APPENDIX A:
NATURAL HERITAGE FEATURES ELEVATION

Natural Heritage Impact Assessment
for
Sophia Creek, City of Barrie

Prepared for:
C.C. Tatham & Associates Ltd.

Prepared by:
Azimuth Environmental
Consulting, Inc.

October 2017

AEC 15-223

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Environmental Assessments & Approvals

October 3, 2017 AEC 15-223

C.C. Tatham & Associates Ltd.
115 Sandford Fleming Drive, Suite 200
Collingwood, Ontario
L9Y 5A6

Attention: Daniel Twigger, B.Sc Eng., P.Eng

Re: **Natural Heritage Impact Assessment (NHIA)**
Municipal Class Environmental Assessment for
Sophia Creek, City of Barrie, County of Simcoe

Dear Mr. Twigger:

Azimuth Environmental Consulting, Inc. (Azimuth) has prepared this finalized version of the Natural Heritage Impact Assessment (NHIA) to evaluate design alternatives being investigated as part of an Environmental Assessment for storm sewer infrastructure upgrades and channel improvement work in the Sophia Creek area in the City of Barrie. This NHIA report identifies natural heritage features and functions associated with the study area, including Species at Risk (SAR) and characterization of vegetation communities, fish and fish habitat, and wildlife. The assessment is based on a review of background natural heritage information, site-specific information collected during field surveys in 2016 within the context of the Barrie Creeks, Lovers Creek and Hewitt's Creek Subwatershed Plan (2012).

In this final version of the NHIA, the core breeding bird season window (April 1 – August 31, formerly indicated in the text as May-August) has been adjusted and clarified to consider the potential for any early-breeding species. The references have been updated in regards to the citations used for the Ecological Land Classification method.

Natural heritage review of eight design alternatives prepared by C.C. Tatham & Associates indicates that the alternatives vary from an anticipated overall neutral impact on natural heritage features and functions to potentially offering significant positive impacts to the environment, provided attention is paid to inclusion of specified mitigation/enhancement measures within the recommended design alternatives.

If you require additional information, please do not hesitate to contact us.

Yours truly,

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

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1.0 BACKGROUND INFORMATION

Azimuth was retained by C.C. Tatham as a sub-consultant to conduct an NHIA. This NHIA Report is part of a Municipal Class Environmental Assessment Update of recommended storm sewer infrastructure upgrades and channel improvements along Sophia Creek in the City of Barrie (the City) to mitigate flooding of private and municipal lands during storm events and address aging storm sewer infrastructure (Figure 1a, 1b). The Report identifies natural heritage features and functions associated with the Sophia Creek project footprint, including SAR, characterization of vegetation communities, wildlife, and fish and fish habitat. The Report also assesses potential environmental impacts associated with the proposed alternatives and recommends five categories of natural heritage feature/function improvements in the study area, in support of the City's Natural Heritage Strategy set out in the Official Plan (City of Barrie Official Plan 2014).

Engineering design plan alternatives provided by C.C. Tatham, as described in Sophia Creek Watershed and Mulcaster Drainage Area Environmental Assessment Update (2016, draft), being considered in this NHIA Report include:

Alternative 1: "Do Nothing" Existing Condition
Alternative 2: SWM Detention Facilities (Flow Reduction)
Alternative 3: Culvert/Channel Improvements along Sophia Creek
Alternative 4: Combine Alternatives 2 and 3
Alternative 5: Owen Street Trunk Storm Sewer
Alternative 6: Second Mulcaster Street Trunk Storm Sewer
Alternative 7: Low Impact Development (LID) Measures
Alternative 8: Upgrading/Relocating Existing Storm Sewer Infrastructure and Building New Storm Sewers Within Road Allowances

2.0 STUDY APPROACH

2.1 Study Area

The project footprint encompasses 11 terrestrial urban sites (Figure 2) and 12 fisheries sites (Figure 4) north of Kempenfelt Bay proximal to Sophia Creek within the Barrie Creeks Subwatershed. Some terrestrial and fisheries sites overlap throughout the study area. The terrestrial and fisheries sites extend from Peel Street (southwest part of project area) to Duckworth Street (northeast part of project area) and include the Ottaway Avenue Storm Water Management Facility (SWMF "SP03") and Bell Farm Road LID Bioretention Zone in the north end of the City (Appendix A, Figure 2). Aerial imagery show that terrestrial natural heritage features are limited to minor patches of meadow,

manicured grass and woodland, including riparian woodland along Sophia Creek. Aerial imagery also shows that Sophia Creek has been historically straightened and enclosed throughout Barrie. No watercourse features or significant natural heritage features were shown to exist within the Mulcaster Drainage Area based on aerial imagery and background information. Therefore, in-field habitat assessments were not conducted within this drainage area. Based on Natural Heritage Information Centre (NHIC) mapping, Sophia Creek lies in Ecoregion 6E and there are no wetland or woodland features or Areas of Natural and Scientific Interest (ANSI) in the area (Figure 3).

2.2 Background Data

A review of background documents provided information on site characteristics, habitat, wildlife, SAR and natural heritage features and ecological function aspects of the study area. Background information review and gap analysis included data from:

- Aerial imagery (Google Earth, Simcoe County Interactive Maps);
- Ministry of Natural Resources and Forestry (MNRF)'s NHIC Make-A-Map: Natural Heritage Areas application[website];
- MNRF SAR Information Request (Appendix B)
    - NHIC Data application [website];
    - Atlas of the Breeding Birds of Ontario (OBBA) [website];
- MNRF's Species at Risk in Ontario list (updated June 2016);
- Government of Canada's Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Annual Report 2014-2015;
- The City's Official Plan Land Use Designation Schedule A (Appendix C) [website];
- Barrie Creeks, Lovers Creek and Hewitt's Creek Subwatershed Plan (LSRCA, 2012); and,
- The City's Annexed Lands Natural Heritage System Report (2012).

In the gap analysis we reviewed this information and looked for any major natural heritage knowledge gaps between documents provided by agencies and current field investigations conducted as part of this NHIA. Existing reports were reviewed and no major knowledge gaps regarding natural heritage features were found. Results of field investigations reported here and our assessment of design alternatives are therefore based on existing conditions.

2.3 Vegetation Community Mapping and Plant Surveys

The Ecological Land Classification for Southern Ontario (ELC; Lee *et al.*, 1998, Lee 2009) was used as a general guide to classify vegetation community types, given the urbanized/disturbed nature of the sites. Vegetation community types were classified

according to ELC and vascular plant species identified on July 19, 2016 (survey time: 9:00am - 1:00pm) and July 20, 2016 (survey time: 9:30am -1:00pm) by Bruna Peloso.

2.4 Wildlife Surveys

Azimuth ecological staff (Scott Tarof) attended the sites on the afternoon of June 28, 2016 (survey time: 2:30-6:00pm) and June 29, 2016 (survey time: 7:15-11:00am). General habitat assessments and site improvement inspections were conducted on June 28 at all sites except the Bell Farm Road LID Bioretention Zone. On June 29 breeding bird point count surveys were performed at the same 10 sites to identify bird species present and any possible avian SAR.

At each of the 10 sites, one 5-minute breeding bird point count survey was conducted on June 29th based on the Ontario Breeding Bird Atlas Guide for Participants (OBBA, 2001). Point count station locations were selected to maximize habitat coverage, and all birds seen or heard were recorded (Figure 2). Variables recorded included species present and general behavioural observations (*e.g.* male singing/territoriality, breeding behaviour, evidence of nesting, *etc*.). Point count survey dates and weather conditions can be found in Table 1. At the Bioretention Zone on Bell Farm Road incidental bird species observations were recorded on July 20th, 2016 (survey time: 9:30am -12:00pm, Figure 2; temperature 25°C, Beaufort Wind Scale 0, precipitation 0, 10% cloud cover, noise index 4) because of the highly commercialized nature of this area and ability to hear bird song was hindered by highway 400 traffic. The Massachusetts Noise Disturbance Index was used to quantify noise levels during surveys.

Formal amphibian, reptile or mammal surveys were not conducted but incidental observations of any suitable anuran habitat and other wildlife species were recorded during avian field surveys.

2.5 Fish and Fish Habitat Surveys

Fish habitat assessments, including water chemistry sampling (temperature, pH, DO, conductivity) at the northeast end of the study area in Sophia Creek, were completed on July 19th, 2016 by Roger Holmes (survey time: 9:30-11:30am). A total of 12 fisheries sites were surveyed (Figure 4). At each site, general fish habitat and watercourse characterises were recorded, and photographs were taken. Due to the extensive background information available on Sophia Creek, fish sampling was not conducted.

2.6 Species at Risk

SAR screening involved contacting the MNRF to request background information regarding known species of concern and/or areas of natural heritage sensitivity related to

the Sophia Creek project footprint. A list of at risk plants, arthropods, reptiles, birds and mammals known to have been present historically within the project footprint and/or surrounding area derived from Ontario Breeding Bird Atlas (10km square 17PK01) and NHIC database queries (neighbouring 1km squares 17PK0316, 17PK0415, 17PK0416) was submitted to the MNRF. Field surveys included searching for these species. SAR screening also involved a desktop analysis of the habitat requirements of these species with the potential to occur within the project footprint relative to existing conditions.

3.0 NATURAL HERITAGE FEATURES AND FUNCTIONS

3.1 General

The City's Official Plan Land Use Designation Schedule A indicates the project footprint is comprised mostly of "Residential" with "Highway 400 Industrial", "General Commercial" and "General Industrial" in the northwest region of the project footprint and "City Centre" in the southeast region of the project footprint. The "Residential" land use zone contains patches of "Open Space" and "Institutional" land use.

Sophia Creek is one of six creek tributaries in the Barrie Creeks Subwatershed (subwatershed area = 37.5km^2 or 1.4% of the Lake Simcoe Watershed) draining into Kempenfelt Bay. Sophia Creek is 4.93km long and flows through a highly urbanized part of downtown Barrie. Estimated population size of the Barrie Creeks Subwatershed is 63,209 (2011 census) (Barrie Creeks, Lovers Creek and Hewitt's Creek Subwatershed Plan 2012). Since 63% of the land use is urban and 17% is classified as 'natural heritage', impervious surfaces (*e.g.* roads, parking lots, building roofs) are ubiquitous (75% of land area) throughout the Barrie Creeks subwatershed. Moderate-low infiltration rates are attributed to intense urbanization and sandy loam/silty clay loam soils (Barrie Creeks, Lovers Creek and Hewitt's Creek Subwatershed Plan 2012). Photographs of the sites attended appear in Appendix D.

3.2 Vegetation

Most of the urban vegetation communities identified are communities resulting from or maintained by anthropogenic disturbance. Vegetation present around commercial and industrial establishments is mainly manicured lawn with scattered ornamental trees and shrubs. ELC units identified appear in Table 2.

Vegetation along Sophia Creek varies from Cultural Meadow (CUM) to Cultural Woodland (CUW) (Table 2). The vegetation unit present in the Stormwater Pond area has characteristics of a Graminoid Mineral Meadow Marsh (MAM2) dominated by Cattail (*Typha sp.*) and Reed-canary Grass (*Phalaris arundinacea*). Lands in the planned LID Bioretention Zone are industrial/commercial; most of the vegetation is manicured

lawn with some ornamental plants. The northwest portion of the Bioretention Zone has a Dry-Moist Old Field Meadow (CUM1-1) and is dominated mostly by graminoids. The eastern portion of this Zone has a remnant patch of Deciduous Forest (FOD) composed mainly of Sugar Maple (*Acer saccharum*) and Red Oak (*Quercus rubra*).

Overall, 116 vascular plant species were identified within the project footprint; 55% (64/116 species) are considered non-native and/or exotic invasive species (Table 3). No plant species designated Endangered, Threatened or Special Concern federally or provincially were observed. None of the vegetation community types are considered rare provincially, and no plant species present are considered rare provincially. One species considered rare in the Lake Simcoe Watershed was detected: Black Walnut (*Juglans nigra*). Black Walnut is common in the City of Barrie, having been planted as landscape trees and established due to widespread seed dispersal largely by squirrel activity.

3.3 Wildlife

A total of 16 urban bird species were found. Results from point counts showed 14 bird species were present at sites one to 10 (Table 1). The three most common species found during point counts were Common Grackles (*Quiscalus quiscula*), American Robins (*Turdus migratorius*) and Song Sparrows (*Melospiza melodia*). Based on incidental bird observations, 14 urban bird species were detected in the Bioretention Zone (site 11), including one Brown-headed Cowbird (*Molothrus ater*) and Ring-billed Gull (*Larus delawarensis*). These two species were not detected at the other 10 sites. Mourning Doves (*Zenaida macroura*), House Sparrows (*Passer domesticus*) and American Goldfinches (*Carduelis tristis*) were the most abundant species detected during incidental observations (Table 1).

All 16 species have a global (G-rank) of G5, meaning the species are common and do not face major conservation threats at the global scale. At the provincial level, five species have a Sub-national (S-rank) of S5 (“secure”, common), one has a rank of S4 (“apparently secure”, uncommon but not rare, some long-term population concerns), nine species are ranked S5B or S4B based on breeding populations. The House Sparrow has a provincial rank of SNA (“not applicable”), meaning this species is not a suitable candidate for conservation activities (Table 1). None of the bird species observed are SAR or of conservation concern nationally (COSEWIC) or provincially (SARO).

Wildlife surveys did not find any evidence of the following SAR birds: Chimney Swift (Threatened, THR), Red-headed Woodpecker (Special Concern, SC), Eastern Wood-Pewee (SC), Wood Thrush (SC), Bank Swallow (THR), Barn Swallow (THR), Bobolink (THR) or Eastern Meadowlark (THR) on-site, unlike earlier reports (15-223 Sophia Creek Class EA OBBA Background Information, Region #13 Simcoe County, Square

17PK01 2016, Natural Heritage System Report 2012). No area-sensitive bird species were detected (Natural Heritage System Report 2012).

Small mammals observed during surveys included two Eastern Cottontail Rabbits (*Sylvilagus floridanus*) at sites six and 11, two Eastern Chipmunks (*Tamias striatus*) at sites one and 11 and Eastern Gray Squirrels (*Sciurus carolinensis*) at site four. No SAR mammals were observed, consistent with the Natural Heritage System Report (2012). No frogs or toads were observed, nor did any sites appear to offer suitable habitat for anurans.

3.4 Fish and Fish Habitat

Sophia Creek is part of the Barrie Creeks subwatershed, and originates to the south of Highway 400 and outlets into Kempenfelt Bay. The majority of the subwatershed, including Sophia Creek, is within urbanized lands (LSRCA, 2012). Sophia Creek is made up of two tributaries that meet northeast of the Grove Street and Bothwell Crescent intersection, and continues south to Kempenfelt Bay. During Azimuth's field survey, no permanent direct fish habitat was observed throughout the study area at the 12 surveyed sites (Figure 4). Sophia Creek has been historically impacted from adjacent urban lands, which has resulted in channel straightening, channel hardening, and barriers to fish passage (LSRCA, 2012). Numerous culverts and road crossings have resulted in large portions of the creek being enclosed, and riparian vegetation is limited throughout the study area. Minimal flow was observed at the northwest, or upstream portion, or the study area near Duckworth Street (Appendix D; Fisheries; Photograph 1). Water parameter measurements at this location (sampled July 19, 2016, 9:45am) were as follows:

Temperature – 16.7°C	pH – 8.6
Conductivity – 960 µS/cm	Dissolved Oxygen – 11.8 mg/L

Sophia Creek was predominantly dry further downstream at numerous locations, such as at the St. Vincent Street crossing (Appendix D; Fisheries; Photograph 6) and Bothwell Crescent crossing (Appendix D; Fisheries; Photograph 7). The only water observed in many locations was within stagnant pools. Therefore, Sophia Creek within the study area is not expected to provide direct fish habitat. The Barrie Creeks, Lovers Creek, and Hewitt's Creek Subwatershed Plan (LSRCA, 2012) also states that Sophia Creek does not provide fish habitat due to significant impacts from urban lands, such as creek enclosures and man-made fish barriers. Figures from the subwatershed plan are provided in Appendix E, which illustrate the lack of fish habitat, warmwater thermal regime, barriers to fish movement, and bank/channel hardening throughout Sophia Creek. Fish barriers were observed at numerous locations throughout the study area, including the culvert

crossings at Bothwell Crescent (Appendix D; Photograph 8) and Berczy Street (Appendix D; Fisheries; Photograph 13). Thus, Sophia Creek within the study area serves as indirect fish habitat.

3.5 Species at Risk

Species at Risk and their preferred habitats were assessed to determine whether there is potentially suitable habitat on/or adjacent to the project footprint (Table 4) to support these SAR. Of the 24 species identified with potential to exist within the broader landscape, four have potential habitat within and/or adjacent to the study area:

- Mammals: Little Brown Bat (Endangered, END);
- Birds: Barn Swallow (THR), Red-headed Woodpecker (SC); and,
- Plants: Butternut (END).

During Azimuth's field investigations, these four species were not detected and bats were not surveyed for specifically. Potential summer roost habitat (*i.e.* existing structures) may exist in the study area for the Little Brown Bat (*Myotis lucifugus*).

3.6 Significant Wildlife Habitat

Field surveys and SAR screening identified the potential for Significant Wildlife Habitat (SWH) in the study area for Red-headed Woodpeckers (*e.g.* MacMorrison Park) (Table 5). Existing structures as potential summer roosting habitat for the Little Brown Bat are not considered 'habitat' according to the Significant Wildlife Habitat Technical Guide (2000). The paucity of tree cover further renders the sites attended as unlikely significant habitat for the Little Brown Bat.

4.0 PROPOSED DESIGN ALTERNATIVES

Design alternatives were provided by C.C. Tatham for assessment of potential environmental impacts on natural heritage features and functions identified in the study area through field investigations. These eight alternatives are detailed in Sections 5 and 6 of the Sophia Creek Watershed and Mulcaster Drainage Area Environmental Assessment Update (2016, draft). Here, we summarize each alternative and provide a brief assessment of natural heritage impacts. Assessment is based on the unweighted ranking system employed by C.C. Tatham (Sophia Creek Watershed and Mulcaster Drainage Area Environmental Assessment Update 2016) from a natural heritage perspective, and incorporates a combination of potential impacts of the alternatives themselves (based on existing conditions) and the impacts of site improvement/enhancement suggestions described.

Significant negative impact (-2)
Modest negative impact (-1)
Neutral (0)
Modest positive impact (+1)
Significant positive impact (+2)

4.1 Alternative 1 (North and South of Peel Street)

The "Do Nothing" Existing Condition option offers a baseline upon which to assess the environmental impacts of the other alternatives on natural heritage features and functions associated with the Sophia Creek project footprint. C. C. Tatham has eliminated Alternative 1; we do not consider this alternative in this assessment.

4.2 Alternative 2 (North and South of Peel Street)

Alternative 2 involves expansion of the existing capacity of the Ottaway Avenue SWMF SP03 and building an additional SWMF (SP01) at MacMorrison Park. This new SWMF would occupy the current park footprint (Sophia Creek Watershed and Mulcaster Drainage Area Environmental Assessment Update 2016 Draft).

The SWMF on Ottaway Avenue currently offers breeding habitat for some species of urban songbirds, such as Red-winged Blackbirds. These species tend to be fairly adaptive to modest urbanization. Expanding/improving this existing facility is unlikely to present negative impacts to natural heritage features or fish habitat (neutral 0) providing the work is done outside the breeding season for migratory birds (*i.e.* May-August) and improvements are completed prior to the subsequent arrival of migratory birds to breed on the subject lands in spring. If possible, new habitat plantings should be given time to establish prior to the bird breeding season, but birds that would use this area will re-establish post-works.

MacMorrison Park currently offers potential SWH for Red-headed Woodpeckers and low potential summer roosting habitat for at risk bat species. Red-headed Woodpeckers were not detected during our field surveys; we did not survey for bats in the field. Building a new SWMF within the MacMorrison Park footprint would result in loss of the riparian forest habitat along this section of Sophia Creek if construction activities include removal of those trees, however much of this riparian habitat is dominated by invasive exotic plant and woody shrub species. As such, its loss would not represent a substantial negative impact (*i.e.* native plant biodiversity loss). Construction of this new SWMF should include replacement of this wildlife habitat by planting exclusively native plants. This alternative, with these suggested alterations, would represent a significant net positive benefit (+2) for natural heritage features and function in the MacMorrison Park footprint. Establishing riparian woodland habitat comprised of native tree groupings

around the facility perimeter of both SWMF's would provide additional positive natural heritage benefits (*e.g.* bird habitat, wildlife refugia/shelter, wind breaks). Bird boxes along the edge of both facilities (boxes placed 5-6m apart) would improve wildlife habitat function for species such as House Wrens. Boxes should face open habitat, with box entrances facing east, north or south. Boxes near paths or wooded edges are suitable for House Wrens. The base of boxes should be 2m from the ground, have 2.54cm diameter openings and be equipped with suitable predator guards. This alternative would have a neutral impact (0) on fish habitat.

4.3 Alternative 3 (North of Peel Street)

Alternative 3 involves culvert and channel improvements along Sophia Creek within the study area as described in the Study Area Section.

Culvert and channel improvements would provide a significant positive benefit (+2) for natural heritage features and functions providing the existing garbage was cleaned up as part of this work and the improvement areas were planted with native flowers and grasses (see below for general site improvement suggestions). Removal of invasive plants should also be part of Alternative 3 work. Culvert improvement and channel works should ensure that perched culverts are removed and natural channel design principles are utilized to improve fish habitat within Sophia Creek. Opening up of enclosed creek segments should be completed where possible. While this segment of Sophia Creek is not known to contain fish, channel and culvert improvements (*e.g.* daylighting, removing perched culverts, *etc.*) could assist with future efforts to restore fish habitat to Sophia Creek. This alternative would likely have a positive impact on fish habitat (+1).

4.4 Alternative 4 (North of Peel Street)

The fourth alternative is based on implementing both Alternatives 2 and 3.

Alternative 4 would confer the positive benefits for natural heritage features and function, as described in Sections 4.2 and 4.3 (significant positive benefit, +2). This alternative would likely have a positive impact on fish habitat (+1).

4.5 Alternative 5 (South of Peel Street)

Alternative 5 is to construct the Owen Street Trunk Storm Sewer. This new trunk storm sewer would extend from Sophia Creek and Peel Street west along Sophia Street to Owen Street, south along Owen Street to Dunlop and then south to Kempenfelt Bay.

Construction of the Owen Street Trunk Storm Sewer in downtown Barrie would likely have a neutral effect (0) on natural heritage features/functions and fish habitat because

these features are very limited in this area of the City. We recommend that, if this alternative is selected, the work be done outside of the core breeding bird season (April 1 – August 31) so that breeding activities are not disrupted, and that disturbance of existing vegetation be minimized to help protect urban wildlife habitat and that work include native plantings.

4.6 Alternative 6 (South of Peel Street)

Alternative 6 is to supplement the existing storm sewer infrastructure at Mulcaster Street by building a second Mulcaster Street Trunk Storm Sewer from Sophia Creek south on Peel Street and extending south along Mulcaster Street to Kempenfelt Bay.

Construction of the second Mulcaster Street Trunk Storm Sewer in downtown Barrie would likely have a neutral effect (0) on natural heritage features/functions and fish habitat because these features are very limited in this area of the City. We recommend that, if this alternative is selected, the work be done outside the core breeding bird season (April 1 – August 31) so that breeding birds are not disturbed, and that any disturbance of existing vegetation be minimized to help protect urban wildlife habitat.

4.7 Alternative 7

Alternative 7 involves Low Impact Development (LID) measures (*e.g.* underground within existing parklands, rainwater harvesting). Pre-screening by C. C. Tatham recommends that these LID measures be considered in combination with the other chosen alternative(s), rendering Alternative 7 not an independent alternative. Objectives of these LIDs would be to help mitigate storm flows, increase infiltration, reduce flooding and improve water quality without changing existing land use or surface features.

LID's generally do not have a negative impact on the environment and can have important positive environmental impacts, such as improving base flow conditions and water quality for fish habitat, and better controlling storm flows. We recommend that any LID work in areas of existing woodland or grassland/meadow habitat (*e.g.* parks) be conducted such that these established habitats are not disturbed. Pairing LID work with native plantings would have an added significant positive benefit (+2) for natural heritage features. We note that the specifics of any LID work have yet to be finalized by the City; as such, Azimuth cannot speak to specific details of LIDs at this time. This alternative would likely have a modest positive benefit on fish habitat (+1).

4.8 Alternative 8 (North and South of Peel Street)

Alternative 8 is based on upgrading and/or relocating existing local storm sewer infrastructure and building additional storm sewers within existing road allowances.

Upgrading and/or relocating existing storm sewer infrastructure and constructing new storm sewer lines, within existing road allowances, should have a neutral impact (0) on natural heritage features and functions and on fish habitat. We recommend that this work be done outside the core breeding bird season (April 1 – August 31) so as to not disturb breeding urban birds, and that disturbance of existing trees and flowering plants be minimized to help protect urban wildlife habitat.

Unweighted rankings of the design alternatives are summarized below, based on an average score for natural heritage features/functions and fish habitat impacts.

Alternative	Ranking
1	N/A
2	+1
3	+1.5
4	+1.5
5	0
6	0
7	+1.5
8	0

5.0 RECOMMENDATIONS

Using data gathered on natural heritage features and functions in the region of Sophia Creek surveyed, we consider Alternative 4 (which is a combination of Alternatives 2 and 3) and 7 to be the best design options in terms of providing significant positive natural heritage benefits. Alternatives 4 and 7 tied for the highest score in our assessment. This conclusion is based on the rankings in the preceding section, which include the impacts of the alternatives themselves and anticipated natural heritage impacts of the recommended site improvements/enhancements described for the corresponding alternatives. The remaining alternatives were assigned a score of +1 or 0.

General site improvement recommendations and mitigation measures to enhance the ecological health of the areas attended include the following ideas. Implementation of these improvement/enhancement ideas, as part of the alternatives works, would strengthen natural heritage feature and function impacts. If Alternative 4 was implemented without the additional site improvements described, its ranking would reduce to +1 because one existing habitat type (with some potential to be used by Red-headed Woodpeckers) would essentially be replaced with another habitat type. Some existing exotic invasive plant species would likely be removed if only the alternative itself was implemented, but the added potential natural heritage benefits gained through

the additional emphasis on native plantings and the other enhancements described, which would likely have an added benefit as wildlife habitat for various species including possibly some SAR, would not be achieved.

Removal of Anthropogenic refuse: Anthropogenic refuse has been deposited along Sophia Creek. This material presents an obstacle to naturalization efforts and limits the potential for natural regeneration to occur. Azimuth recommends that refuse be removed from the watercourse and its riparian vegetation. Concrete debris at site one should be removed. Several locations have downed woody debris that should also be removed. Water at Sites 2 and 3is contaminated with oily residue.

Invasive Species Control: Establishment of non-native and/or exotic invasive vegetation affects the ecological quality of the site by displacing native species through resource competition (*e.g.* sunlight, soil nutrients, water, space) and rapid colonization particularly of disturbed areas. Consequently, non-native and/or exotic invasive plant species generally reduce overall flora and fauna diversity. It is proposed that the following exotic invasive plant species be targeted for control: Garlic Mustard (*Allaria petiolata*), Japanese Knotweed (*Fallopia japonica*), Goutweed (*Aegopodium podagraria L.*), Purple Jewelweed (*Impatiens glandulifera*), Tartarian Honeysuckle (*Lonicera tatarica*) and Common Buckthorn (*Rhamnus cathartica*). Presence of any Common Reed (*Phragmites australis*) in the SP03 SWMF should be controlled as well. Several other non-native species were recorded throughout the study area, but the above-mentioned species are very aggressive and should be removed.

To effectively control invasive species, their removal should be followed by annual monitoring for at least two years to ensure the success of the strategies employed (*e.g.* removal of invasive plants that could have grown out of the soil seed bank, multiple application of herbicide), as determined by a qualified professional. Planting and monitoring of native material are key to avoid re-establishment of invasive species through resource competition.

Enhancement Plantings: Native plants (trees, woody shrubs, forbs, graminoids) should be planted following removal of invasive species to increase biological diversity and habitat quality along Sophia Creek. Flowering plants that attract pollinators would improve the sites. Urban areas can provide important pollinator habitat and improve biodiversity (Kaluza *et al.* 2016, Colla *et al.* 2009). Native enhancement plantings will also help mitigate re-establishment of non-native species. Newly planted vegetation should be tended to for at least two years, including watering, mulching, rodent guards for tree seedlings, replacement of dead material and removal of invasive species.

Enhancement plantings will also improve soil stability. The banks and channel bottom of Sophia Creek in many areas, such as at Site 1, show signs of soil instability and erosion of particulates into the creek, especially during severe storm events. Particulate deposition represents a source of water pollution at this location as well as downstream and at the tributary mouth where Sophia Creek flows into Lake Simcoe. Use of forb and drought-tolerant native graminoids plantings would help stabilize this section of Sophia Creek and provide important urban pollinator habitat for bees and butterflies. Planting native woody shrubs in this area would offer some shade, improving habitat quality and reducing water evaporation in areas where water depth is low.

Culvert and Channel Improvements: Channel daylighting of Sophia Creek should occur where possible to improve aquatic vegetation growth and potential future fish passage throughout the system. Culvert improvements should aim to eliminate perches and improve fish passage in anticipation that future works in Sophia Creek may eliminate downstream barriers to fish passage. Culverts should be embedded properly and sized appropriately to ensure flow velocities within the culverts do not restrict fish passage. Channel improvements should also incorporate natural channel designs (*e.g.* river stone substrate, pool and riffle features) and low flow channels to improve water flow and fish habitat throughout Sophia Creek in hopes that fish habitat within the system is accessible in future years.

Construction Mitigation Measures: A majority of the sites had stagnant/minimal flows, perched culverts and dry channel segments. Therefore, standard mitigation measures for working around water should be sufficient for this project as no direct fish habitat is present. Mitigation measures should aim to maintain the quantity and quality of creek flow around any in-water work areas to help mitigate potential impacts to downstream watercourses. The key fish habitat mitigation measure will be to ensure sediment-laden water from the project work area (*i.e.* from dewatering pumps or diversion pumps) does not re-enter the existing watercourse and impact downstream reaches that are fish-bearing.

Construction Timing: LSRCA and MNRF stated that in-water work is restricted in Sophia Creek from April 1- June 30 due to potential impacts to downstream fisheries (Appendices E and F). Construction and/or any site improvement activities that could disturb/damage breeding bird habitat should also be done outside the breeding bird window to avoid contravention of the Migratory Birds Convention Act, 1994.

6.0 REFERENCES

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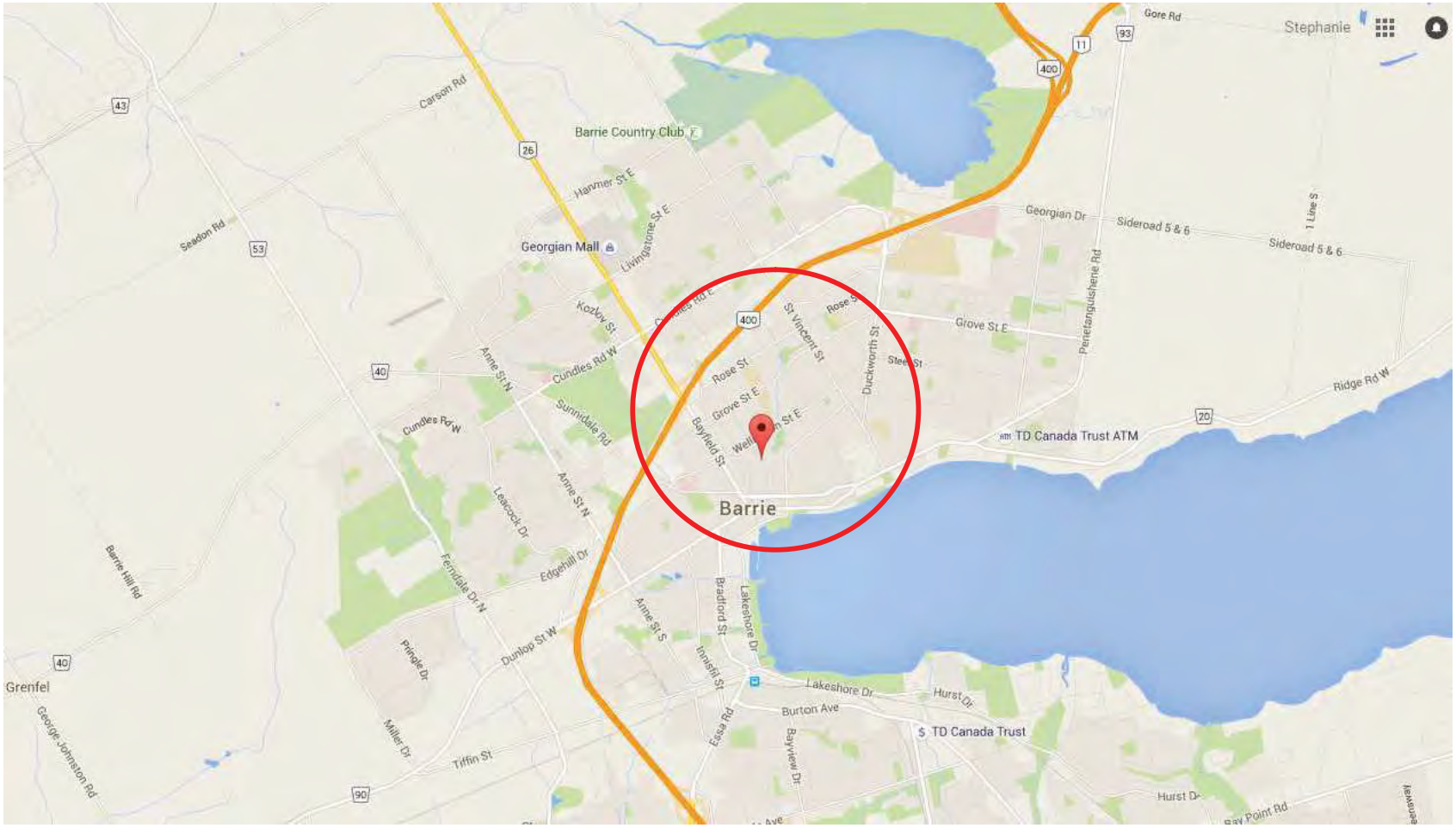
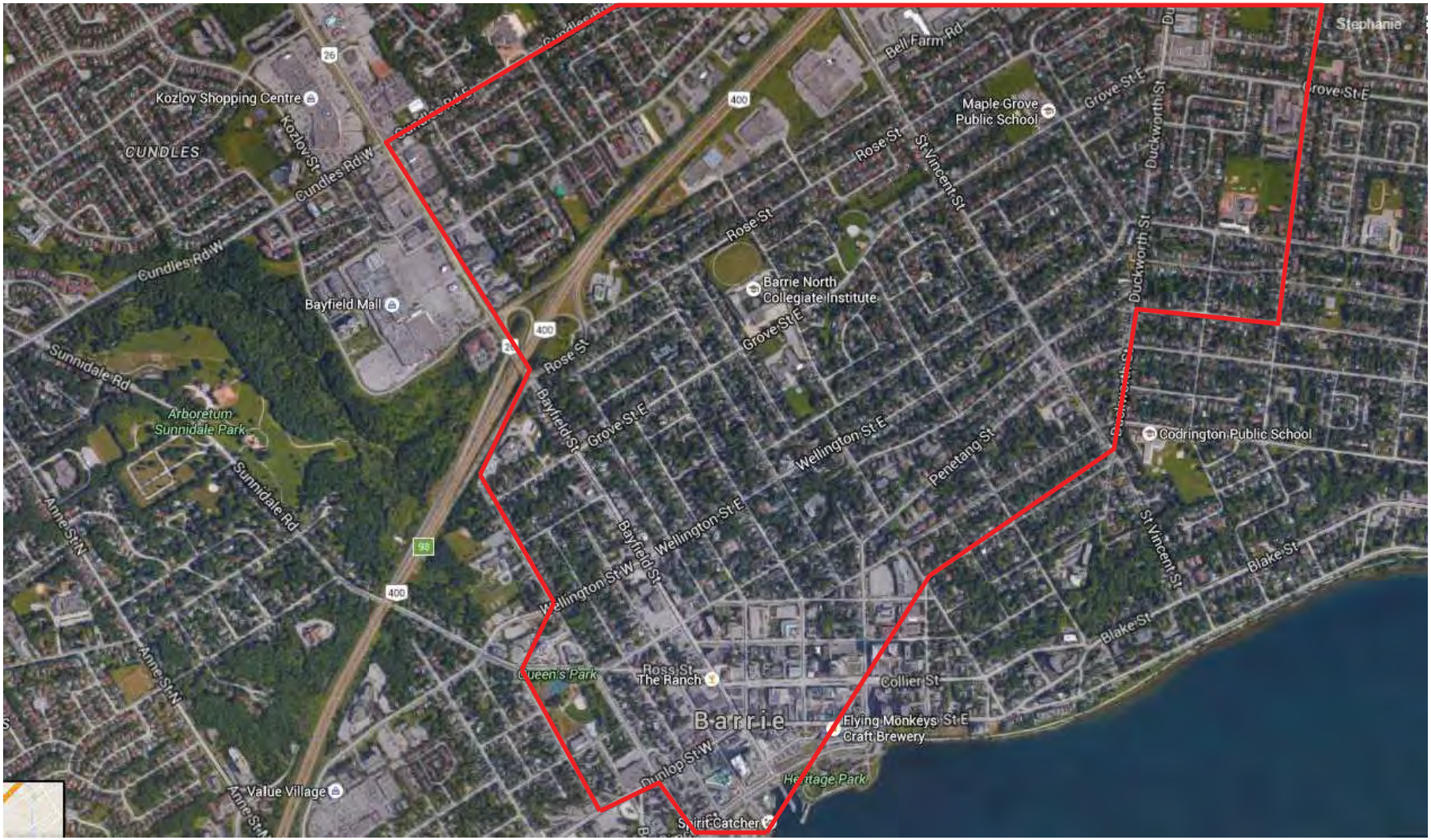
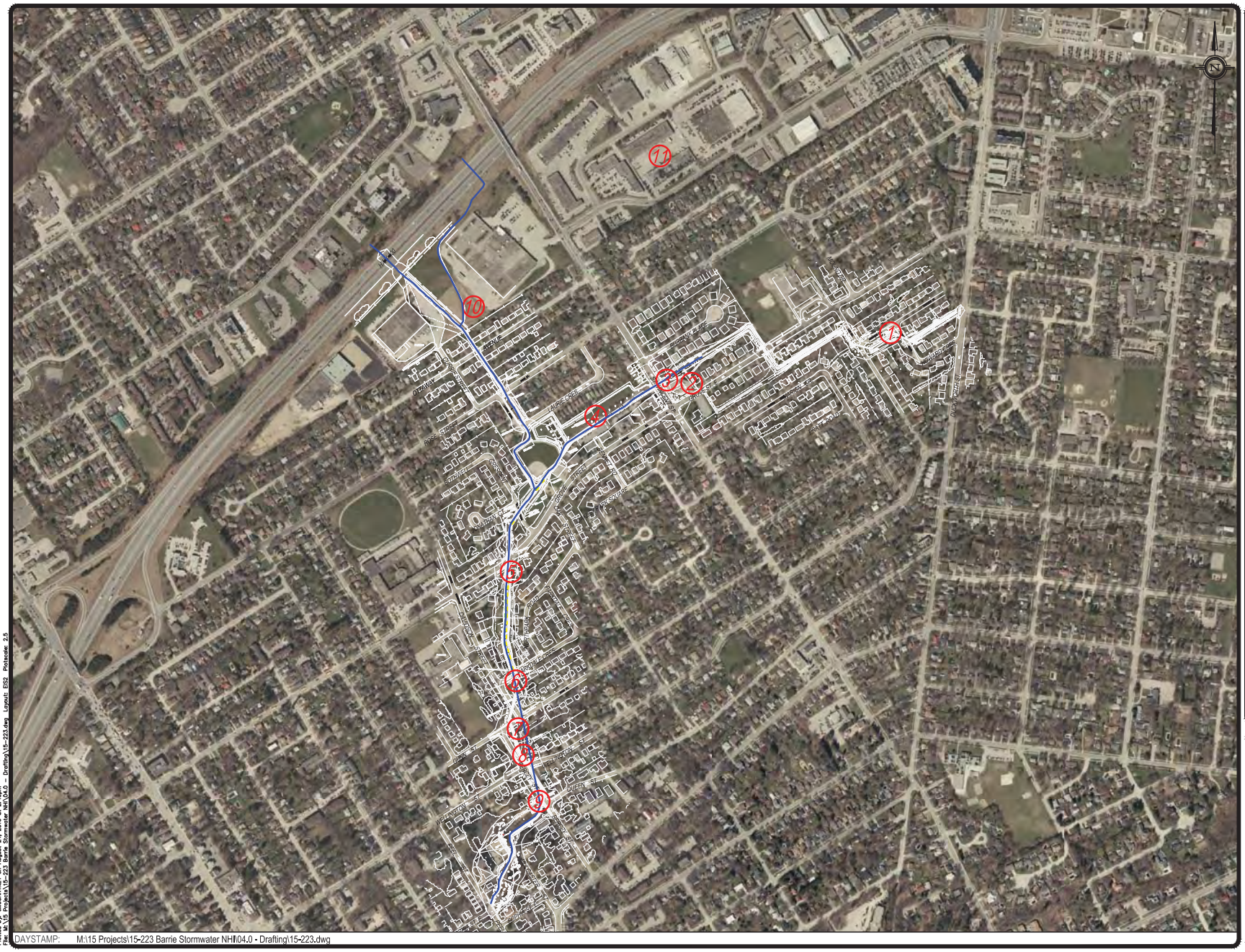
AEC15-223 Sophia Creek Watershed Approximate Study Location



AEC15-223 Sophia Creek Watershed Approximate Study Location





LEGEND:

- # Survey Site
- Watercourse

100m 0 200m

HORIZONTAL SCALE 1: 7,500

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Natural Heritage Features and Functions

Barrie Stormwater Ponds, Barrie, ON

DATE ISSUED:	August 2016	Figure No.
CREATED BY:	JLM	2
PROJECT NO.:	15-223	
REFERENCE:	Simcoe County Maps	

DAYSTAMP: M:\15 Projects\15-223 Barrie Stormwater NHI\04.0 - Drafting\15-223.dwg

Plotted by: JMCCARTNEY on August 24, 2016 at 2:49pm
File: M:\15 Projects\15-223 Barrie Stormwater NHI\04.0 - Drafting\15-223.dwg Layout: ES2 Plotscale: 2.5

Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

Figure 3

Notes:
AEC15-223 Sophia Creek

Legend

- Assessment Parcel
- Woodland
- Conservation Reserve
- Provincial Park
- Natural Heritage System
- Ecoregion

Wetland
- Provincially Significant Wetland Evaluated
- Non - Provincially Significant Wetland Evaluated
- Unevaluated Wetland

Area of Natural Heritage & Scientific Interest (ANSI)
- Provincially Significant Life Science ANSI
- Provincially Significant Earth Science ANSI

Greenbelt Plan
- Boundary
- River Valley Connections

Land Use Designations
- Protected Countryside
- Towns and Villages
- Hamlets
- Urban River Valley
- Specialty Crop Area

Niagara Escarpment Plan (NEP)
- Boundary
- Parks and Open Space System

Land Use Designations
- Escarpment Natural Area
- Escarpment Protection Area
- Escarpment Rural Area
- Mineral Resource Extraction Area
- Escarpment Recreation Area
- Urban Area
- Minor Urban Centre

Oak Ridges Moraine Conservation Plan (ORM)
- Boundary

Land Use Designations
- Natural Core Area
- Natural Linkage Area
- Countryside Area
- Rural Settlement
- Palgrave Estates Residential Community
- Settlement Area

0 0.7 km

Projection: Web Mercator

LEGEND:

- (#) *Fisheries Survey Site*
- *Watercourse*

Notes:

- *Warmwater thermal regime (LSRCA, 2012)*
- *Not Fish Habitat (LSRCA, 2012)*

100m 0 200m

HORIZONTAL SCALE 1: 7,500

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Sophia Creek - Fish and Fish Habitat

Sophia Creek Class EA
Barrie, ON

DATE ISSUED:	*August 2016*	Figure No.
CREATED BY:	*JLM*	4
PROJECT NO.:	*15-223*	
REFERENCE:	*Simcoe County Maps*	

DAYSTAMP: M:\15 Projects\15-223 Barrie Stormwater NH\04.0 - Drafting\15-223.dwg

Plotted by: JMCCARTNEY on September 27, 2016 at 11:48am
File: M:\15 Projects\15-223 Barrie Stormwater NH\04.0 - Drafting\15-223.dwg Layout: ES4 Plotscale: 2.5

			Breeding Bird Survey Data 2016[3]														
			Point Count Sampling Locations (see Figure 2)[6]											Breed-ing?[4]	Forest Bird?[5]	Conservation Rank[2]		
Family	**Scientific Name**	**Common Name[1]**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11 (Incidental)**			**G-rank**	**S-rank**	**SARO**
Cardinalidae	*Cardinalis cardinalis*	Northern Cardinal						S (2)					chipping	Po	X	G5	S5	NAR
Columbidae	*Zenaida macroura*	Mourning Dove	S (1)										X (19)	Po		G5	S5	NAR
Corvidae	*Cyanocitta cristata*	Blue Jay	C (1)	S (1)		S, C (2)							X	Pr	X	G5	S5	NAR
Corvidae	*Corvus brachyrhynchos*	American Crow			C (1)	C, visible (2)							F/O	Pr		G5	S5B	NAR
Emberizidae	*Melospiza melodia*	Song Sparrow	C (1)	S (1)		S (2)						S (1)	X (2)	Pr		G5	S5B	NAR
Emberizidae	*Spizella pusilla*	Field Sparrow						S (1)					X (1)	Pr		G5	S4B	NAR
Fringillidae	*Carduelis tristis*	American Goldfinch	F/O (1)	FO (1)		S (2)		S, FO (1)	FO, S (1)			FO (2)	F/O, X (6)	Pr		G5	S5B	NAR
Icteridae	*Quiscalus quiscula*	Common Grackle				visible (1)	C, FO (4)	C (3-4)	C, visible (2)	C (1)		C, visible (2)	X (5)	Po		G5	S5B	NAR
Icteridae	*Agelaius phoeniceus*	Red-winged Blackbird										C, visible (1)	X	Po		G5	S4	NAR
Icteridae	*Molothrus ater*	Brown-headed Cowbird											X	Pr	X	G5	S4B	NAR
Laridae	*Larus argentatus*	Herring Gull					C, FO (1)							Unk		G5	S5B	NAR
Laridae	*Larus delawarensis*	Ring-billed Gull											F/O (1)	Unk		G5	S5B	NAR
Paridae	*Poecile atricapillus*	Black-capped Chickadee						C (2-3)	C (1)			C (1)	X	Pr	X	G5	S5	NAR
Passeridae	*Passer domesticus*	House Sparrow			C (2-3)	S (2)							X (7)	Po		G5	SNA	NAR
Picidae	*Picoides pubescens*	Downy Woodpecker				C (1)								Unk		G5	S5	NAR
Turdidae	*Turdus migratorius*	American Robin	C, visible (1)		C (1)	S, visible (2)	S (1)	S (2)					X (1)	Pr		G5	S5B	NAR

[1]Nomenclature based on Ontario Ministry of Natural Resources (OMNR), Natural Heritage Information Centre (NHIC) database - https://www.ontario.ca/page/get-natural-heritage-information.

[2]Conservation Rankings: From Ontario Ministry of Natural Resources, Natural Heritage Information Centre (https://www.ontario.ca/page/get-natural-heritage-information); NAR - Not at Risk.

[3]Breeding Bird Evidence Codes: OB - Species observed; H - Species observed in its breeding season in suitable nesting habitat (Possible Breeding); S - Singing male (Possible Breeding); T - Territory (Probable Breeding - singing males from same area on two sampling dates more than 1 week apart);

A - Agitated behaviour or anxiety calls of adult (Probable Breeding); FY - Fledged Young (Confirmd Breeding); FO - Flyover (no evidence of use of property). http://www.bsc-eoc.org/dataentry/codes.jsp?page=breeding

[4]Breeding Assessment: Y - Breeding confirmed on or adjacent to property; Pr - Probably breeding on or adjacent to property; Po - Possibly breeding on or adjacent to property; N - Species observed but no evidence of breeding on or adjacent to property; Unk - breeding status

[5]Habitat Association - Woods and Forests (*i.e.* forest bird) by Cadman *et al* . (2007) - Appendix 3.

[6]Site 1 - Lay St./Highview Rd., Site 2 - St. Vincent St./Grove St. E. (Shell Gas Station), Site 3 - St. Vincent St./Grove St. E. (Grove St. E. culvert), Site 4 - MacMorrison Park, Site 5 - Davidson St./Grove St. E. (Grove St. E culvert), Site 6 Parkdale Cres./Northpark Rd. (Parkdale Rd. culvert).

Site 7 - Davidson St./Gunn St. (Gunn St. culvert), Site 8 - Berczy St. between Gunn St. and Wellington St. E., Site 9 - Berczy St. Park (south of Wellington St. E.), Site 10 - Ottaway Ave. Stormwater Retention Pond, Site 11 - Bell Farm Rd. LID Bioretention Zone (incidental observations only; no point count).

Breeding Bird Survey Conditions: June 29, 2016; temperature 20oC; wind B1-3; precipitation 0; cloud cover 5-80%; search time 07:50 to 10:10. Observer: Dr. S. Tarof.

Table 2 - Ecological Land Classification (ELC), Sophia Creek, City of Barrie, Ontario.

System	Community Class	Community Series	Ecosite	Vegetation Type	Composition	Ground Cover	Station
Terrestrial	CU, Cultural	CUM, Cultural Meadow	CUM1, Mineral Cultural Meadow		Narrow cultural meadow along the banks of the creek, surrounded by manicured lawn. Canopy is sparce, with shrub sized (1-1.5) trees, such as White Ash, Silver Maple, Staghorn Sumac, American Basswood, Manitoba Maple, Common Buckthorn and Riverbank Grape.	Mostly comprised of non-native species. Abundance of Wild Carrot, Orchard Grass and large patches of Goutweed. Occurrence of Bird's-foot Trefoil, Colt'sfoot, Awnless Brome, White Clover, Common Yarrow, Common Plaintain, Goat'sbeard, Ragweed, Black Medic, Greater Burdock, Philadelphia Fleabane, Yellow Buttercup, Field Pennycress, Horseweed, Garlic Mustard and Purple Jewelweed.	1
Terrestrial	CU, Cultural	CUM, Cultural Meadow	CUM1, Mineral Cultural Meadow		Narrow cultural meadow along the banks of the creek, surrounded by developments (gas station and residential family dwellings). Canopy is sparce, with shrub sized (1-1.5) trees, such as White Ash, Manitoba Maple and American Basswood. Presence of Staghorn Sumac, species of willow, Common Buckthorn, Tartarian Honeysuckle, Virginia Creeper and Riverbank Grape.	Mostly comprised of non-native species. Abundance of Reed Canary Grass. Occurrence of Wild Carrot, Orchard Grass, English Ivy, Garlic Mustard, Black Medic, Philadelphia Fleabane, Curly Dock, Awnless Brome, Yellow Field Pussytoes, Elecampane, Tufted Vetch and Purple Jewelweed.	2
Terrestrial	CU, Cultural	CUM, Cultural Meadow	CUM1, Mineral Cultural Meadow		Narrow cultural meadow along the banks of the creek, surrounded by residential family dwellings to the south and manicured lawn/community park to the north. Canopy is sparce, with presence of Staghorn Sumac, Manitoba Maple, Red-osier Dogwood, Tartarian Honeysuckle, Norway Maple, and Siberian Elm.	Mostly comprised of non-native species. Occurrence of Reed Canary Grass, Common Plaintain, Wild Carrot, Orchard Grass, Philadelphia Fleabane, Bull Thistle, Chicory, Colt'sfoot, Bull Thistle, Morning Glory, goldenrods and Bird's-foot Trefoil.	3
Terrestrial	CU, Cultural	CUW, Cultural Woodland	CUW1, Mineral Cultural Woodland		Narrow riparian woodlot, surrounded by residential family dwellings to the south and manicured lawn/community park to the north. Canopy dominated by Manitoba Maple, with occurrence of Norway Maple and Crack Willow. Understory composed by White Ash, species of willow, Common and Glossy Buckthorns, Crabapple and Black Walnut.	Mostly comprised of non-native species. Occurrence of Garlic Mustard, Reed, Narrow-leaved Cattail, Bull Thistle, Wild Carrot, Common Plaintain, Purple Jewelweed, Awless Brome, Orchard Grass, Smartweed, Spearmint, Yellow Buttercup, Common Yarrow, goldenrods.	4
Terrestrial	CU, Cultural	CUM, Cultural Meadow	CUM1, Mineral Cultural Meadow		Narrow riparian meadow, with occasional patches of trees. Canopy is composed by Manitoba Maple, Black Locust, Norway Maple, Black Walnut, and species of willows. Occurrence of Red Raspberry and Virginia Creeper in the understory.	Mostly comprised of non-native species. Occurrence of Garlic Mustard, Purple Jewelweed, Japanese Knotweed, Awless Brome, Greater Burdock, Orchard Grass, Wild Carrot, Smartweed, Spearmint, Yellow Buttercup, Common Yarrow, goldenrods, Philadelphia Fleabane, Creeping Wildrye, Curly Dock, Reed, Narrow-leaved Cattail, Hop Clover, English Ivy, Milkweed, Reed Canary Grass, Yellow Buttercup, Heal-all, Bull Thistle and Black Medic.	5 and 6
Terrestrial	CU, Cultural	CUW, Cultural Woodland	CUW1, Mineral Cultural Woodland		Canopy composed by Crack Willow, Weeping Willow, Manitoba Maple, Norway Maple, American Basswood, White Poplar. Understory sparce, composed by Hawthorn, Cherry, Common Buckthorn, and Riverbank Grape.	Mostly comprised of non-native species. Occurrence of Garlic Mustard, Chocory, Milkweed, English Plantain, Oxeye Daisy, Wild Carrot, Orchard Grass, Common Yarrow, Yellow Buttercup, Creeping Wildrye and sedges.	7 and 8

Table 2 - Ecological Land Classification (ELC), Sophia Creek, City of Barrie, Ontario.

System	Community Class	Community Series	Ecosite	Vegetation Type	Composition	Ground Cover	Station
Terrestrial	CU, Cultural	CUW, Cultural Woodland	CUW1, Mineral Cultural Woodland		Riparian woodlot located along Berczy Park. Dominated by Manitoba Maple, American Elm and Black Walnut. Understory composed by Staghorn Sumac, Red-osier Dogwood and Tartarian Honeysuckle.	Mostly comprised of non-native species. Occurrence of Wild Carrot, Chicory, Common Timothy, goldenrods, Philadelphia Fleabane, Orchard Grass, Curly Dock, Common Yarrow, Garlic Mustard, Creater Burdock, St. John's Wort and Yellow Buttercup.	9
Wetland	MA, Marsh	MAM, Meadow Marsh	MAM2, Mineral Meadow Marsh		Canopy very sparce, composed of Common Buckthorn, Siberian Elm, Norway Maple, Manitoba Maple. Presence of Tartarian Honeysuckle	Co-dominated by Reed Canary Grass and Broad-leaf Cattail. Occurrence of Awnless Brome, Canada Thistle, Bird's foot Trefoil, Common Milkweed, goldenrods, Ox-eye Daisy, Greater Burdock, Viper's Bugloss, Timothy, Curly Dock, Bull Thistle, Tufted Vetch.	10
Terrestrial	CU, Cultural	CUM, Cultural Meadow	CUM1, Mineral Cultural Meadow	CUM1-1, Dry-Moist Old Field Meadow	Graminoid-dominated meadow close to commercial/industrial establishments. Sparce canopy composed of White Ash, Staghor Sumac, Siberian Elm, Common Buckthorn, Riverbank Grape and Tartarian Honeysuckle.	Mostly comprised of non-native species. Abundance of Common Reed, Reed Canary Grass, Redtop Grass, Kentucky Bluegrass and Creeping Wildrye. Presence of several species of forbs, including Common Plaintain, Dandelion, Field-sow Thistle, Black Medic, Bird-sfoot Trefoil, Viper's Bugloss, Bull Thistle, Common Mullein, Canada Thistle, Milkweed, goldenrods, Canada Thistle, Sweet White Clover, Dark-green Bulrush, St. John's Wort, Pigweed, Spotted Knapweed, Narrow-leaved Cattail	11, western portion
Terrestrial	CU, Cultural			Hedgerow and manicured lawn (non-ELC)	Manicured lawn with a hedgerow composed by several trees and shrubs. Presence of Black Locust, American Elm, White Spruce, Scotch Pine, Norway Maple, Blue Spruce, European Mountain-ash, White Cedar, Tartarian Honeysuckle, Common Buckthorn, Black Walnut, Paper Birch, American Basswood, Pin Cherry, Spreading Dogbane, White Ash, Nanyberry, Staghorn Sumac, Russian Olive, Grape and Virginia Creeper.	Mostly comprised of non-native species. Occurrence of White Clover, Black Medic, Greater Burdock, Field Sow-thistle, White Clover, Dandelion, Heal-all, Prickly Lettuce, Bird's foot Trefoil, Common Plantain, English Plaintain, Wild Carrot, White Sweet Clover, Chicory, Oxeye Daisy, Alfafa, Common Yarrow, Creeping Wildrye, St. John's wort, Awless Brome, Redtop Grass, Curly Dock, .Timothy, Orhard Grass, Aspargus, Canada Thistle, Climbing Nightshade.	11, along commercial/industrial establishments
Terrestrial	FO, Forest	FOD, Deciduous Forest	FOD5, Dry-fresh Sugar Maple Deciduous Forest	FOD5-3, Dry-Fresh Sugar Maple-Oak Deciduous Forest	Canopy dominated by Red Oak and Sugar Maple. Abundance of Hop-hornbeam in the sub-canopy. Understory mainly composed by Hop-hornbeam, Common Buckthorn, Tartarian Honeysuckle; presence of Creeping Juniper, Choke Cheery, Basswood, Spreading Dogbane, Red Cedar, American Beech and American Elm.	Abundance of tree/shrub seedlings, particularly White Ash and Bukthorn. Presence of Spreading Dogbane, False Solomon's Seal, Blue Cohosh, Common St. John's wort, Partridgeberry, Rosy Sedge.	11, eastern portion

Table 3 - Vascular Plants List, Sophia Creek, Barrie, Ontario.

Family	Scientific Name	Common Name	1 CUW1	2 CUW1	3 CUW1	4 CUW1	5/6 CUW1	7/8 CUW1	9 CUW1	10 CUW1	11 West CUM 1-1	11 Center Hedge	11 East (FOD 5-3)	G-Rank	S-Rank	MNRF	LSRCA
Aceraceae	*Acer negundo*	Manitoba Maple	X	X	X	X	X	X	X	X				G5	S5		+
Aceraceae	*Acer platanoides*	Norway Maple			X	X	X	X		X		X		GNR	SE5		+
Aceraceae	*Acer saccharinum*	Silver Maple	X											G5	S5		
Aceraceae	*Acer saccharum*	Sugar Maple											X	G5	S5		
Amaranthaceae	*Amaranthus powellii*	Powell's Amaranth									X			G5T5	SE5		+
Anacardiaceae	*Rhus typhina*	Staghorn Sumac	X	X	X				X		X		X	G5	S5		
Apiaceae	*Aegopodium podagraria*	Goutweed		X			X							GNR	SE5		+
Apiaceae	*Daucus carota*	Wild Carrot	X	X	X	X	X	X	X	X	X	X		GNR	SE5		+
Apocynaceae	*Apocynum androsaemifolium*	Spreading Dogbane											X	G5	S5		
Araliaceae	*Hedera helix*	English Ivy		X			X							GNR	SE1		
Asclepiadaceae	*Asclepias syriaca*	Common Milkweed				X	X	X		X	X			G5	S5		
Asteraceae	*Achillea millefolium*	Common Yarrow	X			X	X	X	X	X		X		G5	SE		+
Asteraceae	*Ambrosia artemisiifolia*	Annual Ragweed	X											G5	S5		(+)
Asteraceae	*Antennaria neglecta*	Field Pussytoes		X										G5	S5		
Asteraceae	*Arctium lappa*	Greater Burdock	X		X		X		X	X		X		GNR	SE5		+
Asteraceae	*Bidens frondosa*	Devil's Beggarticks	X											G5	S5		
Asteraceae	*Centaurea stoebe*	Spotted Knapweed									X			GNR	SE5		+
Asteraceae	*Cichorium intybus*	Chicory		X	X			X	X		X	X		GNR	SE5		+
Asteraceae	*Cirsium arvense*	Canada Thistle	X	X	X					X	X	X		GNR	SE5		+
Asteraceae	*Cirsium vulgare*	Bull Thistle			X	X	X			X	X			GNR	SE5		+
Asteraceae	*Erigeron canadensis*	Canada Horseweed	X											G5	S5		
Asteraceae	*Erigeron philadelphicus*	Philadelphia Fleabane	X	X	X		X		X					G5	S5		
Asteraceae	*Inula helenium*	Elecampane		X										GNR	SE5		+
Asteraceae	*Lactuca serriola*	Prickly Lettuce	X									X		GNR	SE5		+
Asteraceae	*Leucanthemum vulgare*	Oxeye Daisy						X		X		X		GNR	SE5		+
Asteraceae	*Soligado sp.*	Goldenrod	X	X	X	X			X	X	X	X					
Asteraceae	*Sonchus arvensis*	Field Sow-thistle	X								X	X		GNRTNR	SE5		+
Asteraceae	*Taraxacum officinale*	Common Dandelion									X	X		G5	SE5		+
Asteraceae	*Tragopogon dubius*	Yellow Goat's-beard	X											GNR	SE5		+
Asteraceae	*Tussilago farfara*	Colt's-foot	X		X									GNR	SE5		+
Balsaminaceae	*Impatiens glandulifera*	Purple Jewelweed	X	X		X	X			X				GNR	SE4		+
Berberidaceae	*Caulophyllum thalictroides*	Blue Cohosh											X	G4G5	S5		
Betulaceae	*Betula papyrifera*	Paper Birch										X		G5	S5		
Betulaceae	*Ostrya virginiana*	Eastern Hop-hornbeam											X	G5	S5		
Boraginaceae	*Echium vulgare*	Common Viper's-bugloss								X	X	X		GNR	SE5		+
Brassicaceae	*Alliaria petiolata*	Garlic Mustard	X	X		X	X	X	X					GNR	SE5		+
Brassicaceae	*Erysimum cheiranthoides*	Wormseed Wallflower	X											G5	SE5		+
Brassicaceae	*Nasturtium officinale*	Watercress				X								GNR	SE		
Brassicaceae	*Thlaspi arvense*	Field Penny-cress	X											GNR	SE5		+
Campanulaceae	*Campanula rapunculoides*	Creeping Bellflower	X				X							GNR	SE5		+
Caprifoliaceae	*Lonicera tatarica*	Tartarian Honeysuckle		X	X				X	X	X	X	X	GNR	SE5		+
Caprifoliaceae	*Viburnum lentago*	Nannyberry										X		G5	S5		
Caryophyllaceae	*Saponaria officinalis*	Bouncing-bet										X		GNR	SE5		+
Caryophyllaceae	*Silene vulgaris*	Maiden's Tears										X		GNR	SE5		+

Table 3 - Vascular Plants List, Sophia Creek, Barrie, Ontario.

Family	Scientific Name	Common Name	1 CUW1	2 CUW1	3 CUW1	4 CUW1	5/6 CUW1	7/8 CUW1	9 CUW1	10 CUW1	11 West CUM 1-1	11 Center Hedge	11 East (FOD 5-3)	G-Rank	S-Rank	MNRF	LSRCA
Clusiaceae	*Hypericum perforatum*	Common St. John's-wort							X	X	X	X	X	GNR	SE5		+
Convolvulaceae	*Convolvulus arvensis*	Field Bindweed			X	X								GNR	SE5		+
Cornaceae	*Cornus stolonifera*	Red-osier Dogwood			X				X					G5	S5		
Cupressaceae	*Juniperus horizontalis*	Creeping Juniper		X									X	G5	S5		
Cupressaceae	*Juniperus virginiana*	Eastern Red Cedar											X	G5	S5		
Cupressaceae	*Thuja occidentalis*	Eastern White Cedar										X		G5	S5		
Cyperaceae	*Carex rosea*	Rosy Sedge						X					X	G5	S5		
Cyperaceae	*Scirpus atrovirens*	Dark-green Bulrush									X			G5?	S5		
Elaeagnaceae	*Elaeagnus angustifolia*	Russian Olive										X		GNR	SE3		
Equisetaceae	*Equisetum arvense*	Field Horsetail	X											G5	S5		
Fabaceae	*Lotus corniculatus*	Garden Bird's-foot Trefoil	X		X					X	X	X		GNR	SE5		+
Fabaceae	*Medicago lupulina*	Black Medic	X	X			X				X	X		GNR	SE5		+
Fabaceae	*Medicago sativa*	Alfalfa										X		GNR	SE5		
Fabaceae	*Melilotus albus*	White Sweet-clover					X				X	X		G5	SE5		+
Fabaceae	*Robinia pseudoacacia*	Black Locust					X					X		G5	SE5		+
Fabaceae	*Trifolium campestre*	Low Hop Clover					X				X			GNR	SE5		+
Fabaceae	*Trifolium pratense*	Red Clover					X							GNR	SE5		+
Fabaceae	*Trifolium repens*	White Clover	X				X					X		GNR	SE5		+
Fabaceae	*Vicia cracca*	Tufted Vetch		X						X				GNR	SE5		+
Fagaceae	*Fagus grandifolia*	American Beech											X	G5	S4		
Fagaceae	*Quercus rubra*	Northern Red Oak											X	G5	S5		
Juglandaceae	*Juglans nigra*	Black Walnut				X	X		X			X		G5	S4		W
Lamiaceae	*Mentha spicata*	Spearmint				X								GNR	SE4		+
Lamiaceae	*Prunella vulgaris*	Self-heal					X					X		G5TU	SE3		
Liliaceae	*Asparagus officinalis*	Garden Asparagus										X		G5?	SE5		+
Liliaceae	*Maianthemum racemosum*	False Solomon's-seal											X	G5	S5		
Oleaceae	*Fraxinus americana*	White Ash	X	X		X					X	X	X	G5	S4		
Onagraceae	*Oenothera biennis*	Common Evening Primrose									X	X		G5	S5		
Pinaceae	*Picea glauca*	White Spruce										X	X	G5	S5		
Pinaceae	*Picea pungens*	Blue Spruce										X		G5	SE1		
Pinaceae	*Pinus sylvestris*	Scotch Pine										X		GNR	SE5		+
Plantaginaceae	*Plantago lanceolata*	English Plantain		X				X			X	X		G5	SE5		+
Plantaginaceae	*Plantago major*	Common Plantain	X		X	X					X	X		G5	S5		+
Poaceae	*Agrostis gigantea*	Redtop									X	X		G4G5	SE5		+
Poaceae	*Bromus inermis*	Awnless Brome	X	X		X	X			X	X	X		G5TNR	SE5		+
Poaceae	*Dactylis glomerata*	Orchard Grass	X	X	X		X	X	X			X		GNR	SE5		+
Poaceae	*Elymus repens*	Creeping Wildrye			X	X	X	X			X	X		GNR	SE5		+
Poaceae	*Phalaris arundinacea*	Reed Canary Grass		X	X	X	X			X	X	X		G5	S5		(+)
Poaceae	*Phleum pratense*	Common Timothy					X		X	X		X		GNR	SE5		+
Poaceae	*Phragmites australis*	American Reed									X	X		G5T4	S4?		(+)
Poaceae	*Poa palustris*	Fowl Bluegrass									X			G5	S5		
Poaceae	*Poa pratensis*	Kentucky Bluegrass	X			X	X					X	X	G5T5	S5		+
Polygonaceae	*Persicaria lapathifolia*	Pale Smartweed				X	X							G5	S5		
Polygonaceae	*Rumex crispus*	Curly Dock	X	X			X		X	X	X	X		GNR	SE5		+

Table 3 - Vascular Plants List, Sophia Creek, Barrie, Ontario.

Family	Scientific Name	Common Name	1 CUW1	2 CUW1	3 CUW1	4 CUW1	5/6 CUW1	7/8 CUW1	9 CUW1	10 CUW1	11 West CUM 1-1	11 Center Hedge	11 East (FOD 5-3)	G-Rank	S-Rank	MNRF	LSRCA
Primulaceae	*Anagallis arvensis*	Scarlet Pimpernel									X			GNR	SE4		
Ranunculaceae	*Ranunculus acris*	Tall Buttercup	X			X	X	X						G5	SE5		+
Rhamnaceae	*Frangula alnus*	Glossy Buckthorn				X								GNR	SE5		+
Rhamnaceae	*Rhamnus cathartica*	Common Buckthorn	X	X		X		X		X	X	X	X	GNR	SE5		+
Rosaceae	*Crataegus sp.*	Hawthorn						X									
Rosaceae	*Geum aleppicum*	Yellow Avens							X					G5	S5		
Rosaceae	*Malus coronaria*	Sweet Crabapple				X						X		G5	S4		
Rosaceae	*Prunus pensylvanica*	Pin Cherry											X	G5	S5		
Rosaceae	*Prunus virginiana*	Choke Cherry						X					X	G5	S5		
Rosaceae	*Rubus idaeus ssp. idaeus*	Common Red Raspberry		X			X							G5T5	SE1		+
Rosaceae	*Sorbus americana*	American Mountain-ash										X		G5	S5		
Rosaceae	*Spiraea japonica*	Japanese Spiraea									X	X		G5	SE1		
Rubiaceae	*Mitchella repens*	Partridge-berry											X	G5	S5		
Salicaceae	*Populus alba*	White Poplar						X						G5	SE5		+
Salicaceae	*Salix euxina*	Crack Willow				X		X						GNR	SE		+
Salicaceae	*Salix sp.*	Willow		X			X										
Salicaceae	*Salix x sepulcralis*	(Salix alba X Salix babylonica)						X						GNA	SE2		+
Scrophulariaceae	*Linaria vulgaris*	Butter-and-eggs								X	X			GNR	SE5		+
Scrophulariaceae	*Verbascum thapsus*	Common Mullein									X			GNR	SE5		+
Solanaceae	*Solanum dulcamara*	Climbing Nightshade	X				X					X		GNR	SE5		+
Tiliaceae	*Tilia americana*	American Basswood	X	X				X			X	X	X	G5	S5		
Typhaceae	*Typha angustifolia*	Narrow-leaved Cattail				X	X				X			G5	SE5		(+)
Typhaceae	*Typha latifolia*	Broad-leaved Cattail								X				G5	S5		
Ulmaceae	*Ulmus americana*	American Elm							X				X	G5?	S5		
Ulmaceae	*Ulmus pumila*	Siberian Elm			X					X	X			GNR	SE3		+
Urticaceae	*Urtica dioica ssp. dioica*	European Stinging Nettle	X				X		X					G5T5?	SE2		
Vitaceae	*Parthenocissus quinquefolia*	Virginia Creeper		X			X	X	X			X		G5	S4?		
Vitaceae	*Vitis riparia*	Riverbank Grape	X	X				X			X	X		G5	S5		

Nomenclature based on Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC, 2017)

ELC Codes based on Ecological Land Classification for Southern Ontario manual (Lee *et al.* 1998, Lee 2009)

Conservation Rankings: From Ontario Ministry of Natural Resources, Natural Heritage Information Centre (http://nhic.mnr.gov.on.ca/nhic_.cfm) and Lake Simcoe Region Conservation Authority (http://www.lsrca.on.ca/Shared%20Documents/reports/lsems/state_lake.pdf)

G-Rank = Global scale (from 1-5); G1 - Critically Imperiled, G2 - Imperiled, G3 - Vulnerable, G4 - Apparently Secure, G5 – Secure/Common; NR – Not Ranked, T – Infraspecific Taxon/Trinomial (*e.g.* subspecies)

S-rank = Sub-national/provincial scale (from 1-5); S1 - Extremely Rare, S2 - Very Rare, S3 - Rare to Uncommon, S4 - Common, S5 - Very Common; NA – Not Applicable because not a suitable conservation target

COSEWIC or MNRF Blank Cell = Species Not at Risk Federally or Provincially

LSRCA Regional Rankings; + - Non-native, (+) – Non-native and naturalized, Blank – not +, W – Rare in watershed, "Not Listed" – species not listed in LSRCA reference document cited

Table 4 - Species at Risk Habitat Assessment, Sophia Creek, Barrie, Ontario.

Taxonomic Group	Common Name	Species Name	MNRF Status	Provincial Rank	Key Habitat Requirements[1]	Field Evidence/Habitat Assessment	Likely to Affect Work?
Bird	Bank Swallow	*Riparia riparia*	THR	S4B	Nests in burrows excavated in natural and human-made settings with vertical sand and silt faces. Colonies commonly found in sand or gravel pits, lakeshores, and along river banks. ESA Protection: Species and general habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	**Barn Swallow**	*Hirundo rustica*	THR	S4B	Ledges and walls of man-made structures such as buildings, barns and boathouses. Cliffs or caves. ESA Protection: Species and general habitat protection	Suitable nesting habitat present on study area (*i.e.* existing buildings, accessory structures), but no Barn Swallows were observed during field surveys.	Potential
Reptile	Blanding's Turtle	*Enydoidea blandingii*	THR	S3	Blanding's Turtles are a primarily aquatic species that prefer wetland habitats, lakes, ponds, slow-moving streams, *etc* ., however they may use upland areas to search for suitable basking and nesting sites. In general, preferred wetland sites are eutrophic and characterized by shallow water, organic substrates, and a high density of aquatic vegetation (COSEWIC 2005). ESA Protection: Species and regulated habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Stormwater Pond is relatively small and it is connected with other waterbodies/wetlands through Sophia Creek, which is shallow and poorly vegetated. Species not expected to occur on study area.	No
Bird	Bobolink	*Dolichonyx oryzivorus*	THR	S4B	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >4ha (MNRF 2000). ESA Protection: Species and general habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Plant	**Butternut**	*Juglans cinerea*	END	S3	Forests and hedge rows. ESA Protection: Species and general habitat protection	No Butternut were observed on the study area, but this tree species has the potential to occur.	No
Bird	Canada Warbler	*Wilsonia canadensis*	SC	S4B	Wet, mixed deciduous-coniferous forests with a dense, well-developed shrub layer. Shrub marshes, red-maple stands, cedar stands, black spruce swamps, larch and riparian woodlands along rivers and lakes (COSEWIC 2008). ESA Protection: N/A	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	Cerulean Warbler	*Setophaga cerulea*	THR	S3B	Mature, core deciduous forests (*e.g.* oak-maple) with large trees, closed or semi-open canopy and relatively open understory. Wetland bottom or upland habitat (COSEWIC 2010).	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	Chimney Swift	*Chaetura pelagica*	THR	S4B, S4N	Nests primarily in chimneys though some populations (*i.e.* in rural areas) may nest in cavity trees (Cadman *et al.* 2007). Recent changes in chimney design and covering of openings to prevent wildlife access may be a significant factor in recent declines in numbers (Adams and Lindsey 2010). ESA Protection: Species and general habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	Common Nighthawk	*Chordeiles minor*	SC	S4B	Open habitats including sand dunes, beaches, recently logged/burned areas, forest clearings, short grass prairies, pastures, open forests, bogs, marshes, lakeshores, gravel roads, mine tailings, quarries and other open relatively clear areas (COSEWIC 2007). ESA Protection: N/A	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No

Table 4 - Species at Risk Habitat Assessment, Sophia Creek, Barrie, Ontario.

Taxonomic Group	Common Name	Species Name	MNRF Status	Provincial Rank	Key Habitat Requirements[1]	Field Evidence/Habitat Assessment	Likely to Affect Work?
Bird	Eastern Meadowlark	*Sturnella magna*	THR	S4B	Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees. Old orchards with adjacent, open grassy areas >4 ha in size (MNRF 2000). ESA Protection: Species and general habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Reptile	Eastern Musk Turtle	*Sternotherus odoratus*	THR	S3	Ponds, lakes marshes and slow-moving rivers with lots of emergent vegetation. Muddy benthic substrates important for overwintering. ESA Protection: Species and general habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Reptile	Eastern Ribbonsnake	*Thamnophis sauritus*	SC	S3	Prefers to live near waterbodies such as in marshes. Requires suitable substrate or rock crevices for burrowing during winter. ESA Protection: N/A	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Mammal	Eastern Small-footed Bat	*Myotis Lleibii*	END	S2-3	Generally occurrs in mountainous or rocky regions where it has been noted to roost in large boulders and beneath slabs of rock and stones. Hibernation is typically confined to caves and abandoned mine adits (MNRF 2014, Best and Jennings 1997). ESA Protection: Species and general habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	Eastern Wood-pewee	*Contopus virens*	SC	S4B	Typically associated with mature deciduous and mixed forests with little understory vegetation; Often found in clearings or on edges of deciduous and mixed forests (MNRF 2015). ESA Protection: N/A	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	Least Bittern	*Ixobrychus exilis*	THR	S4B	Marshes with tall emergent vegetation (*i.e.* Cattails) with stable water levels and about 50% open water interspersed with vegetated areas. Marshes are typically 5-10ha in size. ESA Protection: Species and general habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Mammal	**Little Brown Bat**	*Myotis lucifugus*	END	S4	Forests and regularly aging human structures as maternity roost sites. May sometimes roost in buildings in summer. Overwintering sites are characteristically mines or caves. ESA Protection: Species and general habitat protection	Habitat within the study area is not typically representative of key habitat, although possibility of roosting in existing buildings. Species not expected to occur on study area.	Potential
Reptile	Eastern Milksnake	*Lampropeltis triangulum*	NAR	S3	Occurs in open mature grasslands/fields, open woodlots and swamps. Where found in woodlots, shows preference for heavily forested areas with deciduous forests, pine plantations or bog forests (core or edge areas). May also be found in powerline corridors and railway embankments. ESA Protection: N/A	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Mammal	Northern Long-eared Bat	*Myotis septentrionalis*	END	S3	Maternity roost sites are generally located within deciduous and mixed forests and focused within leaf. Overwintering sites are characteristically mines or caves. ESA Protection: Species and general habitat protection	Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No

Table 4 - Species at Risk Habitat Assessment, Sophia Creek, Barrie, Ontario.

Taxonomic Group	Common Name	Species Name	MNRF Status	Provincial Rank	Key Habitat Requirements[1]	Field Evidence/Habitat Assessment	Likely to Affect Work?
Mammal	Tri-colored Bat	*Perimyotis subflavus*	END	S3?	Maternity roost sites are generally located within deciduous and mixed forests, espcially older forests. May occasionally roost in barns. Forage over bodies of water. Usually overwinter in caves. ESA Protection: Species and general habitat protection	Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Reptile	Northern Map Turtle	*Grapetemys geographica*	SC	S3	Prefers rivers and lakeshores with available emergent rocks and fallen trees for basking. Deep, slow-moving sections of rivers are utilized for hibernation (COSEWIC 2002a). ESA Protection: N/A	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	Olive-sided Flycatcher	*Contopus cooperi*	SC	S4B	Natural forest openings, forest edges near natural openings (*e.g.* wetlands) or open to semi-open forest stands. Occasionally human-made openings (*e.g.* clear cuts). Presence of tall snags and residual live trees is essential (COSEWIC 2007). ESA Protection: N/A	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	Peregrine Falcon	*Falco peregrinus*	THR	S3B	Peregrine Falcons nest on tall, steep cliff ledges close to large bodies of water. Urban falcons raise their young on ledges of tall buildings. ESA Protection: Species and regulated habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat, although potential to occur on tall buildings in downtown core). Species not expected to occur on study area.	No
Bird	**Red-headed Woodpecker**	*Melanerpes erythrocephalus*	SC	S4B	Prefers open woodlands and woodland edges, parks, golf courses and cemetaries where there is a supply of dead trees for nesting and perching. ESA Protection: N/A	Some areas of the habitat surveyed have the potential to support this species (*e.g.* woodland edges, parks), but not found during field surveys.	Potential
Reptile	Snapping Turtle	*Chelydra serpentina*	SC	S3	Utilizes a wide variety of aquatic habitat, but prefers shallow waters with abundant leaf litter. Females travel overland during the nesting season in search of suitable nesting sites such as gravel shoulders of roadways, dams, and aggregate pite. ESA Protection: N/A	Species not detected during surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area. Stormwater pond is relatively small and it is not connected with other waterbodies/wetlands through Sophia Creek, which is shallow and poorly vegetated.	No
Bird	Eastern Whip-Poor-Will	*Caprimulgus vociferus*	THR	S4B	Whip-poor-will prefer areas with a mix of open and forested habitat, open woodlands such as pine plantations, or large openings in mature forests. ESA Protection: Species and general habitat protection	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No
Bird	Wood Thrush	*Hylocichla mustelina*	SC	S4B	Typically associated with moist mature deciduous and mixed forests (*e.g.* maple-beech) with a well-developed understory. ESA Protection: N/A	Species not detected during field surveys. Habitat within the study area is not representative of key habitat. Species not expected to occur on study area.	No

[1]MNRF's Species at Risk website (https://www.ontario.ca/environment-and-energy/species-risk-ontario-list) and/or species-specific COSEWIC reports referenced in this document.

Table 5: Significant Wildlife Habitat Ecoregion 6ECriteria, Sophia Creek, Barrie, Ontario.

SWH Category	SWH Function	SWH Criteria	Assessment
Seasonal Concentration Area	Waterfowl Stopover & Staging Areas (Terrestrial)	Mixed waterfowl species aggregations of >100 birds within flooded field areas used annually during spring migration (mid March to May).	No suitable habitat.
	Waterfowl Stopover & Staging Areas (Aquatic)	Ponds, marshes, lakes, bays, coastal inlets & watercourses used by aggregations of > 100 of listed waterfowl for 7 days during spring and autumn migration. Listed Species: Canada Goose, Cackling Goose, Snow Goose, American Black Duck, Northern Pintail, Northern Shoveler, American Widgeon, Gadwall, Green-winged Teal, Blue-winged Teal, Hooded Merganser, Scaup (Lesser & Greater), Long-tailed Duck, Surf Scoter, Black Scoter, Ring-necked Duck, Common Goldeneye, Bufflehead, Ruddy Duck, Red-breasted Merganser, Brant, Canvasback, Redhead.	No suitable habitat.
	Shorebird Migratory Stopover Area	Shorelines of lakes, rivers and wetlands including beach areas, bars, groynes and muddy/un-vegetated shoreline habitat used by 3 or more listed species demonstrating >1000 "shorebird use days" (*i.e.* accumulated number of shorebirds over the course of the spring or autumn migration period) or sites used by >100 Whimbrel for 3 or more years. Listed Species: Greater Yellowlegs, Lesser Yellowlegs, Marbled Godwit, Hudsonian Godwit, Black-bellied Plover, American Golden Plover, Semi-palmated Plover, Solitary Sandpiper, Spotted Sandpiper, Semi-palmated Sandpiper, Pectoral Sandpiper, White-rumped Sandpiper, Baird's Sandpiper, Stilt Sandpiper, Short-billed Dowitcher, Red-necked Phalarope, Whimbrel, Ruddy Turnstone, Sanderling, Dunlin.	No suitable habitat.
	Raptor Wintering Area	Combinations of fields and woodlands providing roosting, foraging and resting habitat utilized by at least 10 individuals of 2 listed species used regularly for at least 20 days in 3 of 5 years or used by one or more Short-eared Owls. Listed Species: Rough-legged Hawk, Red-tailed Hawk, Northern Harrier, American Kestrel, Snowy Owl, Short-eared Owl.	No suitable habitat.
	Bat Hibernacula	Caves, mine shafts, underground foundations and Kart formations utilized by bat species during winter.	No suitable habitat.
	Bat Maternity Colony	Wildlife cavity trees within deciduous or mixed forest communities having >10/ha, large diameter (*i.e.* >25cm diameter at breast height) trees containing cavities or loose bark pockets of sufficient size to housing five or more adult bats.	No suitable habitat.
	Turtle Wintering Area	Areas of deep water associated with core habitat utilized by turtles throughout the year often in the vicinity of areas of concentrations of basking turtles noted on warm, sunny days in autumn (September – October) or spring (March – May)	No suitable habitat.
	Snake Hibernacula	Animal burrows, rock fissures and other structures that allow underground access below frost and open wetlands containing sparse trees or shrubs cover providing hummocks or depressions with sphagnum moss or sedge ground cover. Areas of observed concentrations of five or more snakes or two or more snake species observed on sunny, warm days in spring (April-May) and autumn (September-October)	No suitable habitat.
	Colonial Bird Nesting (Bank & Cliff)	Sites with exposed soil banks either natural (mainly along shorelines, rivers) or exposed as part of aggregate extraction/material stockpiling. Presence of 1 or more nesting sites with 8 or more pairs of Cliff Swallows or >50 Bank Swallow or Northern Rough-winged Swallow during the breeding season.	No suitable habitat.
	Colonial Bird Nesting (Tree/Shrub)	Sites having live or dead trees in wetlands, lakes, islands or peninsulas having >5 active Great	No suitable habitat.

Table 5: Significant Wildlife Habitat Ecoregion 6ECriteria, Sophia Creek, Barrie, Ontario.

SWH Category	SWH Function	SWH Criteria	Assessment
		Blue Heron nests or active heronries of other species (Black-crowned Night-heron, Great Egret, Green Heron).	
	Colonial Bird Nesting (Ground)	Nesting colonies of gulls and terns on islands or peninsulas having >25 active nests for Herring Gulls or Ring-billed Gulls or >5 active Common Tern nests or > 2 active Caspian Tern nests or any active nests of Little Gull or Great Blacked-backed Gull. Farm ditches or streams having low shrub cover utilized by 5 or more pairs of Brewer's Blackbirds during the nesting season.	No suitable habitat.
	Migratory Butterfly Stopover Area	Meadows and thickets over 10ha in size with a combination of field and forest habitat located within 5km of Lake Ontario having >5000 Monarch Use Days (MUD = number of days site used by Monarchs X number of Monarchs) during autumn migration (August – October) or MUD > 3000 MUD if Painted Lady or White Admiral are observed.	No suitable habitat. Not within 5km of Lake Ontario. No thicket or field habitat on site.
	Landbird Migratory Stopover Area	Woodlots over 10ha in size located within 5km of Lake Ontario used by >200 birds/day with >35 species total with at least 10 species recorded on at least 5 different survey days during spring (April-May) and autumn (August-October) migration.	No suitable habitat. Not located within 5km of Lake Ontario.
	Deer Yarding Area	Conifer and mixed forest and swamp communities in areas typically having snow depths >40cm for more than 60 days that are mapped as Stratum 1 (core) or Stratum 2 deer yard by the MNR and show winter accumulations of deer tracks.	No suitable habitat and not designated Stratum 1 or 2 by MNRF.
	Deer Winter Concentration Area	Large (*i.e.* woodlots >100ha) conifer and mixed forest and swamp communities in areas typically having relatively low snow accumulation that are utilized during winter by >10 deer/km^2 and identified by the MNR.	No suitable habitat and not designated Stratum 1 or 2 by MNRF.
Rare Vegetation Communities	Cliffs & Talus Slopes	Any Ecological Land Classification (ELC) vegetation type for Cliffs or Talus Slopes associated with a vertical to near vertical rock face >3m high.	Not present on study area.
	Sand Barren	Area of exposed sand with sparse vegetation and underlaying rock protruding the surface in places. Site not dominated by exotic or introduces species (*i.e.* <50% vegetative cover by non-native plant species).	Not present on study area.
	Alvar	Area of exposed calcareous bedrock sand with sparse vegetation and shallow soils. Site not dominated by exotic or introduces species (*i.e.* <50% vegetative cover by non-native plant species) and in excellent condition with few conflicting land uses.	Not present on study area.
	Old Growth Forest	Forest communities over 30ha with at least 10ha of "100m forest interior" dominated by trees over 140 years old with a mosaic of gaps establishing a multi-layered canopy with no evidence of forestry activities.	Not present on study area.
	Savannah	Tallgrass Prairie habitat having tree cover between 25% and 60%	Not present on study area.
	Tallgrass Prairie	Open grassland having tree cover <25% containing one or more Prairie indicator plant species.	Not present on study area.
	Other Rare Vegetation Community Type	Any ELC vegetation community having a sub-national (S Rank) of S1, S2 or S3 as assigned by the MNR.	Not present on study area.
Specialized Habitat for Wildlife	Waterfowl Nesting Area	All lands adjacent (i.e., within 120m) of wetlands over 0.5ha in size or clusters of 3 or more small (<0.5) wetlands where waterfowl breeding is known to occur that contain 3 or more nesting pairs of listed species excluding Mallard or 10 or more nesting pairs including Mallard or any active nest site of American Black Duck. Listed Species: American Black Duck, Northern Pintail, Northern Shoveler, Gadwall, Blue-winged Teal, Green-winged Teal, Wood Duck, Hooded Merganser, Mallard.	No suitable habitat.

Table 5: Significant Wildlife Habitat Ecoregion 6ECriteria, Sophia Creek, Barrie, Ontario.

SWH Category	SWH Function	SWH Criteria	Assessment
	Bald Eagle & Osprey Nesting, Foraging & Perching Habitat	Forest and swamp wetlands directly adjacent to lakes, rivers, ponds and other wetlands where nesting by Osprey or Bald Eagle is confirmed. Within 300m of active Osprey nest or 400-800m of an active Bald Eagle nest.	No suitable habitat.
	Woodland Raptor Nesting Habitat	Forests and conifer plantations >30ha with >10ha of "200m interior forest habitat" containing active nests of listed species. Within 400m of an active Red-shouldered Hawk or Northern Goshawk nest or 200m of an active Barred Owl nest or 100m of an active Broad-winged Hawk or Coopers Hawk nest or 50m of a Sharp-shinned Hawk nest. Listed Species: Northern Goshawk, Cooper's Hawk, Sharp-shinned Hawk, Red-shouldered Hawk, Barred Owl, Broad-winged Hawk.	No Woodland Raptors or nests were observed on the property. No known raptor nests within the general area.
	Turtle Nesting Area	Areas of exposed sand and gravel in proximity to wetlands and water bodies providing undisturbed shallow weedy areas utilized by turtles having 5 or more nesting Midland Painted Turtles or one or more nesting Northern Map Turtle or Snapping Turtle plus travel routes between wetlands and nesting areas.	No suitable habitat.
	Seeps & Springs	Forested headwaters of stream or river system containing 2 or more seeps/springs.	No seeps or springs were recorded within the study area.
	Amphibian Breeding Habitat (Woodland)	Forests and swamp wetlands containing permanent or vernal pools containing water in most years until mid-July having a breeding population of 1 or more listed species with at least 20 individuals (adults, juveniles, eggs/larval masses). Listed Species: Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Gray Treefrog, Spring Peeper, Western Chorus Frog, Wood Frog.	No suitable habitat.
	Amphibian Breeding Habitat (Wetland)	Wetlands and pools (including vernal pools >0.05ha) located >120m from woodlands having a breeding population of 1 or more of the listed salamander species or 3 or more of the listed frog species with at least 20 breeding individuals or wetlands with confirmed breeding by Bullfrog. Listed Species: Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Four-toed Salamander, Gray Treefrog, Spring Peeper, Western Chorus Frog, Wood Frog, Northern Leopard Frog, Pickerel Frog, Green Frog, Mink Frog, Bull Frog, American Toad.	No suitable habitat.
Habitat of Species of Conservation Concern	Marsh Bird Breeding Habitat	Wetlands containing 5 or more nesting pairs of Sedge Wren or Marsh Wren or breeding by any combination of 5 or more of the listed species or any wetland with breeding of 1 or more Black Tern, Trumpeter Swan, Green Heron or Yellow Rail. Listed Species: American Bittern, Virginia Rail, Sora, Common Moorhen, American Coot, Pied-billed Grebe, Marsh Wren, Sedge Wren, Common Loon, Sandhill Crane, Green Heron, Trumpeter Swan, Black Tern, Yellow Rail.	No suitable habitat.
	Woodland Area-sensitive Bird Breeding Habitat	Large mature forest stands over 30ha having "200m interior habitat" with breeding pairs of 3 or more listed species or any site with breeding by Cerulean Warbler or Canada Warbler. Listed Species: Yellow-bellied Sapsucker, Red-breasted Nuthatch, Veery, Blue-headed Vireo, Northern Parula, Black-throated Green Warbler, Blackburnian Warbler, Black-throated Blue	No suitable habitat.

Table 5: Significant Wildlife Habitat Ecoregion 6ECriteria, Sophia Creek, Barrie, Ontario.

SWH Category	SWH Function	SWH Criteria	Assessment
		Warbler, Ovenbird, Scarlet Tanager, Winter Wren, Cerulean Warbler, Canada Warbler.	
	Open County Bird Breeding Habitat	Grasslands >30ha in size not actively used for farming (i.e., not Class 1 or 2 farmland) with breeding by 2 or more listed species or 1 or more breeding Short-eared Owls. Listed Species: Upland Sandpiper, Grasshopper Sparrow, Vesper Sparrow, Northern Harrier, Savannah Sparrow, Short-eared Owl.	No suitable habitat.
	Shrub/Early Successional Bird Breeding Habitat	Large field areas succeeding to thicket >10 in size not actively used for farming (*i.e.* not Class 1 or 2 farmland) with breeding by 1 of the listed species and at least 2 of the common species of a thicket having breeding Yellow-breasted Chat or Golden-winged Warbler. Listed Species: Indicator Spp.: Brown Thrasher, Clay-colored Sparrow; Common Spp: Field Sparrow, Black-billed Cuckoo, Eastern Towhee, Willow Flycatcher; Other Spp. Yellow-breasted Chat, Golden-winged Warbler.	No suitable habitat.
	Terrestrial Crayfish	Meadows and edges of shallow marshes containing 1 or more individuals or chimneys of Chimney or Devil Crayfish.	No chimneys documented on the property.
	Special Concern & Rare Wildlife Species	**Site containing wildlife species having a sub-national (S Rank) of S1, S2 or S3 as assigned by the MNR.**	**Potential suitable habitat for Red-headed Woodpecker.**
Animal Movement Corridors	Amphibian Movement Corridors	Movement corridors linking amphibian breeding habitat and summer habitat containing native vegetation and free of gaps such as fields, waterways, water bodies or developed lands that are >200m wide and having gaps <20m wide. If following a riparian area corridor should include vegetation 15m of either side of watercourse.	No suitable habitat.
	Deer Movement Corridors	Forest habitat associated with watercourses and ridges that are >200m wide and having gaps <20m wide. If following a riparian area corridor should include vegetation 15m of either side of watercourse. Corridors leading to deer wintering yards should be unbroken by roads or residential areas.	No suitable habitat.

Reference: MNRF. 2015. Significant Wildlife Habitat Criteria Schedules For Ecoregion 6E. Ontario Ministry of Natural Resources and Forestry, Regional Operations Division: Southern Region Resources Section, 300 Water Street, 4th Floor South, Peterborough, Ontario, Canada, K9J 8M5.

APPENDICES

Appendix A: List of Sites Attended
Appendix B: MNRF Species at Risk Information Request
Appendix C: City of Barrie Official Plan Land Use Designation Schedule A
Appendix D: Natural Heritage Survey and Fisheries Photographs
Appendix E: LSRCA Background Information
Appendix F: MNRF Email Correspondence

APPENDIX A

List of Sites Attended

List of Sites Attended, Sophia Creek, Barrie, Ontario.

Site Number	Site
1	Lay and Highview
2	St. Vincent and Grove St. E. (Sophia Creek beside Shell Gas Station)
3	St. Vincent and Grove St. E. (Culvert crossing, Grove St. E.)
4	MacMorrison Park
5	Davidson and Grove St. E.
6	Parkdale and Northpark
7	Davidson and Gunn (Culvert on Gunn between Davidson and Berczy on south side of Gunn)
8	Sophia Creek parallel to Berczy between Gunn and Wellington
9	Culvert on Berczy south of Wellington in Berczy Park
10	Ottaway Avenue SWMF
11	LID Bioretention Zone on Bell Farm Road

APPENDIX B

MNRF Species at Risk Information Request

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Environmental Assessments & Approvals

May 26, 2016 AEC 15-223

Ministry of Natural Resources
Midhurst District
2284 Nursery Road
Midhurst, Ontario
L0L 1X0

Attention: Jodi Benvenuti, Management Biologist

RE: Species at Risk Information Request for the Sophia Creek Watershed and Mulcaster Drainage Improvement Project in the City of Barrie, County of Simcoe

Dear Ms. Benvenuti:

Azimuth Environmental Consulting (Azimuth) has been retained by C.C. Tatham & Associates to act as a sub-consultant to undertake the natural environmental components of the Sophia Creek Class EA during the completion of drainage improvements project within the Sofia Creek watershed and Mulcaster Drainage Area in the City of Barrie (please see attached mapping). The purpose of this letter is to request additional information regarding Species at Risk (SAR) and any other sensitive areas associated with the study area, and to request any background information that may be relevant to our study.

EXISTING CONDITIONS

The City of Barrie's Official Plan Land Use Designation Schedule A identifies the southern portion of the study area as "City Centre", with "Open Space" along the waterfront. Additional land use designation within the study area includes "Highway 400 Industrial", "General Commercial" and "Residential". No environmental protection areas have been identified within the study area.

642 Welham Road, Barrie, Ontario L4N 9A1
telephone: (705) 721-8451 • fax: (705) 721-8926 • info@azimuthenvironmental.com • www.azimuthenvironmental.com

BACKGROUND SAR DATA

A search of the Ontario Breeding Bird Atlas has been completed. Square 17PK01 was queried and it was determined that several SAR bird species have been recorded demonstrating probable or confirmed breeding evidence within the 10 x 10 km data square, including Chimney Swift, Eastern Wood-pewee, Whip-poor-will, Common Nighthawk, Bank Swallow, Barn Swallow, Wood Thrush, Red-headed Woodpecker, Bobolink, and Eastern Meadowlark.

Available information from the Natural Heritage Information Centre (NHIC) shows no records of SAR within the 1 km of the study area (17PK0416, 17PK0316, and 17PK0415).

In summary, based on information reviewed, the following are being considered in our assessment:

- Mammals: Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septrentionalis*), and Eastern Small-footed Bat (*Myotis leibii*);
- Reptiles and Amphibians: Blanding's Turtle (*Emydoidea blandingii*), Eastern Musk Turtle (*Sternotherus odoratus*), Eastern Ribbonsnake (*Thamnophis sauritus*), Milksnake (*Lampropeltis triangulum*), and Snapping Turtle (*Chelydra serpentina*);
- Birds: Barn Swallow (*Hirundo rustica*), Bank Swallow (*Riparia riparia*), Bobolink (*Doliichonyx oryzivorus*), Canada Warbler (*Wilsonia carolinus*), Cerulean Warbler (*Setophaga cerulea*), Chimney Swift (*Chaetura pelagica*), Common Nighthawk (*Chordeiles minor*), Eastern Wood-pewee (*Contopus virens*), Eastern Meadowlark (*Sturnella magna*), Least Bittern (*Ixobrychus exilis*), Olive-sided fly catcher (*Contopus cooperi*), Wood Thrush (*Hylocichla mustelina*), and Whip-poor-will (*Caprimulgus vociferus*)
- Plants and Lichens: Butternut (*Juglans cinerea*); and,
- Insects: Monarch Butterfly (*Danaus plexippus*).

If the District's files contain additional or contradictory information, we would appreciate your input at this time.

It is generally our intention to append this correspondence in the resulting EIS. If restricted species occur in the area and the MNRF determines that these need to be considered in our review, please provide two copies of the response - one with the species name replaced with (Restricted Species) for inclusion within Azimuth's natural heritage review report, and the other retaining the identity of the species for Azimuth's internal use only.

Thank you very much for your assistance in this matter. If you have any questions regarding this project please do not hesitate to contact us.

Yours truly,

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Stephanie Casutt, H.B.ES
Terrestrial Ecologist

Attach: AEC15-223 Site Location
AEC15-223 Ontario Breeding Bird Atlas Data Summary (17PK01), NHIC 2016

Scott Tarof

From: Stephanie Casutt
Sent: Wednesday, June 22, 2016 8:26 PM
To: Scott Tarof
Subject: FW: MNRF SAR Information Request

Scott:

See below for the MNRF's response to the SAR Info Request for project 15-223.

Steph.

From: Shirley, Brent (MNRF) [brent.shirley@ontario.ca]
Sent: 21 June 2016 08:26
To: Stephanie Casutt
Subject: RE: MNRF SAR Information Request

HI Stephanie,

I have taken a look at the study area and the species at risk found in that immediate area and your list is very complete.

To demonstrate due diligence for species at risk (SAR), an ecological site assessment would not just consider known records of SAR but also, and most importantly, would have to consider the available habitat on the subject lands and what SAR have the potential to be present based on this habitat. As you are aware, given the private landscape in which we work and operate, it would be impossible to know all SAR that occur on private properties.

Any questions feel free to give me a call or email at any time.

Best Regards,

Brent Shirley

A/ Management Biologist
Midhurst District Ministry of Natural Resources & Forestry
2284 Nursery Rd
Midhurst, ON
L0L 1X0

Phone- 705-725-7547
Fax- 705-725-7584

From: Stephanie Casutt [mailto:scasutt@azimuthenvironmental.com]
Sent: May-26-16 11:51 AM
To: Benvenuti, Jodi (MNRF)
Cc: Scott Tarof
Subject: MNRF SAR Information Request

Good Afternoon Ms. Benvenuti,

Azimuth has been retained to undertake the natural environmental components for the Sophia Creek Watershed and Mulcaster Drainage Improvement Project in the City of Barrie, County of Simcoe (see map attached).

I have attached a letter requesting information regarding Species at Risk in the area. I have listed the species we are currently considering in the study, and would appreciate feedback on the matter.

If you have any questions regarding this project please do not hesitate to contact us.

Regards,

STEPHANIE CASUTT
Terrestrial Ecologist

Azimuth Environmental Consulting, Inc.
642 Welham Road, Barrie, ON, L4N 9A1
office: (705)721-8451 ext.204
cell: (705)305-8582
scasutt@azimuthenvironmental.com
www.azimuthenvironmental.com

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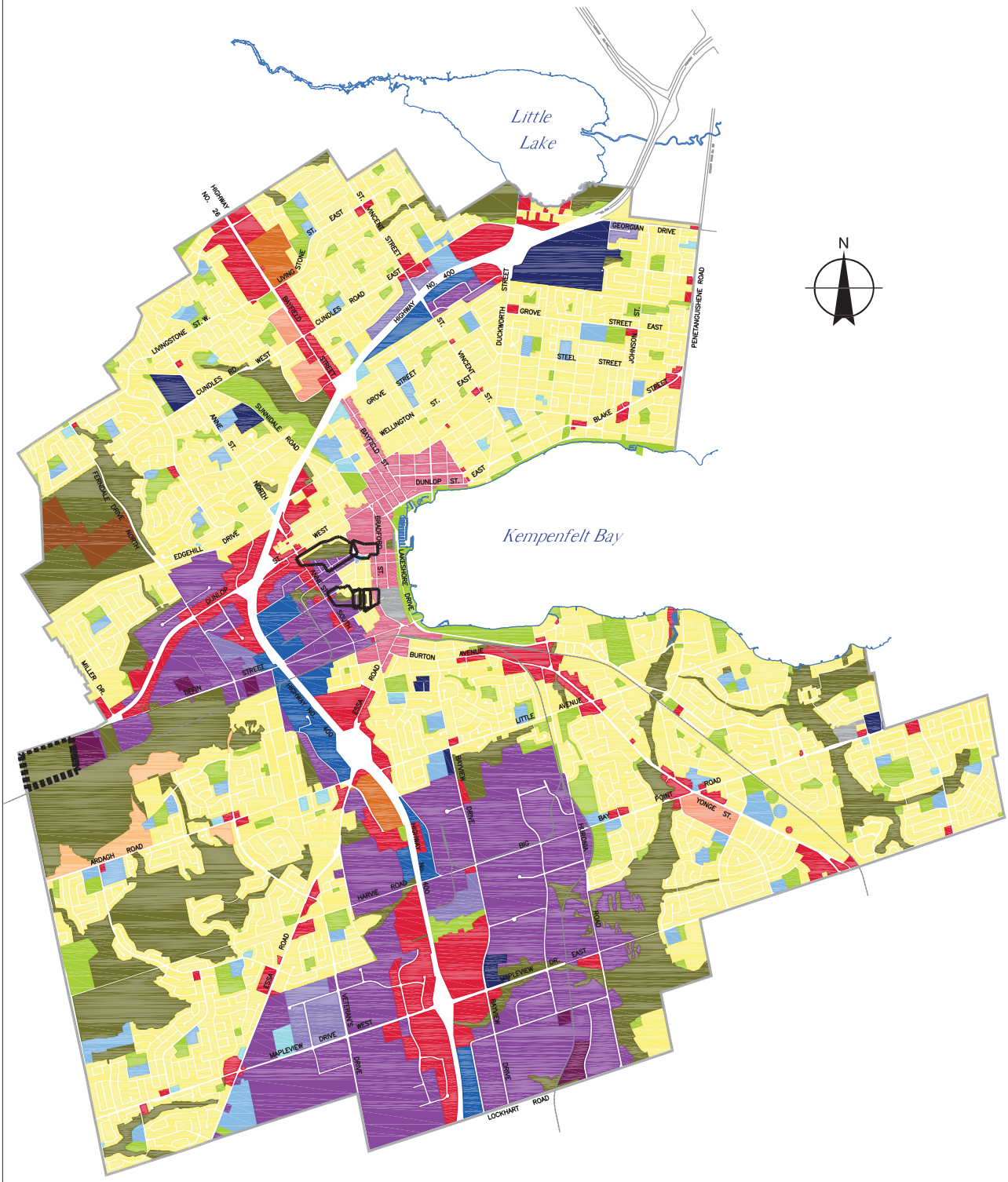
APPENDIX C

City of Barrie Official Plan Land Use Designation Schedule A



The City of BARRIE

OFFICIAL PLAN

- Residential
- City Centre
- General Commercial
- Community Centre Commercial
- Regional Centre Commercial
- Business Park
- General Industrial
- Highway 400 Industrial
- Restricted Industrial
- Institutional
- Educational Institutional
- Major Institutional
- Open Space
- Environmental Protection Area
- Water Treatment Centre
- Waste Management Facility
- Future Urban
- Waste Disposal Assessment Area see (Section 4.7.2.8) Non-Decision
- City Boundary
- Application currently before the Ontario Muncipal Board (OMB)

SCHEDULE A
Land Use

FEBRUARY 2014

500 0 500 1000 m

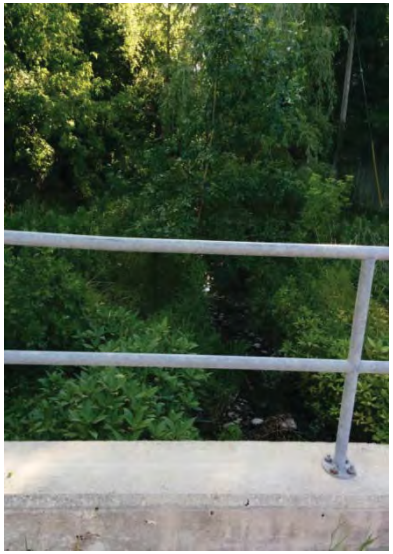
Note: Office consolidation, please consult the Planning Services Department for an accurate reference. Not to be reproduced without permission from the City of Barrie Planning Services Department.

APPENDIX D

Natural Heritage Survey and Fisheries Photographs

Site 1 - Lay and Highview.

Site 2 - St. Vincent and Grove St. (Beside Shell Gas Station)



Site 3 - St. Vincent and Grove (Grove St. Culvert Crossing)

Site 4 - Sophia Creek at MacMorrison Park (Culvert)

Site 4 – MacMorrison Park Sophia Creek Substrate/Watercourse Flow

Site 5 – Sophia Creek at Davidson and Grove (Grove St. Culvert Crossing)

Site 6 – Sophia Creek at Parkdale and Northpark (Parkdale Culvert, Substrate/Watercourse Flow)

Site 7 – Sophia Creek at Davidson and Gunn (Gunn St. Culvert)

Site 8 – Sophia Creek Parallel to Berczy (Between Gunn/Wellington)

Site 10 – Ottaway Ave Stormwater Retention Pond

Site 9 – Sophia Creek in Berczy Park (South of Wellington St.)

Photograph 1: Upstream of Howard Crescent, furthest upstream segment of study area (Fisheries Survey Site 1).

Photograph 2: Looking downstream from Howard Crescent at Fisheries Survey Site 2.

Photograph 3: Sophia Creek at Fisheries Survey Site 2.

Photograph 4: Downstream of Lay Street (Fisheries Survey Site 3).

Photograph 5: Downstream of Grove Street crossing (Fisheries Survey Site 4).

Photograph 6: Culvert inlet at St. Vincent Street (Fisheries Survey Site 5).

Photograph 7: Sophia Creek looking downstream from Bothwell Crescent (Fisheries Survey Site 6).

Photograph 8: Perched outlet at Bothwell Crescent crossing (Fisheries Survey Site 6).

Photograph 9: Stormwater Management Pond at Fisheries Survey Site 7.

Photograph 10: Dry channel downstream of Grove Street (Fisheries Survey Site 7).

Photograph 11: Channel downstream of Grove Street with pockets of stagnant water (Fisheries Survey Site 8).

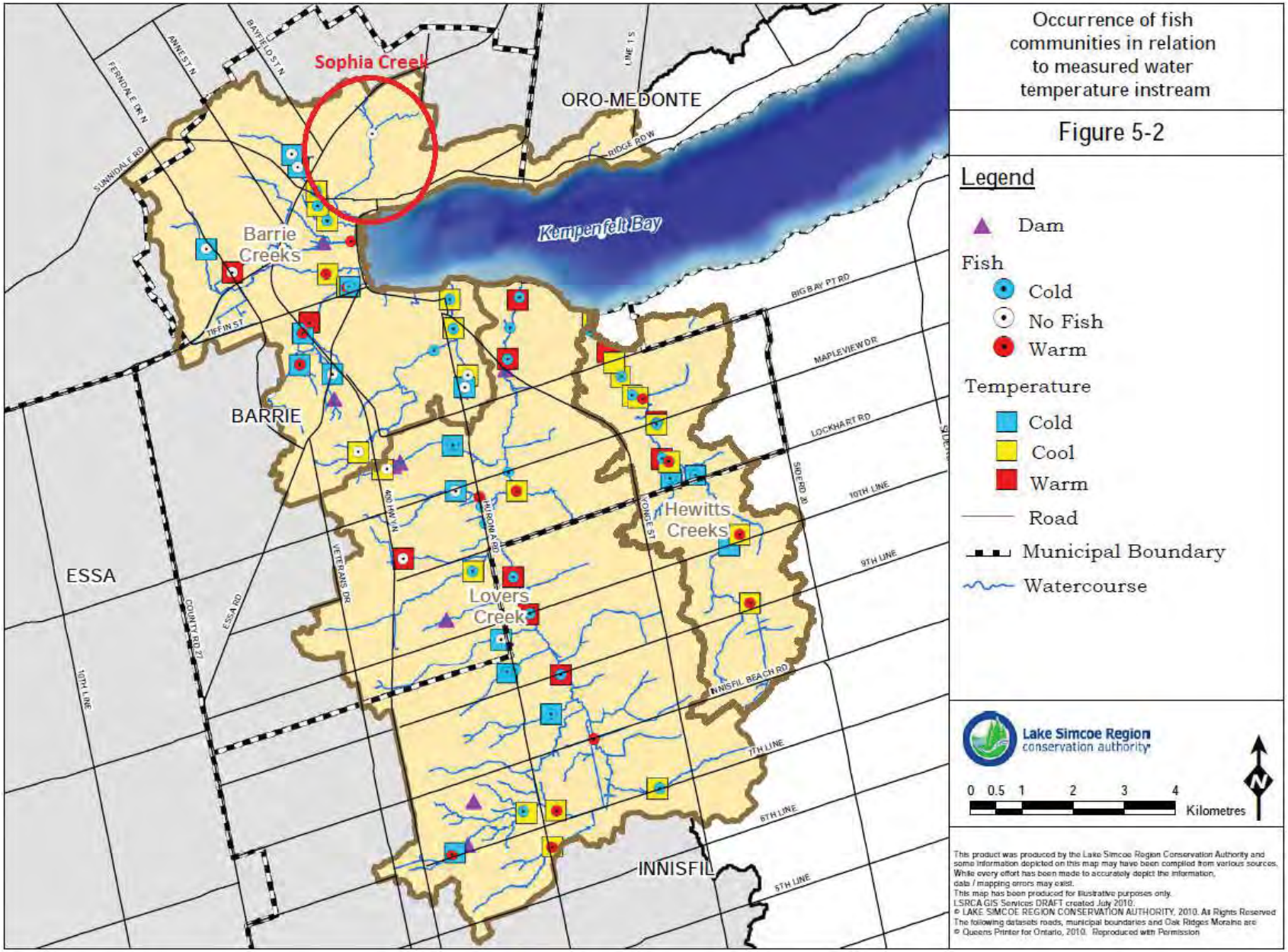
Photograph 12: Sophia Creek between Gunn Street and Berczk Street (Fisheries Survey Site 9).

Photograph 13: Perched culvert downstream of Berczk Street (Fisheries Survey Site 10).

Photograph 14: Sophia Creek downstream of Berczk Street culvert (Fisheries Survey Site 10).

APPENDIX E

LSRCA Background Information



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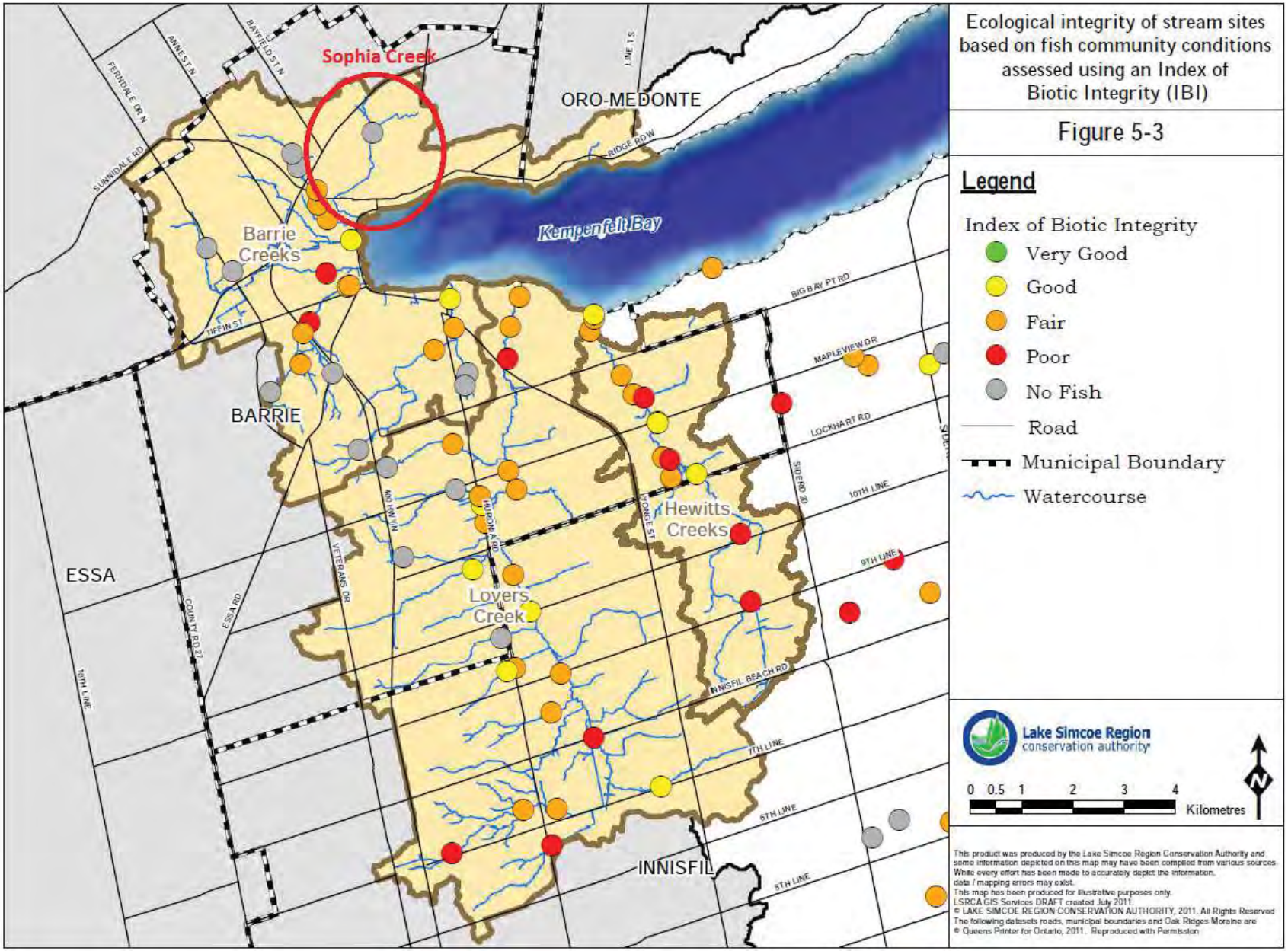
LSRCA GIS Services DRAFT created July 2010.


Sophia Creek
ORO-MEDONTE
Kempenfelt Bay
Barrie Creeks
BARRIE
Hewitts Creeks
Lovers Creek
ESSA
INNISFIL
FERNDALE DR N
ANNE ST N
BAYFIELD ST N
LINE 1 S
SUNNIDALE RD
RIDGE RD W
BIG BAY PT RD
MAPLEVIEW DR
LOCKHART RD
TIFFIN ST
400 HWY N
HURONIA RD
YONGE ST
SIDE RD 20
10TH LINE
9TH LINE
7TH LINE
6TH LINE
5TH LINE
VETERANS DR
ESSA RD
COUNTY RD 27
INNISFIL BEACH RD
Ecological integrity of stream sites based on fish community conditions assessed using an Index of Biotic Integrity (IBI)
Figure 5-3
Legend
Index of Biotic Integrity
Very Good
Good
Fair
Poor
No Fish
Road
Municipal Boundary
Watercourse
Lake Simcoe Region conservation authority
0 0.5 1 2 3 4
Kilometres
N
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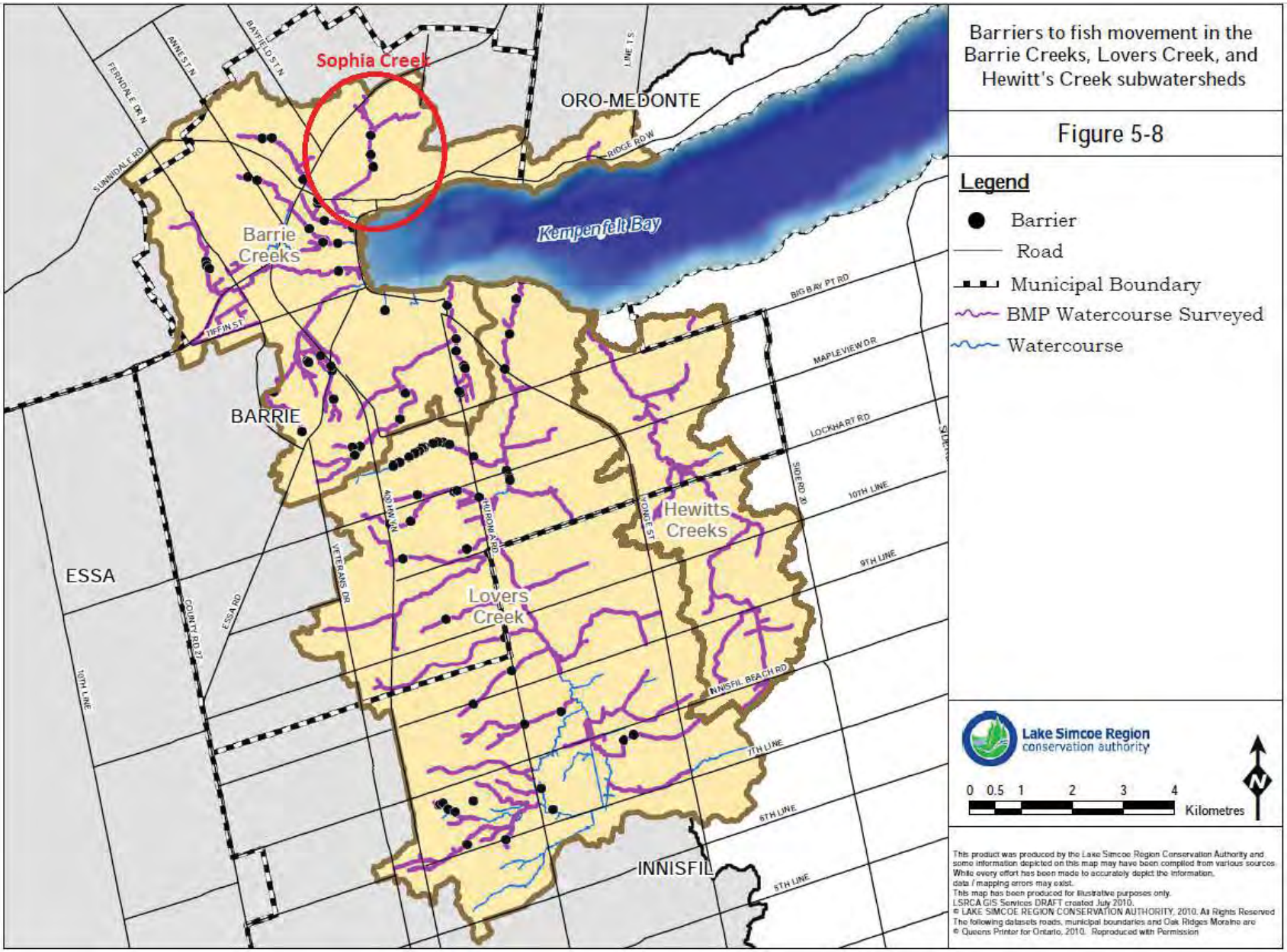

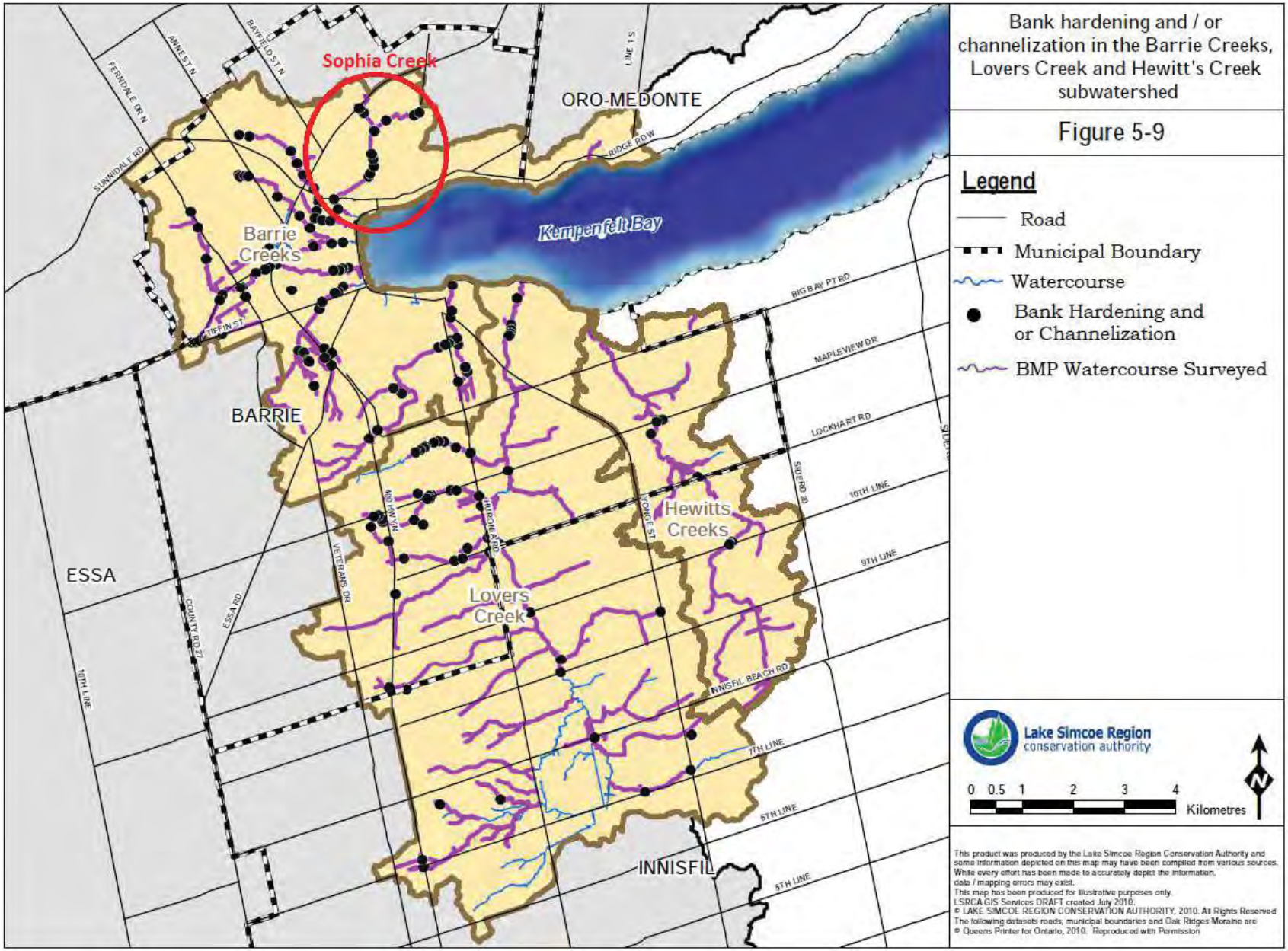
Sophia Creek
ORO-MEDONTE
Kempenfelt Bay
Barrie Creeks
BARRIE
Hewitts Creeks
Lovers Creek
ESSA
INNISFIL
FERNDALE DR N
ANNE ST N
BAYFIELD ST N
LINE 1 S
SUNNIDALE RD
RIDGE RD W
TIFFIN ST
BIG BAY PT RD
MAPLEVIEW DR
LOCKHART RD
10TH LINE
9TH LINE
7TH LINE
6TH LINE
5TH LINE
SIDE RD 20
KING ST
HURONIA RD
VETERANS DR
ESSA RD
COUNTY RD 27
INNISFIL BEACH RD
400 HWY N
Bank hardening and / or channelization in the Barrie Creeks, Lovers Creek and Hewitt's Creek subwatershed
Figure 5-9
Legend
Road
Municipal Boundary
Watercourse
Bank Hardening and or Channelization
BMP Watercourse Surveyed
Lake Simcoe Region conservation authority
0 0.5 1 2 3 4
Kilometres
N
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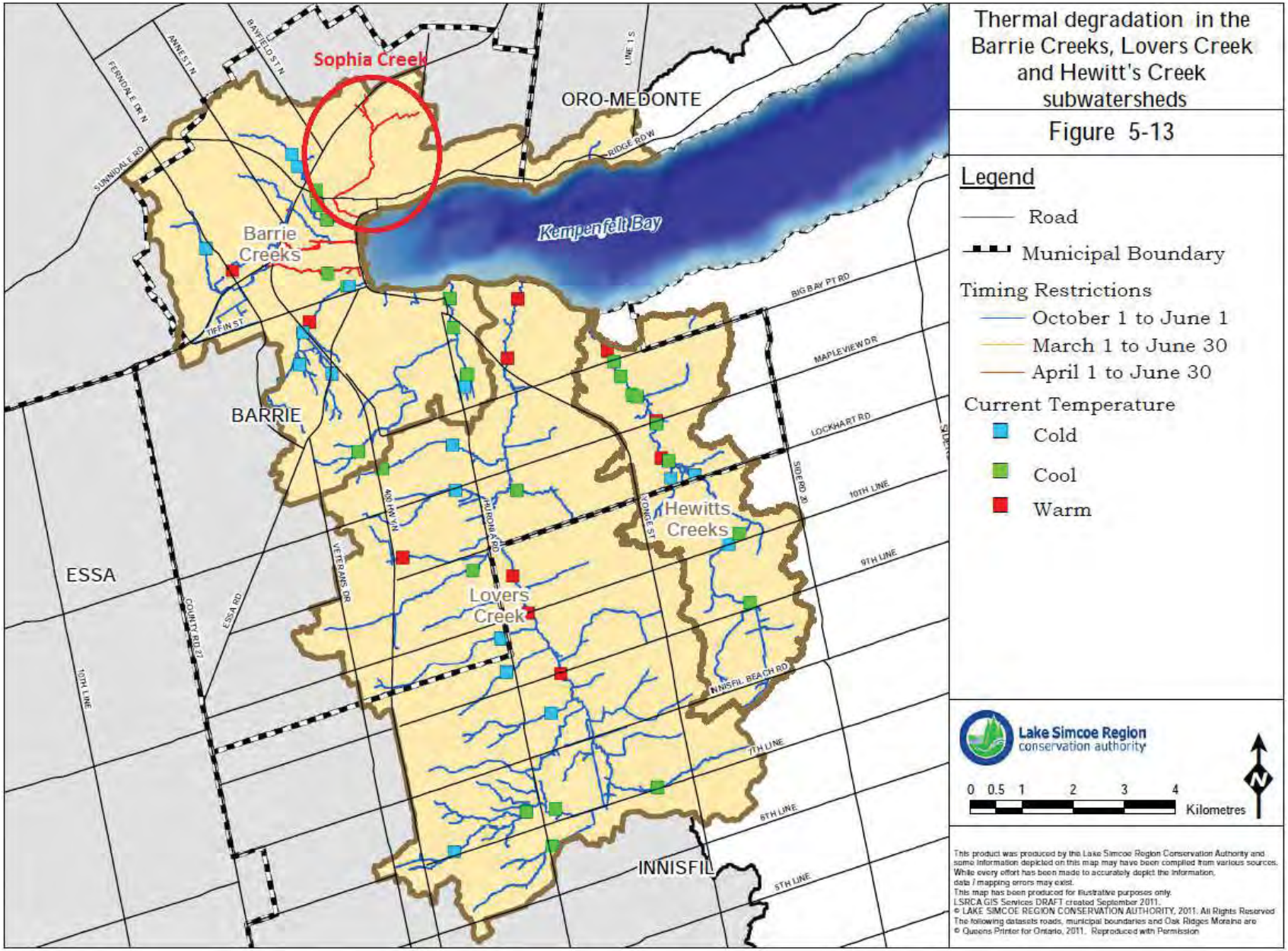
Sophia Creek
ORO-MEDONTE
Kempenfelt Bay
Barrie Creeks
BARRIE
Hewitts Creeks
Lovers Creek
ESSA
INNISFIL
FERNDALE DR N
ANNE ST N
BAYFIELD ST N
LINE 1 S
SUNNIDALE RD
RIDGE RD W
BIG BAY PT RD
TIFFIN ST
MAPLEVIEW DR
LOCKHART RD
10TH LINE
9TH LINE
7TH LINE
6TH LINE
5TH LINE
SIDE RD 20
YONGE ST
HURONIA RD
VETERANS DR
ESSA RD
COUNTY RD 27
INNISFIL BEACH RD
Thermal degradation in the Barrie Creeks, Lovers Creek and Hewitt's Creek subwatersheds
Figure 5-13
Legend
Road
Municipal Boundary
Timing Restrictions
October 1 to June 1
March 1 to June 30
April 1 to June 30
Current Temperature
Cold
Cool
Warm
Lake Simcoe Region conservation authority
0 0.5 1 2 3 4
Kilometres
N
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APPENDIX F

MNRF Email Correspondence

Roger Holmes

From: Findlay, Graham (MNRF) [graham.findlay@ontario.ca]
Sent: Monday, September 26, 2016 3:16 PM
To: Roger Holmes
Subject: RE: Sophia Creek Timing WIndow Inquiry

Hi Roger we appreciate your proactive approach to consideration for potential in-water work impacts within your study area. We do not object to the timing restriction provided through the LSRCA. Please call with any further questions.

Regards,

Graham Findlay
Management Biologist
Huronia Resources Management Team,
Midhurst, MNRF
705-725-7530
705-725-7584 (fax)
graham.findlay@ontario.ca

From: Roger Holmes [mailto:rholmes@azimuthenvironmental.com]
Sent: September 26, 2016 2:37 PM
To: Findlay, Graham (MNRF)
Subject: Sophia Creek Timing WIndow Inquiry

Hello Graham,
I am inquiring about in-water timing restrictions for Sophia Creek in Barrie. While the creek is known to not inhabit fish, which typically results in no in-water timing restrictions, the potential impacts to downstream reaches may require an in-water timing restriction. Attached is some background information with the study area and natural heritage information. Please note that LSRCA has placed an April 1 – June 30 in-water timing restriction. Would you agree with this?
Thanks,

Roger Holmes, M.Sc.,
Aquatic Ecologist

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cell: 705-795-7101
rholmes@azimuthenvironmental.com

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Providing services in hydrogeology, terrestrial and aquatic ecology & environmental engineering