaea</i>	Shelter Shingle Lichen				S3S4	1	94.3 ± 0.2	NS
N	<i>Heterodermia speciosa</i>	Powdered Fringe Lichen				S3S4	50	8.9 ± 0.01	NS
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S3S4	96	14.3 ± 0.01	NS
N	<i>Melanohalea olivacea</i>	Spotted Camouflage Lichen				S3S4	2	71.7 ± 0.4	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Parmeliopsis hyperopta</i>	Gray Starburst Lichen				S3S4	1	97.5 ± 0.5	NS
N	<i>Parmotrema perlatum</i>	Powdered Ruffle Lichen				S3S4	32	25.1 ± 0.2	NS
N	<i>Peltigera hymenina</i>	Cloudy Pelt Lichen				S3S4	2	17.0 ± 2.0	NS
N	<i>Sphaerophorus fragilis</i>	Fragile Coral Lichen				S3S4	16	15.0 ± 0.2	NS
N	<i>Sclerophora peronella</i>	Frosted Glass-whiskers Lichen				S3S4	3	35.0 ± 0.01	NS
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S3S4	378	1.7 ± 0.6	NS
N	<i>Physcia caesia</i>	Blue-gray Rosette Lichen				S3S4	3	18.3 ± 1.0	NS
N	<i>Physcia tenella</i>	Fringed Rosette Lichen				S3S4	7	5.9 ± 0.2	NS
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen				S3S4	155	6.6 ± 0.2	NS
N	<i>Evernia prunastri</i>	Valley Oakmoss Lichen				S3S4	38	47.3 ± 0.01	NS
N	<i>Heterodermia neglecta</i>	Fringe Lichen				S3S4	132	1.7 ± 0.6	NS
P	<i>Rhynchospora macrostachya</i>	Tall Beakrush	Endangered	Endangered	Endangered	S1	10	94.6 ± 0.01	NS
P	<i>Clethra alnifolia</i>	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S2	5	10.4 ± 0.62	NS
P	<i>Juglans cinerea</i>	Butternut	Endangered	Endangered		SNA	5	6.2 ± 0.2	NS
P	<i>Trichostema dichotomum</i>	Forked Bluecurls	Threatened			S1	10	93.5 ± 0.2	NS
P	<i>Fraxinus nigra</i>	Black Ash	Threatened		Threatened	S1S2	807	12.7 ± 0.01	NS
P	<i>Liatris spicata</i>	Dense Blazing Star	Threatened	Threatened		SNA	1	45.8 ± 0.2	NS
P	<i>Lachnanthes caroliniana</i>	Redroot	Special Concern	Special Concern	Vulnerable	S2	369	93.4 ± 0.05	NS
P	<i>Lophiola aurea</i>	Goldencrest	Special Concern	Special Concern	Vulnerable	S2	478	76.7 ± 1.0	NS
P	<i>Lilaeopsis chinensis</i>	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	S3	159	67.8 ± 0.01	NS
P	<i>Scirpus longii</i>	Long's Bulrush	Special Concern		Vulnerable	S3	176	88.9 ± 0.2	NS
P	<i>Isoetes prototypus</i>	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S3	7	96.6 ± 0.5	NS
P	<i>Floerkea proserpinacoides</i>	False Mermaidweed	Not At Risk			S2S3	38	88.1 ± 1.5	NS
P	<i>Salix candida</i>	Sage Willow			Endangered	S1	1	6.0 ± 0.2	NS
P	<i>Acer saccharinum</i>	Silver Maple				S1	13	56.6 ± 0.2	NS
P	<i>Osmorhiza depauperata</i>	Blunt Sweet Cicely				S1	1	76.2 ± 5.0	NS
P	<i>Andersonglossum boreale</i>	Northern Wild Comfrey				S1	5	51.5 ± 1.6	NS
P	<i>Turritis glabra</i>	Tower Mustard				S1	1	75.1 ± 0.5	NS
P	<i>Lobelia spicata</i>	Pale-Spiked Lobelia				S1	7	82.9 ± 7.07	NS
P	<i>Ribes americanum</i>	Wild Black Currant				S1	4	51.1 ± 3.0	NS
P	<i>Fraxinus pennsylvanica</i>	Red Ash				S1	11	33.5 ± 5.0	NS
P	<i>Persicaria careyi</i>	Carey's Smartweed				S1	1	71.5 ± 3.0	NS
P	<i>Phytolacca americana</i>	Common Pokeweed				S1	4	10.8 ± 0.5	NS
P	<i>Podostemum ceratophyllum</i>	Horn-leaved Riverweed				S1	4	80.9 ± 0.1	NS
P	<i>Montia fontana</i>	Water Blinks				S1	1	5.4 ± 1.0	NS
P	<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife				S1	2	14.2 ± 0.2	NS
P	<i>Salix myrtillifolia</i>	Blueberry Willow				S1	1	57.3 ± 0.01	NS
P	<i>Salix serissima</i>	Autumn Willow				S1	2	57.1 ± 0.01	NS
P	<i>Carex digitalis</i>	Slender Wood Sedge				S1	1	82.8 ± 0.2	NS
P	<i>Carex garberi</i>	Garber's Sedge				S1	3	96.4 ± 0.01	NS
P	<i>Carex laxiflora</i>	Loose-Flowered Sedge				S1	2	88.7 ± 1.0	NS
P	<i>Carex ormostachya</i>	Necklace Spike Sedge				S1	1	92.9 ± 5.0	NS
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge				S1	5	76.8 ± 0.2	NS
P	<i>Carex prairea</i>	Prairie Sedge				S1	2	89.4 ± 1.0	NS
P	<i>Carex viridula</i> var. <i>saxillittoralis</i>	Greenish Sedge				S1	5	76.3 ± 2.0	NS
P	<i>Scirpus atrovirens</i>	Dark-green Bulrush				S1	5	5.3 ± 0.21	NS
P	<i>Schoenoplectus torreyi</i>	Torrey's Bulrush				S1	6	92.6 ± 0.01	NS
P	<i>Iris prismatica</i>	Slender Blue Flag				S1	1	85.2 ± 100.0	NS
P	<i>Sisyrinchium fuscatum</i>	Coastal Plain Blue-eyed-grass				S1	1	78.2 ± 0.1	NS
P	<i>Juncus secundus</i>	Secund Rush				S1	1	90.6 ± 0.1	NS
P	<i>Juncus vaseyi</i>	Vasey Rush				S1	1	96.9 ± 0.02	NS
P	<i>Trillium grandiflorum</i>	White Trillium				S1	3	89.4 ± 1.0	NS
P	<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	North American White Adder's-mouth				S1	5	82.9 ± 10.0	NS
P	<i>Spiranthes casei</i> var. <i>casei</i>	Case's Ladies'-Tresses				S1	2	67.4 ± 0.1	NS
P	<i>Dichanthelium</i>	Slender Panic Grass				S1	10	73.6 ± 1.6	NS

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P	<i>xanthophyllum</i>								
P	<i>Elymus hystrix</i>	Spreading Wild Rye				S1	12	49.0 ± 0.5	NS
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S1	25	40.7 ± 1.5	NS
P	<i>Equisetum palustre</i>	Marsh Horsetail				S1	2	82.9 ± 0.2	NS
P	<i>Botrychium lunaria</i>	Common Moonwort				S1	10	23.3 ± 0.2	NS
P	<i>Selaginella rupestris</i>	Rock Spikemoss				S1	1	50.7 ± 0.01	NS
P	<i>Solidago hispida</i>	Hairy Goldenrod				S1?	1	8.9 ± 7.07	NS
P	<i>Suaeda rolandii</i>	Roland's Sea-Blite				S1?	5	51.8 ± 2.0	NS
P	<i>Carex pensylvanica</i>	Pennsylvania Sedge				S1?	4	30.1 ± 0.05	NS
P	<i>Allium schoenoprasum</i>	Wild Chives				S1?	8	6.4 ± 0.2	NS
P	<i>Allium schoenoprasum</i> var. <i>sibiricum</i>	Wild Chives				S1?	1	88.8 ± 7.07	NS
P	<i>Crocanthemum canadense</i>	Long-branched Frostweed			Endangered	S1S2	10	12.6 ± 1.6	NS
P	<i>Cypripedium arietinum</i>	Ram's-Head Lady's-Slipper			Endangered	S1S2	311	46.5 ± 2.0	NS
P	<i>Sanicula odorata</i>	Clustered Sanicle				S1S2	10	49.2 ± 0.1	NS
P	<i>Draba glabella</i>	Rock Whitlow-Grass				S1S2	1	90.9 ± 0.05	NS
P	<i>Proserpinaca intermedia</i>	Intermediate Mermaidweed				S1S2	5	51.2 ± 0.9	NS
P	<i>Anemone virginiana</i> var. <i>alba</i>	Virginia Anemone				S1S2	5	88.8 ± 7.07	NS
P	<i>Carex haydenii</i>	Hayden's Sedge				S1S2	5	62.3 ± 0.2	NS
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S1S2	1	49.6 ± 10.0	NS
P	<i>Euphrasia farlowii</i>	Farlow's Eyebright				S1S3	2	71.6 ± 0.01	NS
P	<i>Carex vacillans</i>	Estuarine Sedge				S1S3	1	66.4 ± 0.01	NS
P	<i>Zizia aurea</i>	Golden Alexanders				S2	42	20.8 ± 0.2	NS
P	<i>Antennaria parlinii</i> ssp. <i>fallax</i>	Parlin's Pussytoes				S2	38	48.1 ± 0.1	NS
P	<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower				S2	29	6.2 ± 0.2	NS
P	<i>Arabis pycnocarpa</i>	Cream-flowered Rockcress				S2	1	91.4 ± 0.1	NS
P	<i>Cardamine maxima</i>	Large Toothwort				S2	1	76.2 ± 0.2	NS
P	<i>Hudsonia ericoides</i>	Pinebarren Golden Heather				S2	197	4.8 ± 1.77	NS
P	<i>Desmodium canadense</i>	Canada Tick-trefoil				S2	14	76.4 ± 7.07	NS
P	<i>Hylodesmum glutinosum</i>	Large Tick-trefoil				S2	24	52.0 ± 0.01	NS
P	<i>Conopholis americana</i>	American Cancer-root				S2	22	71.7 ± 7.07	NS
P	<i>Anemonastrum canadense</i>	Canada Anemone				S2	19	6.0 ± 0.2	NS
P	<i>Hepatica americana</i>	Round-lobed Hepatica				S2	77	46.5 ± 3.1	NS
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup				S2	27	11.1 ± 2.5	NS
P	<i>Galium boreale</i>	Northern Bedstraw				S2	5	82.9 ± 7.07	NS
P	<i>Gratiola neglecta</i>	Clammy Hedge-Hyssop				S2	6	67.4 ± 0.2	NS
P	<i>Dirca palustris</i>	Eastern Leatherwood				S2	75	45.1 ± 1.0	NS
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S2	2	57.4 ± 0.01	NS
P	<i>Carex pellita</i>	Woolly Sedge				S2	2	79.3 ± 10.0	NS
P	<i>Carex livida</i>	Livid Sedge				S2	13	15.4 ± 0.01	NS
P	<i>Juncus Greenei</i>	Greene's Rush				S2	5	6.7 ± 10.0	NS
P	<i>Allium tricoccum</i>	Wild Leek				S2	80	76.2 ± 0.2	NS
P	<i>Lilium canadense</i>	Canada Lily				S2	74	42.6 ± 0.1	NS
P	<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Yellow Lady's-slipper				S2	27	24.4 ± 7.07	NS
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper				S2	12	48.9 ± 0.01	NS
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S2	58	44.4 ± 0.74	NS
P	<i>Platanthera flava</i> var. <i>flava</i>	Southern Rein Orchid				S2	13	73.4 ± 0.01	NS
P	<i>Platanthera flava</i> var. <i>herbiola</i>	Pale Green Orchid				S2	14	73.9 ± 1.0	NS
P	<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid				S2	2	56.4 ± 1.0	NS
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S2	28	79.5 ± 0.01	NS
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S2	60	73.4 ± 0.01	NS
P	<i>Elymus wiegandii</i>	Wiegand's Wild Rye				S2	6	8.9 ± 7.07	NS
P	<i>Festuca subverticillata</i>	Nodding Fescue				S2	9	63.2 ± 7.07	NS
P	<i>Piptatheropsis pungens</i>	Slender Ricegrass				S2	12	60.2 ± 10.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S2	3	55.5 ± 0.25	NS
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S2?	2	29.0 ± 0.25	NS
P	<i>Rumex persicarioides</i>	Peach-leaved Dock				S2?	1	44.0 ± 0.01	NS
P	<i>Crataegus submollis</i>	Quebec Hawthorn				S2?	5	32.7 ± 7.07	NS
P	<i>Carex peckii</i>	White-Tinged Sedge				S2?	4	51.2 ± 5.0	NS
P	<i>Thuja occidentalis</i>	Eastern White Cedar			Vulnerable	S2S3	27	7.6 ± 0.2	NS
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2S3	16	52.1 ± 0.01	NS
P	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane				S2S3	2	80.5 ± 1.0	NS
P	<i>Lactuca hirsuta</i>	Hairy Lettuce				S2S3	4	31.2 ± 7.07	NS
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2S3	2	90.4 ± 7.07	NS
P	<i>Caulophyllum thalictroides</i>	Blue Cohosh				S2S3	72	40.4 ± 7.07	NS
P	<i>Draba arabisans</i>	Rock Whitlow-Grass				S2S3	10	88.7 ± 1.0	NS
P	<i>Boechera stricta</i>	Drummond's Rockcress				S2S3	10	88.7 ± 1.0	NS
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S2S3	4	65.6 ± 0.1	NS
P	<i>Oxybasis rubra</i>	Red Goosefoot				S2S3	2	76.3 ± 2.0	NS
P	<i>Hypericum majus</i>	Large St John's-wort				S2S3	5	8.9 ± 7.07	NS
P	<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort				S2S3	4	10.7 ± 10.0	NS
P	<i>Empetrum atropurpureum</i>	Purple Crowberry				S2S3	5	9.0 ± 7.07	NS
P	<i>Euphorbia polygonifolia</i>	Seaside Spurge				S2S3	12	54.5 ± 3.0	NS
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil				S2S3	9	34.3 ± 1.5	NS
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2S3	14	19.1 ± 5.0	NS
P	<i>Oenothera fruticosa</i> ssp. <i>tetragona</i>	Narrow-leaved Evening Primrose				S2S3	7	6.1 ± 7.07	NS
P	<i>Polygala polygama</i>	Racemed Milkwort				S2S3	1	6.7 ± 1.0	NS
P	<i>Polygonum aviculare</i> ssp. <i>buxiforme</i>	Box Knotweed				S2S3	8	42.6 ± 7.07	NS
P	<i>Polygonum oxyspermum</i> ssp. <i>raii</i>	Ray's Knotweed				S2S3	5	40.2 ± 1.0	NS
P	<i>Rumex triangulivalvis</i>	Triangular-valve Dock				S2S3	9	40.2 ± 0.5	NS
P	<i>Primula mistassinica</i>	Mistassini Primrose				S2S3	17	85.4 ± 1.0	NS
P	<i>Anemone quinquefolia</i>	Wood Anemone				S2S3	14	61.0 ± 0.01	NS
P	<i>Caltha palustris</i>	Yellow Marsh Marigold				S2S3	28	4.7 ± 0.01	NS
P	<i>Amelanchier fernaldii</i>	Fernald's Serviceberry				S2S3	1	73.9 ± 7.07	NS
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S2S3	18	6.6 ± 0.2	NS
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw				S2S3	1	91.7 ± 0.01	NS
P	<i>Salix pellita</i>	Satiny Willow				S2S3	3	66.2 ± 2.0	NS
P	<i>Tiarella stolonifera</i>	Stoloniferous Foamflower				S2S3	12	52.3 ± 0.01	NS
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle				S2S3	56	44.7 ± 0.2	NS
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	8	3.2 ± 0.2	NS
P	<i>Carex capillaris</i>	Hairlike Sedge				S2S3	1	99.9 ± 0.02	NS
P	<i>Carex comosa</i>	Bearded Sedge				S2S3	6	53.9 ± 5.0	NS
P	<i>Carex houghtoniana</i>	Houghton's Sedge				S2S3	4	43.8 ± 0.2	NS
P	<i>Carex hystericina</i>	Porcupine Sedge				S2S3	9	14.5 ± 0.33	NS
P	<i>Eleocharis ovata</i>	Ovate Spikerush				S2S3	5	25.1 ± 0.5	NS
P	<i>Scirpus pedicellatus</i>	Stalked Bulrush				S2S3	7	46.4 ± 0.01	NS
P	<i>Vallisneria americana</i>	Wild Celery				S2S3	11	42.3 ± 1.2	NS
P	<i>Najas gracillima</i>	Thread-Like Naiad				S2S3	2	40.9 ± 0.45	NS
P	<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S2S3	22	47.1 ± 0.01	NS
P	<i>Spiranthes casei</i>	Case's Ladies'-Tresses				S2S3	1	98.6 ± 0.01	NS
P	<i>Spiranthes casei</i> var. <i>novaescotiae</i>	Case's Ladies'-Tresses				S2S3	4	65.4 ± 0.2	NS
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2S3	13	50.9 ± 1.3	NS
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S2S3	10	83.0 ± 1.0	NS
P	<i>Woodsia glabella</i>	Smooth Cliff Fern				S2S3	1	97.5 ± 1.0	NS
P	<i>Botrychium lanceolatum</i> ssp. <i>angustisegmentum</i>	Narrow Triangle Moonwort				S2S3	4	67.4 ± 5.0	NS
P	<i>Botrychium simplex</i>	Least Moonwort				S2S3	7	43.6 ± 0.1	NS
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	5	4.6 ± 50.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Potamogeton pulcher</i>	Spotted Pondweed			Vulnerable	S3	21	69.1 ± 0.01	NS
P	<i>Angelica atropurpurea</i>	Purple-stemmed Angelica				S3	1	81.7 ± 0.01	NS
P	<i>Conioselinum chinense</i>	Chinese Hemlock-parsley				S3	2	61.0 ± 0.05	NS
P	<i>Hieracium robinsonii</i>	Robinson's Hawkweed				S3	2	87.5 ± 1.0	NS
P	<i>Iva frutescens</i>	Big-leaved Marsh-elder				S3	95	50.6 ± 0.01	NS
P	<i>Senecio pseudoarnica</i>	Seabeach Ragwort				S3	31	17.5 ± 1.0	NS
P	<i>Symphyotrichum boreale</i>	Boreal Aster				S3	2	88.8 ± 7.07	NS
P	<i>Symphyotrichum ciliolatum</i>	Fringed Blue Aster				S3	18	51.9 ± 0.01	NS
P	<i>Symphyotrichum undulatum</i>	Wavy-leaved Aster				S3	140	14.5 ± 1.5	NS
P	<i>Alnus serrulata</i>	Smooth Alder				S3	379	76.0 ± 0.01	NS
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch				S3	70	27.1 ± 0.1	NS
P	<i>Betula pumila</i>	Bog Birch				S3	3	54.7 ± 0.01	NS
P	<i>Cardamine parviflora</i>	Small-flowered Bittercress				S3	14	23.0 ± 1.0	NS
P	<i>Palustricodon aparinoides</i>	Marsh Bellflower				S3	14	55.7 ± 1.0	NS
P	<i>Mononeuria groenlandica</i>	Greenland Stitchwort				S3	290	3.5 ± 0.6	NS
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S3	65	11.5 ± 0.5	NS
P	<i>Sagina nodosa ssp. borealis</i>	Knotted Pearlwort				S3	10	18.1 ± 0.2	NS
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S3	9	44.8 ± 5.0	NS
P	<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S3	7	73.9 ± 0.01	NS
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S3	41	46.7 ± 0.01	NS
P	<i>Crassula aquatica</i>	Water Pygmyweed				S3	1	24.4 ± 0.1	NS
P	<i>Empetrum eamesii</i>	Pink Crowberry				S3	94	8.9 ± 7.07	NS
P	<i>Vaccinium uliginosum</i>	Alpine Bilberry				S3	4	15.4 ± 1.0	NS
P	<i>Halenia deflexa</i>	Spurred Gentian				S3	4	19.1 ± 0.01	NS
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill				S3	22	48.5 ± 0.2	NS
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil				S3	3	55.7 ± 3.0	NS
P	<i>Utricularia resupinata</i>	Inverted Bladderwort				S3	5	89.5 ± 0.01	NS
P	<i>Epilobium densum</i>	Downy Willowherb				S3	9	56.1 ± 0.01	NS
P	<i>Polygala sanguinea</i>	Blood Milkwort				S3	38	8.9 ± 7.07	NS
P	<i>Persicaria arifolia</i>	Halberd-leaved Tearthumb				S3	12	54.5 ± 0.05	NS
P	<i>Plantago rugelii</i>	Rugel's Plantain				S3	9	4.3 ± 0.5	NS
P	<i>Primula laurentiana</i>	Laurentian Primrose				S3	19	82.6 ± 7.07	NS
P	<i>Samolus parviflorus</i>	Seaside Brookweed				S3	53	6.3 ± 1.0	NS
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	2	8.8 ± 0.01	NS
P	<i>Anemone virginiana</i>	Virginia Anemone				S3	19	49.4 ± 5.0	NS
P	<i>Cephalanthus occidentalis</i>	Common Buttonbush				S3	722	4.9 ± 0.28	NS
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S3	79	54.4 ± 0.05	NS
P	<i>Salix pedicellaris</i>	Bog Willow				S3	130	44.8 ± 0.01	NS
P	<i>Salix sericea</i>	Silky Willow				S3	126	35.2 ± 1.0	NS
P	<i>Saxifraga paniculata ssp. laestadii</i>	Laestadius' Saxifrage				S3	2	82.9 ± 7.07	NS
P	<i>Lindernia dubia</i>	Yellow-seeded False Pimperel				S3	9	51.5 ± 0.01	NS
P	<i>Laportea canadensis</i>	Canada Wood Nettle				S3	47	45.0 ± 0.01	NS
P	<i>Pilea pumila</i>	Dwarf Clearweed				S3	9	5.2 ± 0.2	NS
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S3	6	64.3 ± 1.5	NS
P	<i>Carex bebbii</i>	Bebb's Sedge				S3	24	48.9 ± 0.01	NS
P	<i>Carex castanea</i>	Chestnut Sedge				S3	39	54.4 ± 0.05	NS
P	<i>Carex cryptolepis</i>	Hidden-scaled Sedge				S3	13	33.9 ± 6.5	NS
P	<i>Carex eburnea</i>	Bristle-leaved Sedge				S3	11	70.3 ± 1.0	NS
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S3	30	49.1 ± 2.0	NS
P	<i>Carex lupulina</i>	Hop Sedge				S3	68	27.8 ± 1.2	NS
P	<i>Carex rosea</i>	Rosy Sedge				S3	38	48.1 ± 2.0	NS
P	<i>Carex swanii</i>	Swan's Sedge				S3	5	7.0 ± 0.5	NS
P	<i>Carex tenera</i>	Tender Sedge				S3	4	51.5 ± 0.1	NS
P	<i>Carex tribuloides</i>	Blunt Broom Sedge				S3	13	50.5 ± 0.01	NS
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S3	32	49.3 ± 2.5	NS
P	<i>Eleocharis nitida</i>	Quill Spikerush				S3	8	49.9 ± 5.0	NS
P	<i>Eleocharis flavescens var.</i>	Bright-green Spikerush				S3	8	16.2 ± 0.25	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>olivacea</i>								
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S3	6	28.1 ± 1.5	NS
P	<i>Coeloglossum viride</i>	Long-bracted Frog Orchid				S3	12	70.2 ± 1.0	NS
P	<i>Cypripedium parviflorum</i>	Yellow Lady's-slipper				S3	590	11.0 ± 0.2	NS
P	<i>Neottia bifolia</i>	Southern Twayblade				S3	171	7.4 ± 0.01	NS
P	<i>Platanthera flava</i>	Southern Rein-Orchid				S3	35	73.5 ± 0.01	NS
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	53	7.2 ± 0.2	NS
P	<i>Platanthera hookeri</i>	Hooker's Orchid				S3	18	50.7 ± 1.0	NS
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S3	8	54.8 ± 7.07	NS
P	<i>Piptatheropsis canadensis</i>	Canada Ricegrass				S3	20	29.9 ± 1.0	NS
P	<i>Poa glauca</i>	Glaucous Blue Grass				S3	7	52.2 ± 1.0	NS
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S3	3	75.9 ± 5.0	NS
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S3	7	60.9 ± 0.01	NS
P	<i>Potamogeton zosteriformis</i>	Flat-stemmed Pondweed				S3	15	45.0 ± 5.0	NS
P	<i>Asplenium viride</i>	Green Spleenwort				S3	9	90.3 ± 7.07	NS
P	<i>Dryopteris fragrans</i>	Fragrant Wood Fern				S3	5	97.0 ± 0.01	NS
P	<i>Sceptridium dissectum</i>	Dissected Moonwort				S3	3	70.3 ± 0.5	NS
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	24	5.2 ± 0.2	NS
P	<i>Persicaria amphibia</i> var. <i>emersa</i>	Long-root Smartweed				S3?	22	46.4 ± 0.01	NS
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S3?	43	4.0 ± 0.2	NS
P	<i>Diphasiastrum x sabinifolium</i>	Savin-leaved Ground-cedar				S3?	1	88.6 ± 0.1	NS
P	<i>Bidens vulgata</i>	Tall Beggarticks				S3S4	7	6.3 ± 0.2	NS
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3S4	25	47.1 ± 7.07	NS
P	<i>Hieracium paniculatum</i>	Panicled Hawkweed				S3S4	31	44.0 ± 11.0	NS
P	<i>Bidens beckii</i>	Water Beggarticks				S3S4	8	44.4 ± 0.5	NS
P	<i>Packera paupercula</i>	Balsam Groundsel				S3S4	110	46.5 ± 0.01	NS
P	<i>Atriplex glabriuscula</i> var. <i>franktonii</i>	Frankton's Saltbush				S3S4	13	56.5 ± 0.01	NS
P	<i>Shepherdia canadensis</i>	Soapberry				S3S4	114	40.9 ± 7.07	NS
P	<i>Vaccinium boreale</i>	Northern Blueberry				S3S4	3	55.9 ± 0.01	NS
P	<i>Vaccinium cespitosum</i>	Dwarf Bilberry				S3S4	53	18.0 ± 0.01	NS
P	<i>Vaccinium corymbosum</i>	Highbush Blueberry				S3S4	15	5.1 ± 0.2	NS
P	<i>Fagus grandifolia</i>	American Beech				S3S4	867	1.0 ± 0.2	NS
P	<i>Bartonia virginica</i>	Yellow Bartonia				S3S4	32	17.5 ± 7.07	NS
P	<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed				S3S4	51	8.8 ± 1.5	NS
P	<i>Decodon verticillatus</i>	Swamp Loosestrife				S3S4	6	48.3 ± 0.2	NS
P	<i>Nuphar microphylla</i>	Small Yellow Pond-lily				S3S4	1	37.4 ± 0.01	NS
P	<i>Persicaria pensylvanica</i>	Pennsylvania Smartweed				S3S4	28	11.6 ± 0.0	NS
P	<i>Fallopia scandens</i>	Climbing False Buckwheat				S3S4	18	8.1 ± 0.2	NS
P	<i>Rumex pallidus</i>	Seabeach Dock				S3S4	1	44.6 ± 0.01	NS
P	<i>Pyrola asarifolia</i>	Pink Pyrola				S3S4	9	45.3 ± 50.0	NS
P	<i>Endotropis alnifolia</i>	Alder-leaved Buckthorn				S3S4	271	44.1 ± 0.01	NS
P	<i>Amelanchier spicata</i>	Running Serviceberry				S3S4	46	12.9 ± 0.01	NS
P	<i>Crataegus succulenta</i>	Fleshy Hawthorn				S3S4	1	14.4 ± 0.01	NS
P	<i>Fragaria vesca</i> ssp. <i>americana</i>	Woodland Strawberry				S3S4	66	44.8 ± 0.01	NS
P	<i>Fragaria vesca</i>	Woodland Strawberry				S3S4	6	6.1 ± 0.2	NS
P	<i>Galium aparine</i>	Common Bedstraw				S3S4	51	7.7 ± 0.08	NS
P	<i>Geocaulon lividum</i>	Northern Comandra				S3S4	4	62.0 ± 0.01	NS
P	<i>Limosella australis</i>	Southern Mudwort				S3S4	10	13.1 ± 3.5	NS
P	<i>Ulmus americana</i>	White Elm				S3S4	89	5.2 ± 0.2	NS
P	<i>Verbena hastata</i>	Blue Vervain				S3S4	177	4.0 ± 0.2	NS
P	<i>Viola sagittata</i> var. <i>ovata</i>	Arrow-Leaved Violet				S3S4	40	2.1 ± 1.7	NS
P	<i>Viola selkirkii</i>	Great-Spurred Violet				S3S4	3	46.6 ± 4.8	NS
P	<i>Symlocarpus foetidus</i>	Eastern Skunk Cabbage				S3S4	10	4.9 ± 0.2	NS
P	<i>Carex argyrantha</i>	Silvery-flowered Sedge				S3S4	9	46.3 ± 1.5	NS
P	<i>Sisyrinchium atlanticum</i>	Eastern Blue-Eyed-Grass				S3S4	36	58.0 ± 0.8	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Triglochin gaspensis</i>	Gaspé Arrowgrass				S3S4	29	19.1 ± 0.01	NS
P	<i>Juncus acuminatus</i>	Sharp-Fruit Rush				S3S4	8	14.7 ± 0.01	NS
P	<i>Juncus subcaudatus</i>	Woods-Rush				S3S4	24	14.1 ± 0.01	NS
P	<i>Luzula parviflora</i> ssp. <i>melanocarpa</i>	Black-fruited Woodrush				S3S4	2	89.2 ± 0.01	NS
P	<i>Goodyera repens</i>	Lesser Rattlesnake-plantain				S3S4	7	63.0 ± 0.01	NS
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3S4	10	14.8 ± 0.2	NS
P	<i>Platanthera obtusata</i>	Blunt-leaved Orchid				S3S4	7	8.9 ± 10.0	NS
P	<i>Platanthera orbiculata</i>	Small Round-leaved Orchid				S3S4	5	46.6 ± 4.8	NS
P	<i>Alopecurus aequalis</i>	Short-awned Foxtail				S3S4	8	50.1 ± 0.01	NS
P	<i>Dichanthelium clandestinum</i>	Deer-tongue Panic Grass				S3S4	306	14.2 ± 0.2	NS
P	<i>Coleataenia longifolia</i>	Long-leaved Panicgrass				S3S4	477	88.3 ± 0.01	NS
P	<i>Panicum philadelphicum</i>	Philadelphia Panicgrass				S3S4	10	51.5 ± 0.01	NS
P	<i>Koeleria spicata</i>	Narrow False Oats				S3S4	16	48.3 ± 0.05	NS
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S3S4	14	71.4 ± 0.85	NS
P	<i>Equisetum pratense</i>	Meadow Horsetail				S3S4	15	49.1 ± 0.01	NS
P	<i>Diphasiastrum complanatum</i>	Northern Ground-cedar				S3S4	14	6.1 ± 1.0	NS
P	<i>Diphasiastrum sitchense</i>	Sitka Ground-cedar				S3S4	2	76.3 ± 1.0	NS
P	<i>Huperzia appressa</i>	Mountain Firmoss				S3S4	14	74.7 ± 7.07	NS
P	<i>Sceptridium multifidum</i>	Leathery Moonwort				S3S4	9	62.5 ± 10.0	NS
P	<i>Botrychium matricariifolium</i>	Daisy-leaved Moonwort				S3S4	4	23.5 ± 0.2	NS
P	<i>Viola canadensis</i>	Canada Violet				SH	2	55.2 ± 0.75	NS
P	<i>Greeneochloa coarctata</i>	Small Reedgrass				SH	1	2.9 ± 6.0	NS

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

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543	McNeil, J.A. 2016. Blandings Turtle (<i>Emydoidea blandingii</i>), Eastern Ribbonsnake (<i>Thamnophis sauritus</i>), Wood Turtle (<i>Glyptemys insculpta</i>), and Snapping Turtle (<i>Chelydra serpentina</i>) sightings, 2016. Mersey Tobeatic Research Institute, 774 records.
496	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
480	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
457	Clayden, S. Digitization of Wolfgang Maass Nova Scotia forest lichen collections, 1964-2004. New Brunswick Museum. 2018.

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455	Belliveau, A.G. 2020. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2019, 2020. E.C. Smith Herbarium.
427	Phinney, Lori. 2020. Pre- and post White-nose Syndrome bat acoustic monitoring, NS. Mersey Tobeatic Research Institute, 1279 recs.
364	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
359	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
348	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
339	McNeil, J.A. 2010. Ribbonsnake (<i>Thamophis sauritus</i>) sightings, 1900-2009. Parks Canada, 2521 recs of 716+ individuals.
335	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.
320	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
307	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
306	Wildlife Division. 2021. <i>Fraxinus nigra</i> records assembled to define and model habitat. Nova Scotia Department of Natural Resources and Renewables.
304	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
232	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.
228	McNeil, J.A. 2019. Blanding's Turtle records, 2017. Mersey Tobeatic Research Institute, 372 recs.
205	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
199	Toms, B. 2018. Bat Species data from www.batconservation.ca for Nova Scotia. Mersey Tobeatic Research Institute, 547 Records.
194	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
162	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
156	Gallop, John. 2023. Species at Risk and Species of Conservation Interest records. McCallum Environmental.
153	Blaney, C.S.; Mazerolle, D.M.; Hill, N.M. 2011. Nova Scotia Crown Share Land Legacy Trust Fieldwork. Atlantic Canada Conservation Data Centre, 5022 recs.
153	Hagerman, Christianne. 2022. Wisqoq and Eastern White Cedar field work. E.C. Smith Herbarium, Acadia University.
149	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2018. Atlantic Canada Conservation Data Centre, 907 recs.
142	Bryson, I.C. 2020. Nova Scotia flora and lichen observations 2020. Nova Scotia Environment, 139 recs.
139	Munro, Marian K. Tracked lichen specimens, Nova Scotia Provincial Museum of Natural History Herbarium. Atlantic Canada Conservation Data Centre. 2019.
138	Churchill, J.L. 2023. Atlantic Canada Conservation Data Centre Fieldwork 2023. Atlantic Canada Conservation Data Centre.
137	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
136	Brazner, J. 2016. Nova Scotia Forested Wetland Bird Surveys. Nova Scotia Department of Lands and Forestry.
135	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
129	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
129	Pepper, C. 2013. 2013 rare bird and plant observations in Nova Scotia., 181 records.
126	e-Butterfly. 2016. Export of Maritimes records and photos. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
123	McNeil, J.A. 2018. Blanding's Turtle records, 2018. Mersey Tobeatic Research Institute, 372 recs.
122	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
120	Churchill, J.L. 2022. Atlantic Canada Conservation Data Centre Fieldwork 2022. Atlantic Canada Conservation Data Centre.
119	Belliveau, A.G. 2021. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2021. E.C. Smith Herbarium.
117	Belliveau, A. 2012. 2012 Atlantic Coastal Plain Flora observations. Mersey Tobeatic Research Institute, 1543.
115	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
112	e-Butterfly. 2019. Export of Maritimes records and photos. McFarland, K. (ed.) e-butterfly.org.
110	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
106	Birds Canada. 2023. Maritimes Swiftwatch project data for 2023. Pers. comm., 270 recs.
105	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
104	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
104	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
99	McNeil, J.A. 2019. Eastern Painted Turtle trapping records, 2019. Mersey Tobeatic Research Institute.
99	Staicer, C. 2021. Additional compiled Nova Scotia Species at Risk bird records, 2005-2020. Dalhousie University.
96	Belliveau, A.G. & Churchill, J.L.; Anderson, F.; Brooks, F. 2023. Lichen Inventory of Blue Rocks, NS. E.C. Smith Herbarium.
96	Toms, Brad & Pepper, Chris; Neily, Tom. 2022. Nova Scotia lichen database [as of 2022-04]. Mersey Tobeatic Research Institute.
95	Breen, A. 2019. 2019 Atlantic Whitefish observations. Coastal Action, 95 recs.
95	Toms, Brad. 2011. Atlantic Coastal Plain Flora records 2010. Mersey-Tobeatic Research Institute, 1074 recs.
93	Blaney, C.S. 2020. Sean Blaney 2020 field data. Atlantic Canada Conservation Data Centre, 4407 records.
91	Hubley, Nicole. 2022. Monarch (<i>Danaus plexippus</i>) records submitted to MTRI from the 2021 field season. Mersey Tobeatic Research Institute.
89	Staicer, Cindy. 2022. 2021 Landbird Species at Risk observations. Dalhousie University.
88	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
87	Layberry, R.A. & Hall, P.W.; LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
87	McNeil, J.A. 2018. Wood Turtle records, 2018. Mersey Tobeatic Research Institute, 68 recs.
87	Mersey Tobeatic Research Institute. 2023. NS Blanding's Turtle GPS Logger Data. MTRI, 87 recs.
87	Richardson, Leif. 2018. Maritimes Bombus records from various sources. Richardson, Leif.
85	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
84	McNeil, J.A. 2019. Blanding's Turtle records, 2019. Mersey Tobeatic Research Institute.
83	Coastal Action. 2024. SAR records from 2022. Coastal Action, 87 records.

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83	Hill, N.M. 1994. Status report on the Long's bulrush <i>Scirpus longii</i> in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
76	Birds Canada. 2022. Maritimes Swiftwatch project data for 2022. Pers. comm., 155 records.
73	Bryson, I. 2020. Nova Scotia and Newfoundland rare species observations, 2018-2020. Nova Scotia Environment.
72	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
71	Belliveau, A.G. 2014. Plant Records from Southern and Central Nova Scotia. Atlantic Canada Conservation Data Centre, 919 recs.
71	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
70	Klymko, John. 2024. Atlantic Canada Conservation Data Centre zoological fieldwork 2023. Atlantic Canada Conservation Data Centre.
70	Staicer, Cindy. 2023. 2022 SAR Bird ARU occurrences. Dalhousie University, 379 records.
70	Staicer, Cindy. 2023. 2022 SAR Bird field occurrences from the Landbirds at Risk Project, NS. Dalhousie University, 446 records.
67	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
66	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
64	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
62	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
60	iNaturalist. 2020. iNaturalist butterfly records selected for the Maritimes Butterfly Atlas. iNaturalist.
60	McNeil, J.A. 2019. Eastern Painted Turtle trapping records, 2017. Mersey Tobeatic Research Institute.
59	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
56	Belliveau, A.G. 2018. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2018. E.C. Smith Herbarium, 6226 recs.
55	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
55	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands., 303 records.
53	Churchill, J.L. 2020. Atlantic Canada Conservation Data Centre Fieldwork 2020. Atlantic Canada Conservation Data Centre, 1083 recs.
53	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
52	Brazner, John. 2022. Clearcut Transect Study. Nova Scotia Department of Natural Resources and Renewables Wildlife Division.
51	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
50	Mersey Tobeatic Research Institute. 2023. 2023 Wood Turtle Records - Volunteer Collection. Mersey Tobeatic Research Institute, 50 recs.
49	Feltham, Carter. 2022. Monarch (<i>Danaus plexippus</i>) and Milkweed MTRI records from the 2022 Field Season. Mersey Tobeatic Research Institute.
49	Mersey Tobeatic Research Institute. 2023. NS Turtle Records. Mersey Tobeatic Research Institute, 214 recs.
47	MacDonald, E.C. 2018. Piping Plover nest records from 2010-2017. Canadian Wildlife Service.
45	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
45	Mersey Tobeatic Research Institute. 2021. 2020 Monarch records from the MTRI monitoring program. Mersey Tobeatic Research Institute, 72 records.
44	Cameron, R.P. 2009. <i>Erioderma pedicellatum</i> database, 1979-2008. Dept Environment & Labour, 103 recs.
44	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
43	Toms, Brad. 2024. MTRI lichens database. Mersey Tobeatic Research Institute, 170 records.
42	Haughian, Sean. 2021. Update to lichen data from 2017-2021. Nova Scotia Museum.
42	Nova Scotia Nature Trust. 2013. Nova Scotia Nature Trust 2013 Species records. Nova Scotia Nature Trust, 95 recs.
41	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
40	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
40	Brooks, Fiona. 2023. Field data - 2023. Atlantic Canada Conservation Data Centre.
40	Cameron, E. 2007. Canadian Gypsum Co. survey 2005-07. Dillon Consulting Ltd, 40 recs.
40	Chapman-Lam, C.J. 2021. Atlantic Canada Conservation Data Centre 2020 botanical fieldwork. Atlantic Canada Conservation Data Centre, 17309 recs.
38	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
37	Tsehtik, M.; Leblanc, M.; Creaser, T. 2020. Coastal Action: 2020 Species at Risk Data. Coastal Action, 40 records.
36	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre, 2318 recs.
34	McNeil, J.A. 2014. Blandings Turtle (<i>Emydoidea blandingii</i>) and Snapping Turtle (<i>Chelydra serpentina</i>) sightings, 2014. Mersey Tobeatic Research Institute.
33	Atlantic Canada Conservation Data Centre. 2020. Cape LaHave Island observations from August 2020. Atlantic Canada Conservation Data Centre, 605 records.
33	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
33	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
32	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
32	McNeil, Jeffie. 2023. 2022 Turtle Records. Mersey Tobeatic Research Institute.
32	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
32	Patrick, A.; Horne, D.; Noseworthy, J. et. al. 2017. Field data for Nova Scotia and New Brunswick, 2015 and 2017. Nature Conservancy of Canada.
32	Westwood, A., Staicer, C. 2016. Nova Scotia landbird Species at Risk observations. Dalhousie University.
31	Bayne, D.M. 2007. Atlantic Coastal Plain Flora record, 2004-06. Nova Scotia Nature Trust. Pers. comm. to C.S. Blaney, 57 recs.
31	MacDonald, E.C. 2018. CWS Piping Plover Census, 2010-2017. Canadian Wildlife Service, 672 recs.
30	Cameron, R.P. 2018. <i>Degellia plumbea</i> records. Nova Scotia Environment.
30	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
29	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
29	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
29	McNeil, Jeffie. 2022. 2021 Turtle Records. Mersey Tobeatic Research Institute.
28	Brazner, John; MacKinnon, Frances. 2020. Relative conservation value of Nova Scotia's forests: forested wetlands as avian biodiversity hotspots. Canadian Journal of Forest Research, 50(12): 1307-1322.

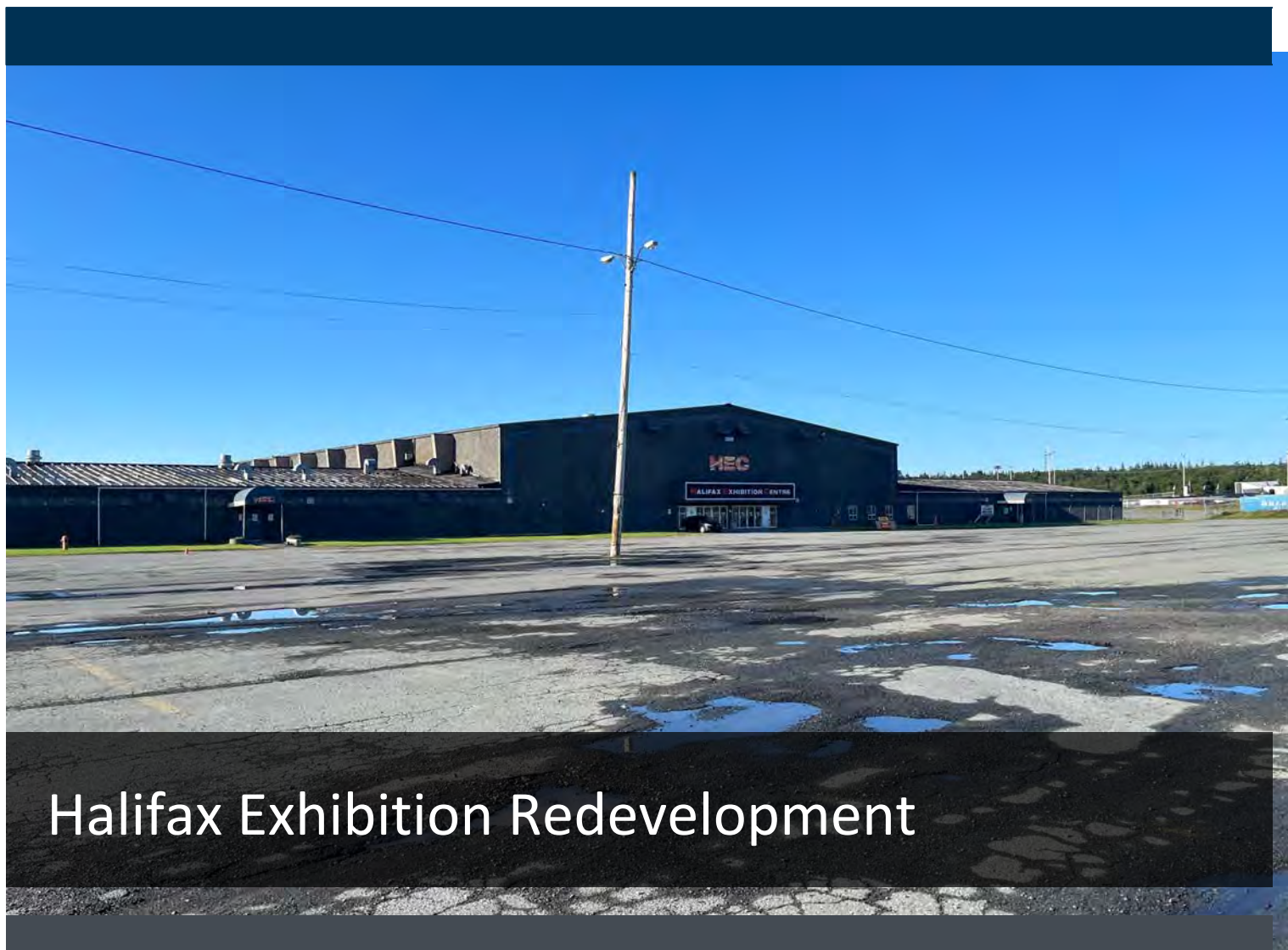
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28	McNeil, J.A. 2020. Snapping Turtle and Eastern Painted Turtle records, 2020. Mersey Tobeatic Research Institute.
28	Pepper, Chris. 2012. Observations of breeding Canada Warbler's along the Eastern Shore, NS. Pers. comm. to S. Blaney, Jan. 20, 28 recs.
27	Belliveau, A. 2013. Rare species records from Nova Scotia. Mersey Tobeatic Research Institute, 296 records. 296 recs.
26	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
26	LaPaix, Rich. 2022. Rare species observations, 2018-2022. Nova Scotia Nature Trust.
26	Neily, T.H. 2013. Email communication to Sean Blaney regarding <i>Listera australis</i> observations made from 2007 to 2011 in Nova Scotia. , 50.
25	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
25	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
24	Belliveau, A.G. 2021. New Black ash site records near Kentville, NS. Acadia University, 47 records.
24	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
24	Stewart, J.I. 2010. Peregrine Falcon Surveys in New Brunswick, 2002-09. Canadian Wildlife Service, Sackville, 58 recs.
22	Breen, A. 2018. 2018 Atlantic Whitefish observations. Coastal Action.
22	Nelly, T.H. 2006. <i>Cypripedium arietinum</i> in Hants Co. Pers. comm. to C.S. Blaney. 22 recs, 22 recs.
21	Chapman, C.J. 2019. Atlantic Canada Conservation Data Centre 2019 botanical fieldwork. Atlantic Canada Conservation Data Centre, 11729 recs.
21	Crowell, Iain & Crowell, Iain. 2023. Field data - 2023. Atlantic Canada Conservation Data Centre.
20	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.
19	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
19	Richardson, D., Anderson, F., Cameron, R, McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen (<i>Anzia colpodes</i>). COSEWIC.
19	Richardson, D., Anderson, F., Cameron, R, Pepper, C., Clayden, S. 2015. Field Work Report on the Wrinkled Shingle lichen (<i>Pannaria lurida</i>). COSEWIC.
19	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
18	Hall, R.A. 2001. S. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
18	McNeil, J.A. 2015. Blandings Turtle (<i>Emydoidea blandingii</i>), Eastern Ribbonsnake (<i>Thamnophis sauritus</i>), and Snapping Turtle (<i>Chelydra serpentina</i>) sightings, 2015. Mersey Tobeatic Research Institute.
18	McNeil, Jeffie. 2022. Ribbonsnake records, 2021. Mersey Tobeatic Research Institute.
18	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
17	Anderson, Frances; Neily, Tom. 2010. A Reconnaissance Level Survey of Calciphilous Lichens in Selected Karst Topography in Nova Scotia with Notes on Incidental Bryophytes. Mersey Tobeatic Research Institute.
17	MacKinnon, D.S. & O'Brien, M.K.H.; Cameron, R.P. 2002. Fieldwork 2000. Dept of Environment & Labour, Protected Areas Branch, 252 recs.
17	Neily, T.H. 2010. <i>Erioderma pedicellatum</i> records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
16	Hall, R.A. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 189 recs.
16	Holder, M. 2003. Assessment and update status report on the Eastern Lilaeopsis (<i>Lilaeopsis chinensis</i>) in Canada. Committee on the Status of Endangered Wildlife in Canada, 16 recs.
16	Keddy, C.J. 1989. Habitat securement for redroot, golden crest and Long's bulrush in Ponhook Lake, NS. World Wildlife Fund (Canada), 131 recs.
16	Nature Conservancy of Canada. 2022. NCC Field data for Nova Scotia. Nature Conservancy of Canada.
15	Basquill, S.P. 2011 vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
15	Cole Vail. 2023 Lichen Observations. C.Vail, 23 recs.
15	Siemens-Worsley, Allison. 2024. iNaturalist Wood Turtle observations for New Brunswick and Nova Scotia. NatureServe Canada.
14	Cameron, R.P. 2014. 2013-14 rare species field data. Nova Scotia Department of Environment, 35 recs.
14	Chapman, C.J. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 11171 recs.
14	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
14	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
14	McNeil, J.A. 2019. Snapping Turtle records, 2017. Mersey Tobeatic Research Institute.
14	McNeil, Jeffie. 2023. Ribbonsnake records from 2022. Mersey Tobeatic Research Institute.
14	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
13	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
13	Nova Scotia Nature Trust. 2014. Ladyslipper records from Saint Croix Nova Scotia, JLC Ed. Nova Scotia Nature Trust.
13	Powell, B.C. 1967. Female sexual cycles of <i>Chrysemy spicta</i> & <i>Clemmys insculpta</i> in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
13	Robinson, S.L. 2015. 2014 field data.
12	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
12	Klymko, J.J.D. 2012. Odonata specimens & observations, 2010. Atlantic Canada Conservation Data Centre, 425 recs.
11	Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
11	Brunelle, P.-M. (compiler). 2010. ADIP/MDDS Odonata Database: NB, NS Update 1900-09. Atlantic Dragonfly Inventory Program (ADIP), 935 recs.
11	McNeil, J.A. 2011. Ribbonsnake (<i>Thamnophis sauritus</i>) sightings, 2010. Parks Canada, 148 recs of 70+ individuals.
11	Mersey Tobeatic Research Institute. 2023. Monarch (<i>Danaus plexippus</i>) and Milkweed MTRI records from the 2023 Field Season. Mersey Tobeatic Research Institute.
11	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-05-25]. Mersey Tobeatic Research Institute, 668 recs.
11	Pepper, C. 2021. Rare bird, plant and mammal observations in Nova Scotia, 2017-2021.
11	Skomorowski, Joanna. 2024. 2022 Nova Scotia Nature Trust SAR occurrences. Nova Scotia Nature Trust, 58 records.
10	Belliveau, A.G. & Vail, Cole; King, Katie. 2020. New Allium tricoccum locations, Cornwallis River. Chapman, C.J. (ed.) Acadia University.
10	Bredin, K.A. 2002. NS Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centre, 30 recs.
10	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
10	Haughian, S.R. 2018. Description of <i>Fuscopannaria leucosticta</i> field work in 2017. New Brunswick Museum, 314 recs.

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10	Neily, T. H. 2018. Lichen and Bryophyte records, AEI 2017-2018. Tom Neily; Atlantic Canada Conservation Data Centre.
10	Patrick, Allison. 2021. Animal and plant records from NCC properties from 2019 and 2020. Nature Conservancy Canada.
9	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
9	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
9	Cameron, R.P. 2006. Erioderma pedicellatum 2006 field data. NS Dept of Environment, 9 recs.
9	Cameron, R.P. 2017. 2017 rare species field data. Nova Scotia Environment, 64 recs.
9	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
9	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
9	McNeil, J.A. 2018. Snapping Turtle records, 2018. Mersey Tobeatic Research Institute.
8	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
8	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
8	Cameron, R.P. 2005. Erioderma pedicellatum unpublished data. NS Dept of Environment, 9 recs.
8	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
8	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.
8	King, Katie; Jean, Samuel. 2021. Black ash observations near Booklyn, NS. E.C. Smith Herbarium.
8	Klymko, J. Butterfly records at the Nova Scotia Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2017.
8	Neily, T.H. & Anderson, F. 2011. Lichen observations from NRC site at Sandy Cove., 97.
8	Phinney, Lori ; Toms, Brad; et. al. 2016. Bank Swallows (Riparia riparia) in Nova Scotia : inventory and assessment of colonies. Merser Tobeatic Research Institute, 25 recs.
8	Sollows, M.C. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
8	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
7	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.
7	Cameron, B. 2006. Hepatica americana Survey at Scotia Mine Site in Gays River, and Discovery of Three Yellow-listed Species. Conestoga-Rovers and Associates, (a consulting firm), october 25. 7 recs.
7	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
7	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
7	Korol, Burke. 2023. Field data - 2023. Atlantic Canada Conservation Data Centre.
6	Benjamin, L.K. 2006. Cyripedium arietinum. Pers. comm. to D. Mazerolle. 9 recs, 9 recs.
6	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
6	Blaney, C.S.; Korol, J.B.; Crowell, I. 2023. 2022 AC CDC Botany program field data. Atlantic Canada Conservation Data Centre, 5293 records.
6	Brazner, J.; Hill, N. 2018. Plant observations along the Cornwallis River, Nova Scotia. Nova Scotia Department of Lands and Forestry.
6	Canadian National Collection of Insects Arachnids, and Nematodes Bombus specimen database export. Government of Canada. 2022.
6	Clayden, S.R. 2005. Confidential supplement to Status Report on Ghost Antler Lichen (Pseudevernia cladonia). Committee on the Status of Endangered Wildlife in Canada, 27 recs.
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4.5 — Appendix E: Archaeological Resource Impact Assessment



Halifax Exhibition Redevelopment

Archaeological Resource Impact Assessment

Heritage Research Permit A2023NS137

7 September 2023

Revised 17 January 2024



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HALIFAX EXHIBITION REDEVELOPMENT:
ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT

Heritage Research Permit A2023NS137
Category C

Davis MacIntyre & Associates Limited
Project No.: 23-051.1

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Cover: The Halifax Exhibition building, facing south.

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EXECUTIVE SUMMARY

In June 2023, Davis MacIntyre & Associates Limited was contracted by Fathom Studio to conduct an archaeological assessment for the Halifax Exhibition Redevelopment in Halifax County. The assessment included a historic background study, predictive modelling and field reconnaissance in order to determine the potential for archaeological resources in the impact area and to provide recommendations for further mitigation, if necessary. The Halifax Exhibition is located at 200 Prospect Road, Goodwood, in the Halifax Regional Municipality and the study area encompassed approximately 44 hectares.

The Mi'kmaq and their ancestors have occupied the K'jipuktuk (Halifax) area since time immemorial with archaeological evidence dating back at least 7,000 years. Mi'kmaq occupation of the region continued into the historic period, even as the Town of Halifax was settled, and continues to this day. While much of the study area has been extensively infilled and impacted, the remaining areas are generally low and wet, or sloped. While some of the wetland appears to have been created by the disturbance and infilling in the center of the property, a review of air photos suggests that some of the wetlands likely pre-date the infilling, and that no significant watercourses were present in most of the study area. However, the northeast corner of the study area does contain a fast-moving, although non-navigable brook that connects Long Lake to the interior. This brook would have been a potential source of fresh water during hunting or resource gathering activities and four elevated potential areas were flagged along higher and drier terraces along the brook.

Very little historic activity is documented within the study area. Maps suggest that there was little historic settlement within the study area itself until the early 20th century. Air photos similarly indicate roads and fields but no clear signs of houses or structures in 1931. Between 1931 and 1947, new activity is visible in the northwest corner of the study area, where several features were identified during the reconnaissance. These two foundations, as well as the midden have been evaluated to have low archaeological significance as they likely date between 1931 and 1947 and appear to have been abandoned by 1973. It is less clear whether the well is contemporaneous with the foundations or whether it relates to earlier historic activity.

An extensive history of 20th and 21st century infilling, disturbance, and development characterizes the majority of the study area, beginning at least as early as the mid-19th century, when a water pipeline was constructed along the east side of the study area in 1867 and 1868. An additional water pipeline was constructed through the center of the study area between 1931 and 1947. Infilling and impact continued within the study area throughout the 20th century and into the 21st century. Fill appears to include construction debris and infilling has been ongoing for decades, completely obscuring the original ground surface. However, given that the desktop study suggests that most of the study area is of low potential for historic and L'nuk archaeological resources, and the impact

that infilling would have had on the original terrain, these disturbed areas have been evaluated to have low potential for intact archaeological resources.

Based on the results of this assessment, the archaeological potential within the study area has been evaluated to be low, in general. Four areas of elevated potential for L'nuk archaeological resources were observed in the northeast end of the study area and several mid-20th century features were recorded in the northwest corner of the study area, as was a well of indeterminate age. Avoidance is the preferred method of mitigation. However, the mid-20th century features have been evaluated to be of low archaeological significance and therefore, there are no further recommendations for these features.

As the age of the well is unclear and it could pre-date the mid-20th century features, it is recommended that monitoring of any ground disturbance is conducted within 30m of the well.

For the four areas of elevated potential, it is recommended that should they be anticipated to be impacted, the areas should first be subjected to shovel testing to determine the presence/absence of archaeological resources and provide recommendations for mitigation, if necessary.

The remainder of the study area has been evaluated to be of low archaeological potential and there are no further recommendations for these areas. Should development plans change, then a qualified archaeologist should be contracted to conduct an additional assessment on any new areas outside the project boundaries identified in this report.

In the unlikely event that any archaeological resources are encountered during ground disturbance and an archaeologist is not already on site, it is required that all activity cease and the Coordinator of Special Places (902-229-3159) be contacted immediately regarding a suitable method of mitigation.

1.0 INTRODUCTION

In June 2023, Davis MacIntyre & Associates Limited was contracted by Fathom Studio to conduct an archaeological assessment for the Halifax Exhibition Redevelopment in Halifax County. The assessment included a historic background study, predictive modelling and field reconnaissance in order to determine the potential for archaeological resources in the impact area and to provide recommendations for further mitigation, if necessary.

The current assessment was conducted under Category C (Archaeological Resource Impact Assessment) Heritage Research Permit A2023NS137 issued by the Department of Communities, Culture, Tourism and Heritage. This report conforms to the standards required by the Culture and Heritage Development Division under the Special Places Protection Act (*R.S., c. 438, s. 1*).

2.0 STUDY AREA

The Halifax Exhibition is located at 200 Prospect Road, Goodwood, in the Halifax Regional Municipality (Figure 2-1). The study area is expected to encompass approximately 44 hectares, including the Exhibition's four-building complex totalling over 100,000 square feet of facilities and its 2000-car parking lot (Figure 2-2). This ARIA is being conducted as part of the design phase of this project. As such, detailed information is not fully known. It is anticipated that construction impacts may include grubbing, excavation, trenching, infilling, and laydown area construction.

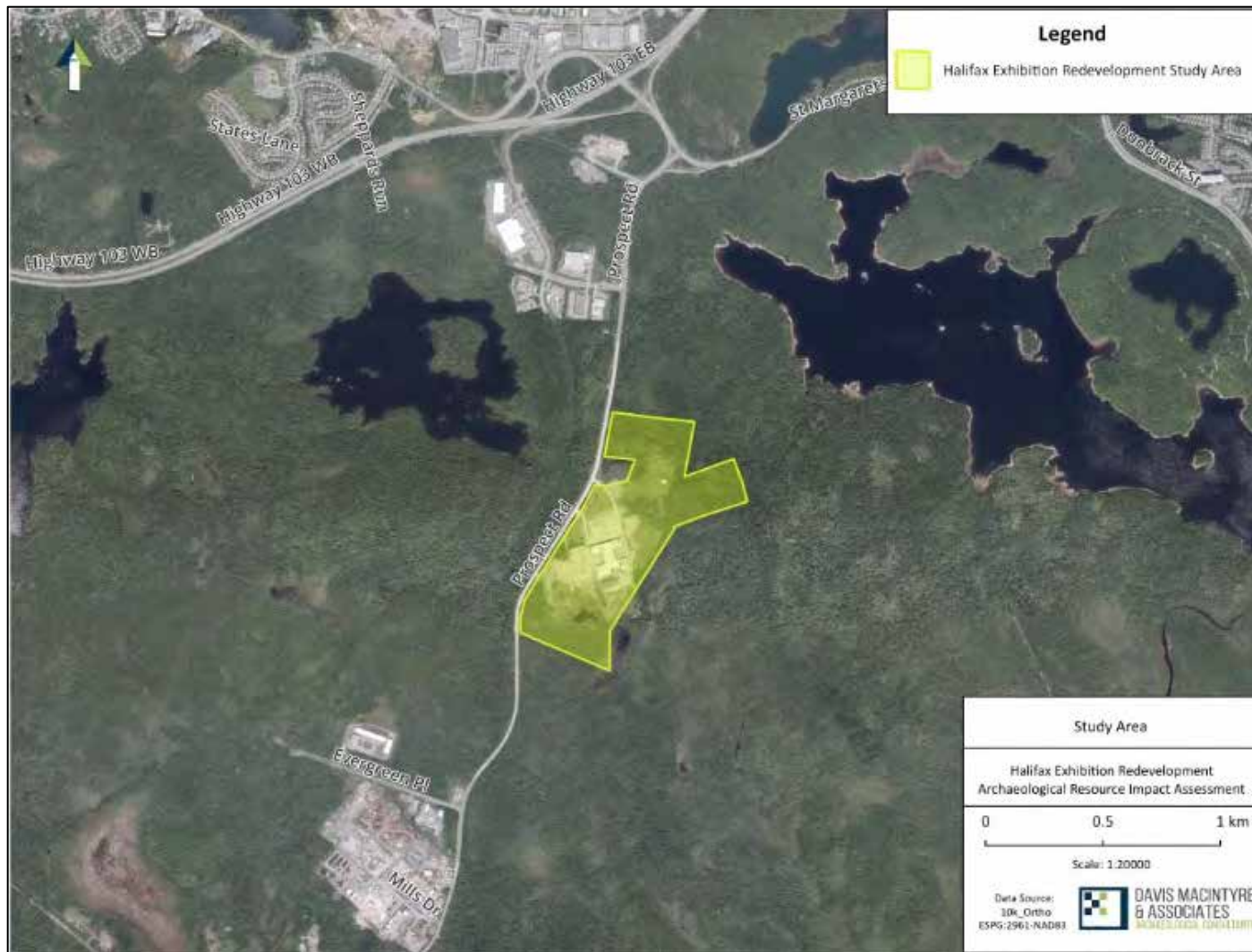


Figure 2-1: Satellite view of the Halifax Exhibition property showing the boundaries of the study area.



Figure 2-2: The Halifax Exhibition Redevelopment study area.

2.1 Palaeoecology

Understanding the changing ecology of the early Holocene is paramount to understanding the archaeological record and the course of human history in our region from its beginnings. Processes associated with glacial advance and retreat have made a lasting impression on our province. During the most recent ice age, Atlantic Canada lay beneath the kilometre thick Laurentide Ice Sheet, which at the last glacial maximum (24 ka BP) extended its reach across the continental shelf to ocean depths of 800m.¹ The modern landscape bears the scars and relics of the Wisconsinan glaciation, in the form of drumlins, moraines, glacial erratics, lakes and drainage systems.

Deglaciation in the northeastern United States and the Atlantic Provinces began in earnest by 20 ka BP. Significant ice streams, draining vast areas of the Laurentide Ice Sheet, delivered large volumes of ice to the ocean and it was along these ice streams that calving occurred. The opening of the Gulf of Saint Lawrence in 14 ka BP accelerated this process, and calving ice margins eventually isolated a Newfoundland ice cap.² Glaciers were largely land-bound by 13 ka, and reduction continued through melting and climatic conditions rather than calving. In the wake of retreating glaciers, a mixed spruce woodland consisting of sedge, spruce, birch, and pine migrated northwards into Nova Scotia and created an environment suitable for large herds of migratory caribou. It is believed Sa'qiwe'k L'nu'k bands followed these herds into the region by at least 10,900 BP (12,900 cal BP).³

Deglaciation was not a unilinear process, as climate variables caused glaciers to retreat at different rates at different times. The Younger Dryas Cooling event took place between 10,900 and 10,600 BP (or 12,900 – 11,600 cal BP) and had a profound effect on vegetation.⁴ Land-bound glaciers reactivated and the advance of forested regions was reversed, with areas of open shrub tundra expanding southwards. A rapid warming period followed the Younger Dryas, and with it, the environment changed again to a more closed, mixed deciduous forest of oak and pine.⁵ Unburdened by the Laurentide Ice Sheet, the continental crust rebounded in isostatic uplift, resulting in a drop of relative sea level. At the same time, large volumes of water held in glacial ice was released back to the oceans, resulting in eustatic change. The pace of eustatic change was initially rapid, following a low sea level stand of -65m at 11.3-11.7 ka BP. Sea level rise slowed after 11 ka BP and was outpaced by isostatic change. By about 9.5 ka BP, the pace of land rise diminished and sea levels again began to overtake exposed shores in most areas.⁶

Glacial isostasy and eustasy changed habitable coastlines over the millennia following deglaciation (Figure 2-3). Significant landforms, subaerially exposed through isostatic

¹ Fader 2005, 2; Lothrop et al. 2011, 549.

² Shaw et al. 2006, 2069, 2072.

³ Ellis 2004, 244; Newby et al. 2005, 151.

⁴ Fader 2005, 5; Lothrop et al. 2011, 550.

⁵ Newby et al. 2005, 151; Deal et al. 2006, 256.

⁶ Shaw et al. 2002a, 1867; Fader 2005, 2.

uplift were subsequently submerged by rising seas.⁷ Seafloors now at 60m depth in the Bay of Fundy, for instance, would have been above sea level.⁸ Local conditions varied, as sedimentation near George's Island indicates that the Halifax Harbour emerged sometime between 8,400 BP to 7,000 BP, functioning as a low-productivity estuarine environment, before submerging again after 7,000 BP.⁹ Sea level at this point is thought to be somewhere higher than -25 m below its present level. Intact ancient shorelines are elusive. Most ancient shorelines have been reclaimed by the sea or reshaped by powerful erosional forces. However, some sheltered or interior areas may hold the potential for relatively intact palaeoshores. Evidence of human occupation from submerged sites has been found offshore. Artifacts like ridged ulus have turned up as unexpected catches of scallop draggers in the Bay of Fundy, Gulf of Maine, and off the coast of Prince Edward Island.¹⁰

In the early Holocene, Halifax and the harbour were much different than what we see today. At about 12,000 years ago when the last glaciers retreated from the region, much of Halifax Harbour was characterized by an ancestral Sackville River system. The former marine shoreline was located about 20 kilometers off Chebucto Head, about 65 to 70 meters below current sea levels (Figure 2-4). The Bedford Basin was occupied by at least three connected lakes - one in Bedford Bay, one in the Basin proper, and one in Fairview Cove. Palaeoshorelines have been identified in these areas by marine geologists. Before about 5,800 years ago, Bedford Basin existed as a lake for about 6,000 years and boulder berms located during surveys of the basin indicate the presence of a number of small islands on the west side and a few on the east side as well. At the same time, a bedrock sill (Wellesley Rock) was exposed between Bedford Bay and the Basin proper. Part of the Sackville River system cascaded over the rock ledge creating a waterfall. This area holds great potential for early Holocene archaeological sites potentially dating back as early as the Palaeo-Indian period (11,500 to 9,000 years BP) as this area would have been favourable for fishing and the rock ledge may have provided a convenient short cut across the Basin. While the Sackville River channel is defined in some areas of the harbour, in other places, it is more approximate.

Throughout the rest of the harbour, including the Northwest Arm, a series of lakes were present, with two long lakes occupying the Arm. The lakes were slowly consumed by the rising sea levels. This inundation caused the freshwater lakes to suddenly change to a marine environment and would have had a major impact not only on animals, fish and vegetation, but also on people living in the area.¹¹

⁷ Fader 2005, 5.

⁸ Fader 2005, 5.

⁹ Edgecomb et al. 1999, 814.

¹⁰ Fader 2005, 6; Shaw et al. 2009, 24.

¹¹ Fader 2005, 140–2.

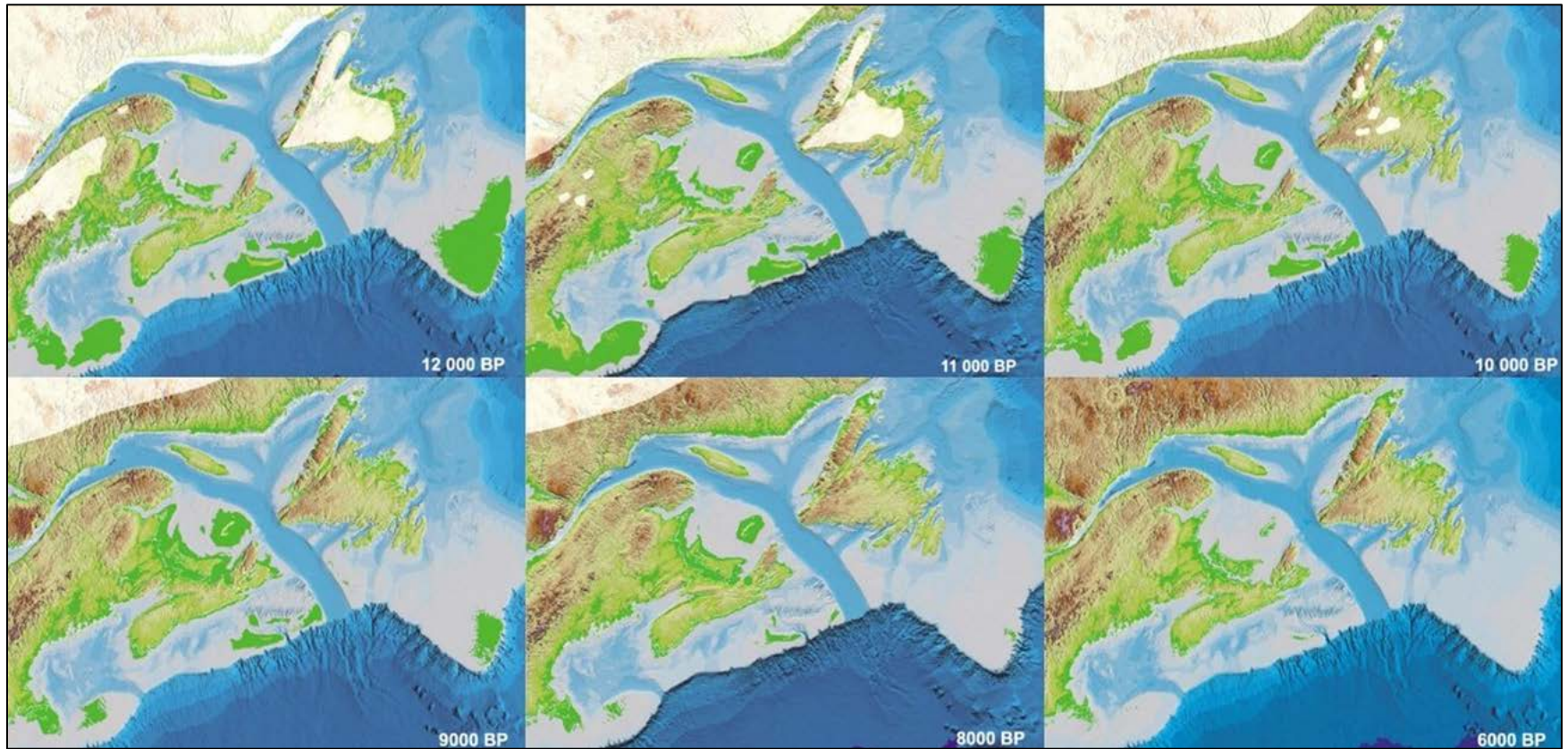


Figure 2-3: Palaeogeography of Maine and the Atlantic Provinces, depicting how emergent landforms on the continental shelf were gradually submerged.¹²

¹² From Shaw et al. 2002a.

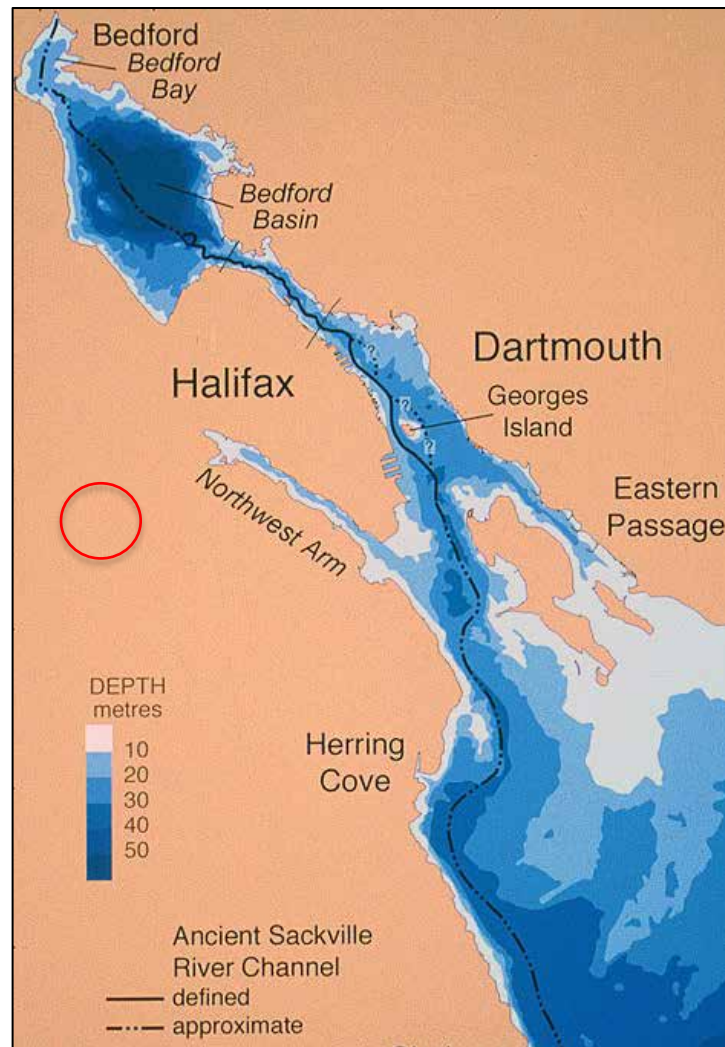


Figure 2-4: Map showing the defined and approximate path of the Ancient Sackville River channel, with approximate study area (red).¹³

More generally, by 6 ka BP, the geographical setting of the Atlantic region nearly matched conditions today. The inundation of the Northumberland Strait finally isolated what is now Prince Edward Island from the mainland as sea levels continued to rise, reaching within 5m of their present depth off the Atlantic coast by 3,000.¹⁴

The natural environment of the peninsula and surrounding areas have changed greatly since the earliest days of Halifax's settlement. At the end of the 18th century, there were approximately 78 kilometers of streams flowing across the peninsula and into the Northwest Arm or Halifax Harbour. These streams were, in many cases, founded by wetlands (about 83 ha in total) that have since been diverted or infilled.¹⁵

¹³ National Resources Canada 2010.

¹⁴ Shaw et al. 2002a, 1872.

¹⁵ Reid 2012.

2.2 Natural Environment

The study area is located in the St. Margaret's Bay ecodistrict #780 and Granite Uplands, South Mountain subunit #451a.

The ecodistrict is part of the Atlantic uplands, composed of granitic batholith which tilts to the south towards the ocean. The climate is often moister than the rest of the province due to its proximity to the cool ocean water. The moist climate causes increased levels of rain and fog, which in turn, increases soil moisture. Soils are typically well-drained sandy loams overlying granitic till. The soil is often stony, shallow, and granitic, and glacial erratics are common. In northern areas, till can be thin or discontinuous with ridges of exposed bedrock. While the underlying bedrock is typically granitic, there is some Meguma Group rocks, greywacke, quartzite and slate at the southwest of the ecodistrict.¹⁶

The study area specifically stretches over two granitic bedrocks. The northern extent of the study area contains Middle to Late Devonian leucomonzogranite, while the southern extent is composed of a Middle to Late Devonian muscovite biotite monzogranite.¹⁷ The surficial geologic unit is a ground moraine that is silty and compact with material derived from local and distant sources.

Watersheds throughout the ecodistrict include large lakes, rivers, streams, bogs, and swamps. Gold River, the largest river in the district, is a major drainage of the western side. The abundance of associated rivers and lakes not only provided access to marine resources and drinking water, but a suite of travelling routes throughout the interior of the province. For example, from the study area one could access the Birch Cove lakes and Sackville River, from which one can easily portage into the Shubenacadie River system which flows into the Bay of Fundy to the north. Conversely, the nearby waters of the Prospect and Nine Mile Rivers could be followed south to the outer coast, emptying into Prospect and Shad Bays, respectively.

Red spruce forests are the most common vegetation, covering sloped hillsides. Hemlocks are present in lower elevations or near watercourses. White pine and black spruce tend to appear in areas of shallow soil and bedrock. There are some tolerant hardwood forests, in deeper, well-drained soils on hills. The lakes and streams are acidic and have low productivity and, therefore, poor waterfowl habitat. However, substantial populations of smallmouth bass are present.¹⁸ Historically, the Prospect River and Nine Mile River were known for their abundance of gaspereau and trout. Fred Veith, who reported on the conditions of said rivers in 1884, also noted that Nine Mile River was prolific for salmon.¹⁹

¹⁶ Neily et al. 2017, 214.

¹⁷ Department of Energy and Mines n.d.

¹⁸ Davis and Browne 1996, 82.

¹⁹ Veith 1886, 17.

3.0 METHODOLOGY

A historic background study was conducted by Davis MacIntyre & Associates Limited in August 2023. Historic maps and manuscripts and published literature were consulted from the Nova Scotia Archives and other online sources. LiDAR and air photos were also examined. The Maritime Archaeological Resource Inventory (MARI), a database of known archaeological resources in the Maritime region, was searched to understand prior archaeological research and known archaeological resources neighbouring the study area.

The Archaeological Research Division at Kwikmu'kw Maw-klusuaqn Negotiation Office (KMKNO-ARD) was contacted in June 2023 to inquire whether traditional Mi'kmaw land use is known in or near the study area. A response was received on 3 July 2023. While the traditional use information provided is confidential, it has been taken into consideration during this assessment. KMKNO-ARD also provided historical references from their database which has been incorporated into the historical background below.

A field reconnaissance of the study area was conducted in August 2023, with particular attention paid to areas anticipated to be impacted. Detailed notes and photographs were collected, with tracklogs recorded via handheld GPS units. Archaeological features and areas of potential were recorded using handheld GPS/GNSS rover unit.

4.0 RESULTS

4.1 Maritime Archaeological Resource Inventory

The Maritime Archaeological Resource Inventory was accessed in August 2023 in order to determine if known archaeological sites or resources exist within or near the study area. A search radius of 5 kms from the study area was examined. Fives sites are located within a 5-km radius, all of them clustered to the north or northeast of the study area.

The closest four sites, **BdCw-12** to **BdCw-15** represent four stone features, including three residences, that are believed to have been built by War of 1812 Black refugees who formed the community of "Refugee Hill" or "Beech Hill". Full excavation of Residence 1 (**BdCw-12**) provided further associative evidence that the dwelling was occupied in the early 19th century, before it burned between 1832 and 1840. A pentagonal structure and associated stone features, **BdCv-09**, is also located north of the study area. These features are commonly referred to as the "Bayers Lake Mystery Walls".

Just over 5km to the east are a series of historic sites dating to the mid to late 19th century. **BdCw-04** to **BdCw-10** consist of a series of cellars, stone features, and a family cemetery recorded around the existing Otter Lake Landfill facility. These sites were identified during a series of archaeological surveys in the 1990s.

The relative lack of archeological sites that have been identified within a 5-km radius of the study area likely reflects the lack of past archaeological research in the vicinity. This is compounded by poor site preservation and visibility due to historic land development as well as steadily rising sea levels over the last several thousand years.

4.2 Historic Background

4.2.1 L’nuk Settlement During the Precontact and Historic Periods

Spatially and geographically, L’nuk land use throughout Mi’kma’ki is not considered in the same sense that European occupation is recorded in historic times. Colonialism has had a significant impact on Mi’kmaw lifeways but prior to European contact, the Mi’kmaq and their ancestors had a very dynamic relationship with the land which was reflected in their language, legends, songs, dances, and oral tradition. The landscape was viewed as “sentient, ever-changing, and in a continual process of becoming”.²⁰ Therefore, the euro-centric view of the land as discrete and definitive land parcels does not reflect the Mi’kmaw world view and references to site-specific pre-contact land use from the first-hand perspective of the Mi’kmaq (through oral tradition) are difficult to ascertain. However, historic references by Europeans do exist, although they must be carefully considered due to their inherent bias, and Mi’kmaw land use and occupation is reflected in the archaeological record.

Nova Scotia has been home to the Mi’kmaq and their ancestors for at least 13,000 years. A legacy of experience built over millennia shaped cultural beliefs and practices, creating an intimate relationship between populations and the land itself. The complexity of this history, culturally and ecologically, is still being explored.

The earliest period is Saqiwe’k L’nuk (the Ancient People) or the Palaeoindian period (13,000 - 9,000 cal BP). The changing ecology following deglaciation allowed the entrance of large herds of migratory caribou into Nova Scotia, followed by Palaeoindian groups from the south.²¹ Currently, the Debert/Belmont Sites provide the only significant evidence of Palaeoindian settlement in the province. Commonly believed to be big-game hunters, research is now aimed at exploring the diverse subsistence patterns that may have supported populations, and what adaptations were made when the environment shifted once again in the early Holocene.²²

Succeeding the Saqiwe’k L’nuk is the Mu Awsami Kejikawe’k L’nuk (the Not so Recent People) or the Archaic Period (9,000-3,000 cal BP). This time saw a reorientation to a more maritime subsistence, with settlement pivoting more towards coastal areas, lakes, and

²⁰ Sable and Francis 2012, 18.

²¹ Newby et al. 2005, 151.

²² Lothrop et al. 2011, 562.

bountiful riverine resources.²³ Remnants of these sites along the coast have largely been engulfed by rising seas or battered by wind and wave, though interior sites are increasingly being discovered.²⁴ Ground stone tools, specialized for woodworking, appear at this time and may have been used to create dug-out canoes. Numerous traditions and distinct technologies have been documented throughout Maine and the Atlantic provinces. A growing catalogue of exotic cultural components demonstrates that groups within Nova Scotia were engaged in spheres of interaction spanning hundreds of kilometers. Unfortunately, a lack of formally excavated sites within Nova Scotia still obscures the degree to which these traditions were present.

By the Kejikawe’k L’nuk (the Recent People) or Woodland/Ceramic period (3,000-550 cal BP), the Mi’kmaq were a maritime people, with known sites concentrating along coastal shorelines and navigable watercourses.²⁵ Migration of ideas and people introduced new worldviews and technologies from groups originating in places like northern New England and the Great Lakes area, to local populations, including the earliest ceramic forms. Harvesting of marine molluscs and shellfish appears in this period, and substantial shell-middens have gifted archaeologists with well-preserved records of these past lives.²⁶ Fish weirs populating the province’s rivers and streams speak to the importance of migrating fish species to Mi’kmaq life. Terrestrial hunting and foraging were practiced with varying degrees of intensity depending on seasonality and region. A generally stable cultural form is believed to have developed by 2,000 cal BP, forming the way of life first encountered by Europeans arriving on our shores.²⁷

Mi’kmaw life was substantially altered in the Kiskukewe’k L’nuk (Today’s People) or Contact Period (500 BP- Present). Trade and European settlement introduced change and upheaval to the traditional way of Mi’kmaw life. Mobile hunting and gathering still defined Mi’kmaw life, with identity residing within family households.²⁸ Trading posts and fishing villages became intersections of European and Mi’kmaq interaction, affecting traditional seasonal rounds and access to land. The hunting of fur-bearing mammals intensified to satisfy the mutual exchange of skins for European goods.²⁹ It is not accurate, however, to say that Mi’kmaq *adopted* European goods and culture, but rather *adapted* to it. The Mi’kmaq remained an influential social and political force forming a triadic narrative of contention with the English and French in the 18th century. However, disease, conflict, and alienation from the land wreaked a ruinous effect on the Mi’kmaq by the 19th century, pushing people to the margins of colonial society.³⁰

²³ Tuck 1975.

²⁴ Deal et al. 2006.

²⁵ Davis 1993, 100.

²⁶ Davis 2005, 18.

²⁷ Wicken 2004, 26.

²⁸ Wicken 2004, 30.

²⁹ Whitehead 1993, 89.

³⁰ Reid 2009.

Table 4-1: Mi'kmaw/Archaeological Cultural Periods.³¹

Mi'kmaw Period	Archaeological Period	Years (C ¹⁴ Uncalibrated)	Calendar Years (Calibrated)
Saqiwe'k L'nuk (the Ancient People)	Palaeoindian <i>Early/Middle</i> <i>Late</i>	11,500 – 9,000 BP <i>11,500 – 10,000 BP</i> <i>10,000 – ~9,000 BP</i>	13,000 – 9,000 cal BP <i>13,000 – 11,600 cal BP</i> <i>11,600 – 9,000 cal BP</i>
Mu Awsami Kejikawe'k L'nuk (the Not so Recent People)	Archaic <i>Early/Middle</i> <i>Late/Transitional</i>	9,000 – 3,000 BP <i>9,000 – 5,000 BP</i> <i>5,000 – 2,500 BP</i>	9,500 – 3000 cal BP <i>9500 – 5,500 cal BP</i> <i>5,500 – 3,000 cal BP</i>
Kejikawe'k L'nuk (the Recent People)	Woodland/Ceramic <i>Early</i> <i>Middle</i> <i>Late</i>	3,000 – 500 BP <i>3,000 – 2,400 BP</i> <i>2,400 – 1,700 BP</i> <i>1,700 – 500 BP</i>	3,000 – 550 cal BP <i>3,000 – 2200 cal BP</i> <i>2,200 – 1,300 cal BP</i> <i>1,300 – 550 cal BP</i>
Kiskukewe'k L'nuk (Today's People)	Protohistoric Historic/Modern	500 BP – 350 BP 500 BP – present	550 – 350 cal BP 350 cal BP – present

The Mi'kmaq inhabited the territory known as Mi'kma'ki or Megumaage, which included all of Nova Scotia including Cape Breton, Prince Edward Island, New Brunswick (north of the Saint John River), the Gaspé region of Quebec, part of Aroostook County in northern Maine and southwestern Newfoundland (Figure 4-1). The study area is located within the Mi'kmaw territory known as Sipekne'katik meaning “wild potato area” or “place of groundnuts.” Sipekne'katik encompasses parts of what today are Hants, Lunenburg, Kings, Colchester, Halifax and Cumberland Counties. Historic European records suggest there were three summer villages within the territory, located at Shubenacadie, Truro, and Tatamagouche. Several villages are also recorded in and around K'jipuktuk/Halifax.³² More villages were likely established throughout Sipekne'katik, but either fell outside of the knowledge of European sources or were simply not recorded.

³¹ Lewis 2006b; Confederacy of Mainland Mi'kmaq 2007, 3; Davis 2011, 22; Betts and Hyrnick 2021, 19.

³² Hoffman 1955, 534-35.

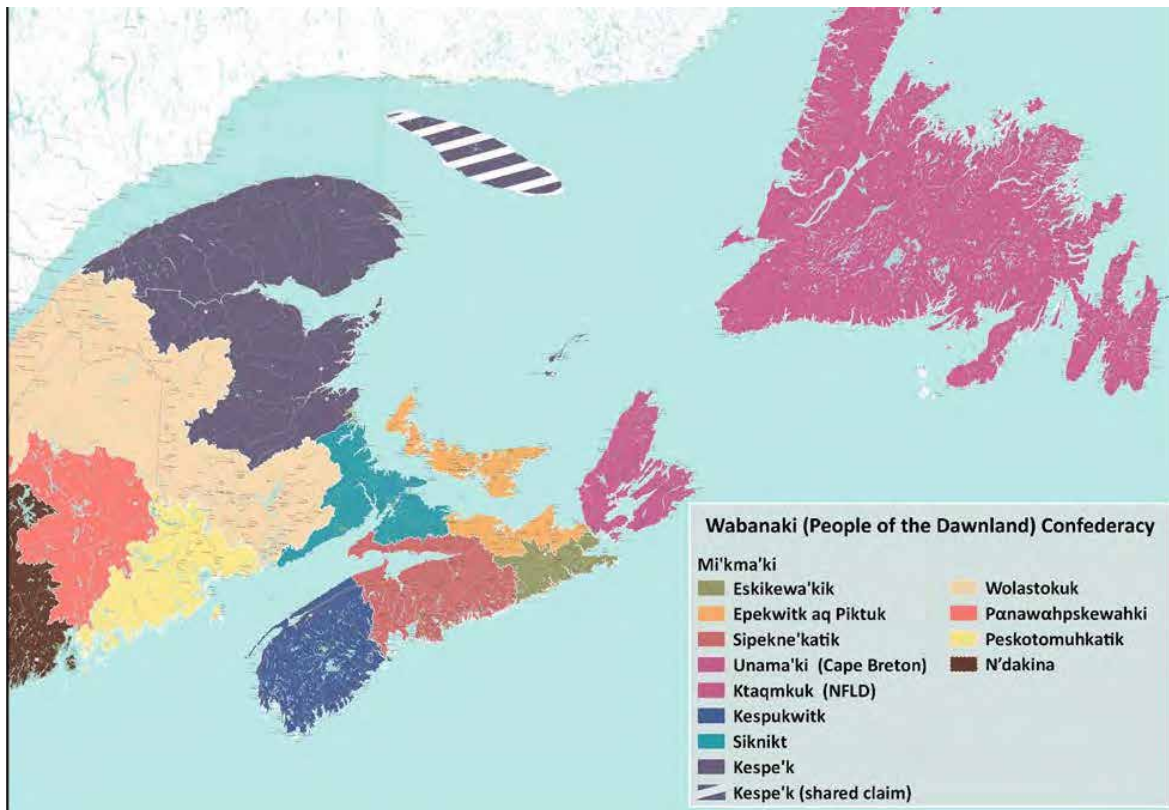


Figure 4-1: The districts of Mi'kma'ki and Wabanaki Traditional Territories.³³

The cultural significance of the study area to the Mi'kmaq and their ancestors is recorded in the Mi'kmaw language. The Mi'kmaw language, inseparable from Mi'kma'ki, is embedded with knowledge of the land and a unique way of understanding the world, reflected in both oral traditions and place names.³⁴ For archaeologists, the Mi'kmaw language can provide powerful insights into traditional land-use, available resources, and how these places were perceived. Several place names are recorded in the vicinity of the study area, though most of the known recorded names relate to areas around Halifax, or K'jipuktuk, meaning Great Harbour. Nearby Big Indian Lake is Apukji'jue'katik meaning "place of mice". Williams Lake is known as Etu'panuek, meaning "two streams flowing into an opening". The Northwest Arm is known as We'kwaltijk, or "end of the bay; ending

³³ Adapted from Sable et al. 2012; Maliseet Nation Conservation Council 2009; Johnson 2020; Membertou Geomatics Solutions (MGS) and Unama'ki Institute of Natural Resources (UINR) 2016; EPA 2015; and Abbe Museum. Some traditional territory overlap exists in western New Brunswick, Quebec and Northern New England. This adaptation is based upon modern watershed delineations. Boundaries within modern territories were likely fluid during periods of landscape and climactic changes. Current delineations are more reflective of series of treaties, negotiated between various Wabanaki nations and contemporary indigenous groups, and post contact treaties with the French, English, and federal governments of Canada and USA.

³⁴ Sable and Francis 2012, 26.

without a river coming in.” Herring Cove or Mulipjikejk means “a deep chasm, valley or gorge.”³⁵

Archaeological evidence supports a precontact occupation of Halifax County and the surrounding landscape by the Mi’kmaq and their ancestors for at least 7,000 years and almost certainly much longer. The Mi’kmaq and their ancestors would have harvested marine birds and animals at the coast, gone to interior rivers and lakes for seasonal migrations of fish, eel, and opportunities to hunt larger game animals. Plants were also harvested from different interior and coastal environments. Movement from the coast to the interior may have followed a generalized winter-interior, summer-coastal migration round suggested by ethnohistoric sources.³⁶ However, mobility across Mi’kma’ki was likely more complex.³⁷ Use of rivers and long inlets allowed more fluid movement between coastal and interior camps.³⁸ Movement between the coast and interior may have been dependant on weather and availability of valued resources, as suggested by other sites found throughout Nova Scotia.³⁹

Historic documents record Mi’kmaq living throughout K’jipuktuk. The indented coves and inlets of the harbour provided ideal camping grounds at places such as Birch Cove, Fairview Cove, and McNab’s Island. K’jipuktuk offered Mi’kmaq families numerous advantages including freshwater sources, access to marine, coastal, and riverine resources, as well as easy movement throughout the greater landscape along waterways like the Shubenacadie and Sackville Rivers. Rivers near the study area, including the Nine Mile and Prospect Rivers, would also have been a source of important resources as well as travel routes to the outer coast at Shad Bay and Prospect Bay. Following Long Lake, it would also have been easy to travel along the lakes and waterways that empty into the head of the Northwest Arm.

The most significant travel route was the K’jipuktuk/We’kokeptik trail along the Shubenacadie River System, which allowed cross-province travel between Halifax Harbour and Cobequid Bay. This trail, which archaeological evidence indicates dates to the Precontact period, could be travelled by canoe over several portages or by foot during times of the year when the lakes were impassable. Travel to the Cobequid area could also be achieved by a short trip up the Little Sackville River, a portage of less than one kilometre to First Lake, then a passage through Second and Third lakes, before entering the Shubenacadie River system.⁴⁰

Mi’kmaw settlement in K’jipuktuk is reflected in historic documents as early as 1688, when Sieur de Gargas recorded thirty-three Mi’kmaq living in seven ‘cabanes’ when he

³⁵ Ta’n Weji-sqalia’tiek.

³⁶ Hoffman 1955, 153–4.

³⁷ Wicken 1994, 63.

³⁸ Lewis 2006a, 58.

³⁹ Sheldon 1988, 134.

⁴⁰ Sanders and Stewart 1999, 7.

visited Halifax Harbour in 1688.⁴¹ Sieur de Diereville, a French surgeon and author, met three Mi'kmaw chiefs at Halifax Harbour in 1699, leading Diereville to speculate the harbour was an important gathering place for the Mi'kmaq.⁴² The Governor of Acadia, Jacques Monbeton de Brouillan, describes hundreds of Mi'kmaq living around K'jipuktuk in 1701.⁴³ While these population descriptions are helpful, the number of Mi'kmaq living in the harbour likely fluctuated throughout the year. For example, during the spring salmon run, there is evidence that Mi'kmaq gathered in a large encampment on a rise upstream of the outlet of the Sackville River into the Bedford Basin.⁴⁴ This may be the same location, near Fort Sackville, where four Mi'kmaq camps are known in the 19th century. It is likely that more habitation sites were in use around the harbour in the 17th century, however fewer records exist during this time period due to the lack of French activity in the area.

Contact between the Mi'kmaq of K'jipuktuk and Europeans became more frequent during the eighteenth century. This period also marked a time of increasing strife between Mi'kmaq and British colonizers. The Mi'kmaq of K'jipuktuk were deeply involved in these conflicts and were central in a historical tragedy which unfolded on the shores of the Bedford Basin in the mid-18th century. In the summer of 1746, Mi'kmaq warriors from Chebucto and bands throughout Mi'kma'ki gathered in K'jipuktuk. They were awaiting a French armada of over 70 ships led by Duc d'Anville, the greatest naval military force ever sent from France to North America. Together, their goal was to avenge the loss of Louisbourg the year prior, destroy the British fort at Annapolis Royal, and retake all of Acadia from the British.⁴⁵

The expedition was doomed nearly from the onset. Delayed by weather and poor organization, only forty-four ships arrived in the harbour. By the time of their arrival, many of the Mi'kmaq had dispersed and gone home. The remaining Mi'kmaq assisted the French soldiers to their camps at Fairview and Birch Coves, which proved to be a tragic decision. The sailors were in poor health and the Mi'kmaq were exposed to highly contagious diseases to which they had no immunity.⁴⁶ These illnesses killed countless Mi'kmaq in K'jipuktuk. Surviving Mi'kmaq left, unknowingly carrying these fatal diseases to their home villages, spreading the contagion further. The Mi'kmaq buried their dead "back of the site of Forrest's Tannery", located in the vicinity of Titus Smith Park in Fairview today.⁴⁷

The historical consequences of the event for the Mi'kmaq of K'jipuktuk were immediate. Due to the depopulation of K'jipuktuk, in 1749 Edward Cornwallis and ships full of British

⁴¹ Wicken 2004, 171.

⁴² Hoffman 1955, 335.

⁴³ Ingalls and McGrath 1998, 10.

⁴⁴ Ingalls and Ingalls 2010, 11–2.

⁴⁵ Ingalls and Ingalls 2010, 11–2.

⁴⁶ Ingalls and Ingalls 2010, 14.

⁴⁷ Ingalls and Ingalls 2010, 15–7.

settlers arrived at a Halifax Harbour nearly absent of its Mi'kmaq residents. Though devastated by disease, the Mi'kmaq defended their claim on K'jipuktuk and resisted British settlement in the area for years after the founding of the colony. British settlement in K'jipuktuk, seen by the Mi'kmaq as a violation of the 1726 treaty, resulted in a deterioration of relations between the two nations and numerous confrontations.⁴⁸ This includes the 1749 attack by the Mi'kmaq on the burgeoning settlement of Dartmouth. In response, a small group of Mi'kmaw living on the Dartmouth side of the Harbour were deported.⁴⁹ They were moved to the northeastern portion of McNab's Island, now called "Indian Point", and lived there for some time.

Though displaced through disease, war and colonization, the Mi'kmaq continued to live in K'jipuktuk through the 18th and 19th centuries. A travelling reverend, Joshua Marsden explained in August 1800 that a few Mi'kmaq "...live in the vicinity of Halifax, who chiefly get their living by fishing; but alas! these natives of the wilderness are much diminished in every part of the province...".⁵⁰ Three hundred Mi'kmaq were recorded as living in Halifax County in 1842.⁵¹ In 1880, it was reported that Mi'kmaq "from other counties" come to Bedford, Dartmouth "and other places near the city" in the summer to camp.⁵²

Dartmouth became a gathering place for local Mi'kmaq, with historic references to habitations on the harbour shores and along the area's plentiful lakes. By at least the late 18th century, local Mi'kmaq established a community at Tuft's Cove called Turtle Grove (Figure 4-2). A school was constructed, and several families lived in the area earning a living as artisans of baskets, hockey sticks, firkins, and other goods. Tragically, this community was destroyed by the Halifax Explosion in 1917 and never rebuilt.

There is no specific reference to a Mi'kmaq habitation within the study area in the historical record. However, there is historical documentation of Mi'kmaq living to the north and south of the study area. To the north, near Governor's Lake, the area was recorded in 1914 as a hunting territory of Mi'kmaw man, Frank Cope and his family.⁵³ It is possible that an old flintlock gun of Cope's is stored at the Nova Scotia Museum. The gun was obtained in 1933, and purportedly was used by a Mi'kmaw man named Frank Cope who died in 1915 at age 86.⁵⁴ It is possible that this is the same Frank Cope whose hunting territory comprised the Governor's Lake territory recorded by Speck in 1914, while Frank Cope would still have been alive. To the south of the study area, near Big Indian Lake, it was reported that in the early 19th century, a Mi'kmaw man named Tom

⁴⁸ Paul 2008, 112.

⁴⁹ Kinsman 1995, 2.

⁵⁰ Marsden 1816, 16.

⁵¹ Wicken 2004.

⁵² Canada House of Commons 1881, 42.

⁵³ Speck 1922, 103.

⁵⁴ Whitehead 2015, 339.

Philips was ground at “a camping ground at foot Big Indian Lake, head of St. Margarets Bay.”⁵⁵



*Figure 4-2: Hibbert Newton Binney's watercolour of a Mi'kmaq encampment at Tufts Cove in Dartmouth c. 1791.*⁵⁶

4.2.2 African-Nova Scotian and Euro-Canadian Settlement

When Halifax was founded by the British in 1749, a grid of the streets and city blocks was laid out, originally stretching north-south from Joseph Street (now Scotia Square) to Salter Street, and east-west from the harbour to just below the Citadel. By the middle of October of that year, shortly after the arrival of Halifax's European settlers, a rough barricade had been erected around the town. This barricade was composed of “felled trees, logs and birchwood”. The following summer, a true palisade was erected, with five forts located at intervals along the fortifications. The forest was cleared 30 feet beyond the palisade to prevent potential attackers from using it for cover.⁵⁷ In the early years of the town, settlement outside of the palisade was confined to some country tracks and a few cabins.⁵⁸ By the 1770s, most of the peninsula of Halifax had been cleared for farmland.⁵⁹

⁵⁵ Whitehead 1991, 250.

⁵⁶ Binney 1791.

⁵⁷ Piers 1947, 1–3.

⁵⁸ Piers 1947, 1–3.

⁵⁹ Fingard et al. 1999, 22.

Until the fall of Louisbourg in 1758, British occupation outside the protection of the blockhouse line beyond the Northwest Arm was a limited and often deadly undertaking for civilians caught in the middle of colonial warfare. Skirmishes between Acadian insurgents, the Mi'kmaq and the British colonialists subsided during the 1760's with the signing of several treaties and subsequent deportation of the majority of the Acadian population. This made British settlement outside the peninsula a safer endeavour.⁶⁰

Just two kilometers northwest of the study area, the community of Beechville (Beech Hill or Refugee Hill) was settled by Black Refugees in the early 19th century. Nova Scotia occupied a prominent position in the African diaspora in Eastern Canada during the 17th through 19th centuries. The first permanent occupation of people of African-descent in Nova Scotia were the enslaved individuals of French and British settlers in the early to mid-18th century. Slavery was relatively short-lived in Nova Scotia due to the absence of plantations and lack of economic necessity. Attempts to legalize slavery in the province were also rebuffed in the Nova Scotia Legislature in 1787 and again in 1808.⁶¹ Historian Bridglal Pachai is clear that while the public may have seen a “softer side” to slavery in Nova Scotia, the “...legacy of slavery affected race relations in Nova Scotia for centuries”.⁶²

The Black Loyalists were the first sizable population of people of African descent to arrive in the Maritimes. They comprised a part of the larger influx of Loyalist immigrants during the American War of Independence, 1775-1783. Approximately 1,232 enslaved people and 2,775 free Black Loyalists arrived in Nova Scotia during this period. The latter group consisted of free Blacks and former slaves who earned passage to Nova Scotia by fighting for the British during the war and were promised free grants of land.⁶³ Black Loyalist communities soon formed in Birchtown (Shelburne), Preston (Halifax), Little Tracadie (Guysborough) and Brindley Town (Digby). However, difficulties in securing their promised land allotments from the British government and discrimination from the white settlers led to a mass exodus of Black Loyalists in 1792 to Sierra Leone. Approximately half of the Black population of Nova Scotia departed for the African colony, including many prominent Black leaders, leaving many of the communities deserted.⁶⁴ In 1796, 550 Jamaican Maroons landed in Halifax, but faced with similar issues to the Black Loyalists, also left for Sierra Leone in 1800.

Between 1813 and 1816 a fourth group of Black settlers arrived in the Maritimes, the Black Refugees. This group consisted of over 2,000 escaped enslaved people who attained their freedom by fighting for the British in the War of 1812. Approximately 1,600 Black Refugees ended up in Nova Scotia. Like the Black Loyalists before them, they came as free people seeking a new home. Unfortunately, their circumstances resembled the Black

⁶⁰ Piers 1947, 1–3.

⁶¹ Pachai and Bishop 2006, 8–9.

⁶² Pachai and Bishop 2006, 8–9.

⁶³ Pachai 1997, 11–2.

⁶⁴ Pachai 1997, 19–20.

Loyalists in other ways. Full land grants were withheld by the colonial government of the time, and licences of occupation limited the ability of Black Refugee settlers to make improvements to their property or to leverage the land for funds.⁶⁵ Furthermore, lands granted were small and unproductive compared to those given to white settlers. The 10-acre lots were often unable to produce food necessary to survive, and crops routinely failed in the rocky, infertile soil.⁶⁶

These issues were compounded by a series of natural events soon after their arrival which made farming all but impossible, including a plague of mice in 1815, as well as the “Year Without Summer” in 1816 where frost persisted in fields until June. This made eeking out a living in the sometimes-harsh Nova Scotia climate even more difficult than usual. Discrimination and racial prejudice towards the Black population remained an issue as well, and the majority of the white population saw the arrival of the Black Refugees as an inconvenience at best.⁶⁷ Early troubles due to the aforementioned crop failures by the Black Refugees gave rise to latent resentments from established settlers, who saw the refugees as dependent on the state and as a threat to working class whites as a source of cheaper labour. Despite these hardships, the Black Refugees persevered, expanded existing Black communities, and began new ones. Most settled near Halifax, including at Preston, Hammonds Plains, and Beechville.⁶⁸

Black Refugees settled near what is today Beechville by at least 1815. Documentary evidence in the form of land licenses and official correspondence record 23 Refugee settlers at ‘Refugee Hill’ at this time.⁶⁹ By the end of 1816 the population climbed to at least 76. The community may have alternatively been known as ‘Beech Hill’, though there is confusion in the secondary literature over whether this is the same community or two different settlements.⁷⁰

Regardless, in 1816 the Surveyor General laid lots for Black Refugees at ‘Beech Hill’ (Beechville).⁷¹ Lots consisted of 10-acre parcels of land licensed to heads of households. As previously mentioned, these licenses were distinct from land grants and gave the licensee limited control over the property for at least the first 5 years of occupation. Lands surveyed for Beech Hill were located south of St. Margaret's Bay Road and north of modern-day Beechville.

In 1818, a second license of occupation plan shows a growing settlement, depicting two divisions of plots. Division B is located in the same location as the 1816 plan, while Division A shows a new allotment of plots further east. Comparison of the licensees from each

⁶⁵ Pachai 1997, 26.

⁶⁶ Whitfield 2005.

⁶⁷ Pachai 1997, 24.

⁶⁸ Grant 1990, 77–85.

⁶⁹ Fergusson 1948, 55.

⁷⁰ Fowler 2014, 11–2.

⁷¹ Commissioner of Public Records 1816.

plan show that with the exception of one individual, all licensees listed in 1816 were still in possession of their lots by 1818.⁷² An overlay of the 1818 plan of licenses of occupation for Black Refugees at 'Refugee Hill' with modern satellite imagery shows the proximity of the residents to the study area (Figure 4-3).

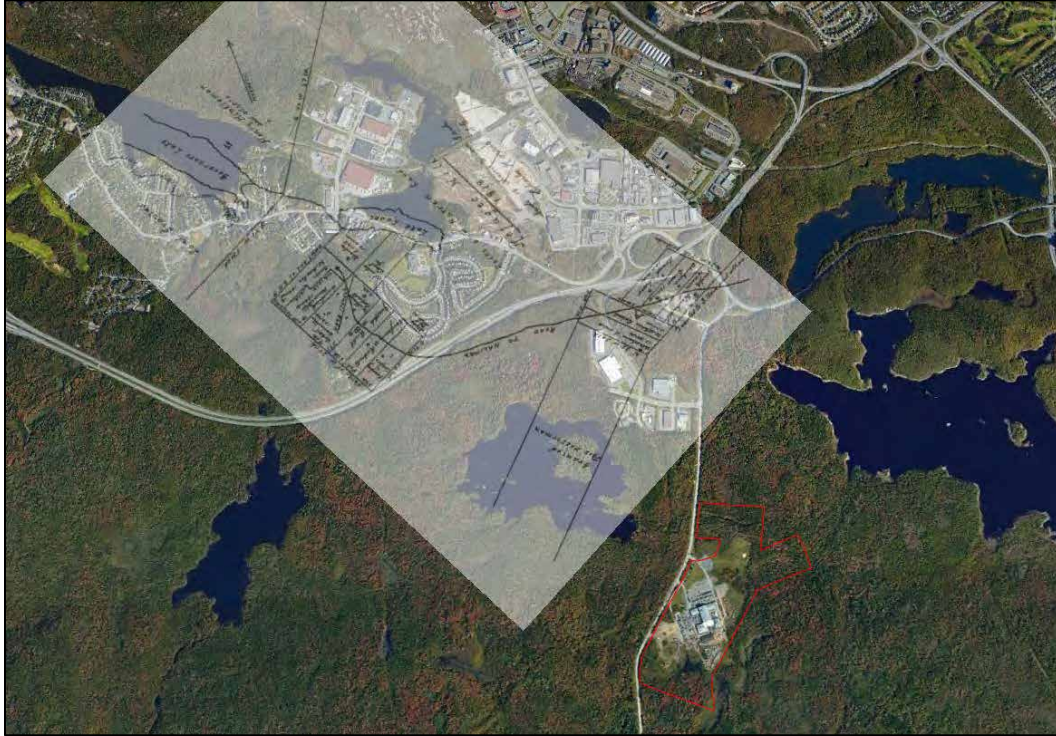


Figure 4-3: 1818 grant of "Refugee Hill" in Beechville overlaid on modern satellite imagery in proximity to the study area (red).⁷³

As with many land licenses given to Black settlers during this time, the plots were less than ideal for farming. Lord Dalhousie, who awarded the licenses in 1818, described lots as "rough and rocky for cultivation".⁷⁴ At the time the grants were awarded, a number of homes had already been built on the lots and Dalhousie notes that 28 families were settled on detached plots of land as well which could not be represented on the plan. While no examples of Black Refugee homes survived today, nor any photographs, descriptions from primary documents suggest that many were modest log cabins or huts.⁷⁵

There is no indication that the community of Refugee Hill or any Black Refugee settlers were present within the study area, however. John Gosbee and Thomas Wagner received some of the earliest land grants in what would become the community of Goodwood,

⁷² Shears 2015.

⁷³ Grant 1990, 84.

⁷⁴ Commissioner of Public Records 1818.

⁷⁵ Fergusson 1948, 75–80 from Fowler 2014; Grant 1990, 80–1 from Fowler 2014.

overlapping with the study area (Figure 4-4). John Gosbee, Thomas Wagner, Philip Tollmer, John Bower and Jacob Bower are thought to have received the earliest grants in Goodwood in the 1770s. It is thought the name of the community, Goodwood, is descriptive and was first used in John Gosbee's 1770 grant.⁷⁶

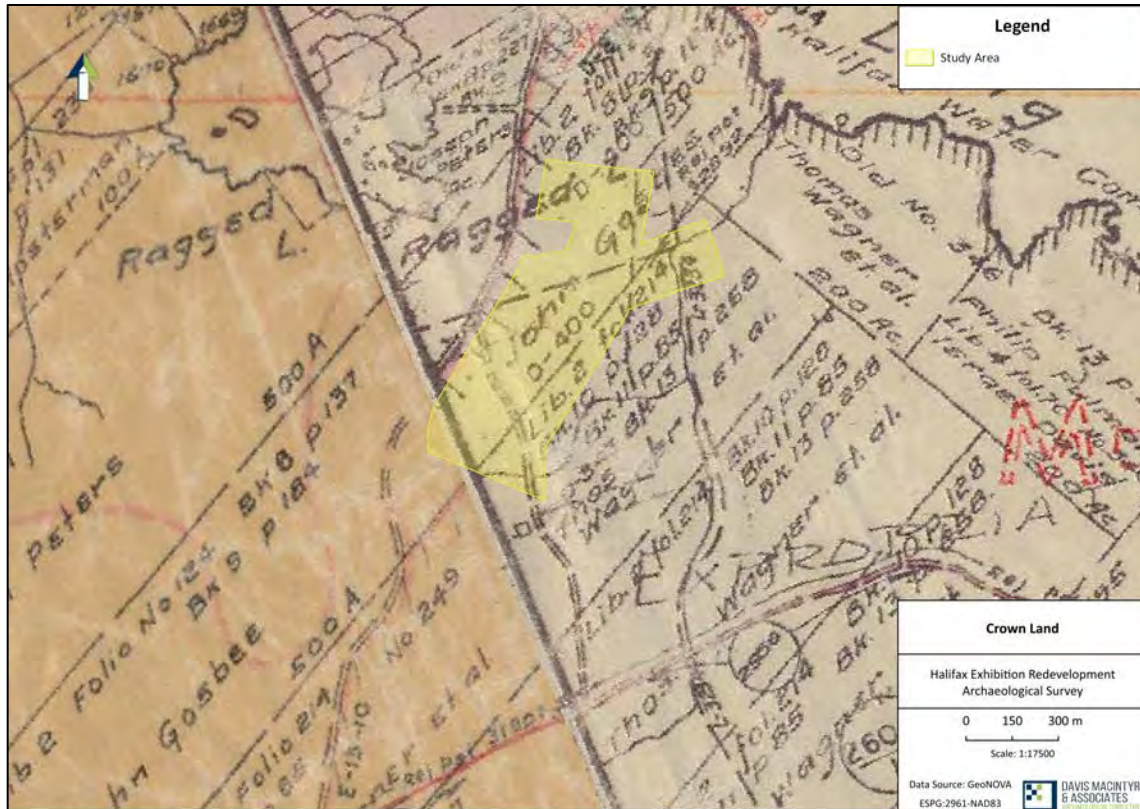


*Figure 4-4: Crown Land Grant map showing study area (yellow) intersecting the grants of John Gosbee and Thomas Wagner et al.*⁷⁷

Unfortunately, it is unclear whether John Gosbee or Thomas Wagner settled the land surrounding the study area as both men received significant portions of land between Goodwood and Spryfield. However, Thomas Wagner, a German settler, passed on some, if not all, of his land to his daughter Mary Anne Wagner. Mary married William Umlach of Goodwood, and together the couple had 14 children and after her death in 1822, her land was divided amongst all of their children. While many of the Umlach (later spelled Umlah) family stayed in the Goodwood area, there is no evidence to suggest they settled the study area. As shown on an 1865 map by A. F. Church, there are no recorded inhabitants near the study area (Figure 4-5).⁷⁸

⁷⁶ Fergusson 1967, 248.

⁷⁷ Department of Lands and Forests 1954a; 1954b.

⁷⁸ Shea 2003.

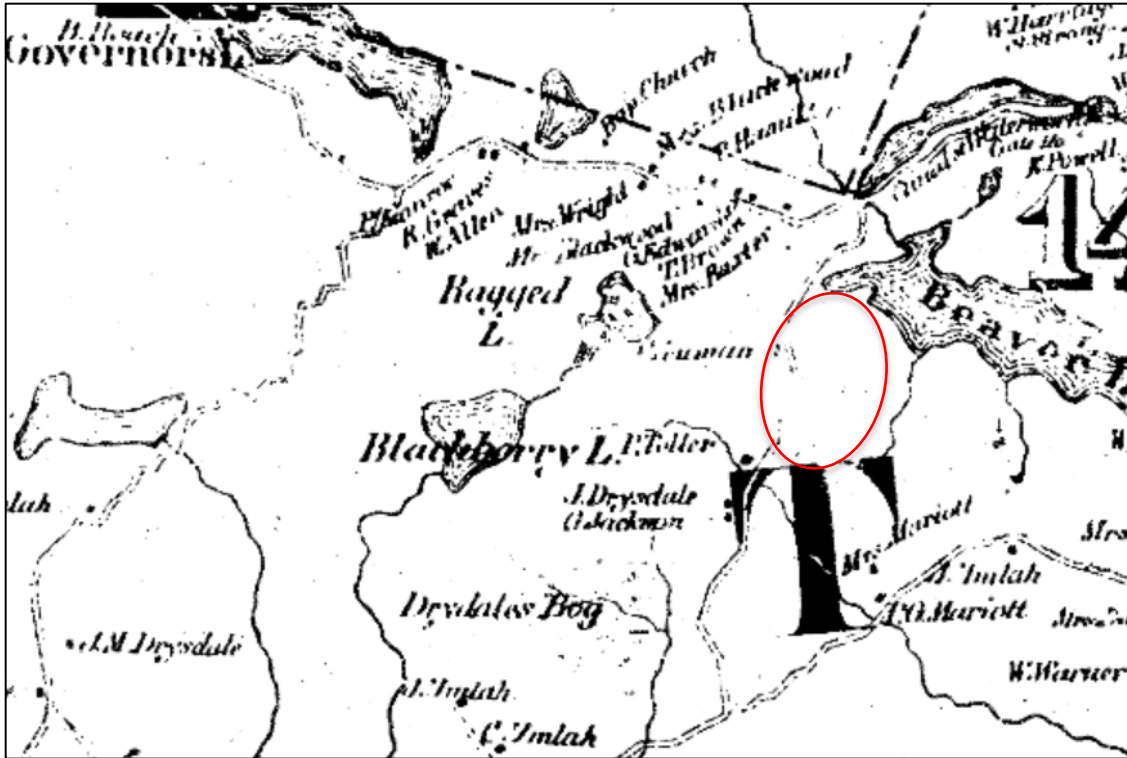
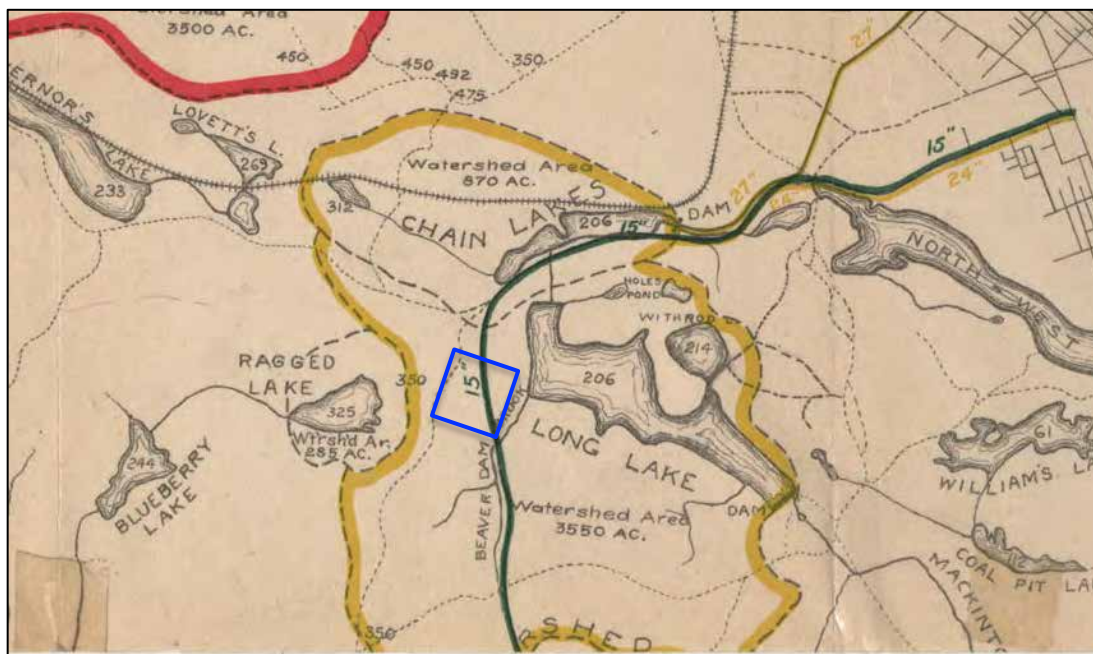
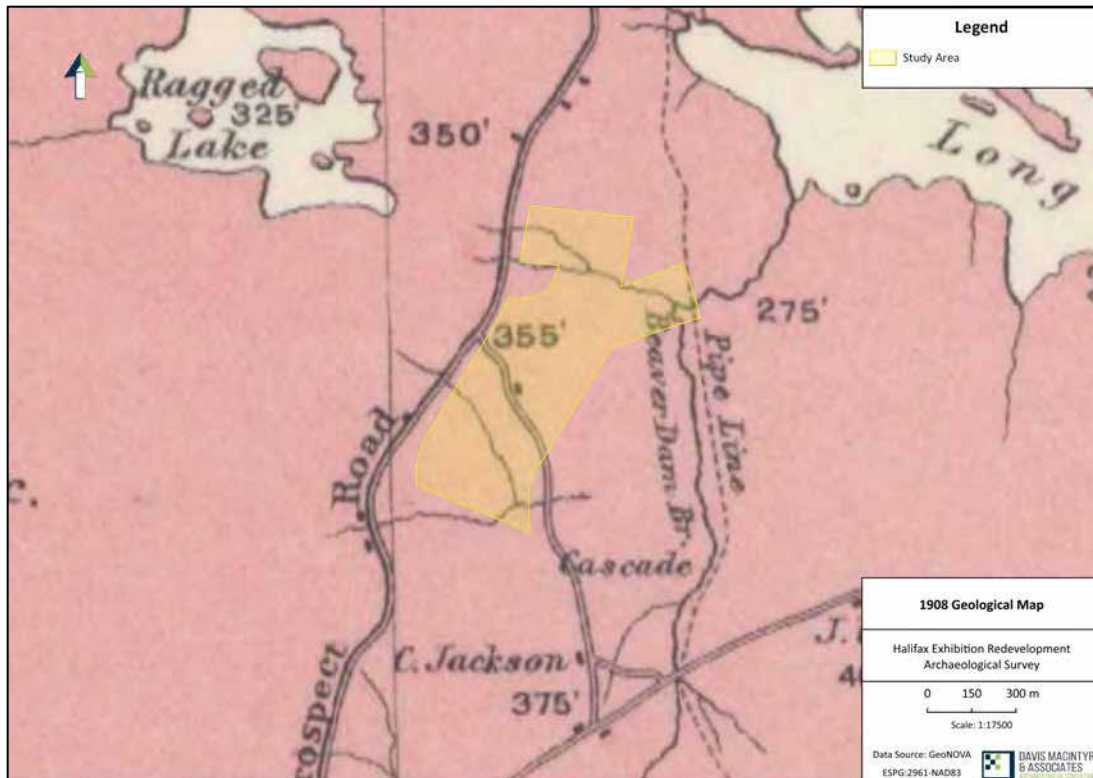


Figure 4-5: 1865 A. F. Church map with study area (red).⁷⁹

By the time of the publishing of the 1908 Geological Survey of Canada map, a road cuts south across the study area from Prospect Road to what is labelled today as “Old St. Margaret’s Bay Road” (Figure 4-6). On the 1908 map, one structure appears near the center of the study area, and a pipeline crosses the study area at the eastern extent. The pipeline is related to water infrastructure for the city of Halifax and connects Long Lake and Second Chain Lake with Spruce Hill Lake to the south. A 1906 map of the existing water pipes and infrastructure shows an existing 15-inch pipe running along the northeast edge of the study area (Figure 4-7). This pipeline was constructed in 1867-1868.⁸⁰ In 1957, a topographic map shows that the pipeline at the eastern extent was still in place and another pipeline had been constructed crossing through the study area roughly east-west (Figure 4-8). This second pipeline connected Long Lake to Big Indian Lake. Additionally, two structures appear to be located within the study area, along Prospect Road.

⁷⁹ Church 1865.

⁸⁰ Johnston 1906, 83.



⁸¹ Faribault 1908.

⁸² Doane et al. 1906.



Figure 4-8: 1957 topographic map showing the study area (yellow). Note the blue dashed lines indicating the presence of water pipelines through the study area.⁸³

The late twentieth century witnessed major changes to the study area with the construction of the Halifax Exhibition Centre. The history of the Halifax Exhibition begins with the Atlantic Winter Fair (AWF). The AWF was an annual fair beginning in 1963 that moved around the province taking place at different Exhibition grounds, most frequently, in Windsor. During the 1980's newspapers reported that the AWF was looking for a permanent home in the Halifax area. Several locations were suggested including Dartmouth, Bedford and Sackville before the decision was made to start construction at Prospect Road.⁸⁴

Before the AWF Exhibition Park, or “the Exhibition” for brevity, was constructed, the Halifax City Council requested an assessment of its environmental impact. The Exhibition was in the watershed for Long Lake, which had been the municipal water supply until 1977, at which time it became a backup water reserve for the city. Long Lake subsequently became part of Long Lake Provincial Park due to this re-evaluation of its water status.⁸⁵ An assessment by the Lakes and Waterways Advisory Committee of the City of Halifax recommended the Exhibition could be built as long as they provided for:

⁸³ National Topographical Survey 1957.

⁸⁴ Anon 1982.

⁸⁵ Waller et al. 1983, 3.

- 1) adequate buffer strips adjacent to stream channels,
- 2) preparation and implementation of an erosion and sediment control plan for the construction phase,
- 3) Disposal of liquid and solid waste outside of the Long Lake watershed, and
- 4) Treatment and disposal of storm runoff from parking and loading areas that are likely to contribute pollutants to the lake.⁸⁶

After receiving environmental clearance, construction commenced, and the Atlantic Winter Fair had its first fair at the Exhibition in fall 1984 (Figure 4-9). During the 1980s and 1990s, the fair ran yearly, and it was kept busy by visitors, seeing over 85,000 people in 1992.⁸⁷ The Halifax City Council Minutes from this time show that the Atlantic Winter Fair Committee were managing increased traffic along Prospect Road and entertained the construction of a horse-racing track in collaboration with the Horse Harness Owners Association in 1988. It was eventually decided that the track be built closer to the Halifax International Airport.⁸⁸



Figure 4-9: A pamphlet from the first Atlantic Winter Fair at Prospect Road.⁸⁹

⁸⁶ Murtagh 1983.

⁸⁷ Atlantic Winter Fair 1984.

⁸⁸ Harness Horse Owners Associaton 1988.

⁸⁹ Atlantic Winter Fair 1984.

Aerial photography from 1931 shows that the study area was mostly forested, with clear-cut patches throughout (Figure 4-10). There was also a narrow road that ran south from Prospect Road to Old St. Margaret's Bay Road. It does not appear there were any structures in the study area at this time, however, this may be due to tree cover or the quality of the photo. A small, cleared area existed along Prospect Road in the north end of the study area but structures are not clearly visible in the 1931 air photo. In the 1947 air photo, however, at least one structure appears to be present here. This structure may have been short lived as it is no longer visible on the 1973 photo.

By 1947, a linear clear-cut across the study area is visible, showing the location of the water pipeline connecting Big Indian Lake to the pipeline that connects to Long Lake, as shown in Figure 4-8. The 1954 aerial photo also shows that the forest was regenerating, and the highway had been straightened sometime between 1947 and 1954 (Figure 4-11). The road that ran south from Prospect Road was still extant, and there was a rectangular clear-cut section at the southwestern extent. There may have been a structure in the rectangular clear-cut section, however it is difficult to say definitively due to the photo quality.

The 1981 aerial photo shows further indication of forest regeneration and the road running south from Prospect Road was grown over to the point it is difficult to discern on the photo (Figure 4-12). The rectangular clear-cut section from the 1954 also appears to be grown over. The presumed pipeline road still cuts across the study area, and there was a new road clear-cut at the northern extent of the study area.

Finally, 1992 aerial photography denotes the largest changes to the study area with the construction of the Halifax Exhibition Centre (Figure 4-13). The Exhibition had a large parking lot, multiple roads and a large structure. The surrounding landscape exhibits exposed soil, likely related to the recent construction. The presumed pipeline still runs across the study area, and the road at the northern extent of the study area was still extant. LiDAR indicates that infilling continued after 1992, particularly in the north end of the study area.

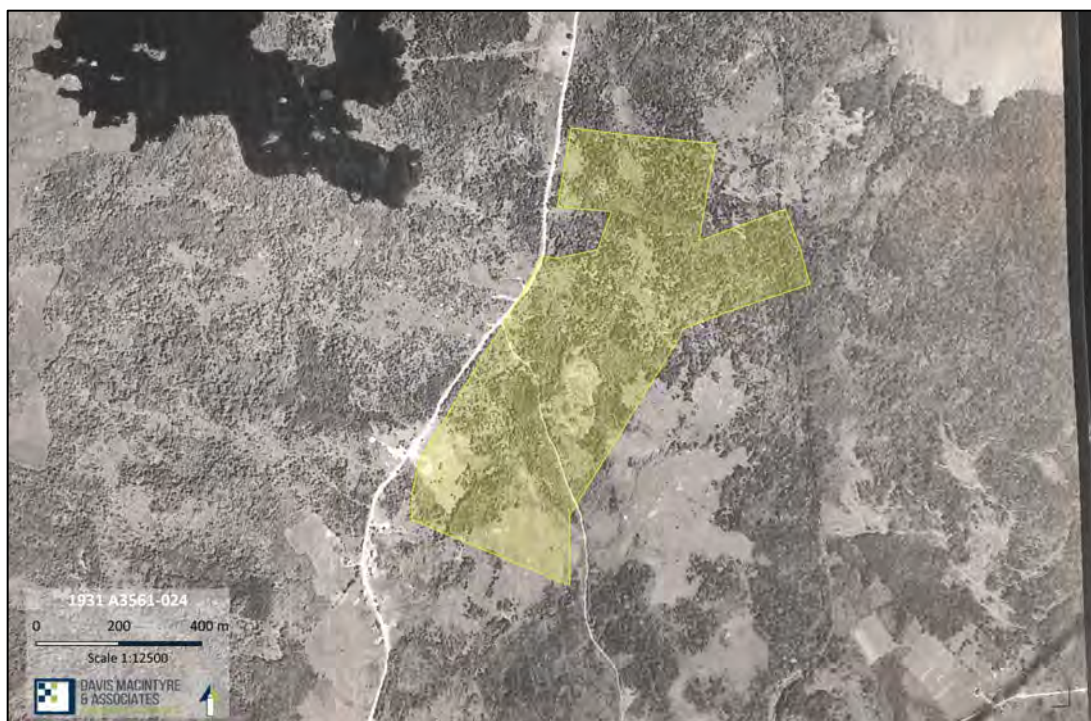


Figure 4-10: 1931 air photo with study area (yellow).⁹⁰

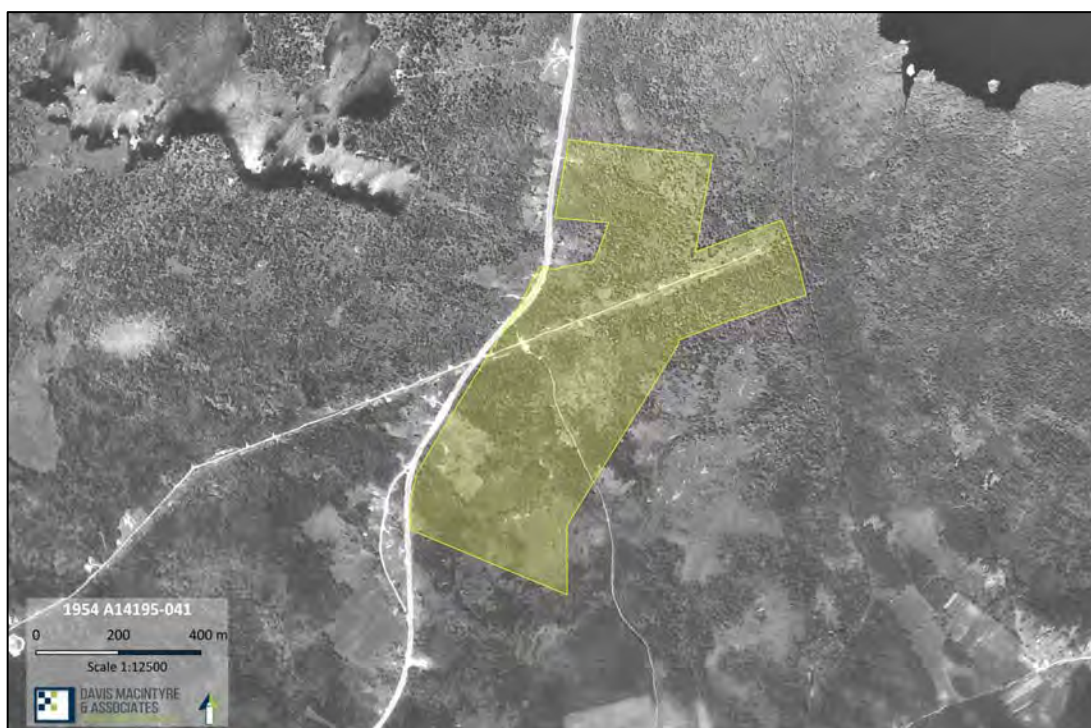


Figure 4-11: 1954 air photo with study area (yellow).⁹¹

⁹⁰ Nova Scotia Department of Lands and Forestry 1931.

⁹¹ Nova Scotia Department of Lands and Forestry 1954.



Figure 4-12: 1981 air photo with study area (yellow).⁹²



Figure 4-13: 1992 air photo with study area (yellow).⁹³

⁹² Nova Scotia Department of Lands and Forestry 1981.

⁹³ Nova Scotia Department of Lands and Forestry 1992.

4.3 Predictive Modelling

Predicting the occurrence of L'nuk heritage resources during the Late Pleistocene to the Holocene is a complicated task. Understanding localized geomorphological factors that influenced this rapidly evolving landscape and how the landscape may have been utilized by the ancestors is paramount for the prediction of potential site locations. Often, face value modern visual interpretations of these landscapes are not sufficient. This may lead to unintentionally overlooked resources for this expansive time period.⁹⁴ However, human movement is seldom tied solely to resource collection and to the ease of passage between resource collection areas. Exchange networks, familial histories, traditions, and ceremonial practices are also important factors to consider when seeking the relationships of past peoples and a given landscape.⁹⁵ Nevertheless, the prediction of past resource collection areas and travel corridors, such as the evolution of individual watercourses, can help narrow down potential activity areas. Difficulty in predicting landscape use for a specific study area is also compounded by the lack of localized geomorphological, climactic, and archaeological research. Historic anthropogenic landscape alterations further complicate desktop models. This is additionally muddled by innumerable unknown factors. However, broader regional trends and statistical modeling may offer insight into how the landscape may have been utilized as it evolved, thus, predicting the occurrence of previously unknown resources with greater accuracy and efficiency.

The earliest known occupation of the Maritime Peninsula occurred just before, and roughly overlapping with, the Younger Dryas cooling event that occurred from ~11,000 ¹⁴C to 10,000 BP (13,000 to 11,600 cal BP). The open spruce landscape typical of the region reverted to a dry, cold, treeless shrub tundra with the onset of colder temperatures.⁹⁶ During this time glaciers residing in the Highlands of Nova Scotia were reinvigorated, blocking several river systems near these areas with sediments and ice. New glacial lakes and outflows were formed throughout the province (See Section 2.1).⁹⁷ The Minas Basin Glacier reactivated and blocked the outlet to the Shubenacadie drainage system with an ice and clay dam. At around 10.6 ¹⁴Cka, the Shubenacadie River and its tributaries overflowed their banks flooding low-lying areas of the Shubenacadie, Musquodoboit and Stewiacke River valleys that were located below 30 m in elevation. This massive lake, coined Glacial Lake Shubenacadie II, was the largest of two massive glacial lakes that flooded central Nova Scotia during this event. These lakes essentially bisected the province for the duration of their short existence. New outflows were created through the Dartmouth lakes into Dartmouth Cove and near Gibraltar Rock in Musquodoboit Harbour.⁹⁸ The Dartmouth outlet flowed into the remnants of the Ancient Sackville River north of Georges Island towards the sea, which at the time, was located at approximately

⁹⁴ Suttie et al. 2007.

⁹⁵ Lacroix 2015, 31.

⁹⁶ Stea and R.J. Mott 1989, 172.

⁹⁷ Stea 2011.

⁹⁸ Stea and R.J. Mott 1989.

-65m below modern levels. Sea level rose rapidly during this period, and then steadily increased after 11 ka.⁹⁹ Coastal lowstands offered early peoples open corridors for moving freely about the region unimpeded by modern ocean extents.¹⁰⁰

As the climate again warmed at the end of the stadial, ice dammed lakes breached as glaciers retreated. Once flooded regions emerged as bogs and fens leaving large sand and clay deposits in their stead. These glacial lake strandlines may have continued to be important activity areas and travel corridors for both animals and L'nuk during the early post glacial period as the terrain recovered. The landscape eventually rebounded, and vegetational expanse continued into the Late Palaeo Period. Relative sea level reached approximately -40 m below modern levels by 10,000 BP.¹⁰¹ The lowstand within the Halifax Harbour and Northwest Arm slowly inundated with water progressively eroding the Ancient Sackville River and its tributaries resulting in the creation ten postglacial lakes. Two of these were located within the Northwest Arm.¹⁰²

Predictive modeling for the early Holocene Archaic Period presents a unique set of challenges for archaeologists. Over this approximately 3,000-year period post deglaciation, riverine systems and coastlines of the Maritime Peninsula experienced a series of dramatic changes influenced by numerous factors including localized isostatic rebound, lake formation and collapse, changes in relative sea levels, and rapid sediment depositions.¹⁰³ Recent studies, following examples from Northern Maine suggest that during the period between 9,000 BP and 7,000 BP, river systems in the region were largely unstable, with near continual gradation and reworking due to accelerated sea level rise. Often, inland archaeological sites from this period are masked by deep aggraded deposits of alluvium. The small fraction of isolated finds representing this period are likely “dislodged” by a multitude of natural and unnatural disturbances.¹⁰⁴ The natural effects of chronological shingling may also add to the representation bias of finds recovered from shorelines and streambeds. By 6,000 BP, sea level rise had steadied inundating drainage systems and presently continues to rise approximately 0.36m/100 years.¹⁰⁵

Submerged palaeoshores and ancient channels have been mapped at Lake Banook which indicate significant water fluctuations in the Dartmouth Lakes throughout the postglacial period.¹⁰⁶ This stable rise resulted in the formation of a well-defined palaeoshoreline at approximately -23 m within the inner reaches of Halifax Harbour.¹⁰⁷ The last remaining lake in the Harbour, Lake Bedford, transitioned from freshwater to marine as the waters

⁹⁹ Shaw et al. 2002a, 1867.

¹⁰⁰ Shaw et al. 1993, 223.

¹⁰¹ Fader and Miller 2008.

¹⁰² National Resources Canada 2010.

¹⁰³ Murphy 1998, 93.

¹⁰⁴ Murphy 1998, 93.

¹⁰⁵ Baechler 2017, 394.

¹⁰⁶ Webster et al. 2015.

¹⁰⁷ National Resources Canada 2010.

raised over the shallow sill at The Narrows around 5,700 BP.¹⁰⁸ Consequently by 5,000 to 4,000 BP, the lake and river systems in Nova Scotia largely stabilized in their current configurations coinciding with the latter half of the Late Archaic Period.¹⁰⁹ By 3,000 BP, the Halifax Harbour had resembled current conditions with the shoreline residing less than 5m from modern levels.¹¹⁰

The general location of Woodland to Historic period occupation sites along the river systems and coastlines of Nova Scotia are largely predictable owing, in part, to river stabilization and the characteristic slow predictable sea level rise of this period. Yet, the increasing pace of mid-20th century sea level rise has left near coastal sites from this period vulnerable to rapid erosion and loss. Sea level rise combined with increasing storm severity will undoubtedly affect upstream watercourse alignments and sediment depositions, especially in low lying areas, in the years to come. The upper limits of SLR projections are estimated at 1.3m over the next 100 years.¹¹¹ This process has submerged known L'nuk cultural resources first recorded in the early 20th century and has undoubtedly caused the erosion of numerous unknown sites along coastlines and river systems within recent memory.

Understanding the geomorphological changes of shorelines and individual river systems is paramount in the prediction of L'nuk cultural resource potential due to the strong connections between Mi'kmaw, waterways, and bodies of water.¹¹² Yet, modeling landscape change and its subsequent landscape usage is a challenge that is often limited to the amount of prior localized geological and archaeological research. Historic alterations can further complicate these interpretations. However, the use of ground-truthed archaeological potential buffers can be used to statistically highlight areas to inform interpretations in the field for archaeological potential when previous research is unavailable. Following the model required to be used for archaeological consulting by New Brunswick Archaeological Services (developed from the Sevogle River Test Plot),¹¹³ a 50-metre high and an 80-metre moderate L'nuk archaeological potential buffer was created for the watercourses and shorelines recorded near the study area (Figure 4-14).

A cross examination of the 15 sites attributed to L'nuk occupation recorded within 15 kilometres of the study area reveals that 13 sites lie within these predictive watercourse activity buffers (or within a 10 meters grace given for pre-GPS coordinate recording errors) for an accuracy of 87%. It is important to note that many of these sites were recorded before the implementation of handheld GPS and their locations rely on human transcription, and therefore may not be exact. Site locations are recorded within the MARI database as a single coordinate; therefore, recorded site locations are reflective of

¹⁰⁸ Fader and Miller 2008.

¹⁰⁹ Shaw et al. 2002b, 143.

¹¹⁰ Fader and Miller 2008.

¹¹¹ Forbes et al. 2009.

¹¹² Thwaites 1896; Cook 2007, xxiii.

¹¹³ Archaeological Services 2012.

overall mobility trends rather than site extents. It should also be noted that sites recorded within urban HRM that lie well outside potential buffers may be related to the alteration of ancient watercourses as well as non-watercourse related movement.

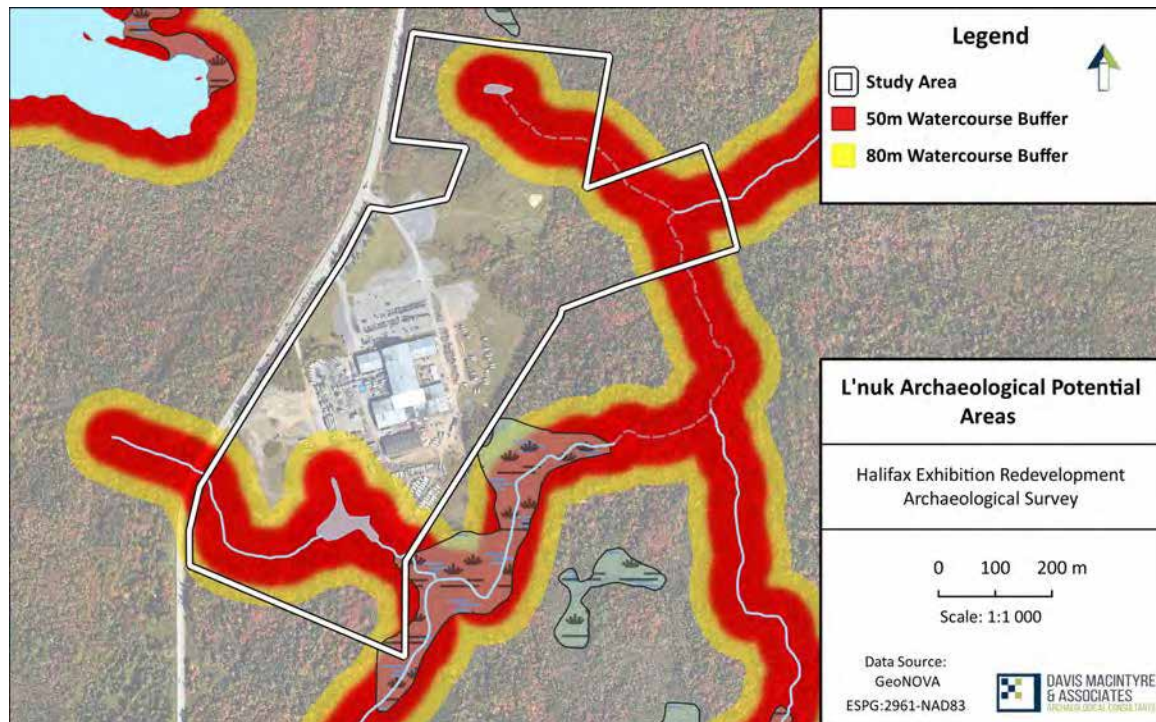


Figure 4-14: The study area with watercourses and L'nuk archaeological potential buffers.

4.4 Field Reconnaissance

A reconnaissance was conducted on 28 August 2023 under warm and sunny conditions (Figure 4-15, Figure 4-16). The majority of the study area is currently developed or has been previously extensively impacted, with the exception of a few areas on the north and south edges of the study area. Prior to the reconnaissance potential LiDAR anomalies were flagged for examination in the field. However, none of the potential anomalies were archaeological in origin and instead, were related to natural activity (tree falls, large boulders) or modern cultural activity (skidder trails, borrow pits, etc).

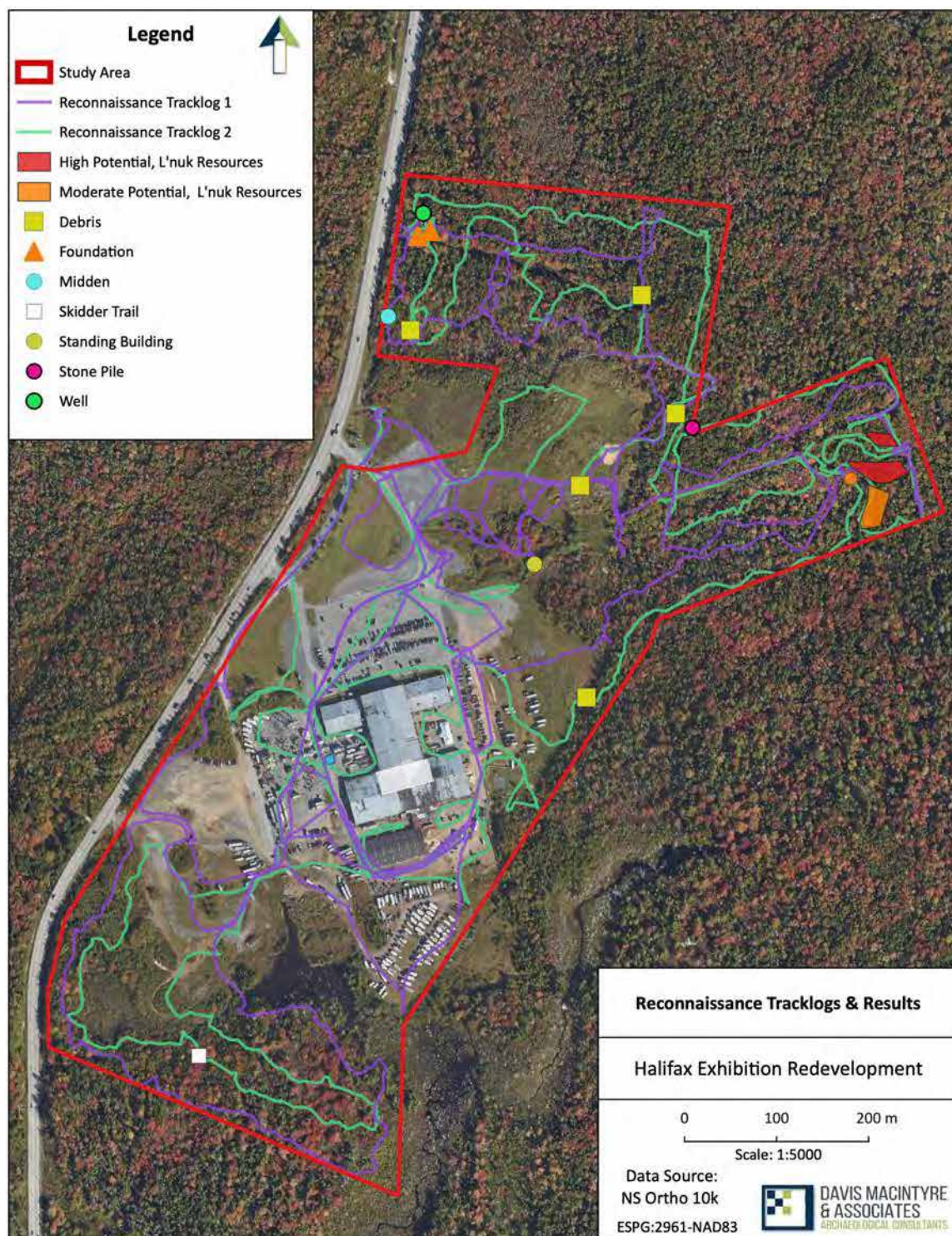


Figure 4-15: Tracklogs, points of interest, and areas of elevated potential identified during the 2023 reconnaissance, on 2017 satellite footage.

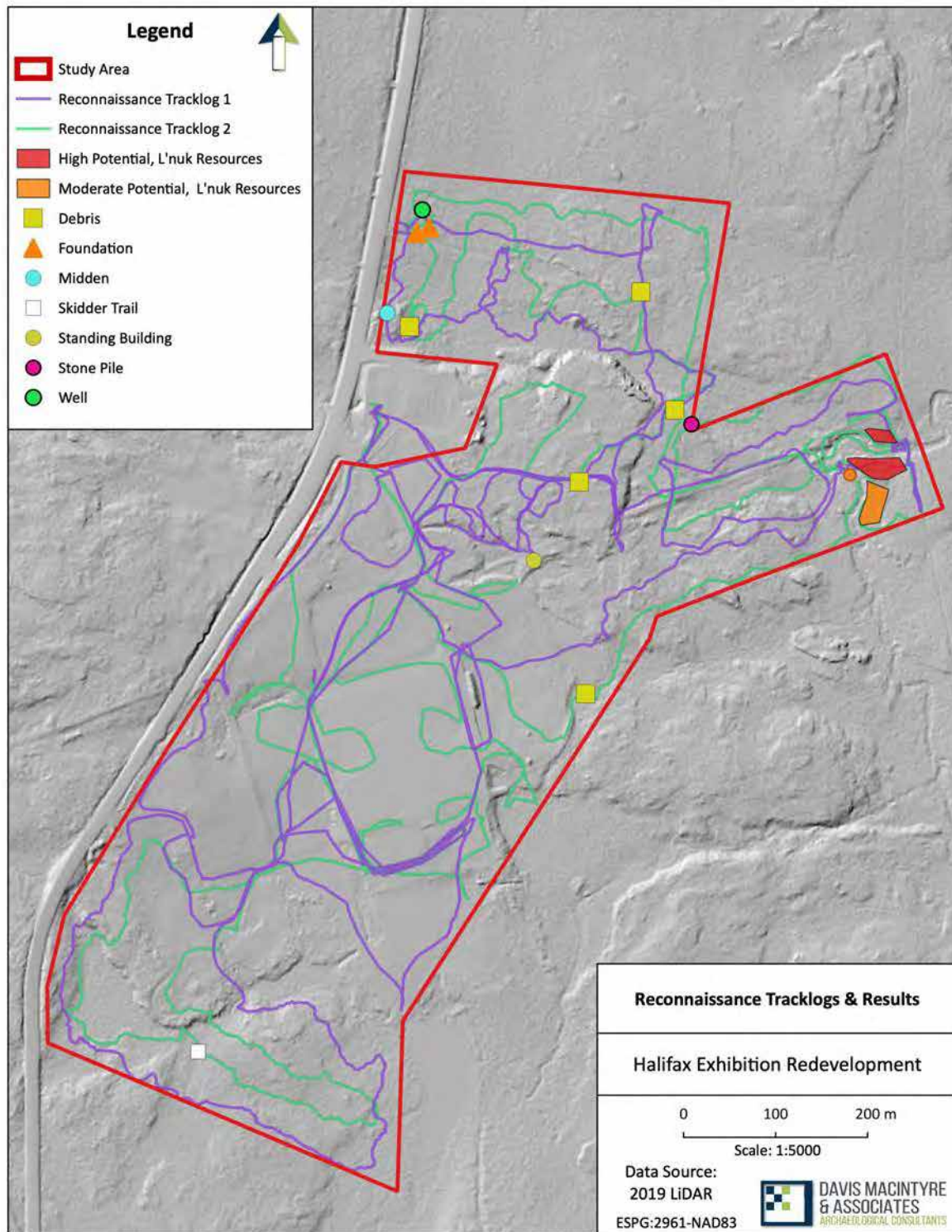


Figure 4-16: Tracklogs, points of interest, and areas of elevated potential identified during the 2023 reconnaissance, on 2019 LiDAR data.

In the north end of the study area, the terrain is forested but shows signs of disturbance in the 20th century. Debris and modern garbage were noted in several areas, along a road and pond that appear to have been constructed between 1973 and 1981, according to air photos. The pond contains unidentified metal items, possibly related to a water pipeline (Plate 1). The surrounding terrain is undulating, rocky, and wet, with patches of dense shrubs like rhodora and Labrador tea (Plate 2), as well as areas with moss or fern understory (Plate 3). The trees are semi-mature to mature mixed wood and show signs of past logging. Large blowdown is also present along the edges of more open wetland areas (Plate 4).

Along Prospect Road, numerous signs of past landscape use and disturbance were noted. These include significant infilling, as well as dense young clearcut regrowth, and mid-20th century historic features. A stone-lined well was noted, as was a concrete foundation, a stone foundation, a road, and a midden (Plate 5). Dense young regrowth is present along the edge of Prospect Road, making for poor visibility.



Plate 1: The pond with unidentified metal objects, constructed between 1973 and 1981, looking east.



Plate 2: Dense shrub understory in the north end of the study area, facing west.



Plate 3: More open and mature forest, with fern and moss understory in the north end of the study area, facing west.



Plate 4: Blow down around an area of more open wetland, looking west.



Plate 5: The concrete foundation (Foundation_01), looking north.

South of these features, the study area abuts a large area of ongoing and significant infilling. This infilling has created a large wetland, with standing water that was not walkable (Plate 6). Vegetation outside of the infilling consists of a mixture of young to semi-mature to mature trees, mainly spruce with some hardwood (Plate 7). The understory is mossy or dense shrub cover. In the infilled area, ongoing infilling has not yet had a chance to revegetate. In older infilled areas, vegetation varies between tall grass fields and dense pockets of Japanese knotweed (Plate 8). Some infilled areas are forested, suggesting a long pattern of infilling on the property (Plate 9).



Plate 6: The large area of wetland along the edge of the extensive and ongoing infilling, looking east.



Plate 7: Large concrete blocks along the edge of the re-vegetating infilled slope, looking south.



Plate 8: Tall grass, goldenrod, and clumps of Japanese knotweed growing on top of an extensive area of fill.



Plate 9: A mature tree growing on top of a pile of fill, including concrete blocks, looking west.

The northeast corner of the study area consists of a less impacted and more forested landscape. Extensive disturbance is present along the edge of this forested area, and the landscape is bisected by a built-up gravel trail, the remains of the water pipeline built between 1931 and 1947, that connects the Halifax Exhibition parking lot to the Long Lake Pipeline Trail (Plate 10). Near the edge of extensive past infilling, the terrain is low and wet, characterized by spruce, moss, ferns and standing water and wetland (Plate 11). A culvert and stone-lined ditch drain into the Beaver Dam Brook along the side of the connector trail (Plate 12). Signs of recent erosion and wash out of soils were noted surrounding the connector trail, which is generally built up by 1 to 2m from the surrounding terrain. North of the connector trail, the landscape is forested with higher sloped terrain surrounding low wetland. Signs of logging were noted closer to the Halifax Exhibition Centre, as were signs of modern garbage.



Plate 10: Gravel trail/20th century water pipeline that connects to the Long Lake Pipeline Trail, looking northeast.



Plate 11: Area of wetland, with standing water, in the northeast branch of the study area.



Plate 12: A stone-lined ditch leading from a culvert to the brook, along the gravel trail (right), facing southwest.

Towards the northeast, the terrain becomes higher and drier near where Beaver Dam Brook crosses the study area. This watercourse is non-navigable but was fast flowing at the time of the reconnaissance (Plate 13). The watercourse connects to Long Lake in approximately 500 meters. While not navigable, this watercourse would provide ample freshwater and several high and dry terraces along the banks of the brook were evaluated to be of elevated potential for L'nuk archaeological resources (HP_01, HP_02, MP_01, MP_02; see Section 5.0). In other areas, particularly lower areas, signs of scouring were observed, suggesting these lower areas are prone to flooding (Plate 14). Numerous boulders and glacial erratics dot the landscape. The vegetation in these areas is semi-mature to mature mixed wood forest. Dry channels from past alignments of the brook were also noted.

The Pipeline Trail crosses the Beaver Dam Brook near the edge of the study area and is located along the historic water pipeline constructed in 1867/68. A bridge or other structure may have been present at one time but appears to have since washed out. Several pieces of unidentified metal were observed within the brook itself, likely part of the pipeline infrastructure, while cut granite blocks are also observable in the streambed (Plate 15). A possible stone abutment was also noted in the bank on the south side (Plate 16). Erosional faces along the watercourse revealed a sandy gravel, likely roadbed or pipeline construction materials.



Plate 13: Beaver Dam Brook, a fast-flowing, non-navigable watercourse, looking north.



Plate 14: Scouring and sand deposited along the lower banks of the brook, looking north.



Plate 15: Cut granite blocks (blue) and unidentified metal (yellow) in the brook at the Pipeline Trail crossing, looking north.



Plate 16: A possible stone abutment or stone lining the brook on the south bank, looking south.

The center portion of the study area is the largest, characterized by extensive past disturbance, including infilling, standing buildings, and parking lots, along with associated utilities. Fire hydrants, manholes, propane tanks, and power poles are located around the existing buildings of the Halifax Exhibition Centre (Plate 17, Plate 18, Plate 19). Numerous areas show signs of recent and significant erosion, particularly around manholes. Surrounding the center is a large parking lot to the north and west. Between the parking lot and Prospect Road is a tall grass field and paved road, which all appear to have been extensively disturbed and infilled. Two show homes are present in this area, one located on a grass covered area with a sidewalk, curb, and paved roadway, the other located in a gravel parking lot (Plate 20, Plate 21). To the west of the Halifax Exhibition Centre is a fenced in racetrack and large parking lots (Plate 22, Plate 23).

East of the Halifax Exhibition Centre is a large gravel parking lot and grass covered infilled area (Plate 24). Surrounding this area is a steep slope of infilling down to wetter forested terrain (Plate 25), and a small standing building on a concrete foundation, which appears to be abandoned (Plate 26).



Plate 17: An existing stormwater drain and line in the parking lot in front of the Halifax Exhibition Centre, looking northeast.



Plate 18: A fire hydrant, power poles, and eroding manholes/storm drains, looking south.



Plate 19: Propane tanks (enclosed in fencing to the right) and propane shut off switches on the building (yellow on left side), looking northwest.



Plate 20: The driveway into the property from Prospect Road, with a show home in place on a grass covered infilled area.



Plate 21: The large gravel-covered infilled parking lot to the north of the Halifax Exhibition Centre, with a show home or trailer present, looking east.



Plate 22: The racetrack located to the west of the Halifax Exhibition Centre, looking east.



Plate 23: A large parking lot between the racetrack (left) and the Halifax Exhibition Centre (right), looking north.



Plate 24: An area of rock fill and vegetation-covered construction debris fill, including bricks and large blocks of ironstone, looking east.



Plate 25: The edge of rock fill, onto a low wet spruce forest, looking south.



Plate 26: A small, potentially abandoned building with a concrete foundation in the woods to the east of the Halifax Exhibition Centre.

South of the Halifax Exhibition Centre complex is a gravel driveway and a large grass-covered infilled area (Plate 27). In general, infill appears to consist of construction debris, including rock, brick, and wood, as well as large rock fill. Most of the infilled areas are covered in tall grass, goldenrod, and bushes, which makes visibility of the uneven and rocky surface difficult and walk through the area challenging (Plate 28). Large blocks of concrete and large boulder fill are present, particularly in the south end (Plate 29).

The very south end of the study area consists of a small strip of forested terrain and wetland that abuts the significant area of infilling and disturbance. The forested terrain consists of a steep slope near Prospect Road which runs down to a large wetland. The wetland may have been at least partially created by the extensive infilling to the north (Plate 30, Plate 31). A large pond is present along the edge of the filling, which appears to be man-made, as it is not present on any 20th century air photos (Plate 32). A recent skidder trail is also present through this area. In general, the tree cover is young to semi-mature trees, with cut stumps indicating past logging activity in the area (Plate 33). In the southeast corner, a large bog is present, surrounded by low, wet terrain with dense shrub cover (Plate 34).



Plate 27: A gravel road leading from the gravel driveway at the south end (back) of the Halifax Exhibition complex. Note the large rock and concrete fill visible under the eroding gravel, looking north.



Plate 28: A large grass- and goldenrod-covered infilled field, looking south.



Plate 29: Large concrete block fill, with dense vegetation and goldenrod covering the fill, looking southeast.



Plate 30: The steep and rocky edge of the infilling in the south end, with a wetland and drainage watercourse running along the base of the fill, looking north.



Plate 31: Part of the large wetland area in the south end of the study area, looking east.



Plate 32: A large pond of standing water in the south end of the study area.



Plate 33: A recent skidder trail, with standing water visible in the tracks, looking east.



Plate 34: The edge of a large bog in the southeast corner of the study area, looking southeast.

5.0 RESOURCE INVENTORY

Four historic features were identified during the reconnaissance. Foundation_01, a concrete, L-shaped foundation, measures approximately 6m by 5m. The walls of the foundation are approximately 1m tall, although most sections have collapsed (Plate 35). A road or driveway is present to the south of the foundation and leading southeast into the study area. Nearby, approximately 10m away is a shallow depression (less than 50cm), approximately 7m by 10m, that appears to be lined in sporadic dry stone (Plate 36). Foundation_02 has less clear feature definition and is a possible foundation. A large metal drum and large metal tank, possibly for water or septic, have been dumped into the shallow depression (Plate 37). Two small concrete filled metal bases (possibly for signs or fence posts) were noted to the north of Foundation_01 (Plate 38). To the north of Foundation_01 is a stone lined, uncovered well (Plate 39). Approximately 100m south of Foundation_01 is a midden in the toe of slope of Prospect Road (Plate 40). This midden consists of metal cans, as well as 20th century ceramics.

Air photos suggest that most of these features are related to mid-20th century activity. None of the features are visible in 1931, although this area is generally open and may be a field. Between 1931 and 1947, buildings have been constructed in this area, likely Foundation_01 and possible Foundation_02. The midden likely also dates to the mid-20th century. By 1973, the features appear to be abandoned and by 1981, a new road has been constructed through the area and in towards a newly constructed pond approximately 115m from Foundation_01. The date and age of the well is less clear from air photos. Given that the area appears to be old field in 1931, the well may be related to earlier historic activity or may be related to Foundation_01 and Foundation_02.

HP-01 was assigned to a section of the east bank of the brook, encompassing a hilltop located above the brook and a higher terrace. The area is forested in mature trees, with a mossy understory. It is approximately 50m by 20m (Plate 41). HP-02 was assigned to a higher terrace on the north/west side of the brook. This area contains mature trees and while there are signs of some recent scouring, this seems to be due to recent extreme flooding and footpaths through the area. It is approximately 30m by 10m (Plate 42). Two areas of moderate potential were also noted. MP-01 was assigned to a small 5m by 10m area that was slightly higher than the surrounding scoured bank (Plate 43). MP-02 was assigned to a large area south of HP-01, which was lower and wetter but with fewer signs of scouring. At least one old brook channel was noted in this area as well. It is approximately 45m by 20m (Plate 44).

Table 5-1: A list of cultural features and areas of archaeological potential identified during the 2023 reconnaissance. Greyed-out items have been evaluated to be of low archaeological significance and have no further recommendations.

Feature Name	Description	Date Range	Archaeological Significance or Potential	Recommendation
Foundation_01	L-shaped, partially concrete foundation	Constructed between 1931 and 1947 (according to air photos). Abandoned by 1973	Low Significance	No further recommendations
Foundation_02	A possible dry-stone lined depression/foundation	Constructed between 1931 and 1947 (according to air photos). Abandoned by 1973	Low Significance	No further recommendations
Well	Stone lined, abandoned.	Indeterminate	Indeterminate	Monitoring of ground disturbance with 30m of the feature
Midden	20 th century material, including cans.	Indeterminate	Indeterminate	No further recommendations
HP_01	50m by 20m	N/A	High Potential, L'nuk Resources	Shovel testing at 5m intervals if it will be impacted
HP_02	30m by 10m	N/A	High Potential, L'nuk Resources	Shovel testing at 5m intervals if it will be impacted
MP_01	5m by 10m	N/A	Moderate Potential, L'nuk Resources	Shovel testing at 5m intervals (due to size) if it will be impacted
MP_02	45m by 20m	N/a	Moderate Potential, L'nuk Resources	Shovel testing at 10m intervals if it will be impacted



Plate 35: The remaining standing walls of the concrete foundation of Foundation_01, looking east.



Plate 36: A shallow, rectangular depression lined by moss covered rocks, potentially a foundation (Foundation_02), looking east.



Plate 37: A large metal drum and square metal tank, within Foundation_02.



Plate 38: Two metal and concrete bases (yellow), possible for fencing or signs, looking east.



Plate 39: The stone-lined well to the north of Foundation_01, north at top.



Plate 40: The 20th century midden located south of Foundation_01.



Plate 41: HP_01, looking northeast, with Beaver Dam Brook visible in the far left.



Plate 42: HP_02, on the far side of Beaver Dam Brook, looking northwest.



Plate 43: MP_01, a small area of slightly higher terrain, looking north.



Plate 44: The lower terrace, assigned as MP_02, located south of HP_01, facing north.

6.0 DISCUSSION

The Mi'kmaq and their ancestors have occupied the K'jipuktuk (Halifax) area since time immemorial with archaeological evidence dating back at least 7,000 years. Mi'kmaq occupation of the region continued into the historic period, even as the Town of Halifax was settled, and continues to this day. While much of the study area has been extensively infilled and impacted, the remaining areas are generally low and wet, or sloped. While some of the wetland appears to have been created by the disturbance and infilling in the center of the property, a review of air photos suggests that some of the wetlands likely pre-date the infilling, and that no significant watercourses were present in most of the study area. However, the northeast corner of the study area does contain a fast-moving, although non-navigable brook that connects Long Lake to the interior. This brook would have been a potential source of freshwater during hunting or resource gathering activities and four elevated potential areas were flagged along higher and drier terraces along the brook (Figure 6-1). Historic impact from the construction of a water pipeline in the late 1860s along this northeast edge is highly likely.

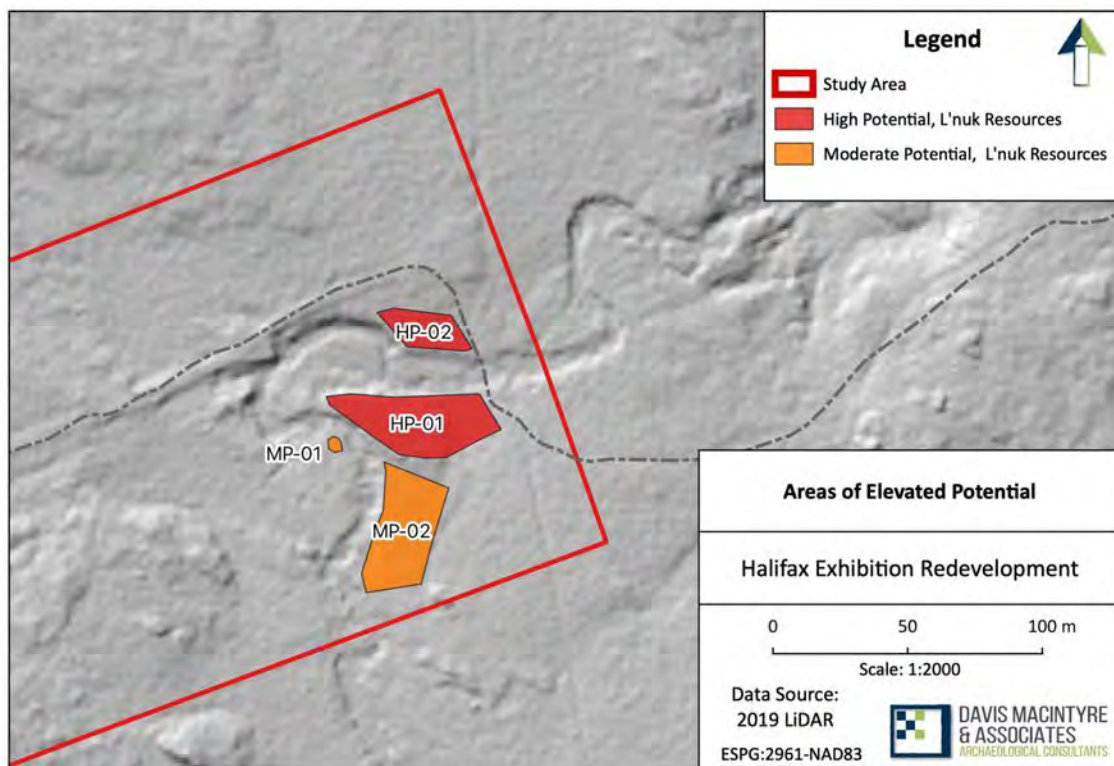


Figure 6-1: Areas of elevated potential in the northeast end of the study area identified during the 2023 reconnaissance.

Very little historic activity is documented within the study area. Maps suggest that there was little historic settlement within the study area itself until the early 20th century. Air photos similarly indicate roads and fields but no clear signs of houses or structures in 1931.

Between 1931 and 1947, new activity is visible in the northwest corner of the study area, where several features were identified during the reconnaissance (Figure 6-2). These two foundations, as well as the midden have been evaluated to have low archaeological significance as they likely date between 1931 and 1947 and appear to have been abandoned by 1973. It is less clear whether the well is contemporaneous with the foundations or whether it relates to earlier historic activity.

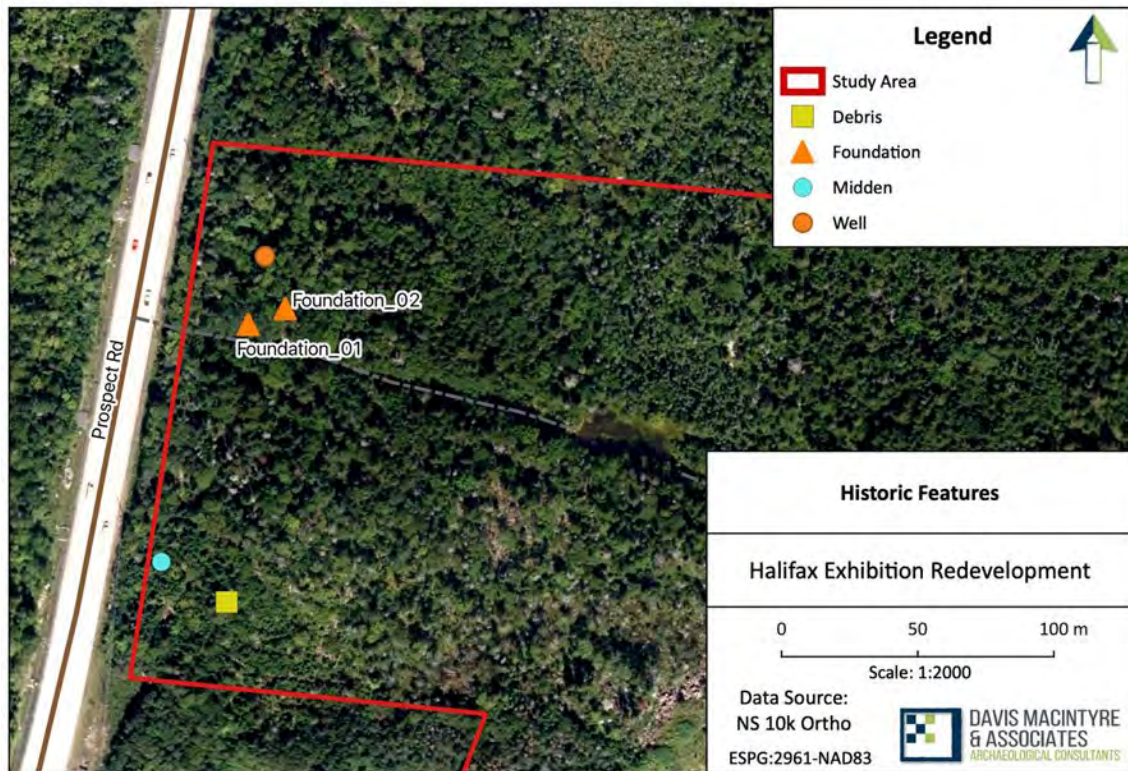


Figure 6-2: Historic and 20th century features identified during the 2023 reconnaissance in the northwest corner of the study area.

An extensive history of 20th and 21st century infilling, disturbance, and development characterizes the majority of the study area, beginning at least as early as the mid-19th century, when a water pipeline was constructed along the east side of the study area in 1867 and 1868. An additional water pipeline was constructed through the center of the study area between 1931 and 1947. Infilling and impact continued within the study area throughout the 20th century and into the 21st century. Fill appears to include construction debris and infilling has been ongoing for decades, completely obscuring the original ground surface. However, given that the desktop study suggests that most of the study area is of low potential for historic and L'nuk archaeological resources, and the impact that infilling would have had on the original terrain, these disturbed areas have been evaluated to have low potential for intact archaeological resources.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this assessment, the archaeological potential within the study area has been evaluated to be low, in general. Four areas of elevated potential for L'nuk archaeological resources were observed in the northeast end of the study area and several mid-20th century features were recorded in the northwest corner of the study area, as was a well of indeterminate age. Avoidance is the preferred method of mitigation. However, the mid-20th century features have been evaluated to be of low archaeological significance and therefore, there are no further recommendations for these features.

As the age of the well is unclear and it could pre-date the mid-20th century features, it is recommended that monitoring of any ground disturbance is conducted within 30m of the well.

For the four areas of elevated potential, it is recommended that should they be anticipated to be impacted, the areas should first be subjected to shovel testing to determine the presence/absence of archaeological resources and provide recommendations for mitigation, if necessary.

The remainder of the study area has been evaluated to be of low archaeological potential and there are no further recommendations for these areas. Should development plans change, then a qualified archaeologist should be contracted to conduct an additional assessment on any new areas outside the project boundaries identified in this report.

In the unlikely event that any archaeological resources are encountered during ground disturbance and an archaeologist is not already on site, it is required that all activity cease and the Coordinator of Special Places (902-229-3159) be contacted immediately regarding a suitable method of mitigation.

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Appendix A: Heritage Research Permit



Heritage Research Permit (Archaeology)

Special Places Protection Act 1989

(Original becomes Permit when approved by
Communities, Culture and Heritage)

Office Use Only
Permit Number:

A2023NS137

<i>Greyed out fields will be made publicly available. Please choose your project name accordingly</i>	
Surname Crowell	First Name Travis
Project Name Halifax Exhibition Redevelopment	
Name of Organization Davis MacIntyre & Associates Limited	
Representing (if applicable)	
Permit Start Date 11 July 2023	Permit End Date 31 December 2023
General Location: Halifax Exhibition, 200 Prospect Rd, Halifax Regional Municipality	
Specific Location: (cite Borden numbers and UTM designations where appropriate and as described separately in accordance with the attached Project Description. Please refer to the appropriate Archaeological Heritage Research Permit Guidelines for the appropriate Project Description format) 20T 447178.58 m E 4940573.64 m N	
Permit Category: Please choose one ☐ Category A – Archaeological Reconnaissance ☐ Category B – Archaeological Research ☒ Category C – Archaeological Resource Impact Assessment ☒ I certify that I am familiar with the provisions of the <i>Special Places Protection Act</i> of Nova Scotia and that I have read, understand and will abide by the terms and conditions listed in the Heritage Research Permit Guidelines for the above noted category.	
Signature of applicant 	Date 27 June 2023
Approved by Executive Director 	Date 7/6/23

