



# Conceptual Restoration Plan

551 Avonhead Road  
Mississauga, Ontario

JANUARY 2022



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Mississauga, Ontario

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## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>3</b>
1.1	RESTORATION GOAL AND OBJECTIVES .....	4
<b>2.0</b>	<b>EXISTING CONDITIONS .....</b>	<b>5</b>
2.1	LANDSCAPE SETTING .....	5
2.2	PHYSICAL SETTING .....	5
2.3	BIOLOGICAL SETTING .....	5
2.3.1	Ecological Land Classification and Botanical Inventory .....	6
2.3.2	Wildlife Species and Habitats .....	8
2.3.3	Headwater Drainage Feature .....	9
2.4	VEGETATION AND WILDLIFE HABITAT PROPOSED FOR REMOVAL .....	10
2.4.1	Vegetation Communities Proposed for Removal .....	10
2.4.2	Wildlife Habitat Proposed for Removal .....	11
<b>3.0</b>	<b>TARGETED RESTORATION DESIGN .....</b>	<b>12</b>
3.1	TARGET VEGETATION COMMUNITIES .....	12
3.1.1	Native Thicket Community .....	13
3.1.2	Native Meadow Community .....	14
3.1.3	Native Migratory Supporting Boulevard Tree Plantings .....	15
3.2	TARGET WILDLIFE HABITAT .....	15
3.2.1	Barn Swallow RHS Location .....	16
3.2.2	Migratory Land Bird Stop Over Area .....	16
3.2.3	Migratory Butterfly Stop Over Area .....	16

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3.3	ENHANCED NATIVE BIOSWALE DESIGN .....	17
3.3.1	Enhanced Native Bioswale and Associated Wetland Pockets .....	17
<b>4.0</b>	<b>CONCEPTUAL RESTORATION DESIGN.....</b>	<b>18</b>
4.1	NATIVE MIGRATORY BIRD THICKET HABITAT COMMUNITY DESIGN .....	18
4.1.1	Recommended Thicket Species Selection .....	19
4.2	NATIVE MIGRATORY MEADOW HABITAT COMMUNITY DESIGN .....	20
4.2.1	Recommended Meadow Species Selection .....	20
4.3	NATIVE BOULEVARD TREE SPECIES SELECTION.....	21
4.3.1	Recommended Boulevard Species Selection.....	22
4.4	ENHANCED BIOSWALE SPECIES SELECTION.....	22
4.4.1	Recommended Bioswale Species Selection .....	22
4.5	COVER CROP .....	23
<b>5.0</b>	<b>INVASIVE MANAGEMENT .....</b>	<b>24</b>
<b>6.0</b>	<b>MONITORING PLAN AND ADAPTIVE MANAGEMENT STRATEGY.....</b>	<b>24</b>
6.1	CONSTRUCTION MONITORING .....	24
6.2	PERFORMANCE MONITORING .....	25
6.2.1	Vegetation.....	25
6.2.2	Invasive Species.....	25
6.2.3	Fauna.....	25
6.3	ADAPTIVE MANAGEMENT.....	26
<b>7.0</b>	<b>CONCLUSIONS .....</b>	<b>26</b>
	<b>REFERENCES AND BACKGROUND MATERIALS.....</b>	<b>28</b>
	<b>APPENDICES .....</b>	<b>29</b>

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## 1.0 INTRODUCTION

GEI was contracted by Cartera Management Inc. (Cartera) to prepare a Conceptual Restoration Plan for their 551 Avonhead Road property in Mississauga, Ontario (herein referred to as the Subject Lands). The location of the Subject Lands and the associated development are depicted on **Figure 1 (Appendix D1)**. As part of the planning application for industrial development on the Subject Lands, GEI previously prepared an Environmental Impact Study (EIS) for the 551 Avonhead property, submitted in June 2021. An updated EIS has been prepared, and this Conceptual Restoration Plan is an Appendix to the revised EIS. GEI identified the opportunity for ecological restoration to mitigate for removal of significant thicket and meadow natural heritage features where two single story industrial buildings with associated docking and parking areas are proposed. As shown on **Figure 2 (Appendix D1)**, the proposed development will occupy the majority of the Subject Lands.

The proposed draft plan requires the removal of 2.90 ha of significant thicket and meadow communities. Compensation will be completed at just under the 1:1 ratio, with the creation of 2.81 ha of suitable habitat. As 2.66 ha of this habitat removal area consists of Common Buckthorn Thicket, of which the removal will benefit the landscape through the control and subsequent management of the Common Buckthorn and its dispersal. However, the natural features proposed for removal and compensation have been identified as Migratory Landbird Significant Wildlife Habitat (SWH) and Migratory Butterfly SWH through their proximity to Lake Ontario despite this invasive presence based on discussions with the Credit Valley Conservation Authority (CVC). The Conceptual Restoration Design targets the creation of native vegetation communities and plant species that support migratory bird and butterfly species. The Conceptual Restoration Plan also includes an enhanced bioswale to maintain the flow conveyance functions of the H1S1 Headwater Drainage Feature (HDF) into the restoration area to ensure the Subject Lands does not negatively impact downstream fish communities.

This Conceptual Restoration Plan:

- Characterizes the natural heritage features proposed for removal:
  - 2.66 ha of Cultural Buckthorn Thicket (CUT1-7) and 0.24 ha of Cultural Meadow (CUM1-1) communities associated with the H1S1 HDF;
  - 2.90 of Migratory Landbird and Migratory Butterfly SWH (habitat associated with the CUT1-7 and CUM1-1 communities discussed above);
  - Barn Swallow nesting habitat (within the existing buildings present in the DIST community);

- Provides restoration design goals, objectives and targets (i.e., vegetation type) for natural heritage feature compensation and conceptual design;
- Indicates location for natural heritage feature compensation; and
- Includes preliminary targeted plant lists and their estimated spacing.

The sections below provide an overview of the objectives of the restoration design; define target vegetation community types; outline habitat design elements; and outlines the ecological monitoring plan and triggers for adaptive management.

At the detailed design stage, detailed planting plans will be developed along with a corresponding Design Brief that will provide specific details for each restoration area, including: finalized plant species lists, recommended planting standards, proposed plant stock type and sizing, and planting timing considerations. The necessary hydrological information for the final design of the realigned H1S1 through an enhanced bioswale and associated wetland communities will also be provided at this stage, to ensure the plant species selected are confirmed to suit the actual conditions of the design. Plantings will be selected to establish a suitable restoration trajectory towards the intended target vegetation communities as described in **Section 3**.

## 1.1 Restoration Goal and Objectives

The restoration goal is to establish self-sustaining native thicket and meadow communities.

Ecological restoration objectives for the Compensation Plan include:

- Maintain and improve the existing migratory bird habitat present on the Subject Lands, with a target of keeping the same baseline migratory bird numbers observed or increasing them by providing enhanced habitat;
- Sustain and enhance the existing migratory butterfly habitat present on the Subject Lands by providing roosting and nectaring habitat into the design with a focus on pollinator supporting vegetation to attract / support local insect populations (e.g., Monarch);
- Replicate nesting habitat and provide improved foraging habitat for Barn Swallow;
- Replicate on-site flow and outlet flows to maintain feature functions with an enhanced bioswale and associated wetland pockets;
- Increase overall native plant species diversity that will improve structural diversity, floral diversity, support a variety of native fauna species and provide community resiliency over the long-term;
- Eradicate the existing invasive present on the Subject Lands to prevent the continuation of the rapid spread of invasive species within and adjacent to the Subject Lands with the implementation of diverse and healthy communities and invasive species management; and
- Derive planting stock from locally propagated species (Seed Zone 34), where available.

## **2.0 EXISTING CONDITIONS**

The existing conditions present on site consist of cultural influenced vegetation communities that support migratory habitat for songbirds and butterflies due to their proximity to Lake Ontario. As the communities are degraded and have been invaded by invasive species, there is an opportunity for enhancement to increase the amount of useable habitat and it's resiliency.

Should any further details be required to support the existing conditions described below, the methodologies and results for the baseline ecological inventories can be found within the EIS and associated Appendices (Appendix A and B).

### **2.1 Landscape Setting**

The Subject Lands are generally bound by Avonhead Road to the west, industrial complexes and Lake Ontario to the south, disturbed open areas and significant woodlands and industrial lands to the north, as well as further industrial lands to the east. The Subject Lands are located approximately 800 m north of Lake Ontario within the Lakeside Creek sub-watershed. No natural vegetation, such as forest, is present on or remains on the Subject Lands and all communities are cultural and anthropogenic in nature, consisting of a large percentage (52%) of exotic and invasive species.

### **2.2 Physical Setting**

The Subject Lands are located within the Lake Iroquois Plain physiographic region, where subsoils consist of sand and silty sand (EXP 2020a). The City of Mississauga Natural Areas Survey Update (NAS; 2019) noted that the bedrock in this area is comprised of grey shales of the Georgian Bay formation overlain with soils and glacial deposits. Geotechnical investigations completed in 2020 found that the Subject Lands generally consists of a surficial layer of topsoil and/or concrete, underlain with fill, silty sand, silt till, clayey silt till, and shale bedrock.

### **2.3 Biological Setting**

From a landscape perspective, the Subject Lands are located in the Lakeside Creek subwatershed. The Subject Lands are situated within 800 m of Lake Ontario, at the southwest corner of the City of Mississauga. They are located north of a wastewater facility, and south of regenerated natural areas historically used for livestock grazing. On the east and west the Subject Lands are bordered by industrial facilities. During the limited periods when the H1S1 was observed to be flowing, the drainage would flow southward through the wastewater facility in the direction of Lake Ontario, and this feature is partially piped south to the lake.

### 2.3.1 Ecological Land Classification and Botanical Inventory

The entire Subject Lands are covered by anthropogenic, cultural ELC types, ranging from open meadows to various thicket types (**Figure 1, Appendix D1**). In addition to the absence of natural plant cover, all the communities include varying amounts of invasive plant species, with one thicket type dominated entirely by the highly invasive Common Buckthorn (*Rhamnus cathartica*). Each community is described below.

**CUM1-1:** Fresh-Moist Old Field Meadow is found as patchwork communities between shrubs and in one larger separate unit in the southern portion of the Subject Lands. Main species are Kentucky Bluegrass, Tall Goldenrod, Smooth Brome (*Bromus inermis*), Canada Thistle (*Cirsium arvense*), Common Bedstraw (*Galium aparine*) and Greater Burdock (*Arctium lappa*). In general, these communities are characterized by non-native species that provide limited habitat for wildlife.

**CUT1-1:** Sumac Cultural Thicket is found in two locations within the Subject Lands. It is a tall thicket community dominated by Staghorn Sumac (*Rhus typhina*). Common Buckthorn is present throughout with occasional to abundant presence, young Black Walnut (*Juglans nigra*) and White Elm (*Ulmus americana*) trees are also scattered across the community. Ground cover composed of Garlic Mustard (*Alliaria petiolata*), Tall Goldenrod (*Solidago altissima*), Yellow Avens (*Geum aleppicum*), Kentucky Bluegrass (*Poa pratensis*) and Tufted Vetch (*Vicia cracca*). This community contains several species that are native and likely provide suitable habitat for migrating bird and butterfly species. However, as the community is being invaded by Common Buckthorn and the groundcover is increasingly being taken over by Garlic Mustard, the native diversity is decreasing and impacting the quality of habitat the community provides.

**CUT1-4:** Grey Dogwood Cultural Thicket is found in one area within the Subject Lands. It consists of a moist tall thicket with old field meadow cover between shrub clusters. Dominated by Grey Dogwood (*Cornus foemina*), followed by Red-osier Dogwood (*C. stolonifera*), Common Buckthorn and Tartarian Honeysuckle (*Lonicera tatarica*). Occasional presence of Nannyberry (*Viburnum lentago*) and Red Raspberry (*Rubus idaeus*). In the ground cover grow Garlic Mustard, Tall Goldenrod, Wild Carrot (*Daucus carota*), Tufted Vetch, Dandelion (*Tarxacum officinale*) and Teasel (*Dipsacus fullonum*). This community contains several species that are native and likely provide suitable habitat for migrating bird and butterfly species, however, the presence of Common Buckthorn and Garlic Mustard may lead to the quality of this habitat lessening over time.

**CUT1-7:** Common Buckthorn Cultural Thicket is the largest thicket community present within the Subject Lands. It consists of a moist and dense thicket community, almost exclusively dominated by Common Buckthorn, including an abundant ground cover of Common Buckthorn seedlings. Occasional presence of trees that emerge above the 4-6 m tall shrub layer: White Elm and Green Ash (*Fraxinus pennsylvanica*), many of which were observed to be dead. Canopy Cover observations collected during field investigations identified a canopy cover of less than 25%,

triggering the classification of cultural thicket. In general, this community is characterized almost exclusively by a Category 1 invasive species, leaving a community that provides limited suitable habitat for wildlife.

**MAM2-11:** The Common Reed Mineral Meadow Marsh is a small and degraded roadside wetland dominated by Common Reed (*Phragmites australis*). In general, this community is characterized almost exclusively by a Category 1 invasive species, leaving a feature that provides limited ecological value to the landscape.

### Invasive Species

As discussed above, the Subject Lands are composed of several cultural vegetation types in which highly invasive plant species are either dominant or co-dominant. Seven highly aggressive invasive species (Category 1) are present (Urban Forestry 2002) throughout the Subject Lands:

- Common Buckthorn (CUM1-1, CUT1-1, CUT1-4 and CUT1-7);
- Canada Thistle (CUM1-1);
- Dame's Rocket (CUM1-1)
- Garlic Mustard (CUT1-1, CUT1-4)
- Purple Loosestrife (MAM2-11)
- European Reed (MAM2-11)
- Tatarian Honeysuckle (CUT1-4)

There is evidence of soil dumping and soil compaction within the cultural vegetation communities present, especially within the old field meadow in the eastern half of the lands. There are no areas of native vegetation communities with completely native and natural plant cover remaining anywhere within the Subject Lands. Features such as the Common Buckthorn Cultural Thicket (CUT1-7) vegetation community, contains the highest density of invasive species, and the lowest abundance of native species. When features like this are left on a landscape they can become a source that continues the spread of invasive species across the landscape. Due to the minimal natural vegetation diversity that was observed throughout the site during the site investigation, the opportunity to considerably enhance the ecological functionality of the landscape is great.

### Rare Species

Two rare species were observed within the Subject Lands:

- Catchweed Bedstraw (*Galium aparine* – R4)
- Clammy Ground-cherry (*Physalis heterophylla* – R9)

At the detailed design stage these species will be assessed for their transplant potential and may be included within the native meadow planting area to conserve the species on the landscape.

## Butternut

One Butternut was observed along the northeastern corner of the Subject Lands in 2020 during the Tree Inventory. The individual was observed outside of the Subject Land boundaries, however the 50 m buffer is within the Subject Lands. Preliminary observations by a certified Butternut Health Assessor in April 2021, observed the Butternut to be non-retainable, however a full Butternut Health Assessment was not conducted as the tree is located off-property and not accessible, therefore this tree is considered retainable.

### **2.3.2 Wildlife Species and Habitats**

#### Barn Swallow Nesting Habitat

Barn Swallows were observed during 2020 breeding bird surveys foraging over the natural areas on the Subject Lands, as well as actively nesting within two structures on the Clean Harbors site.

#### Migratory Land Bird Stop Over Area

The Subject Lands do not meet the MNRF criteria for designation as Significant Wildlife Habitat for Migratory Land Bird SWH (MNRF 2015). However, the Subject Lands do meet the Peel-Caledon (2009) criteria for designation as the study does not include any species threshold numbers that would conclude the SWH type is not present. As the Subject Lands SWH are within 2 km of Lake Ontario and contain a portion of the contiguous habitat that totals 10 ha, the SWH thresholds are met. When looking at these thresholds specifically and including the adjacent lands, the Subject Lands contain a portion of the contiguous habitat. Upon discussion with CVC, the Common Buckthorn cultural thicket community and the two associated Cultural Meadow communities are considered SWH for Migratory Land Birds within the Subject Lands.

To better understand the migratory bird habitat use within the Subject Lands, five rounds of migratory land bird surveys were completed between March and May, 2021. A total of 71 species were recorded with an average of 112 migratory birds per day. The highest number of individuals, 242, were observed on April 29, 2021.

Specifically, the following songbirds were identified during the survey efforts: Brown Creeper, House Wren, Cedar Waxwing, American Goldfinch, Chipping Sparrow, White-throated Sparrow, Song Sparrow, Palm Warbler, Yellow-rumped Warbler, and Kinglet species. These species are a mix of frugivores, insectivores and granivores.

## Migratory Butterfly Stop Over Area

When considering both Subject Lands and adjacent lands (including all suitable meadow, thicket and woodland communities) for Significant Wildlife Habitat Criteria Schedule for Migratory Butterfly Stopover Habitat, habitat and size thresholds are met when contiguous habitat is taken into consideration. Upon discussion with CVC, the Common Buckthorn cultural thicket community and the two associated Cultural Meadow communities are considered SWH for Migratory Butterfly Stopover Area within the Subject Lands.

No targeted migratory butterfly surveys were conducted.

### **2.3.3 Headwater Drainage Feature**

One headwater drainage feature was identified within the Subject Lands and contained one reach segment (H1S1; **Figure 4, Appendix A**). The feature is located within the Common Buckthorn Cultural Thicket community and was primarily receiving drainage from the adjacent container storage area to the north. A potential seepage area was identified adjacent to the reach, however, flows from this feature were conveyed southeast, through the Common Buckthorn community. No surface connection to the reach was observed and areas of the reach adjacent to the seepage area were observed to be dry. Bed and bank substrates consisted of silty clay grain sizes. Evidence of bed erosion was identified within the entrenched feature. No fish habitat was identified within the feature.

The reach segment was classified as a swale feature type that contained standing water within its downstream extent during the spring and summer assessments. The downstream reach is connected to an off-site berm/Common Reed wetland. A 25 m length of the downstream reach contained standing water and appeared to primarily function as a backwater and water storage area for overflow from the connecting feature. The upstream extent of the H1S1 was observed to be dry during both survey rounds.

The dominant riparian vegetation was composed of the Common Buckthorn thicket community. Feature width was measured at 1.76 m with wetted width ranging from 0.64 m to 0.74 m. Wetted depth measurements ranged from 2 cm to 30 cm at the confluence with the downstream feature.

The resulting management recommendations for the reach, as depicted in **Figure 1 (Appendix A)**, along with the recommended management approaches for each management classification (from the HDFA Guidelines) is as follows: Mitigation (H1S1).

This feature is located within a non-native cultural thicket that provides migratory bird habitat (providing important terrestrial habitat) that can be replicated elsewhere. Flow contributions can

be mitigated through low infrastructure development (LID) infrastructure, such as a vegetated bioswale. Therefore, a final management recommendation of Mitigation has been provided to ensure appropriate mitigation of migratory bird habitat occurs and flows are maintained to downstream piped features (under the Clarkson Wastewater Treatment Plant).

## 2.4 Vegetation and Wildlife Habitat Proposed for Removal

### 2.4.1 Vegetation Communities Proposed for Removal

The proposed development will include the removal of the majority of vegetation communities within the Subject Lands. However, the only habitat proposed for compensation is the CUT1-7 and associated CUM1-1 pockets identified as SWH for Migratory Landbird and Migratory Butterfly Stopover Habitat. Table 1 below provides a summary of the compensation proposed.

**Table 1: Significant Vegetation Community and Habitat Removal Summary**

ELC	Total Area	Habitat Removed	Habitat Remaining
CUM1-1 (SWH)	0.24	0.24	0.00
CUT1-7 (SWH)	2.72	2.66	0.06
<b>TOTAL</b>	<b>2.96</b>	<b>2.90</b>	<b>0.06</b>

The proposed development will result in a total of 5.69 ha of identified SWH thicket and meadow community removals (**Figure 1, Appendix D1**). Of this, 2.90 ha is considered to be habitat requiring compensation efforts (as per discussions with the CVC), with 2.81 ha to be restored and enhanced (**Figure 2, Appendix D1**). This will leave 0.06 ha of the existing Common Buckthorn (CUT1-7) community remaining on the landscape. However, as the Common Buckthorn Thicket is completely dominated by a dense presence of established shrubs and a groundcover of their associated seedlings, this community acts as a seed source on the landscape. Any remaining habitat, such as the CUT1-1 in the northeastern corner of the Subject Lands, will require extensive invasive removals to protect the newly created 2.81 ha of habitat.

Common Buckthorn is considered one of the most rampant invasive plants in southern Ontario due to its ability to outcompete native flora, it is considered a benefit to the landscape to remove it. These habitats will be created and to compensate for the loss of habitat and enhanced to maintain and improve their ecological function on the landscape (**Figure 1, Appendix D1**).

### Tree Removals

A Tree Inventory and Preservation Plan (Appendix C) was completed for the Subject Lands. A total of 390 trees were inventoried, of these, 331 were identified as removal trees (including 201 dead trees). Removal trees are those that are located within the proposed construction footprint and cannot be preserved.

Trees inventoried within the Study Area are governed under the City of Mississauga Private Tree Protection By-law No. 254-12. Removals of 103 healthy trees under 50 cm DBH will require compensation at a 1:1 ratio. Removals of four healthy trees 50 cm DBH or greater will require compensation at a 2:1 ratio. Removals of a total of 23 trees in poor condition and/or Ash (*Fraxinus* sp.) trees do not require compensation. Accordingly, a total of 111 trees are required as compensation for tree removals. The opportunity for compensation through cash-in lieu may be reviewed with the City of Mississauga.

Compensation trees, if planted, shall be native to the CVC watershed. Coniferous replacement trees will be at least 1.8 m tall, and deciduous replacement trees will be at least 6 cm DBH (City of Mississauga 2019a).

## **2.4.2 Wildlife Habitat Proposed for Removal**

### Barn Swallow Nesting Habitat

The removal of these two structures is proposed in support of the development plan. A Notice of Activity Form (NAF) will be submitted to the MECP prior of removal of habitat from the landscape. Removals will occur in compliance with Ontario Regulation (O. Reg.) 242/08 section 23.5 outside of the active Barn Swallow season (beginning of May to end of August).

A Replacement Habitat Structure (RHS) with artificial nest cups will be constructed on the Subject Lands within 1 km of the original structures prior to the first spring after the structures have been removed. Barn Swallows returning in that spring may be temporarily displaced given that the barn will no longer be present but they are expected to find suitable nesting habitat nearby, including the proposed replacement structure. This RHS will be incorporated into the conceptual design in close proximity to suitable foraging habitat.

### Migratory Land Bird Stop Over Area

As discussed above, a total 5.69 ha of migratory bird habitat is present and proposed for removal within the Subject Lands, of which 2.81 ha will be compensated.

### Migratory Butterfly Stop Over Area

As discussed above, a total 5.69 ha of migratory butterfly habitat is present and proposed for removal within the Subject Lands, of which 2.81 ha will be compensated.

### 3.0 TARGETED RESTORATION DESIGN

The proposed restoration will include 2.81 ha of compensation habitat. This is considered to be a 1:1 compensation ratio of the central CUT1-7 and CUM1-1 communities, as the 2.81 ha will be used to create habitat that supports both of the targeted migratory types. It should be noted that although the two community types will not be compensated for at a 1:1 ratio (i.e., 2.55 ha of thicket habitat and 0.24 ha of meadow habitat), the communities being replaced are highly degraded and invasive dominated communities. The compensation efforts will be completed in four treatment areas:

- Native Migratory Bird Thicket Habitat and Planting Area (1.909 ha)
- Native Migratory Butterfly Meadow Habitat Planting Area (0.193 ha)
- Enhanced Bioswale (0.383 ha) and associated Wetland Pockets (0.059 ha)
- Native Migratory Supporting Boulevard Tree Plantings (0.263 ha)

#### 3.1 Target Vegetation Communities

The design process of restoring or creating ecosystems often depends on the use of native reference sites to inform restoration activities (Gann et al., 2019). Reference sites are defined as ecosystems that have experienced little to no human intervention or disturbance, and that are as close to historically natural as possible (Pollock et al., 2012). In the discipline of ecosystem restoration, reference sites are a vital tool for assessing current conditions and developing restoration goals for natural areas (Gann et al., 2019). They are used to inform scientists of the best management practices to lead to a healthy recovery of a degraded ecosystem, and they can also be used to assess whether current management practices are moving the restoration of a site in the direction of recovery (Pollock et al., 2012).

In order to be used as a reference site, proposed locations must have specific characteristics. To assist ecologists in identifying appropriate reference sites, The Society for Ecological Restoration (SER) has outlined six essential reference site attributes. These attributes include: 1) absence of threats, 2) suitable physical conditions, 3) appropriate species composition, 4) ample structural diversity, 5) adequate ecosystem function, and 6) sufficient external exchanges (Gann et al., 2019).

In Southern Ontario, there are few reference sites that meet the six reference site attributes as the natural environment was highly altered >200 years ago, primarily from the removal of natural habitat types for agricultural practices. This is also true for the City of Mississauga and the surrounding landscape, which can be described as containing lands heavily influenced by anthropogenic activities. When appropriate reference sites cannot be determined for a restoration project, Certified Ecological Restoration Practitioners (CERPs) will use target ecosystems as an alternative. While reference sites are physical locations where data has been collected and it has

been determined that the SER's reference site attributes are adequately met, target ecosystems are conceptual descriptions of community assemblages, such as those found in the ELC manual (Lee et al. 1998). The target ecosystem method leaves more to the discretion of the CERP; however, since the community descriptions in the ELC manual are based on data collected from actual sites within Ontario, these descriptions should serve as a fair alternative to reference sites when necessary. An additional method is the specific habitat creation of a particular species or group of species (i.e., Monarchs or pollinators). The habitat necessities can be then be targeted to ensure the created habitat will support the targeted species selected. A combination of target and reference ecosystems, along with species specific habitat creation will inform the design of restoration vegetation communities.

### **3.1.1 Native Thicket Community**

The native thicket communities have been proposed within 1.909 ha (**Figure 3, Appendix A**). This community will be designed to provide direct compensation for the removal of the Common Buckthorn thicket community. Native tree species will also be included within thicket community to provide vertical stratification and will be concentrated in two areas to provide contiguous habitat with the adjacent significant woodland communities as the community succeeds.

#### Target Community

The native thicket restoration will target greater than 25% shrub cover as described in the ELC manual (1998). All thicket communities described within the ELC manual (1998) are Cultural Thickets, with each community described by the dominate shrub present. As the designed thicket aims to include a diverse number of species, no specific community will be targeted, instead some of the different dominant shrub species will be included into the thicket community design.

#### Reference Community

As previously stated, there are limited native thicket communities to use as a reference when creating these habitat types. The thicket communities present within the Subject Lands and adjacent lands have various dominant native species but are also all being invaded by Common Buckthorn. However, the natural cover and wildlife observed in the thicket communities will be used in planning the design and density of the compensation communities. The general goal will be to replicate and enhance the existing native shrub cover observed within the communities on the Subject Lands, in order to provide the same amount of habitat with an increase in foraging opportunities and eventual shelter to support migratory songbirds.

#### Design

In lieu of using a specific target community to create the design details of this habitat type, the creation of targeted wildlife habitat will direct the design. The community will be designed to target

migratory land bird species, though consideration will also be made for early to mid-successional species or generalist species that require a variety of food and shelter sources outside of the migratory window. Therefore, the plant species selected will include fruit-bearing shrubs (food sources for a variety of birds and insects), flowering species (provides a source of habitat for insects) and species known for producing seed as another food source to provide foraging habitat for a variety of species. The fruit bearing shrubs and flowering forb-graminoid herbaceous species will support a variety of pollinator species and will also provide edge habitat for roosting which is a habitat necessity of Monarch butterflies during their spring and fall migration.

Specifically, the following migratory songbirds were used to direct the design and are anticipated to utilize the thicket and meadow communities. The species chosen were the species observed with the highest numbers during the 2021 spring migration survey efforts, these species include; Brown Creeper, House Wren, Cedar Waxwing, American Goldfinch, Chipping Sparrow, White-throated Sparrow, Song Sparrow, Palm Warbler, Yellow-rumped Warbler and Kinglet species. These species are a mix of frugivores, insectivores and granivores, and the selected native plant species will aim to provide suitable habitat for all. Additionally, a variety of pollinator species will inform the shrub species composition, including the three migratory butterflies, Monarch (*Danaus plexippus*), Painted Lady (*Vanessa cardui*) and Red Admiral (*Vanessa atalanta*).

### **3.1.2 Native Meadow Community**

The native meadow community has been proposed within 0.193 ha (**Figure 3, Appendix A**). This community will be designed to provide direct compensation for the removal of the Cultural Meadow communities. The proposed native meadow plant species will also be used as the ground cover within the thicket community, increasing the amount of pollinator habitat when taking the total proposed thicket compensation area ground cover into consideration.

#### Target Community

Meadow Restoration faces many of the same difficulties as thicket restoration, as the one meadow community described within the ELC manual (1998) is a Cultural Meadow. This community type is described as containing less than 60% tree cover and often characterized by a large proportion of non-native plant species. The designed meadow will be created in conjunction with the thicket community, with a target of a diverse number of native herbaceous and grass species.

#### Reference Community

As previously stated, there are limited to no known native meadow communities to use as a guide when creating this habitat type. The majority of meadow communities present in the surrounding landscape are heavily disturbed cultural communities that contain a number of non-native species. However, a restoration trajectory can be derived from meadow communities within the

Subject Lands, and provide habitat used by the species already present on the property and surrounding landscape. The native species and wildlife observed in the meadow communities were used in planning the design of the meadow communities.

## Design

In place of using a specific target community to create the design details of this habitat type, the creation of targeted wildlife habitat will direct the design. As the thicket and meadow communities will be planted with the same ground cover species, the native meadow species will be sown across the majority of the compensation area. The forb-graminoid meadow seed mix includes species with a variety of flowering windows throughout spring, summer and fall. The community will create important open habitat providing vertical stratification in a corridor that will establish as woodland and thicket communities.

Specifically, the following migratory songbirds were used to direct the design and are anticipated to utilize the thicket and meadow communities. The species chosen were the species observed with the highest numbers during the 2021 spring migration survey efforts, these species include; Brown Creeper, House Wren, Cedar Waxwing, American Goldfinch, Chipping Sparrow, White-throated Sparrow, Song Sparrow, Palm Warbler, Yellow-rumped Warbler and Kinglet species. These species are a mix of frugivores, insectivores and granivores, and the selected native plant species will aim to provide suitable habitat for all. Additionally, a variety of pollinator species will inspire the design, including the three migratory butterflies, Monarch, Painted Lady and Red Admiral.

### **3.1.3 Native Migratory Supporting Boulevard Tree Plantings**

Native boulevard tree plantings are proposed in the compensation area fronting onto Avonhead Road, accounting for 0.263 ha of habitat. The trees selected for this area will largely overlap with the trees selected for planting within the thicket communities, as they are known to attract birds through fruit production, hosting insects and providing perching and shelter opportunities, additionally many of the trees proposed here are also known to be suitable roosting trees for Monarch butterflies. As boulevard trees are subject to sedimentation and salt from winter maintenance the proposed boulevard trees may also require streetscape planting.

Therefore, though no specific target community is proposed, it will incorporate characteristics as described above within the native thicket community design.

## **3.2 Target Wildlife Habitat**

Three main types of wildlife habitat have been identified within the Subject Lands. Each habitat type and the proposed design features will be discussed below.

### **3.2.1 Barn Swallow RHS Location**

The Barn Swallow RHS is proposed to be placed along the eastern portion of the compensation area (**Figure 3, Appendix D1**) where native meadow with a buffer of shrubs between the proposed development and the RHS has been proposed. This location is in close proximity to the existing habitat and the adjacent lands contain a continuation of Cultural Meadow that will also provide suitable foraging habitat.

### **3.2.2 Migratory Land Bird Stop Over Area**

During the spring and fall migration period, songbirds require rest and refueling habitat, also referred to as stopover sites (Partridge 2018). This is even more true of the expanding urban landscapes, where this habitat is being removed or degrading due to anthropogenic impacts, such as invasive species invading natural spaces. Therefore, vegetation communities along the Lake Ontario migratory flyway including urban streetscapes offer areas for shelter from the elements, and food to support them for the journey to their breeding grounds. The presence of high-quality stopover habitat can increase the chance of survival and reproductive success and is an essential habitat type to maintain on the ever increasing urban landscape (Partridge 2018).

As has been discussed in **Sections 2.3.1 and 2.4**, the existing communities within the Subject Lands are disturbed communities with a large invasive presence, the most dominant one being Common Buckthorn. Therefore, though the existing communities are considered to be Migratory Land Bird Stopover Habitat, they do not provide high quality habitat for migrating species (as per the MNRF SWH Criteria 2015 and large invasive presence). The conceptual restoration design proposed has the potential to host a diverse native community with a focus on fruit and seed stores, and abundant vegetation targeting insects. Thus, the created habitat would support frugivorous, granivorous and insectivorous bird species during the migration period (Partridge 2018).

### **3.2.3 Migratory Butterfly Stop Over Area**

During the spring and fall migration, migratory butterfly species such as the Painted Lady, Red Admiral and Monarch migrate south for the winter. Two main habitat features are required to support migrating butterflies, roosting (rest resource) and nectaring (food source) habitat. The habitat should provide a variety of tree and shrubs to provide roosting potential and provide flowering species that bloom over a variety of seasons.

Painted Lady, Red Admiral and Monarch are usually described as generalists when it comes to nectaring habitat, with nectaring observations over a variety of species. However, Monarchs have one genus of host plant (Milkweeds; *Asclepias spp.*), which will also be incorporated into the design to provide useful habitat as their breeding efforts begin during their journey north in the spring. Monarchs typically arrive in Ontario in late May and breed until the end of September

before migrating south to their roosting grounds. A range of spring, summer and fall blooming plant species will be targeted to provide nectar sources throughout the migratory and breeding season for all butterfly species. Native groundcover seed mixes applied within the compensation area will include Milkweed species and other nectaring plants to help support Monarch and local generalist pollinator insects. Selected seed mixes should provide pollinator breeding and foraging opportunities for Monarch through the targeted inclusion of nectaring species that flower from mid-spring to mid-fall.

Limited insect/pollinator habitat is currently present within the Subject Lands due to the limited diversity of native plant species and presence of highly invasive species invading the

### **3.3 Enhanced Native Bioswale Design**

A vegetated bioswale (5 m wide corridor) is proposed to convey off-site drainage from the west to the east. This bioswale will maintain the inlet and outlet locations of HDF H1S1, however the bioswale will be aligned along the northern property boundary within the compensation area.

Drainage from the west will continue to be conveyed through the property via piped features from the inlet and outlet to an open vegetated bioswale. The vegetated bioswale will maintain the inlet and outlet locations associated with HDF H1S1. The bioswale will be located along the northern Subject Land boundary within the compensation area. The bioswale will continue to convey flows and allochthonous materials to downstream habitats and replicate existing drainage conveyance functions of HDF H1S1. Ecological functions will be replicated within the created within the bioswale and associated wetland pockets. Moreover, the bioswale will be vegetated with native seed mix.

#### **3.3.1 Enhanced Native Bioswale and Associated Wetland Pockets**

##### Native Bioswale

The native bioswale has been proposed within the created thicket community with the corridor proposed to be 5 m wide and take up 0.383 ha (**Figure 3, Appendix D1**). This habitat will not be created with a target habitat or reference community, however, the habitat designed will aim to provide suitable characteristics to support song bird species and pollinator species.

The final design of this habitat will be included within the detailed design stage once more is known about the predicted hydrology and infrastructure.

##### Wetland Pockets

The wetland pockets have been conceptually placed along the bioswale corridor within the thicket community, and in total will provide 0.059 ha of wetland habitat (**Figure 3, Appendix D1**). The

wetland communities will be designed to ensure the migratory species have access to water and to provide additional habitat.

The final design of this habitat will be included within the detailed design stage once more is known about the predicted hydrology and infrastructure. At this time, the final locations of the wetland communities, the possible hydrology and the suitable plant diversity will be provided.

#### **4.0 CONCEPTUAL RESTORATION DESIGN**

This section of the Conceptual Restoration Plan includes initial plant lists for the communities planned within the Subject Lands. The species lists provided in the sections below have been created with the intention to create the habitat discussed within **Section 3** and will be refined once all the site conditions are known.

The proposed vegetation communities within each restoration community will reflect the naturally occurring native species groupings identified on the Subject Lands, while providing increased diversity and . Plant species will be chosen from across several functional groups (e.g., shrubs, forbs, and graminoids), reproductive strategies (e.g., seed-heavy annuals, perennials and biennials), and moisture requirements (e.g., drought-tolerant, upland and facultative) in consideration of the variety of water presence each proposed community. Within each group, several plant species should be selected in order to provide redundancy and adaptability within the community. This redundancy increases the likelihood that suitable species will colonize the microhabitats within the created habitats, and that restoration areas can adapt to changing environmental conditions over the long term.

##### **4.1 Native Migratory Bird Thicket Habitat Community Design**

The plant species selected were chosen based on the characteristics that would support migrating songbird and butterfly species, as well as providing general habitat for a variety of other wildlife. The existing communities within the Subject Lands include species such as:

- Staghorn Sumac (food source and shelter/roosting habitat);
- Red Osier and Grey Dogwood (food source and shelter/roosting habitat);
- Nannyberry (food source and shelter/roosting habitat);
- Red Raspberry (food source); and
- Tall Goldenrod (nectaring source).

Where possible, these species, or species that provide similar attributes have been incorporated into the habitat design.

#### 4.1.1 Recommended Thicket Species Selection

Thicket creation is proposed for 1.909 ha (**Figure 3, Appendix D1**). Trees, shrubs and a native upland seed mix are planned (**Table 1**).

Though the majority of the proposed thicket community will have a slower successional trajectory to maintain the important thicket habitat proposed to support the migratory song bird species discussed above in **Section 3.1.1** and **3.1.2**, a portion (0.57 ha) will have an increased tree density proposed to provide eventual connectivity with the significant woodlands present on the adjacent lands. The planting densities of these two areas will be included within the detailed design stage.

The native seed mix, shrubs and trees were selected to provide a diverse plant assemblage targeting both song bird and pollinators and includes fast-growing and pioneer species more tolerant of harsher/variable growing conditions. Staghorn Sumac has not been included as a recommended species, as it exists in the northern portion of the Subject Lands and is anticipated to spread naturally within the newly created community. The establishment of native meadows (through native seed mix application) in the open ground cover while the thicket community establishes will increase wildlife habitat for generalist species that utilize early successional communities (i.e., small- to medium-sized mammals) and for specialist (foraging opportunities for aerial insectivores, and insects, including pollinator species).

The recommended spacing has been included within Table 1, however this is subject to change based on the plant stock size chosen at the detailed design stage.

**Table 1: Migratory Bird Habitat Thicket Plant Species**

Latin Name	Common Name	Spacing	% of Mix
<b>Tree Species</b>			
<i>Acer rubrum</i>	Red Maple	5 m	20
<i>Quercus rubra</i>	Red Oak	5 m	20
<i>Populus tremuloides</i>	Trembling Aspen	5 m	15
<i>Acer saccharum</i>	Sugar Maple	5 m	15
<i>Prunus serotina</i>	Black Cherry	5 m	15
<i>Tilia americana</i>	American Basswood	5 m	15
<b>Shrub Species</b>			
<i>Amelanchier arborea</i>	Downy Serviceberry	3 m	10
<i>Prunus virginiana</i>	Choke Cherry	3 m	10
<i>Diervilla lonicera</i>	Northern Bush-honeysuckle	2 m	10
<i>Viburnum lentago</i>	Nannyberry	2 m	10
<i>Lonicera canadensis</i>	Fly Honeysuckle	2 m	10
<i>Sambucus racemosa</i>	Red Elderberry	2 m	10
<i>Cornus racemosa</i>	Grey Dogwood	1 m	10
<i>Rubus odoratus</i>	Flowering Raspberry	1 m	10
<i>Rubus idaeus ssp. strigosus</i>	Red Raspberry	1 m	10
<i>Rubus occidentalis</i>	Black Raspberry	1 m	10

Latin Name	Common Name	Spacing	% of Mix
<b>Ground Cover Seed Mix (CVC1 – same mix as used for the meadow community)</b>			
<i>Anemone canadensis</i>	Canada Anemone	22 - 25 kg/ha	1
<i>Asclepias syriaca</i>	Common Milkweed		2
<i>Carex granularis</i>	Limestone Meadow Sedge		15
<i>Elymus virginicus var. virginicus</i>	Virginia Wildrye		40
<i>Euthamia graminifolia</i>	Grass Leaved Goldenrod		1
<i>Monarda fistulosa</i>	Wild Bergamot		1
<i>Oenothera biennis</i>	Evening Primrose		25
<i>Rudbeckia hirta</i>	Black Eyed Susan		10
<i>Solidago canadensis</i>	Canada Goldenrod		1
<i>Solidago juncea</i>	Early Goldenrod		1
<i>Solidago nemoralis ssp. Nemoralis</i>	Gray-stemmed Goldenrod		1
<i>Aster novae-angliae</i>	New England Aster		1
<i>Verbena urticifolia</i>	White Vervain		1

## 4.2 Native Migratory Meadow Habitat Community Design

The plant species selected were chosen based on the characteristics that would support migrating songbird and butterfly species, as well as providing general habitat for a variety of other wildlife. The existing communities within the Subject Lands include species such as:

- Tall Goldenrod (nectaring source/roosting habitat);
- Indian Hemp (nectaring source);
- Common Milkweed (nectaring source and host plant);
- New England Aster (nectaring source); and
- Virginia Strawberry (food source and nectaring source);

Where possible, these species, or species that provide similar attributes have been incorporated into the habitat design.

### 4.2.1 Recommended Meadow Species Selection

Meadow creation is proposed for 0.193 ha (**Figure 3, Appendix D1**). The purpose of native meadow creation is to establish a restoration trajectory that favours the development of a diverse, resilient, and open vegetation community. The native meadow creation areas will attract local insect populations and provide habitat for a variety of pollinators, such as Monarch Butterflies and other local generalist pollinator species. In particular, pollinators on site will benefit from restored native ground cover that will include Milkweed and nectaring/forage species.

The groundcover seed mix used in the native meadow creation areas includes pollinator foraging/host plants, and the transitional seed mix (**Table 2**) will be applied to facilitate native

species establishment and reduced competition from non-native and invasive plants. The additional recommendations provided in Table 2 are species currently found within the Subject Lands, transplanted may be an option or the species can be planted as seeds or plugs depending on how they are able to be sourced.

**Table 2: Migratory Habitat Meadow Plant Species**

Latin Name	Common Name	Spacing	% of Mix
<b>Ground Cover Seed Mix (CVC1)</b>			
<i>Anemone canadensis</i>	Canada Anemone	22 - 25 kg/ha	1
<i>Asclepias syriaca</i>	Common Milkweed		2
<i>Carex granularis</i>	Limestone Meadow Sedge		15
<i>Elymus virginicus var. virginicus</i>	Virginia Wildrye		40
<i>Euthamia graminifolia</i>	Grass Leaved Goldenrod		1
<i>Monarda fistulosa</i>	Wild Bergamot		1
<i>Oenothera biennis</i>	Evening Primrose		25
<i>Rudbeckia hirta</i>	Black Eyed Susan		10
<i>Solidago canadensis</i>	Canada Goldenrod		1
<i>Solidago juncea</i>	Early Goldenrod		1
<i>Solidago nemoralis ssp. Nemoralis</i>	Gray-stemmed Goldenrod		1
<i>Aster novae-angliae</i>	New England Aster		1
<i>Verbena urticifolia</i>	White Vervain		1
<b>Additional Pollinator and Granivores Species Recommendations</b>			
<i>Apocynum cannabinum</i>	Indian Hemp	-	-
<i>Fragaria virginiana</i>	Virginia Strawberry	-	-

### 4.3 Native Boulevard Tree Species Selection

The existing thicket communities within the Subject Lands include a number of tree species, many of which are dead or in poor condition. The native species present include:

- White Ash
- Red Ash
- White Elm
- Eastern Cottonwood
- Black Walnut
- Northern Red Oak

No Ash or Elm species will be proposed as compensation species due to their susceptibility to pests and disease.

### 4.3.1 Recommended Boulevard Species Selection

Native boulevard tree migratory habitat creation is proposed for 0.263 ha (**Figure 3, Appendix D1**). The proposed tree species will attract song birds through the production or attraction of food sources (fruit, insects) and provide shelter and perching opportunities. Additionally, the trees chosen will support roosting habitat for Monarchs as well as providing habitat for a variety of local generalist pollinator species. In particular, pollinators on site will benefit from restored native ground cover that will include Milkweed and nectaring/forage species.

**Table 3: Native Tree and Large Shrub Plant Species**

Latin Name	Common Name	Spacing	% of Mix
<b>Tree Species</b>			
<i>Acer rubrum</i>	Red Maple	5 m	15
<i>Quercus rubra</i>	Red Oak	5 m	15
<i>Acer saccharum</i>	Sugar Maple	5 m	15
<i>Prunus serotina</i>	Black Cherry	5 m	15
<i>Tilia americana</i>	American Basswood	5 m	15
<i>Quercus alba</i>	White Oak	5 m	15
<b>Shrub Species</b>			
<i>Amelanchier arborea</i>	Downy Serviceberry	3 m	50
<i>Prunus virginiana</i>	Choke Cherry	3 m	50

## 4.4 Enhanced Bioswale Species Selection

### 4.4.1 Recommended Bioswale Species Selection

Currently the hydrology of the enhanced bioswale and associated wetland pockets is unknown. Therefore, suitable plant species selection is difficult to propose at this stage. **Table 4** below includes a general wetland seed mix as prepared by CVC within the Plant Selection Guidelines (2018). Additional species, including shrubs, may be added at the detailed design stage once the hydrology of the enhanced bioswale has been determined.

**Table 4: Enhanced Bioswale Plant Species**

Latin Name	Common Name	Spacing	% of Mix
<b>Bioswale and Wetland Ground Cover Mix Option (CVC3)</b>			
<i>Anemone canadensis</i>	Canada Anemone	22 - 25	1
<i>Bidens cernua</i>	Nodding Beggarticks		1
<i>Carex vulpinoidea</i>	Fox Sedge		25
<i>Elymus virginicus var. virginicus</i>	Virginia Wildrye		25
<i>Eutrochium maculatum var. maculatum</i>	Spotted Joe Pye Weed		1

Latin Name	Common Name	Spacing	% of Mix
<i>Juncus effusus ssp. solutus</i>	Soft Rush	kg/ha	5
<i>Juncus tenuis</i>	Path Rush		5
<i>Poa palustris</i>	Fowl Bluegrass		25
<i>Scirpus atrovirens</i>	Dark-green Bulrush		5
<i>Aster novae-angliae</i>	New England Aster		1
<i>Symphotrichum puniceum</i>	Swamp Aster		1
<i>Verbena hastata</i>	Blue Vervain		5

#### 4.5 Cover Crop

A cover crop is to be applied together with all ground cover seed mixes proposed in order to more rapidly establish thorough herbaceous cover during the first year of planting. This allows time for native seeds to germinate and grow with less competition from non-native species. Cover crop species selection depends on the time of planting. **Table 5** outlines suitable options. A mixture of cover crop species is recommended for the planting window between May 1 and September 31, and a single, cold-hardy cover crop is recommended for the planting window between October 1 to November 30. Application is not recommended in mid-summer (July and August) unless appropriate maintenance (e.g., regular watering in dry conditions) can be provided. Utilizing the late fall planting window (October 1 to November 30) is recommended, when possible, to allow for cold stratification of native plant seeds during the winter months to ensure greater seed germination the following spring. Note that native seed mix applied earlier in the year may not emerge in full until the following spring.

**Table 5: Recommended Cover Crop Seed Mix**

Latin Name	Common Name	Window to Seed	Application Rate	% of Mix
<b>Transitional Zone</b>				
<i>Elymus canadensis</i>	Canada Wild Rye	May 1 to September 31	15 kg/ha	15
<i>Avena sativa</i>	Annual Oats			40
<i>Hordeum vulgare</i>	Common Barley			45
<i>Triticum aestivum</i>	Winter Wheat	October 1 to November 30	15 kg / ha	100
<b>Riparian Zone</b>				
<i>Fagopyrum esculentum</i>	Buckwheat	June 1 to July 31	20 kg/ha	100
<i>Avena sativa</i>	Annual Oats	May 8 to May 31 and August 1 August 31	20 kg/ha	100
<i>Triticum aestivum</i>	Winter Wheat	September 1 to October 31	20 kg/ha	100

The cover crop will be distributed at the same time as the native seed mix.

## 5.0 INVASIVE MANAGEMENT

As was discussed in **Section 2.3.1**, seven Category 1 invasive species (Common Buckthorn, Garlic Mustard, Tartarian Honeysuckle, Canada Thistle, Dame's Rocket, Purple Loosestrife and Common Reed) are present within the boundary of the Subject Lands. Two management practices, Common Buckthorn uprooting and topsoil removal, will be employed prior to the planting plan commencing as outlined below.

Seven Category 1 invasive species were documented on the Subject Lands, as categorized by Urban Forest Associates (2002):

- Canada Thistle
- Garlic Mustard
- Dame's Rocket
- Tartarian Honeysuckle
- Purple Loosestrife
- Common Buckthorn
- European Reed

Limited existing habitat will remain within the Subject Lands, but where it does, invasive species management is recommended to remove any potential seed sources that may compromise the proposed compensation communities.

An invasive management plan will be developed at the detailed design stage.

## 6.0 MONITORING PLAN AND ADAPTIVE MANAGEMENT STRATEGY

The purpose of the monitoring plan and adaptive management strategy is to evaluate the performance of the plantings, and provide necessary adjustments through adaptive management, should they be required.

Baseline ecological inventories provide information on the pre-development/pre-restoration biotic elements for the existing conditions. The baseline inventory helps to form a local native reference system that the restoration activity strives to achieve.

The sections below layout a general monitoring plan that will be finalized during the detailed design brief stage.

### 6.1 Construction Monitoring

A qualified ecologist will conduct the following site visits/inspections:

1. Ecologist to inspect material delivery – inspection of plant species, size, quantity, and health;
2. Landscaping contractor to provide 72 hours notice to the Ecologist and Landscape Architect if species, size and/or quantity is not available, and substitutions are needed. Ecologist to identify suitable substitutions and have these substitutions approved by the Town and CH;
3. Ecologist to identify suitable substitutions and have these substitutions approved by the City and CVC Landscaping contractor to provide Ecologist and Landscape Architect with 48 hours notice before an area is to be planted. Layout of plant material to be reviewed by the Ecologist prior to installation;
4. All species substitutions and stock size adjustments must be approved through the Ecologist, Landscape Architect, CVC and the City before the substitution is planted; and
5. Substantial performance (90% completion) – at this point the two-year warranty (compliance period) detailed below begins.

## **6.2 Performance Monitoring**

### **6.2.1 Vegetation**

Monitoring of planted vegetation will be coordinated through the landscape architect to ensure that planted vegetation survives the initial two-year compliance period. Two surveys are recommended to take place in the spring and summer of each year to assess growth rate, survivorship and general coverage of the planted areas. This information will be used to determine the success rates for the establishment of the newly restored areas and determine whether any adaptive management efforts are required. In years 3 and 5, vegetation performance monitoring will assess planting coverage, growth, native species diversity and determine whether any highly invasive plant species are present (Category 1; Urban Forest Associates 2002).

### **6.2.2 Invasive Species**

The Ecologist will monitor and manage local outbreaks of aggressive invasive species that threaten the establishment, health, and/or success compensation restoration areas. Should highly invasive species be identified (Category 1; Urban Forest Associates 2002), the species, location, area affected, and density will be recorded, and an invasive species management plan will be developed and submitted to the City and CA.

### **6.2.3 Fauna**

#### Migratory Bird Surveys

Five rounds of migratory land bird monitoring surveys are proposed to be conducted on and adjacent to the Subject Lands between March and May on year 5, post planting. Surveys are to be conducted between dawn and five hours after dawn with suitable wind conditions, no thick fog or precipitation (Cadman et al., 2007). Citizen science databases such as eBird were monitored to target migratory waves across Lake Ontario. Transects were walked through various habitat types within the Subject Lands combined with area searches to help determine the presence, variety and abundance of bird species

### **6.3 Adaptive Management**

The Performance Monitoring will identify the degree of success in achieving the range of targets established through the Conceptual Restoration Plan and the eventual detailed design process. Ultimately, the information gained through these efforts will be of value in applying to future design efforts elsewhere.

During site preparation and for five years following construction, invasive species monitoring and management are planned as described in Section 6. During this time period, invasive species will be identified, managed and, where required, in-plantings of native species (i.e., seeding) completed to reduce re-invasion. While it is expected that achievement of the target vegetation communities will attract target fauna, the occupation of target species cannot be guaranteed. Monitoring indicator species have been selected for amphibians. Should these species not be detected during a given monitoring year then adaptive management efforts will not be imposed. This type of data, regarding species' usage of created habitats, will be utilized to assist with planning for future development areas where habitat restoration is being considered.

## **7.0 CONCLUSIONS**

The work proposed within this Conceptual Restoration Plan been designed to maintain and enhance the existing communities and their function on the landscape, create new and more resilient features, increase plant species and vegetation community diversity and control the presence of invasive species. Continuing and enhancing the migratory habitat within the Subject Lands was the overarching goal of the proposed restoration design.

When looking at the original restoration objectives, the detailed design will:

- Maintain and improve the existing migratory bird habitat present on the Subject Lands, with a target of keeping the same baseline migratory bird numbers observed or increasing them by providing enhanced habitat;
- Sustain and enhance the existing migratory butterfly habitat present on the Subject Lands by providing roosting and nectaring habitat into the design with a focus on pollinator supporting vegetation to attract / support local insect populations (e.g., Monarch);
- Replicate nesting habitat and provide improved foraging habitat for Barn Swallow;

- Replicate on-site flow and outlet flows to maintain feature functions with an enhanced bioswale and associated wetland pockets;
- Increase overall native plant species diversity that will improve structural diversity, floral diversity, support a variety of native fauna species and provide community resiliency over the long-term;
- Eradicate the existing invasive present on the Subject Lands to prevent the continuation of the rapid spread of invasive species within and adjacent to the Subject Lands with the implementation of diverse and healthy communities and invasive species management; and
- Derive planting stock from locally propagated species (Seed Zone 34), where available.

These restoration efforts have been designed to increase the quality of habitat within the Subject Lands. As a result, these restoration efforts will contribute to the establishment of a healthier linkage system in a developing landscape.

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## **APPENDICES**

### **Appendix D1 – Figures**

Figure 1.0: Habitat Features Proposed for Removal and Compensation

Figure 2.0: Compensation Area Overview

Figure 3.0: Conceptual Design



**NOTES:**  
 1. Coordinate System: NAD 1983 UTM Zone 17N.  
 2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2022.  
 3. Orthoimagery © First Base Solutions, 2021. Imagery from 2020.

**Legend**

- Subject Property
- Watercourse
- Ecological Land Classification
- Barn Swallow Nesting Structure
- Butternut
- Butternut + 50 metres
- SAR Habitat
- Candidate SAR Habitat
- Significant Wildlife Habitat
- Significant Woodland
- Significant Woodland +10 metres
- Habitat Proposed for Removal and Compensation (2.90 ha)
- Habitat Outside of the G2 Zone (0.14 ha)

**ELC Legend**

- CUM1, Mineral Cultural Meadow
- CUM1-1, Fresh-Moist Old Field Meadow
- CUT1, Mineral Cultural Thicket
- CUT1-1, Sumac Cultural Thicket
- CUT1-4, Grey Dogwood Cultural Thicket
- CUT1-7\*, Common Buckthorn Cultural Thicket
- CUW1, Mineral Cultural Woodland
- DIST, Disturbed
- FOD, Deciduous Forest
- MAM2, Mineral Meadow Marsh
- MAM2-11\*, Common Reed Mineral Meadow Marsh
- SWD, Deciduous Swamp

\*Type not included in Southern Ontario ELC Guide.

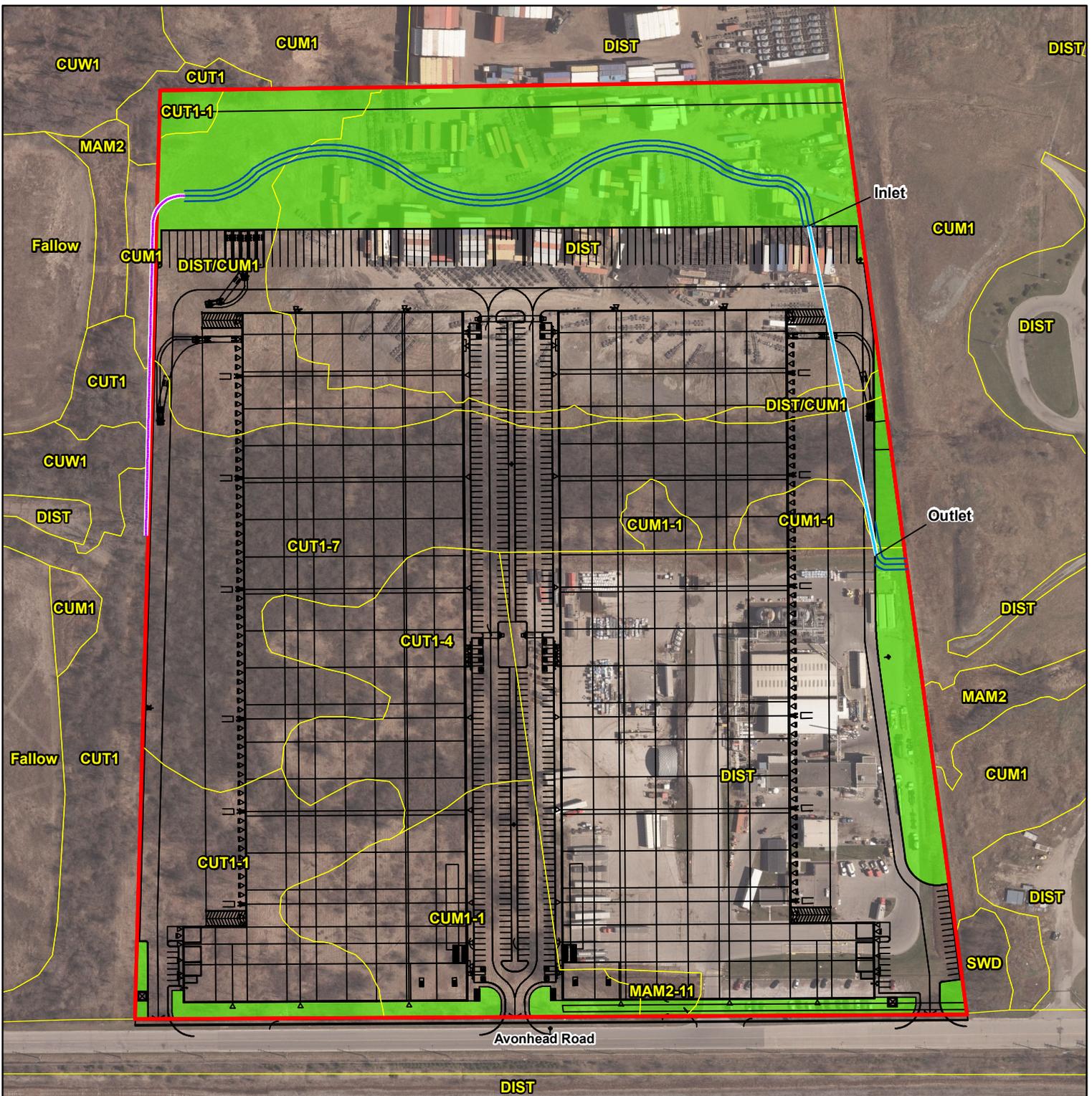
551 Avonhead Road  
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Figure 1  
 Habitat Features Proposed  
 for Removal and  
 Compensation

0 50 m  
 1:3,500



Project 2002593



**NOTES:**  
 1. Coordinate System: NAD 1983 UTM Zone 17N.  
 2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2022.  
 3. Orthoimagery © First Base Solutions, 2022. Imagery from 2020.  
 4. Draft Plan from x\_site\_greenpace option.dwg, issued on January 25, 2022.

**Legend**

- Subject Property
- Enhanced Bioswale
- Piped H1S1 Inlet to Compensation Area
- Overland Flow
- Ecological Land Classification
- Habitat Compensation Area (2.81 ha)

**ELC Legend**

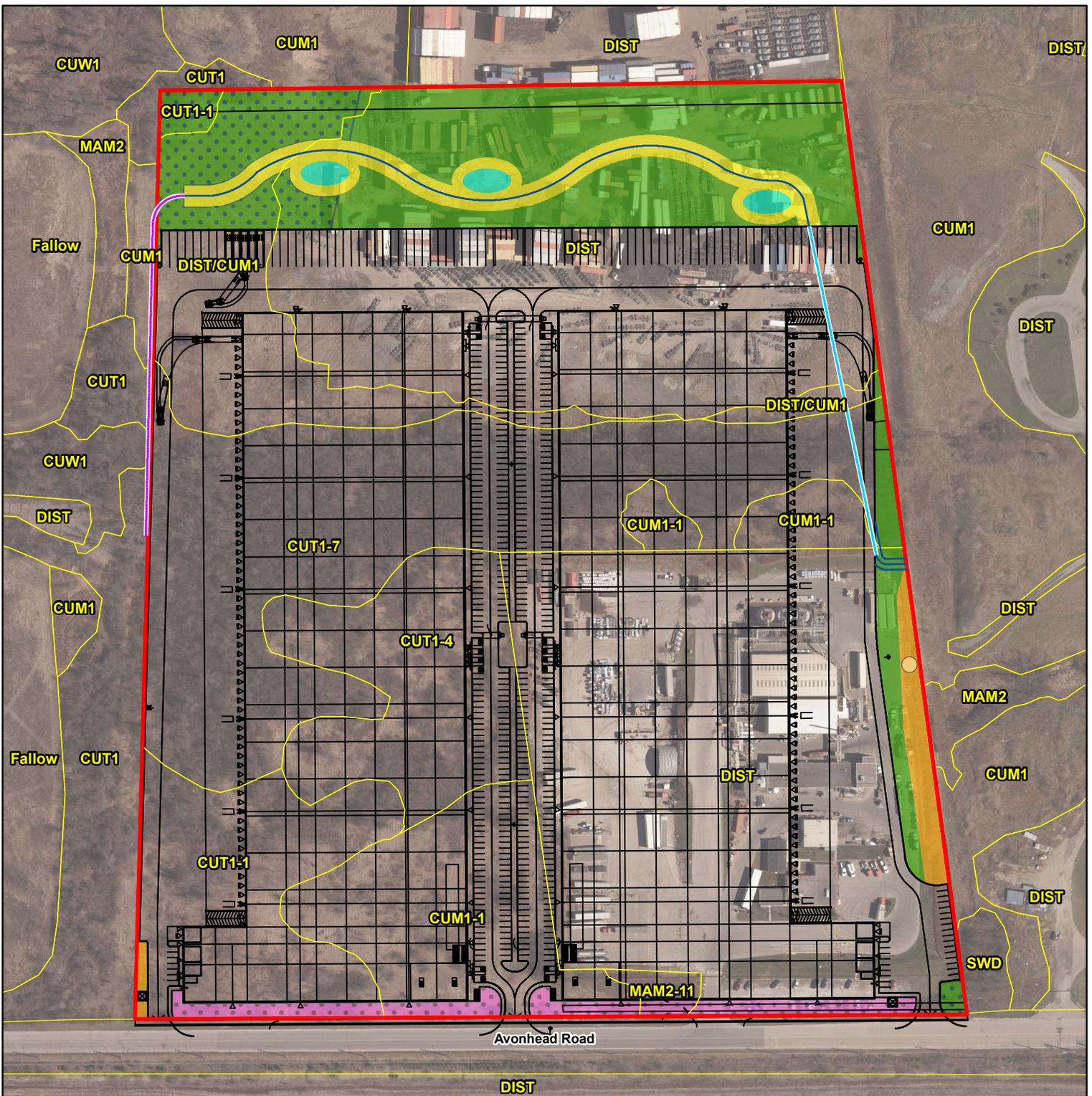
- CUM1, Mineral Cultural Meadow
- CUM1-1, Fresh-Moist Old Field Meadow
- CUT1, Mineral Cultural Thicket
- CUT1-1, Sumac Cultural Thicket
- CUT1-4, Grey Dogwood Cultural Thicket
- CUT1-7\*, Common Buckthorn Cultural Thicket
- CUW1, Mineral Cultural Woodland
- DIST, Disturbed
- FOD, Deciduous Forest
- MAM2, Mineral Meadow Marsh
- MAM2-11\*, Common Reed Mineral Meadow Marsh
- SWD, Deciduous Swamp
- \*Type not included in Southern Ontario ELC Guide.

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Figure 2  
 Compensation Area  
 Overview



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 4. Draft Plan from x\_site\_greenpace option.dwg, issued on January 25, 2021.

- Legend**
- Subject Property
  - Barn Swallow Replacement Habitat Structure
  - Enhanced Bioswale
  - Piped H1S1 Inlet to Compensation Area
  - Overland Flow
  - Ecological Land Classification
  - 5 metre Corridor Bioswale Habitat with Native Seed Mix (0.383 ha)
  - Native Meadow Habitat (0.193 ha)
  - Native Boulevard Plantings (0.263 ha)
  - Native Thicket Habitat (with increased tree densities) (0.475 ha)
  - Native Thicket Habitat (1.434 ha)

- ELC Legend**
- Wetland Pocket (0.059 ha)
  - CUM1, Mineral Cultural Meadow
  - CUM1-1, Fresh-Moist Old Field Meadow
  - CUT1, Mineral Cultural Thicket
  - CUT1-1, Sumac Cultural Thicket
  - CUT1-4, Grey Dogwood Cultural Thicket
  - CUT1-7\*, Common Buckthorn Cultural Thicket
  - CUW1, Mineral Cultural Woodland
  - DIST, Disturbed
  - FOD, Deciduous Forest
  - MAM2, Mineral Meadow Marsh
  - MAM2-11\*, Common Reed Mineral Meadow Marsh
  - SWD, Deciduous Swamp
- \*Type not included in Southern Ontario ELC Guide.*

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## Figure 3 Conceptual Design



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