Appendix A

Natural Environment Memos

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Appendix A1

Ecological Land Classification and Sensitive Wildlife Habitat

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Technical Memorandum

Date: January 29, 2018 **Project No.:** 300039946.0000

Project Name: John St WWPS Class EA - Vegetation Community Survey and Significant Wildlife Habitat

Client Name: Halton Region

Submitted To: Avid Bani Hashemi

Submitted By: Peter De Carvalho

Reviewed By: Nicholle Smith

1.0 Introduction

The Region's John Street Wastewater Pumping Station (WWPS) in Georgetown is nearing the end of its useful life. Accordingly, Halton Region has undertaken a Municipal Class Environmental Assessment (Class EA) Study to investigate the proposed capital upgrades in order to maintain the station in a state of good repair.

A wide range of WWPS and/or collection system upgrade alternatives were considered, in order to select the most appropriate station design concept that meets Halton Region's latest design standards, including provision for an emergency over flow to reduce the risk of a sewer surcharge in the event of WWPS system failure and/or during peak wet weather events. R.J. Burnside & Associates Limited (Burnside) has facilitated the EA on behalf of the Region.

The Study has been completed in accordance with the requirements of a Schedule B Undertaking as outlined in the Municipal Engineers Association Municipal Class Environmental Assessment Document (October 2000, as amended 2007, 2011 & 2015), which is an approved process under the Ontario Environmental Assessment Act.

As part of the EA Study, Burnside has completed a Vegetation Community Survey and Delineation using the Ecological Land Classification System for Southern Ontario for all naturally vegetated areas of the Site, focusing on the Credit River valley system and upland forested areas. We have also conducted a high-level screening for candidate Significant

Wildlife Habitat, as defined in the Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (SWHCS).

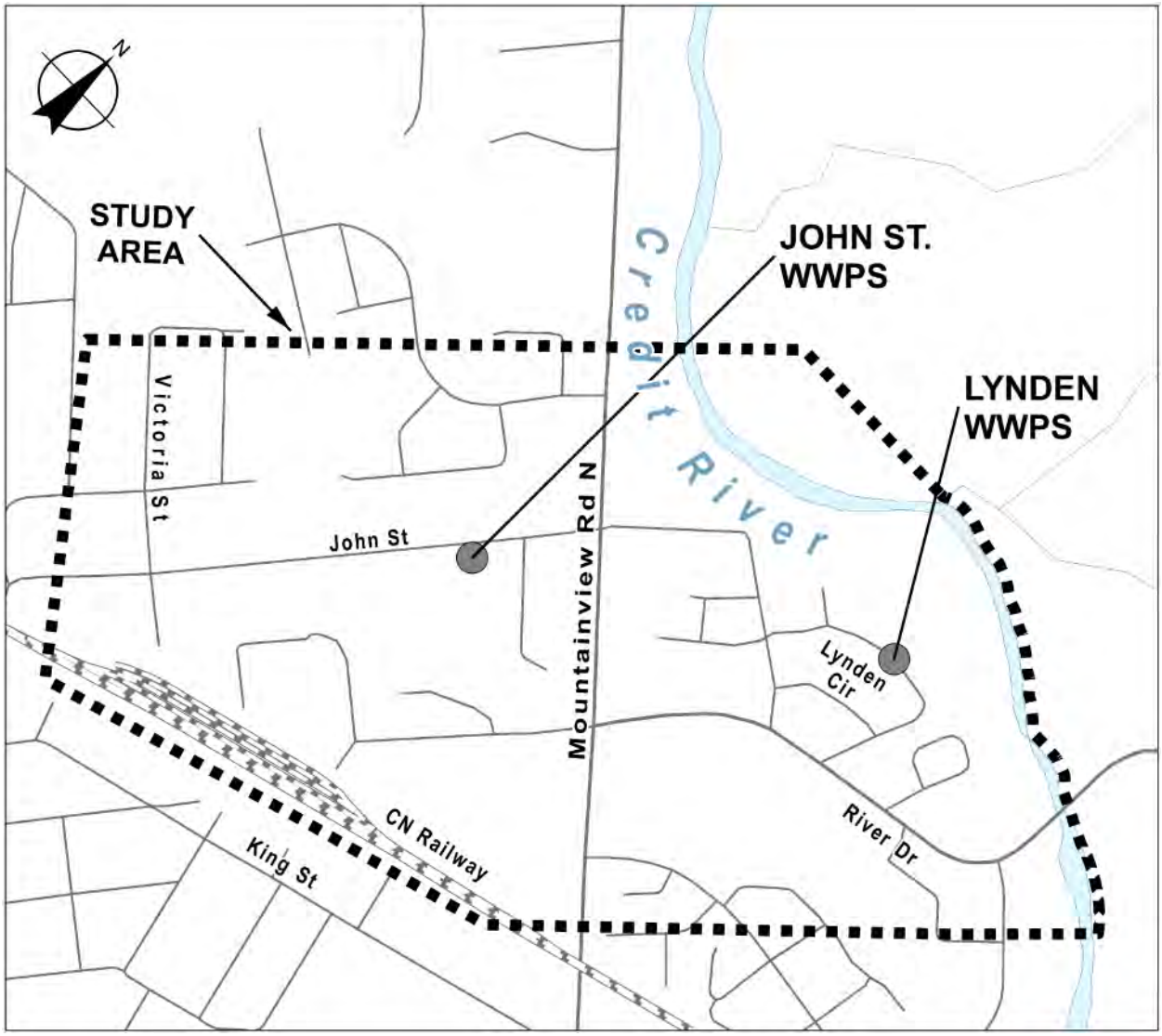
2.0 Study Area

The Study Area will be bounded roughly by Silver Creek to the west, CN rail line to the south, Credit River to the east and the Georgetown Urban Area boundary to the north. Please refer to Figure 1 for a depiction of these boundaries.

The John Street WWPS – built in 1970 - is situated in a residential area in the northeast corner of John Street Park in Georgetown, the property lands owned by Town of Halton Hills, close to the Hamlet of Glen Williams. The John Street Park includes a playground, manicured open space and a remnant urban forest with very little connectivity to the Credit River Valley system. The Study Area includes a privately owned (Wolf Leopold Estates) part of the Credit River Valley identified as a dense riparian treed corridor along the Credit River. This corridor embraces the Credit River Anglers Association (CRAA) Fish Hatchery which is located in the vicinity of the proposed emergency outflow location in Credit River Valley at the bend of John Street. The remainder of the Study Area is characterized by urban development.

The catchment area for the John Street WWPS is approximately 88 ha, with an estimated current average daily flow of 5 L/s and a peak hourly flow of 67 L/s. In addition to its own catchment area, the station collects wastewater from Lynden Circle WWPS. An estimated peak hourly flow for Lynden Circle WWPS is 27 L/s. The pumping station discharges through a single 250 mm diameter forcemain to a manhole at the intersection of Victoria Street and John Street, and flows into a 300 mm trunk sewer that connects to the Silver Creek trunk sewer.

Figure 1: Study Area



3.0 Ecological Analysis

The natural environment within the Study Area was assessed using a combination of background review and field studies. Works included characterization of vegetation communities and screening for candidate Significant Wildlife Habitat types.

4.0 Vegetation Communities

4.1 Methods

Vegetation communities were characterized using methodologies as presented by Lee *et al*. (1998) in the Ecological Land Classification (ELC) System for Ontario (First Approximation). During these studies, information on the plant species documented within the Study Area was also compiled into a plant inventory. Field surveys were conducted on July 13, 2017 by two Burnside terrestrial ecology staff. The ELC system involves gathering data on topography, soil moisture regime and effective texture, as well as density and composition of plant species to map and characterize the existing plant species and vegetation communities within an area of study. These data are then used to arrive at specific ecosites that best represent each distinct ecological unit which have been mapped (Figure 2, attached) and described below.

4.2 Results

This study assessed the natural environment within areas that may potentially be impacted due to works proposed for the John Street wastewater pump station improvements project. Assessment was conducted using the Ecological Land Classification – First Approximation for Ontario system (Lee *et al*., 1998). Implementation of this system resulted in the delineation and mapping of seven ecosite polygons within the Study Area, as described below.

Polygon #1

Water Lily Floating-leaved Shallow Aquatic / Cattail Mineral Shallow Marsh Ecosite (SAF1-1/MAS2-1)

This polygon consists of three interconnected ponds and their associated shorelines. This complex exhibits areas of both Water Lily Floating-leaved Shallow Aquatic (SAF1-1) and Cattail Mineral Shallow Marsh (MAS2-1). The shallow water portions of the ecosite contain obligate-wetland vegetation species including Broad-leaved Arrowhead (*Sagittaria latifolia*), Fragrant White Water Lily (*Nymphaea odorata*), and Duckweed species (*Lemna spp*.).

Inland from the flooded areas, additional wetland-indicator species were observed including Narrow-leaved Cattail (Typha angustifolia), Common Cattail (*Typha latifolia*), Marsh Bedstraw (*Galium palustre*), Sedge (*Carex c.f. crinata*). Black Bulrush (*Scirpus atrovirens*), Woolgrass (*Scirpus cyperinus*), and Kidney-leaved Violet (*Viola renifolia*). American Toad (*Anaxyrus americanus*) individuals were observed around the wetland area.

Disturbance was evident in the polygon including manicured lawn, which extends almost to the edge of water in some areas, and walking trails which extend around most of the shoreline. Refuse was evident in many areas, as was evidence of fishing (discarded bait containers, floats

in the water). Some small sections of the polygon also include extensive growth of non-native and invasive Garlic Mustard (*Alliaria petiolata*).

Polygon #2

Fresh – Moist Oak – Sugar Maple Deciduous Forest Ecosite (FOD9-1)

FOD9 ecosites are characterized by tree cover greater than 60% of predominantly deciduous species. Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), Bur Oak (*Quercus macrocarpa*), Sugar Maple (*Acer saccharum*) Red Maple (*Acer rubrum*), Shagbark Hickory (*Carya ovata*) and Bitternut Hickory (*Carya cordiformis*) can dominate separately or in variable mixtures within these ecosites. Small patches of Eastern Hemlock (*Tsuga canadensis*) and individual Red Pine (*Prinus resinosa*) were found at intervals throughout the forest, but at no point would the forest composition have met the ELC definition of a mixed forest (FOM). Ontario's FOD9 forests are characterized by hydrophilic and hydro-tolerant species and are considered to represent an interface between upland and swamp plant communities.

This polygon encompasses most of the Credit River's forested northern shoreline within the Study Area. Red Oak and Sugar Maple are abundant in the canopy and Manitoba Maple are the most commonly encountered understory tree species. Common shrub species include Choke Cherry (*Prunus virginiana*), European Buckthorn (*Rhamnus cathartica*), Wild Grape (*Vitis riparia*), Virginia Creeper (*Parthinocissus quinquefolia*), Staghorn Sumac (*Rhus typhina*), and Common Blackberry (*Rubus occidentalis*). The most common herbaceous species is Kentucky Blue Grass (*Poa pratensis*) due to the prevalence of manicured lawn within the ecosite, though *Carex* sp., Aster sp., and Spotted Jewelweed (*Impatiens capensis*) are commonly found outside manicured areas.

The ecosite is heavily fragmented by trails, a gravel road, manicured lawn, a number of camping trailers and outside seating / living space. The extent of fragmentation likely reduces the ecological functionality of the ecosite due to large breaks in canopy and more noted presence of edge effects.

Polygon #3

Fresh – Moist Sugar Maple – Hardwood Deciduous Forest (FOD6-5) with White Cedar Mineral Coniferous Swamp (SWC1-1) and Maple Mineral Deciduous Swamp (SWD3) Inclusions

Polygon #3 spans the southern extent of the Credit River valley within the Study Area. The majority of this polygon has been identified a Fresh – Moist Sugar Maple – hardwood deciduous forest (FOD6-5). Two adjacent wetland-type ecosite pockets (SWC1-1 – White Cedar mineral coniferous swamp; SWD3 – Maple mineral deciduous swamp) are too small to be mapped as

distinct polygons, and as these ecosites form a contiguous canopy, they are classified as inclusions within Polygon #3.

The forest here traverses a steep valley slope along the entire length of Polygon #3. The ecosite is dominated by Sugar Maple within all forest levels (canopy, sub-canopy, understorey, and ground layer). Red Oak is also a common constituent of the upper canopy. Other common tree species include Manitoba Maple (*Acer negundo*), American Beech (*Fagus grandifolia*), and Basswood (*Tilia americana*). Common shrubs include Virginia Creeper, Choke Cherry, and Common Blackberry.

These forests are adjacent to residential buildings. Disturbance from human use is common, and includes bare-earth trails, dumping of garden waste, fencing, and rubbish. Invasive species were common along forest edges and included European Buckthorn, Garlic Mustard (*Alliaria petiolate*), and Canada Thistle (*Cirsium arvense*).

Two wetland pockets were identified within Polygon #3 as seen in Figure 2. Inclusion #3a is a White Cedar mineral coniferous swamp. It includes a stand composed of mostly White Cedar (*Thuja occidentalis*) with substrate that was permanently inundated with water on the lower slopes; this water may have originated from a groundwater seep, though this is not confirmed. Inclusion #3b is a moist treed swamp with an overstorey of mature Sugar Maple which appeared to be growing perched from the water table. The understorey consisted of Green Ash (*Fraxinus pennsylvanica*) with a groundlayer dominated by Spotted Jewelweed and Ostrich Fern (*Matteuccia struthiopteris*).

Polygon #4

Fresh – Moist Black Walnut Lowland Deciduous Forest Ecosite (FOD7-4)

This polygon is contiguous with the FOD6-5 and FOD9-1 treed sections of the Credit River Valley, but was slightly upland from the floodprone region of the Study Area. It was dominated by Manitoba Maple and Black Walnut (*Juglans nigra*), with occasional Green Ash individuals. Hydrologically this ecosite was similar to Polygons #2 and #3, as all three ranged in soil moisture regime from moist to very moist (5-6).

This polygon features heavy disturbance. The ecosite is bisected by a paved driveway that connects to River Drive to the east. Dumping was prevalent in the areas adjacent to residential buildings, and invasive / horticultural plant species were common along the paved route.

Polygon #5

Reed-canary Grass Mineral Meadow Marsh Ecosite (MAM2-2)

Polygon #5 includes a small section of riparian wetland at the margin of the Credit River. It was dominated by Stinging Nettle (*Urtica dioica*) and *Phragmites australis*, with occasional instances

of Narrow-leaved Cattail (*Typhus angustifolia*), Spotted Jewelweed, and *Salix* sp. Walking trails from the nearby manicured lawn indicated moderately frequent human use.

Polygon #6

Dry – Moist Old Field Meadow Ecosite (CUM1-1)

This ecosite includes an open field adjacent to a municipal park. Species diversity was low, and common species included Indian Hemp (*Apocynum cannabinum*), Canada Thistle, Kentucky Blue Grass, and American Vetch (*Vicia americana*). No soil analyses were conducted at this site due to public exposure, but the species present indicate a drier upland substrate profile.

Polygon #7

Fresh – Moist Black Walnut Lowland Deciduous Forest Ecosite (FOD7-4)

Polygon #7 includes a Fresh-moist Black Walnut lowland deciduous forest adjacent to a municipal parkette that also houses the existing John Street wastewater pumping station. A detailed ELC analysis was not conducted here as no impact is anticipated to this ecosite.

The dominant canopy species is Black Walnut, while the sub-canopy and understorey were composed predominantly of Manitoba Maple, Red Pine (*Pinus resinosa*), and Sugar Maple. Understory shrub constituents include Virginia Creeper and Wild Blackberry.

5.0 Significant Wildlife Habitat

5.1 Screening

According to the Natural Heritage Reference Manual (MNRF, 2010) and Significant Wildlife Habitat Technical Guide (MNRF, 2000), there are four types of Significant Wildlife Habitat (SWH), as follows:

- Habitats of Seasonal Concentrations of Animals;
- Rare Vegetation Communities / Specialized Habitats;
- Habitats of Species of Conservation Concern; and
- Animal Movement Corridors.

Significant Wildlife Habitat (SWH) is designated at the local planning level (i.e., municipality). Local designations occur because conditions and feature vary widely between municipalities and what is important and unique in one area may be common and secure in another.

Both the Regional Municipality of Halton and Town of Halton Hills indicate that any known SWH habitat is generally provided within the Core Environmental Features.

As such, this assessment will use broad habitat descriptions from the Significant Wildlife Habitat Technical Guide (SWHTG) and the SWHTG Ecoregion 6E Criterion Schedule (MNRF, 2015) as well as our professional judgement to determine whether any habitats may be potentially present.

The following SWH are potentially present within the Site and surrounding areas:

- Habitats of Seasonal Concentrations of Animals
  - Waterfowl Stopover and Staging Areas (Aquatic);
  - Shorebird Migratory Stopover Area;
  - Bat Maternity Colonies (Confirmed); and
  - Turtle Wintering Areas.
- Rare Vegetation Communities / Specialized Habitats
  - Other Rare Vegetation Communities;
    - (FOM 6-1) Moist-fresh Hemlock-Sugar Maple Mixed Forest.
- Habitats of Species of Conservation Concern
  - Bald Eagle and Osprey Nesting, Foraging, and Perching Habitat;
  - Seeps and Springs;
  - Amphibian Breeding Habitat (Wetland);
  - Marsh Breeding Bird Habitat;
  - Terrestrial Crayfish Habitat; and
  - Special Concern and Rare Wildlife Species;
    - Canada Warbler;
    - Eastern Wood Pewee;
    - Golden-winged Warbler;
    - Snapping Turtle; and
    - Wood Thrush.
- Animal Movement Corridors
  - Amphibian Movement Corridors.

5.2 Assessment

5.2.1 Habitats of Seasonal Concentrations of Animals

The combination of habitat types along the Credit River riparian corridor contains three candidate, and one confirmed, Habitat of Seasonal Concentrations of Animals types. Acoustic monitoring results for bats during the active season have satisfied the confirmation criteria for Bat Maternity Colony SWH in all riparian forest / swamp ecosites.

Waterfowl Stopover and Staging Areas, Shorebird Migratory Stopover Areas, and Turtle Wintering Areas are potentially present within the wetland areas on the riparian corridor of the Credit River, as well as riverine wetland vegetation along the banks of the river itself.

5.2.2 Rare Vegetation Communities

Records show that a regionally rare vegetation community (Moist-fresh Hemlock-Sugar Maple Mixed Forest) exists within the Credit River riparian corridor. Though pockets of hemlock were found within the Oak – Sugar Maple deciduous forest, no areas reached the 25%-conifer threshold to be considered mixed forest.

5.2.3 Habitats of Species of Conservation Concern

Background screening has indicated the potential presence of six habitats of conservation concern, and records of five species listed as Special Concern under the ESA.

Bald Eagle and Osprey Nesting, Foraging and Perching habitat can exist in any forest or swamp community adjacent to lakes, ponds, rivers, or wetlands. No records of Bald Eagle or Osprey were identified within background screening, but the habitat conditions for this SWH are present. The MAM ecosite areas were also identified as candidate Marsh Breeding Bird Habitat. The MAM and MAS areas all serve as candidate breeding habitat for amphibians, and the margins of these ecosites are potential habitat for Terrestrial Crayfish.

Seeps and Springs are areas where groundwater feeds a wetland or aquatic feature on the landscape. The White Cedar mineral coniferous swamp inclusion is likely fed in part by groundwater seepage. These areas are important sources of liquid water for wildlife that are active during the winter months.

Four avian SC species were identified as present within a 10 x 10 km radius of the Study Area. Canada Warbler, Wood Thrush, and Eastern-wood Pewee all frequently inhabit deciduous and mixed forest, while Golden-winged Warbler is often found nesting in thicket or disturbed areas adjacent to mature forest. Suitable habitat is present within the Credit Valley River corridor for these species.

Snapping turtles spend much of their lives in water; they prefer shallow aquatic systems with muddy substrate and leaf litter. Any aquatic system that does not freeze in winter, including the identified SAF / MAS systems within the Study Area, is potential habitat for this species.

5.2.4 Habitats of Seasonal Concentrations of Animals

The riparian corridor of the Credit River represents a relatively in-tact continuous natural area by which many species may move from one habitat to another. This movement of species and genetic information is essential for all stages of life and contributes to robust wildlife populations. This area has been identified as a candidate Amphibian Movement Corridor, where organisms may safely move amid an otherwise largely-developed urban / rural landscape.

6.0 Impact Assessment and Mitigation

6.1 Impacts

Direct or indirect impacts to identified vegetation communities or SWH during the construction, operations, or maintenance phase of the project include:

- Incidental mortality, breeding disturbance, or general harassment of wildlife in the vicinity of project works;
- Degradation or fragmentation of existing wildlife habitat/corridors, as well as the creation of edge or marginal habitat;
- Contamination of surface water features and substrates, including wetlands, that may support wildlife and/or candidate Significant Wildlife Habitat through project construction activities, works, utilization, and maintenance;
- Alteration of water balance in forested wetland inclusions and/or open water marsh and pond areas;
- Removal of root cover which may compromise integrity of the underlying soil matrix and increase the potential for soil loss or erosive action; and
- Encroachment into identified groundwater discharge areas.

6.2 Mitigation

Strategies to avoid impacts to the natural environment include:

- Choose a design alternative with the lowest impact to sensitive habitats;
  - Restrict work to the John Street Right-of-Way or other disturbed areas wherever possible.
- Employ erosion and sediment control (ESC)/exclusion fencing for all construction areas;
  - ESC and exclusion fencing should be inspected regularly to ensure it is operating as designed. If maintenance is required, construction activities should cease until the installation is functional.
- Fueling and maintenance of construction equipment should occur in designated areas only. Designated fueling and maintenance areas should be as far from sensitive habitats as possible.
- Disturbance to natural areas should be minimized wherever possible through the use of underground directional drilling;
  - Compensatory plantings for removed trees should be discussed with regulatory biologists.
- All works that may disrupt nesting birds should take place outside of the bird breeding window for zone C2 (April 1 to August 31).
- Active nests are not to be destroyed at any time of the year.

7.0 Conclusion

Background review and field studies have identified seven ecosite types within the study area, including cultural meadow, deciduous forest, deciduous / coniferous swamp, meadow marsh, and shallow marsh environments.

The ecosites present within the Study Area, in combination with the Study Area's proximity to the Credit Valley River, has indicated the potential presence of 11 Significant Wildlife Habitat types. One of these habitat types (Bat Maternity Habitat) has been confirmed as present by merit of acoustic monitoring that was conducted in summer 2017. One other type (Rare Vegetation Communities – Sugar Maple - Hemlock Mixed Forest) was determined as not present within the Study Area. There is also potential habitat for five species listed as Special Concern by the ESA with observation records identified in the Study Area vicinity.

Mitigation strategies to minimize impacts to the natural environment include choosing design alternatives with lowest impact to sensitive habitats, ESC / exclusion fencing, underground directional drilling, and abiding by the local bird breeding window for tree removal activities.

8.0 References

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Lee, H.T, W.D. Bakowsky, J.L. Riley, J. Bowles, M. Puddister, P. Uhlig, S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Region, Science Development and Transfer Branch. Technical Manual ELC-005.

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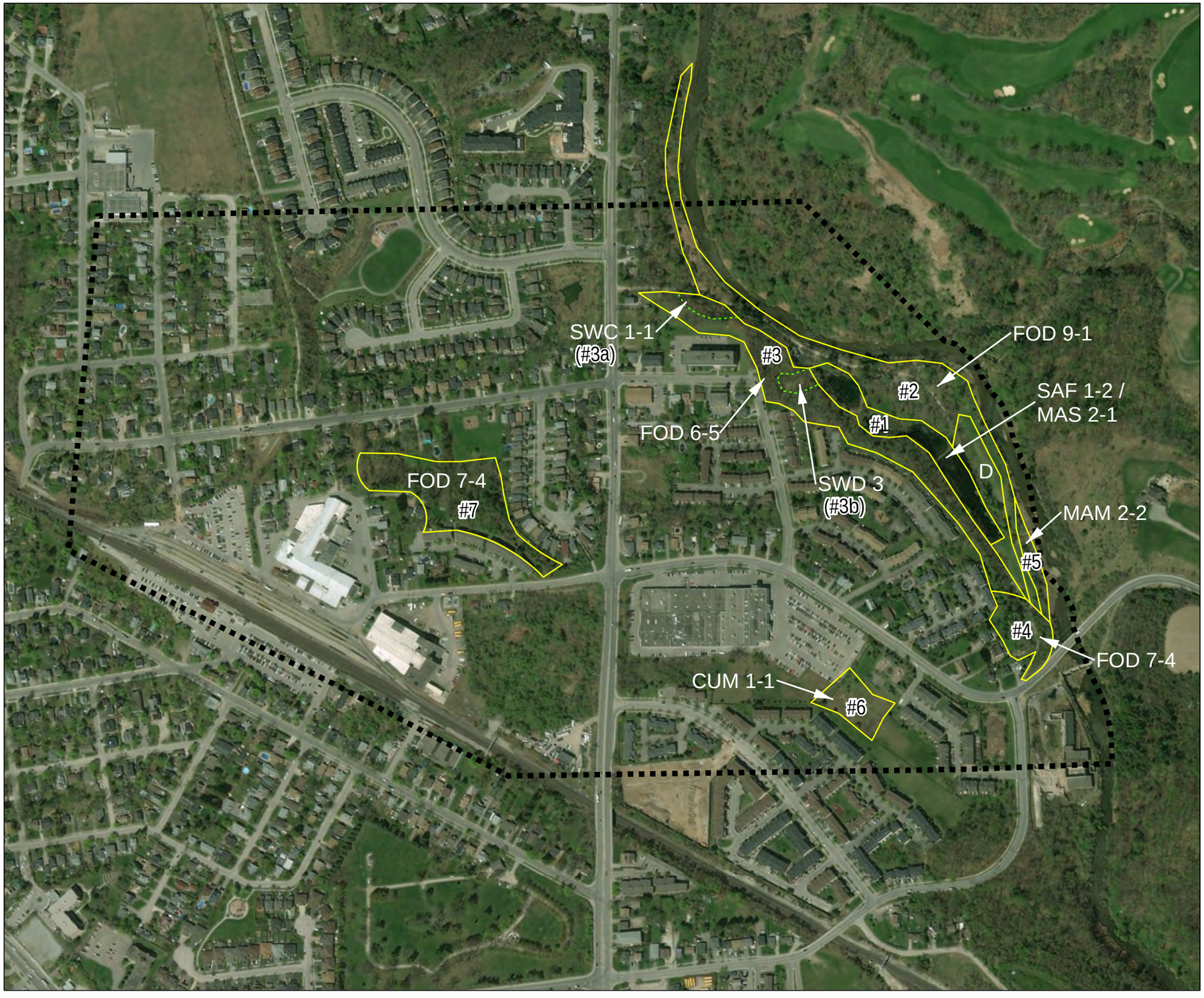
R.J. Burnside & Associates Limited

Peter De Carvalho B.Sc. (Bio), B.Eng. (Env), Rest. Cert. EIT
Engineering Assistant/Terrestrial Ecologist

PFD:sr

Enclosure(s) Figure 2 – Ecological Land Classification



ELC Boundary

Inclusion

Study Area

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: -45	Scale Factor: 0.99960

Grid North

0 100 200 300 400

Metres

BURNSIDE

Client

TOWN OF HALTON HILLS

Figure Title

JOHN ST WWPS EA

ECOLOGICAL LAND CLASSIFICATION

Drawn	Checked	Date	Figure No.
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Appendix A2

Breeding Birds

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Technical Memorandum

Date: October 26, 2017 **Project No.:** 300039946.0000

Project Name: John Street WWPS Class EA - Breeding Birds

Client Name: Halton Region

Submitted To: Avid Bani Hashemi

Submitted By: Hannah Maciver

1.0 Introduction

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As part of the EA Study, Burnside has completed breeding bird surveys in the study area in order to characterize existing conditions and identify sensitive species that may be present.

2.0 Study Area

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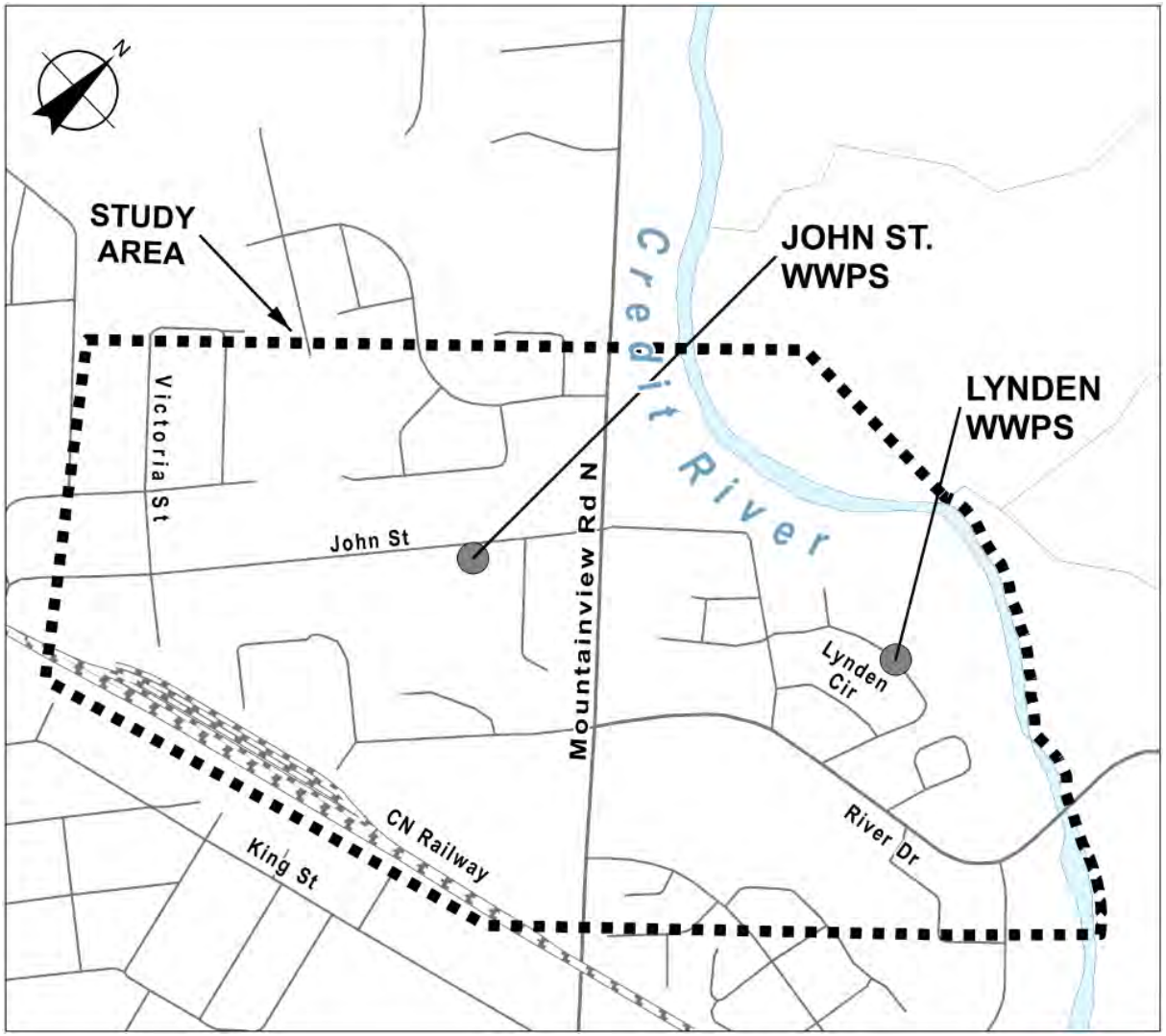
The catchment area for the John Street WWPS is approximately 88 ha, with an estimated current average daily flow of 5 L/s and a peak hourly flow of 67 L/s. In addition to its own catchment area, the station collects wastewater from Lynden Circle WWPS. An estimated peak hourly flow for Lynden Circle WWPS is 27 L/s. The pumping station discharges through a single 250 mm diameter forcemain to a manhole at the intersection of Victoria Street and John Street, and flows into a 300 mm trunk sewer that connects to the Silver Creek trunk sewer.

Figure 1: Study Area



3.0 Breeding Bird Surveys

3.1 Methodology

Breeding bird surveys were conducted for this project on June 8 and July 4, 2017 by an Avian Biologist. Breeding bird surveys were completed following the general principles outlined in the *Ontario Breeding Bird Atlas (OBBA) Guide for Participants* (March 2001), tailored to the needs of this project. The survey methodology is summarized below and in **Table 1** (below):

- Surveys were conducted between May 24th and July 10th which falls within the peak breeding window for the majority of bird species in Southern Ontario.
- The OBBA Guide states that breeding bird surveys conform to the following weather conditions requirements: counts should not be done if it is raining, there is thick fog, or if winds are greater than 19 km per hour (i.e., >3 on the Beaufort scale). Generally, weather conditions were conducive for auditory and visual surveys, with winds less than 19 km per hour, and no precipitation.
- Surveys in the study area were conducted at designated locations that captured the different vegetation habitats present. Three main habitat units were surveyed. Refer to Figure 2 appended to this memo for the survey locations:
  - The forested riparian corridor;
  - The stormwater management (SWM) pond on Mountainview Road; and
  - The John Street Park.
- All birds observed and heard were recorded at each location, including level of breeding evidence (refer to Section 3.2 and Table 2 appended to the end of this memo).

Table 1: Summary of Breeding Bird Surveys Conducted by Burnside Staff

Breeding Bird Survey #1 – June 8, 2017	
Time (24h): 0700-0935	Air Temp (°C): 12-19
Sky Code[1]: 0	Wind Scale[2]: 0-1
Breeding Bird Survey #2 – July 4, 2017	
Time (24h): 0645-0930	Air Temp (°C): 18-21
Sky Code[1]: 1	Wind Scale[2]: 2

[1] NAAMP/Beaufort Sky Codes: 0=clear (no cloud cover); 1=partly cloudy (scattered or broken) or variable; 2=cloudy or overcast; 3=sandstorm, duststorm or blowing snow; 4=fog, smoke, thick dust, or haze; 5=drizzle or light rain; 6=rain; 7=snow or snow/rain mix; 8=showers; 9=thunderstorms.
[2] Beaufort Wind Scale: 0=calm, smoke rises vertically (0-2 km/hr); 1=light air movement, smoke drifts (3-5); 2=slight breeze, wind felt on face; leaves rustle (6-11); 3=gentle breeze, leaves & twigs in constant motion (12-19); 4=moderate breeze, small branches moving, raises dust & loose paper (20 to 30); 5=fresh breeze, small trees begin to sway (31-39); 6=strong breeze, large branches in motion (40 to 50).

3.2 Results

A total of 30 summer resident bird species, exhibiting some level of breeding evidence, were observed within the study area during targeted breeding bird surveys (i.e., probable, possible or confirmed) (refer to Table 2 appended to the end of this memo).

Three additional bird species were observed as either flyovers over the study area or foraging in the ponds in the study area during breeding bird surveys, but no breeding evidence (i.e., suitable breeding habitat or breeding behavior) was recorded in the study area limits: Great Blue Heron (*Ardea herodias*), Barn Swallow (*Hirundo rustica*), and Chimney Swift (*Chaetura pelagica*).

Great Blue Heron is typically associated with wetland habitats, or woodland habitats adjacent to wetlands. It is assumed suitable nesting sites (i.e., heronries) are located beyond the study area as no heronries are present in the study area. The wetland units present in the study area are suitable habitats for foraging only.

Barn Swallow and Chimney Swift are aerial insectivores, and forage over open areas of the landscape where insects are abundant (i.e., open water, wetlands, fields). Barn Swallow was observed foraging over the Credit River in the riparian corridor and Chimney Swift was observed foraging over John Street Park.

Barn Swallow typically builds mud nests on ledges or walls in or outside of a barn or another human-made structure, including buildings or bridges (Cadman, M.D., et al 2007). A few old camping trailers are present in the riparian corridor. The exterior of these trailers were searched for nests and none were present. The exterior of the pumping station at John Street Park was also searched for nests and none were present. Therefore, no nesting habitat for this species is considered present in the study area. Suitable nesting habitat is likely present in the study area vicinity under bridges or culverts or on agricultural properties located just outside of Georgetown.

In urban environments and throughout most of its range, Chimney Swift typically nests in chimneys. Rarely, they may nest in large hollow trees, tree cavities, and cracks in cliffs (Cadman, M.D. et al 2007). No chimneys are present in the study area limits. Therefore, no nesting habitat is considered present for this species in the study area. Suitable nesting habitat is likely present in the study area vicinity in chimneys that are present in the surrounding residential landscape.

Two “area-sensitive” bird species, as defined by the Ministry of Natural Resources and Forestry (MNRF), were observed in the study area during the breeding bird surveys in the riparian corridor: American Redstart (*Setophaga ruticella*) and White-breasted Nuthatch (*Sitta carolinensis*). According to the Significant Wildlife Habitat Technical Guide (MNR 2000), area-sensitive species are defined as species that “require large areas of suitable habitat for long term population survival. Fragmentation of essential habitats can result in overall declines in populations.” The forest in this portion of the riparian corridor has been previously fragmented by the creation of walking trails, a hatchery, a gravel access road, man-made ponds, and channels, and areas where manicured lawn has replaced natural vegetation communities. The forested corridor extends further east along the south side of the Credit River, as well as along the north side of the Credit River in an east and west direction. A larger, more intact forested corridor of the Credit River is present approximately 1.5 km east of the study area.

Three bird species listed as provincially significant under the *Endangered Species Act*, 2007 (ESA) were observed in the study area during the breeding bird surveys: Barn Swallow (Threatened), Chimney Swift (Threatened) and Eastern Wood-pewee (*Contopus virens*) (Special Concern). Barn Swallow and Chimney Swift have been discussed above and it is Burnside's conclusion that nesting habitat for these two species is not considered present in the study area. Eastern Wood-pewee was recorded as a probable breeder in the riparian corridor. It typically breeds in deciduous and mixed woods. Its preference for open space near the nest is often provided by forest edges, clearings, roadways, and water (Cadman, M.D. et al 2007). Suitable nesting habitat is present for this species in the riparian corridor.

4.0 Provincial Endangered Species Act, 2007

The ESA provides protection for Species at Risk (SAR) and their habitat. The ESA is administered by the MNRF and provides policies for the protection of Extirpated, Endangered and Threatened species, as well as species of Special Concern. These four categories of species form the Species at Risk in Ontario (SARO) List, which are classified by the Committee on the Status of Species at Risk in Ontario (COSSARO). COSSARO is also responsible for maintaining criteria for assessing and classifying SAR.

The ESA helps protect species (Section 9) and their habitat (Section 10). Section 9(1)(a) of the ESA states "no person shall kill, harm, harass, capture or take a living member of a species that is listed on the SARO list as Extirpated, Endangered or Threatened". Section 10(1)(a) of the ESA states "no person shall damage or destroy the habitat of a species that is listed on the SARO list as an Endangered or Threatened species".

The ESA includes a general habitat regulation as well as species-specific habitat regulations. Species uplisted to Endangered or Threatened automatically receive general habitat protection under the ESA.

As discussed in Section 3.2 of this memo, foraging habitat for Barn Swallow and Chimney Swift was confirmed in the study area. No nesting habitat for these species is considered present in the study area (i.e., barns or other typical nesting structures and chimneys).

Barn Swallow receives species and general habitat protection under the ESA. Development exemptions for this species are addressed under the ESA in Ontario Regulation 242/08 Subsections 23.5 and 23.18. Generally, Subsection 23.5 applies to development activities that are related to the maintenance, repair, modification, replacement or demolition of a building or structure that provides Barn Swallow nesting habitat. Subsection 23.18 generally applies to development activities that are necessary to avoid or reduce a threat to human health or safety in situations where the threat is not imminent but is likely to have serious consequences in the short or long term if the activity is not carried out. Given that there is no nesting habitat in the study area, the development exemptions listed above do not apply. It is not anticipated that foraging habitat will be affected by the proposed upgrade alternatives.

Chimney Swift receives species and general habitat protection under the ESA. Development exemptions for this species are addressed under the ESA in Ontario Regulation 242/08 Subsection 23.8. Given that there is no nesting habitat in the study area, the development exemptions do not apply. It is not anticipated that foraging habitat will be affected by the proposed upgrade alternatives.

Due to its status as Special Concern, Eastern Wood-pewee does not receive the same species and habitat protection under the ESA as species listed as Threatened or Endangered. However, habitat where this species is confirmed is considered Significant Wildlife Habitat, as per the MNRF's SWH Criteria Schedules for Ecoregion 7E (January 2015). Therefore, measures to protect the species and its habitat are encouraged, which includes minimizing tree removal to the extent possible.

5.0 Recommended Impacts and Mitigation Measures for the Preferred Alternative 3

The Preferred Alternative 3 involves constructing a replacement pumping station at the existing location including the provision of emergency storage and an emergency outflow to Credit River, upstream of the hatchery. Alternative 3 requires tree / vegetation removals at the pumping station site and emergency overflow location. Impact on environmental habitats is expected along the roads and at the overflow location. Alternative 3 will also impact migratory breeding birds, SAR, and area-sensitive birds.

Potential Impacts

- Impacts to SAR and their habitat and area-sensitive birds within the forested riparian corridor in the location of the emergency outflow to the Credit River: Eastern Wood-pewee (Special Concern); White-breasted Nuthatch (AS); American Redstart (AS); and
- Impacts to migratory birds potentially breeding. Potential for disturbance or destruction of migratory breeding birds and their habitat in landscaped trees or vegetation along the roadway and within the riparian corridor in the location of the emergency outflow if the works occur during the active breeding window (prohibitions under the Migratory Birds Convention Act, 1994 (MBCA) and/or ESA will apply).

Recommended Mitigation Measures

- To reduce the risk of contravening the MBCA and ESA, timing constraints shall be applied to avoid any limited vegetation clearing (including grubbing) and/or structure works (construction, maintenance) during the breeding bird period - broadly from end of March to end of August for most species (regardless of the calendar year);
- Active nests (nests with eggs or young birds) of protected migratory birds, including SAR protected under the ESA, cannot be destroyed at any time of the year; and
- If a nesting migratory bird (or SAR protected under ESA) is identified within or adjacent to the construction site (or during operations and maintenance activities) and the activities are

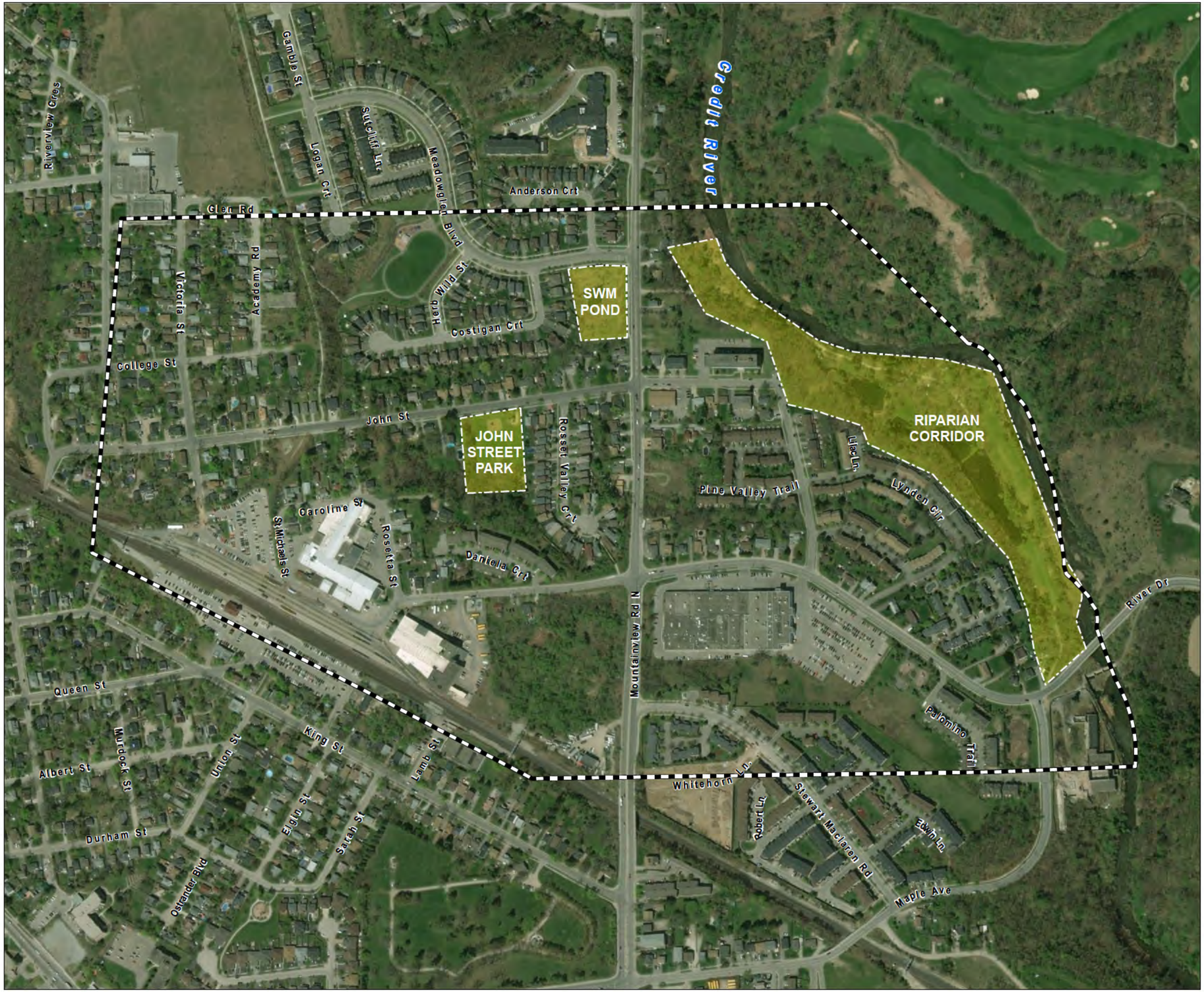
such that continuing works in that area would result in a contravention of the MBCA or ESA, all activities will stop and the Contract Administrator (with assistance from an Avian Biologist) shall discuss mitigation measures with the Region. The MNRF and Environment Canada shall be contacted to discuss mitigation options. The Contract Administrator shall instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the Region, the MNRF and/or Environment Canada.

R.J. Burnside & Associates Limited

Hannah Maciver, B.E.S.
Engineering Assistant/Terrestrial Ecologist
HM:sr

Enclosure(s) Figure 2 – Breeding Bird Surveys
Table 2 – Breeding Bird Summary Table

039946_John St EA_Summary Breeding Bird Memo
2/8/2018 4:53 PM



Study Area

Breeding Bird Survey Area

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: -45	Scale Factor: 0.99960

Grid North

0 100 200 300 400

Metres

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Client

THE REGIONAL MUNICIPALITY OF HALTON

Figure Title

JOHN ST WWPS EA

BREEDING BIRD SURVEYS

Drawn	Checked	Date	Figure No.
HN	HM	2017/10/11	2
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File Path: \\eimo\Shared Work Areas\039946 (John St WWPS)\Map\039946 Breeding Bird Survey Areas.mxd Print Date: 2017/10/11 Time: 04:39 PM

Table 2: Breeding Bird Survey Summary Table

Surveys Conducted by: Hannah Maciver

Common Name	Scientific Name	Provincial SRANK[1]	Provincial SARO (Endangered Species Act, 2007)[2]	Federal COSEWIC[3]	Federal SARA (Species At Risk Act)[3]	Federal SARA Schedule[4]	Provincial MNRF Area Sensitive Species[5]	Highest Number Recorded			Highest Recorded Breeding Evidence[6]	Comments
								Riparian Corridor	SWM Pond	John St Park		
American Crow	*Corvus brachyrhynchos*	S5B						2	-	1	S	
American Goldfinch	*Carduelis tristis*	S5B						2	6	3	T	
American Redstart	*Setophaga ruticilla*	S5B					Yes	1	-	-	S	
American Robin	*Turdus migratorius*	S5B						10	2	4	CF	
Baltimore Oriole	*Icterus galbula*	S4B						4	-	2	CF	
Barn Swallow	*Hirundo rustica*	S4B	THR	THR	No Status	No Schedule		3	-	-	X	Foraging overhead.
Black-capped Chickadee	*Poecile atricapillus*	S5						6	-	1	T	
Blue Jay	*Cyanocitta cristata*	S5						4	-	3	CF	
Canada Goose	*Branta canadensis*	S5						8	29	-	FY	Adults with goslings at pond in riparian corridor; flying overhead at SWM pond.
Cedar Waxwing	*Bombycilla cedrorum*	S5B						4	-	2	T	
Chimney Swift	*Chaetura pelagica*	S4B,S4N	THR	THR	THR	1		-	-	2	X	Foraging overhead.
Common Grackle	*Quiscalus quiscula*	S5B						16	3	-	FY	
Common Yellowthroat	*Geothlypis trichas*	S5B						1	-	-	T	
Downy Woodpecker	*Picoides pubescens*	S5						-	-	1	S	
Eastern Phoebe	*Sayornis phoebe*	S5B						-	1	-	S	
Eastern Wood-pewee	*Contopus virens*	S4B	SC	SC				1	-	-	T	
European Starling	*Sturnus vulgaris*	SNA						6	-	4	FY	
Gray Catbird	*Dumetella carolinensis*	S4B						2	-	-	T	
Great Blue Heron	*Ardea herodias*	S4						1	1	-	X	Foraging at the ponds in both habitat units.

Common Name	Scientific Name	Provincial SRANK[1]	Provincial SARO (Endangered Species Act, 2007)[2]	Federal COSEWIC[3]	Federal SARA (Species At Risk Act)[3]	Federal SARA Schedule[4]	Provincial MNRF Area Sensitive Species[5]	Highest Number Recorded			Highest Recorded Breeding Evidence[6]	Comments
								Riparian Corridor	SWM Pond	John St Park		
Great Crested Flycatcher	*Myiarchus crinitus*	S4B						2	-	1	T	
House Sparrow	*Passer domesticus*	SNA						4	-	-	P	
House Wren	*Troglodytes aedon*	S5B						-	-	1	T	
Mourning Dove	*Zenaida macroura*	S5						7	3	2	FY	
Northern Cardinal	*Cardinalis cardinalis*	S5						3	-	2	T	
Northern Flicker	*Colaptes auratus*	S4B						1	-	-	T	
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S4B						2	-	-	H	Foraging overhead.
Red-bellied Woodpecker	*Melanerpes carolinus*	S4						1	-	-	T	
Red-eyed Vireo	*Vireo olivaceus*	S5B						1	-	-	T	
Red-winged Blackbird	*Agelaius phoeniceus*	S4						18	-	15	AE	
Song Sparrow	*Melospiza melodia*	S5B						2	1	-	T	
Warbling Vireo	*Vireo gilvus*	S5B						2	-	-	T	
White-breasted Nuthatch	*Sitta carolinensis*	S5					Yes	2	-	-	T	
Yellow Warbler	*Dendroica petechia*	S5B						3	-	-	T	
TOTAL SPECIES: 33												

[1]S-Ranks (provincial)
Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario (Please refer to: http://explorer.natureserve.org/nsranks.htm)

SX — Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH — Possibly Extirpated (Historical) - Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20–40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
S1 — Critically Imperiled - Critically imperiled in the province or state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2 — Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3 — Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 — Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 — Secure - Common, widespread, and abundant in the province.
SNR — Unranked - Province conservation status not yet assessed.
SU — Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA — Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

S#S# — Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
S#? – Inexact or Uncertain - Denotes inexact or uncertain numeric rank.

Breeding Status Qualifiers
B – Breeding Conservation status refers to the breeding population of the species in the nation or state/province.
N – Nonbreeding Conservation status refers to the non-breeding population of the species in the province.
M – Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.

[2]SARO *Endangered Species Act, 2007*
(provincial status from http://www.ontario.ca/environment-and-energy/how-species-risk-are-listed#section-3)
The provincial review process is implemented by the MNRF's Committee on the Status of Species at Risk in Ontario (COSSARO).

Extinct - A species that no longer exists anywhere.
Extirpated (EXT) - Lives somewhere in the world, and at one time lived in the wild in Ontario, but no longer lives in the wild in Ontario.
Endangered (END) - Lives in the wild in Ontario but is facing imminent extinction or extirpation.
Threatened (THR) - Lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.
Special concern (SC) - Lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.
Not at Risk (NAR) - A species that has been evaluated and found to be not at risk.
Data Deficient (DD) - A species for which there is insufficient information for a provincial status recommendation.

[3]SARA (Federal *Species at Risk Act*) Status and Schedule (includes COSEWIC Status)
The Act establishes Schedule 1, as the official list of wildlife species at risk. It classifies those species as being either Extirpated, Endangered, Threatened, or Special Concern. Once listed, the measures to protect and recover a listed wildlife species are implemented.

Extinct - A wildlife species that no longer exists.
Extirpated (EXT) - A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.
Endangered (END) - A wildlife species facing imminent extirpation or extinction.
Threatened (THR) - A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient (DD) - A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not At Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

[4]SARA Schedule
Schedule 1: is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.
Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
Schedule 3: species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

The Act establishes Schedule 1 as the official list of wildlife species at risk. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern.

Species that were designated at risk by COSEWIC prior to October 1999 (Schedule 2 & 3) must be reassessed using revised criteria before they can be considered for addition to Schedule 1 of SARA. After they have been assessed, the Governor in Council may on the recommendation of the Minister, decide on whether or not they should be added to the List of Wildlife Species at Risk.

[5]Source: Ontario Ministry of Natural Resources. 2000. *Significant Wildlife Habitat Technical Guide* & Appendices.

[6]Ontario Breeding Bird Atlas - Breeding Evidence Codes

Observed	
X	Species observed in its breeding season (no breeding evidence).

Possible	
H	Species observed in its breeding season in suitable nesting habitat.
S	Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season.

Probable	
P	Pair observed in suitable nesting habitat in nesting season.
T	Permanent territory presumed through registration of territorial behaviour (song, etc.) on at least two days, a week or more apart, at the same place.
D	Courtship or display, including interaction between a male and a female or two males, including courtship feeding or copulation.
V	Visiting probable nest site
A	Agitated behaviour or anxiety calls of an adult.
B	Brood Patch on adult female or cloacal protuberance on adult male.
N	Nest-building or excavation of nest hole.

Confirmed	
DD	Distraction display or injury feigning.
NU	Used nest or egg shells found (occupied or laid within the period of the survey).
FY	Recently fledged young (nidicolous species) or downy young (nidifugous species), including incapable of sustained flight.
AE	Adult leaving or entering nest sites in circumstances indicating occupied nest.
FS	Adult carrying fecal sac.
CF	Adult carrying food for young.
NE	Nest containing eggs.
NY	Nest with young seen or heard.

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Appendix A3

Amphibians

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Technical Memorandum

Date: November 1, 2017 **Project No.:** 300039946.0000

Project Name: John Street WWPS Class EA - Amphibian Surveys

Client Name: Halton Region

Submitted To: Avid Bani Hashemi

Submitted By: Nicholle Smith

1.0 Introduction

The Region's John Street Wastewater Pumping Station (WWPS) in Georgetown is nearing the end of its useful life. Accordingly, Halton Region has undertaken a Municipal Class Environmental Assessment (Class EA) Study to investigate the proposed capital upgrades in order to maintain the station in a state of good repair.

A wide range of WWPS and/or collection system upgrade alternatives were considered, in order to select the most appropriate station design concept that meets Halton Region's latest design standards, including provision for an emergency over flow to reduce the risk of a sewer surcharge in the event of WWPS system failure and/or during peak wet weather events. R.J. Burnside & Associates Limited (Burnside) has facilitated the EA on behalf of the Region.

The Study has been completed in accordance with the requirements of a Schedule B Undertaking as outlined in the Municipal Engineers Association Municipal Class Environmental Assessment Document (October 2000, as amended 2007, 2011 & 2015), which is an approved process under the Ontario Environmental Assessment Act.

As part of the EA Study, Burnside has completed a Vegetation Community Survey and Delineation using the Ecological Land Classification System for Southern Ontario for all naturally vegetated areas of the Site, focusing on the Credit River valley system and upland forested areas.

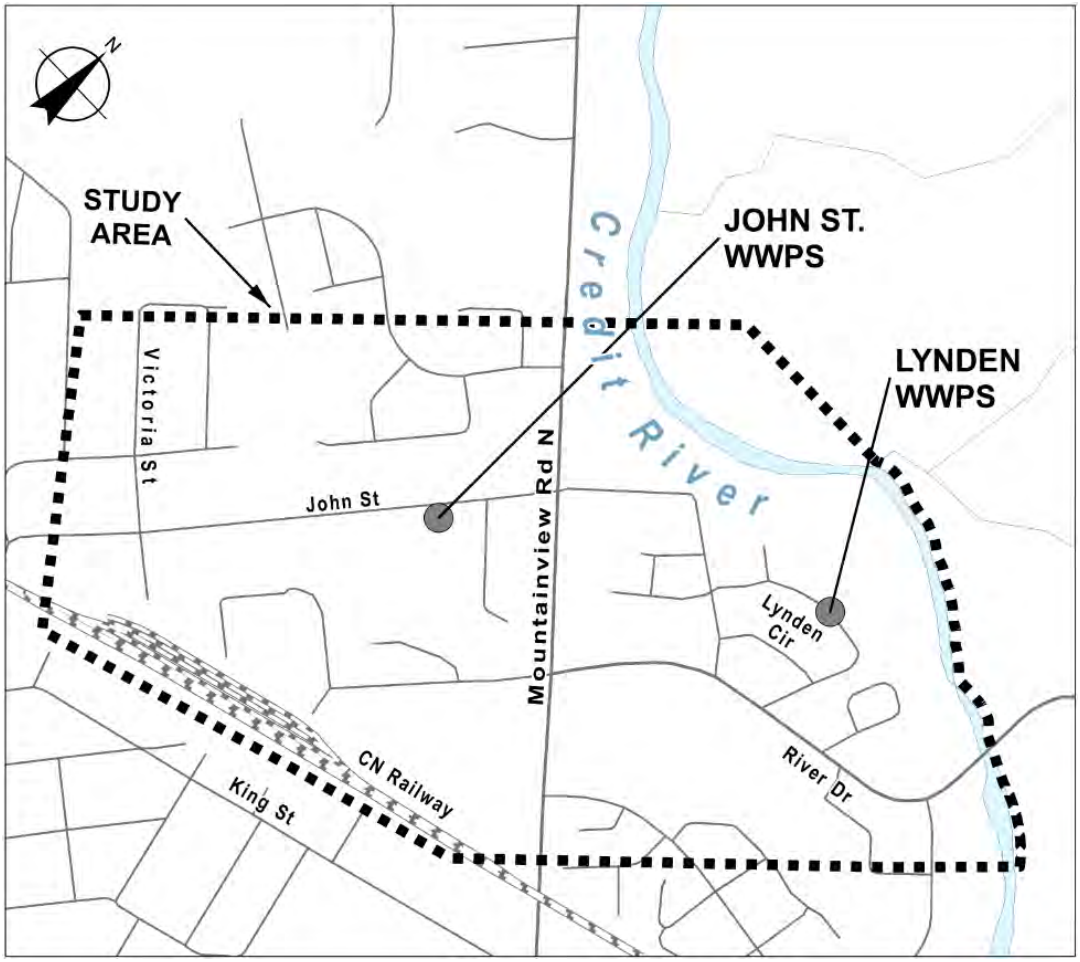
2.0 Study Area

The Study Area will be bounded roughly by Silver Creek to the west, CN rail line to the south, Credit River to the east and the Georgetown Urban Area boundary to the north. Please refer to Figure 2 (attached) for a depiction of these boundaries.

The John Street WWPS – built in 1970 – is situated in a residential area in the northeast corner of John Street Park in Georgetown, the property lands owned by Town of Halton Hills, close to the Hamlet of Glen Williams. The John Street Park includes a playground, manicured open space and a remnant urban forest with very little connectivity to the Credit River Valley system. The Study Area includes a privately owned (Wolf Leopold Estates) part of the Credit River Valley identified as a dense riparian treed corridor along the Credit River. This corridor embraces the Credit River Anglers Association (CRAA) Fish Hatchery which is located in the vicinity of the proposed emergency outflow location in Credit River Valley at the bend of John Street. The remainder of the Study Area is characterized by urban development.

The catchment area for the John Street WWPS is approximately 88 ha, with an estimated current average daily flow of 5 L/s and a peak hourly flow of 67 L/s. In addition to its own catchment area, the station collects wastewater from Lynden Circle WWPS. An estimated peak hourly flow for Lynden circle WWPS is 27 L/s. The pumping station discharges through a single 250 mm diameter forcemain to a manhole at the intersection of Victoria Street and John Street, and flows into a 300 mm trunk sewer that connects to the Silver Creek trunk sewer.

Figure 1: Study Area



2.1 Frogs and Toads

2.1.1 Anuran Call Count Surveys Methods

Amphibian monitoring surveys were conducted at three points around the property during the last two weeks of April, May, and first week of July, 2017, respectively to determine the presence of breeding amphibians within 120 m of the wetland and open water habitats within the Study Area. Survey protocols were based on the Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (Bird Studies Canada (BSC), 2009).

For the April survey, night temperatures were above 5°C (7°C), above 10°C (14 °C) for the May survey, and above 17°C (26 °C)for the early July survey.

Three call level codes are used for amphibians (Code 1, Code 2, and Code 3).

Table 1 below shows the descriptions for each of these codes (taken from BSC, 2009).

Table 1: Amphibian Call Level Codes

Call Code	Code Description
1	Calls not simultaneous, number of individuals can be accurately counted.
2	Some calls simultaneous, number of individuals can be reliably estimated.
3	Full chorus, calls continuous and overlapping, number of individuals cannot be reliably estimated.

2.2 Salamanders

No targeted surveys for salamanders were conducted as part of field data collection program for the John Street WWPS EA study. However, a background review of agency records and the NHIC database, a desktop review of aerial photography, and confirmation of ELC communities within the Study Area during site investigations assisted in screening for the potential habitat of these species, located in Appendix B – NHIC Background Research Results. No incidental sightings of amphibians were recorded during any site investigations.

2.3 Reptiles

No targeted surveys for reptiles (i.e., snakes, turtles) were conducted as part of field data collection program for the John Street WWPS EA study. However, a background review of agency records and the NHIC database, a desktop review of aerial photography, and confirmation of ELC communities within the Study Area during site investigations assisted in screening for the potential habitat of these species, located in Appendix B – NHIC Background Research Results. Incidental sightings of reptiles were recorded during all site investigations and reported in their respective technical memorandums.

3.0 Results

This study assessed the natural environment within areas that may potentially be impacted due to works proposed for the John Street WWPS improvements project. Assessment was conducted using the methodology discussed above and resulted in a three night survey of wetland and pond features within the Study Area to determine the presence of calling anuran species. The presence of call frogs and toads during the appropriate season and temperature provides a good indication of habitat suitability based on this territorial behavior and the presence of breeding individuals within these habitat features. A total of five survey station locations were surveyed as part of the field data collection (Figure 2).

Survey Station Locations

Survey Station 1 is located adjacent to the western end of the easternmost pond within the valley (Figure 2). This open water feature was mapped as a Water Lily Floating-leaved Shallow Aquatic / Cattail Mineral Shallow Marsh Ecosite (SAF1-1 / MAS2-1) during the Vegetation Community identification and mapping field surveys and is described in detail in the Ecological Land Classification technical memorandum.

Survey Station 2 is located between Ponds 2 and 3 which are part of the same vegetation community as Pond 4. However, both of these ponds are shallower and tend to have a wider variety of aquatic plants in them.

Survey Station 3 is located beside the CRAA Hatchery. This feature was included in the SAF1-1 / MAS2-1 but does not include any notable aquatic plant species. The water in this pond has a lower temperature and disturbance includes the hatchery tanks and pumping equipment.

Survey Station 4 is located at the property boundary where the entry driveway is closest to the Credit River, in an attempt to document any species using riparian features as breeding habitat. According to the ELC mapping, this survey location is classified as a White Cedar Mineral Coniferous Swamp Inclusion (SWC1-1).

Survey Station 5 is located adjacent to the stormwater management pond located in the south corner of the intersection of Mountainview Road and Meadowglen Boulevard. This SWM pond has naturalized and provides Mineral Cattail Marsh habitat with open water and a Red-Osier Dogwood boarder.

Survey results are summarized in Table 2. The following species were observed (heard calling and/or seen) within the Study Area, over the course of the three site visits:

- Gray Treefrog (*Hyla versicolor*).
- Green Frog (*Lithobates clamitans*).
- American Bullfrog (*Lithobates catesbeianus).*

Table 2: Summary of Amphibian Call Survey Station Conditions

Site Visit	Date	Start / End Time	Conditions	Station ID	Species Observed	Comments
Amphibian Call Survey #1	April 21, 2017	19:55 – 20-40	7°C 9/10 cloud cover 3 Beaufort Wind	1	None observed	
				2	None observed	
				3	None observed	
				4	None observed	
				5	None observed	
Amphibian Call Survey #2	May 26, 2017	21:20 – 22:10	14°C 10/10 cloud cover 1 Beaufort Wind	1	Bullfrog, Gray Treefrog, Green Frog	
				2	None observed	
				3	None observed	Gray Treefrog outside of survey area; trout species in Pond 2
				4	None observed	Gray Treefrog outside of survey area
				5	Green Frog	More seen than heard
Amphibian Call Survey #3	July 6, 2017	21:46 – 22:43	26°C 5/10 cloud cover 1 Beaufort Wind	1	Green Frog	Road noise
				2	Green Frog	
				3	Green Frog	Many
				4	None observed	Gray Treefrog outside of survey area
				5	Green Frog	Many

Note:
Beaufort Wind Scale: 0=calm, smoke rises vertically (0-2 km/hr); 1=light air movement, smoke drifts (3-5); 2=slight breeze, wind felt on face; leaves rustle (6-11); 3=gentle breeze, leaves & twigs in constant motion (12-19); 4=moderate breeze, small branches moving, raises dust & loose paper (20-30); 5=fresh breeze, small trees begin to sway (31-39); 6=strong breeze, large branches in motion (40-50).

4.0 Incidental Observations

A number of other ecological surveys were completed in the Study Area in appropriate habitat for reptiles and amphibians. As a result a number of incidental observations for herpetofaunal species occurred, as listed below:

- June 8th – Pond #4 – one Midland Painted Turtle basking on log.
- June 8th – Pond #1 – two Bullfrog calling; also one Green Frog calling. I was a little surprised to hear Bullfrog calling but according to Harding, J.H. (1997) "*almost any still, permanent body of water may be home to this species, including river backwaters, sloughs,*

lakes, farm ponds, impoundments, marshes and shallow Great Lakes bays. Places with abundant submerged and emergent vegetation are preferred."

- June 8th – SWM Pond – two Green Frog calling.

The Ministry of Natural Resources and Forestry (MNRF) might ask about habitat potential for Northern Map Turtle – however, a search of the Ontario Reptile & Amphibian Atlas for our Square did not result in any records for this stretch of the Credit River; neither did the NHIC search for Squares 17NJ8734 and 17NJ8735. Northern Map Turtle is known from the Credit River, but further downstream closer to the shoreline of Lake Ontario (maybe they were further upstream historically?). They are highly aquatic and their habitat is associated with the Credit River itself, not the man-made ponds that are present in the Study Area.

5.0 Background Data Source Information

Data requests were submitted to both the MNRF and Credit Valley Conservation (CVC) in order to obtain background information on the John Street WWPS Study Area. This information included both current and historic records of wildlife species that have been documented within a 500 m radius of the Study Area, therefore including lands outside of the area of focus for this EA. In addition to the CVC and MNRF data, a desktop review of the Ontario Herpetofaunal Atlas was completed for the Ontario Base Mapping squares in which the Study Area is located. As a result of these searched, the following list of potential species was compiled for the general location of the Study Area and surrounding landscape.

Table 3: Summary of Amphibian Survey Results

Species Common Name	Scientific Name	Rarity	Habitat Potential
Frogs and Toads			
Wood frog	*Lithobates sylvaticus*		Yes
Western Chorus Frog	*Pseudacris triseriata*	THR	Yes
Spring Peeper	*Pseudacris crucifer*		Yes
Pickerel Frog	*Lithobates palustris*		No
Northern Leopard Frog	*Lithobates pipiens*		Yes
Green Frog	*Rana clamitans*		Yes
Gray Treefrog	*Hyla versicolor*		Yes
American Toad	*Anaxyrus americanus*		Yes
American Bullfrog	*Lithobates catesbeianus*		Yes
Salamanders and Newts			
Spotted Salamander	*Ambystoma maculatum*		No
Salamander Hybrid	*Ambystoma species*		No
Jefferson X Blue Spotted Salamander Complex	*Ambystoma jeffersonianum x laterale*		No
Jefferson Salamander	*Ambystoma jeffersonianum*		No
Eastern Red-backed Salamander	*Plethodon cinereus*		Marginal
Eastern Newt	*Notophthalmus*		No

Species Common Name	Scientific Name	Rarity	Habitat Potential
	viridescens		
Snakes			
Red-bellied Snake	*Storeria occipitomaculata*		Yes
Milksnake	*Lampropeltis triangulum*		Yes
Eastern Ribbonsnake	*Thamnophis sauritus sauritus*	SC	No
Eastern Gartersnake	*Thamnophis sirtalis*		Yes
Cornsnake	*Pantherophis guttatus*		Non-native species – likely escapee or released specimen
Turtles			
Snapping Turtle	*Chelydra serpentina*	SC	Yes
Red-eared Slider	*Trachemys scripta elegans*		Non-native species – likely escapee or released specimen
Midland Painted Turtle	*Chrysemys picta*		Yes
Northern Map Turtle	*Graptemys geographica*	SC	No

Note:
THR – Threatened
SC – Special Concern

6.0 Impact Assessment and Mitigation

Detailed field surveys were undertaken to characterize terrestrial habitats within 120 m of the proposed the Study Area to verify information collected through background records review, to further characterize known features, and to identify any additional features not previously recorded. Field investigations included delineation of vegetation communities through the use of Ecological Land Classification (ELC).

Lands within the Study Area Vicinity (within 500 m of WWPS and potential outlet locations) were also evaluated based on a desktop review of background reports, aerial photography, natural heritage databases, and agency consultation.

Based on the results of these studies, the footprint of the proposed alternative was selected in an effort to both avoid and minimize the potential for adverse effects to the natural heritage features and functions associated with the Study Area. Direct effects to vegetation communities and species have been minimized through the use of directional drilling for the outlet pipe and location of the outlet structure and pumping station in previously disturbed areas.

The following is a summary of Provincially Significant Features present in the Study Area where direct or indirect impacts are anticipated given the construction, operations, and/or maintenance of the preliminary Conceptual Design.

7.0 Direct Impacts

Direct impacts to natural heritage features during the construction, operations, or maintenance phase of the project include:

- Minor removal of vegetation within the Credit River Valley feature.
- Alteration of water balance in forested wetland inclusions and/or open water marsh and pond areas.
- Encroachment into identified groundwater discharge areas.

8.0 Indirect Impacts

Indirect impacts to natural heritage features during the construction, operations, or maintenance phase of the project must also be considered.

- Contamination of surface water features containing reptiles, amphibians and fish within the Credit River Valley feature through project construction activities, works, utilization, and maintenance.

Impacts from the WWPS and maintenance have the potential to adversely affect natural features and their ecological functions in the Study Area. Impacts with farther-reaching implications include surface-water runoff and emergency discharge events.

In summary, both the direct and indirect impacts will have no net impact overall to the existing natural environment. The proposed WWPS and outfall is not anticipated to impact the form and function of vegetation, wildlife habitat and headwater drainage features.

Table 4: Impact and Management Measures

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Impact Management Measures (including Mitigation Measures)	Recommended Monitoring Activities	Net Effects
Surface and Ground Water	Surface Water	Potential for erosion and sedimentation impacts.	The footprint of disturbed areas shall be minimized to the extent possible. For example, vegetated buffers shall be left in place adjacent to natural vegetation features (forested areas) to the maximum extent possible. A Soil Management Plan (SMP) will be prepared by a Qualified Professional as defined in O.Reg. 160/06 for managing soil materials on-site (includes excavation, location of stockpiles, reuse and off-site disposal). An Erosion and Sediment Control (ESC) Plan will be developed during detailed design in consultation with CVC and will conform to industry best management practices and recognized standard specifications such as Ontario Provincial Standards Specification (OPSS). Any in-water work will be conducted in isolation of flowing water. All work zones will be clearly marked on detailed design drawings and the ESC Plan to indicate that no work should occur outside the work zone. ESC measures shall be installed and maintained during the construction phase and until all areas of the construction site have been stabilized. ESC measures shall be inspected daily to confirm they are functioning and maintained as required. If ESC measures are not functioning properly, no further work in the affected areas will occur until the sediment and/or erosion problem is resolved. All disturbed areas of the construction site will be stabilized and re-vegetated as soon as conditions allow. Wet weather restrictions shall be applied during site preparation and excavation.	A qualified Environmental Inspector shall regularly monitor construction activities to confirm the requirements outlined in the SMP and ESC are being followed. A qualified Environmental Inspector shall inspect, suggest and confirm the repair of ESC measures as needed.	No net effects anticipated.
Surface and Ground Water	N/A	Potential for localized surface water or groundwater impacts as a result of spills, discharge or dumping of materials, fluids and other wastes during construction of proposed pipe and outfall and associated surface water facilities (e.g., swales).	Refueling and maintenance of construction equipment should occur within designated areas only. Any hazardous materials used for construction will be handled in accordance to appropriate regulations. A Construction Emergency Response and Communications Plan shall be developed and followed throughout the construction phase (including spill response plans). The Contractor shall develop spill prevention and contingency plans for the construction of pipe and outfall facilities. Personnel shall be trained in how to apply the plans and the plans shall be reviewed to strengthen their effectiveness and continuous improvement. Spills or depositions into watercourses shall be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. A	A qualified Environmental Inspector shall regularly monitor construction activities to confirm the requirements outlined in the SMP and ESC are followed. Workers shall report any instances of spills to their supervisors.	No net effects anticipated.

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Impact Management Measures (including Mitigation Measures)	Recommended Monitoring Activities	Net Effects
			hydrocarbon spill response kit will be on site at all times during the work. Spills will be reported to the Ontario Spills Action Centre at 1-800-268-6060.		
Surface and Groundwater	Headwater feature	Change in water balance to seasonally flooded or wet habitat within natural vegetation communities affecting groundwater recharge functions.	Incorporation of Low Impact Development (LID) to direct surface water flow to grassed swales in close proximity to the natural heritage features associated with the WWPS location (refer to CVC Grey to Green Road Retrofits). LID elements should be designed to preserve local predevelopment water balance as they reduce runoff volume through the processes of infiltration and evapotranspiration and improve stormwater quality through a variety of physical and biological treatment processes.	Monitoring of vegetation communities for changes in plant species composition and soil moisture regime.	No net effects anticipated
Natural Environment	Vegetation	Direct effects of construction activities will include the limited clearing and loss of both herbaceous and woody vegetation. Indirect effects include the increase to edge habitats, which includes a number of potential effects, such as wind throw and sunscald, introduction of invasive plant and wildlife species which may outcompete or predate native species, change in soil moisture regime and water availability to plants and plant communities, increases in light penetration (pollution) and noise, soil compaction, equipment and pedestrian “traffic”, equipment laydown and spills.	Exclusion fencing should be installed prior to commencement of construction activities to both prevent the unnecessary encroachment / disturbance by humans and machinery into vegetation communities and to prevent wildlife from entering the construction areas. Hoarding should be installed and inspected prior to any land. Hoarding should be installed at the dripline of any trees to be preserved. Construction activity should be outside of the dripline of any trees that are proposed to be retained (Tree Survey Report). Plant species loss should be minimized, where possible, and compensatory planting plans established in areas of the Study Area when no clearing activities are proposed, referencing CVC’s Plant Selection Guidelines for the existing soil and vegetation communities. Potential for establishing pollinator species of plants should also be included when establishing a formal planting plan. Works within the CVC regulated areas will require a permit under O.Reg. 156/06. The inclusion of bio swales, infiltration galleries or other features to promote localized surface water infiltration to maintain the existing water balance should be included as part of the detailed design and landscape plan WWPS, pipe and outfall locations.	Fencing shall be inspected regularly to ensure damage is repaired in a timely manner and that additional risk to wildlife is minimized. Hoarding site visit required.	No net effects anticipated.
Natural Environment	Woodlands	Removal of snag trees suitable as Bat Maternity Habitat (BMH) on the edge of natural heritage features directly adjacent to proposed WWPS, pipe and outfall locations. a) Potential for direct environmental effects to woodland habitats during clearing and construction activities for the proposed	Removal of candidate BMH trees will require appropriate compensation during the appropriate timing windows, including the installation of bat house(s) to compensate for loss of habitat. The recommended approach from MNRF includes proactive establishment of alternate bat habitat features within the Study Area to avoid the requirement for permitting under the ESA. • Prior to construction works commencing, installation of exclusion fencing is recommended along the perimeter of the limit of	a) Fencing should be monitored on a regular basis to ensure there is no damage that may result in a decrease in function or opportunities for injury or death to wildlife species. b) The Avian Biologist may be required to confirm the presence	No net effects anticipated.

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Impact Management Measures (including Mitigation Measures)	Recommended Monitoring Activities	Net Effects
		WWPS and outlet structure. b) Potential for indirect environmental effects to adjacent woodland features. Potential indirect effects may include noise disturbance as a result of construction and/or operations and maintenance activities. Noise disturbance may impact breeding success of avian species.	construction which includes all areas required for excavation and spoil stockpile, vehicle and worker access and material laydown in order to prevent any wildlife from attempting to access the construction zone during construction works – specifically, fencing shall be installed at the beginning of April or earlier. • If designated areas are created during construction for the stockpiling of materials, especially fill, soil and gravel, the Contractor shall install temporary exclusion fencing around the perimeter of these areas to prevent any reptile species from entering the area and attempting to nest (reptiles are attracted to these materials for nesting). • Any wildlife should be safely relocated, or permitted to escape, to a suitable habitat no more than 200 m away from the work zone. Wildlife shall be released no more than 200 m away from the work zone in a similar ecosystem type. • In the event that SAR are found within the construction zone all activities will stop and mitigation options shall be discussed with the Town, whereby an MNRF SAR Biologist may be contacted for advice as these animals are protected under ESA 2007. • Educational material shall be provided by a Biologist to construction personnel prior to commencement of construction works to assist personnel in identifying SAR species, should they be encountered. These materials shall also include protocols to be followed to prevent contravention of the ESA 2007, should any SAR be encountered. • All works should stop immediately and MNRF contacted should a SAR be encountered within a construction or operation area to ensure compliance with the ESA; • In the event that SAR are found within the construction zone all activities will stop and mitigation options shall be discussed with the Town, whereby an MNRF SAR Biologist may be contacted for advice as these animals are protected under ESA 2007. • SAR identification training shall be provided by a Biologist to construction personnel prior to commencement of construction works to assist personnel in identifying SAR species, should they be encountered. Educational materials shall also include protocols to be followed to prevent contravention of the ESA 2007, should any SAR be encountered. All construction personnel will be trained on how to identify and deal with SAR encountered during work.	and identification of an active nest and/or breeding bird prior to contacting MNRF for further advice.	

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Impact Management Measures (including Mitigation Measures)	Recommended Monitoring Activities	Net Effects
			a) A mitigation plan will be designed and implemented to compensate for the temporary removal of vegetation and provide enhancement of the existing features. b) To reduce the risk of disturbing breeding birds (and contravening the *Migratory Bird Convention Act, 1994*), timing constraints shall be applied to avoid vegetation clearing (including grubbing) and/or structure works (construction, maintenance) during the breeding bird period - broadly from end of March to end of August for most species (regardless of the calendar year) (see Breeding Birds for more detail).		

9.0 References

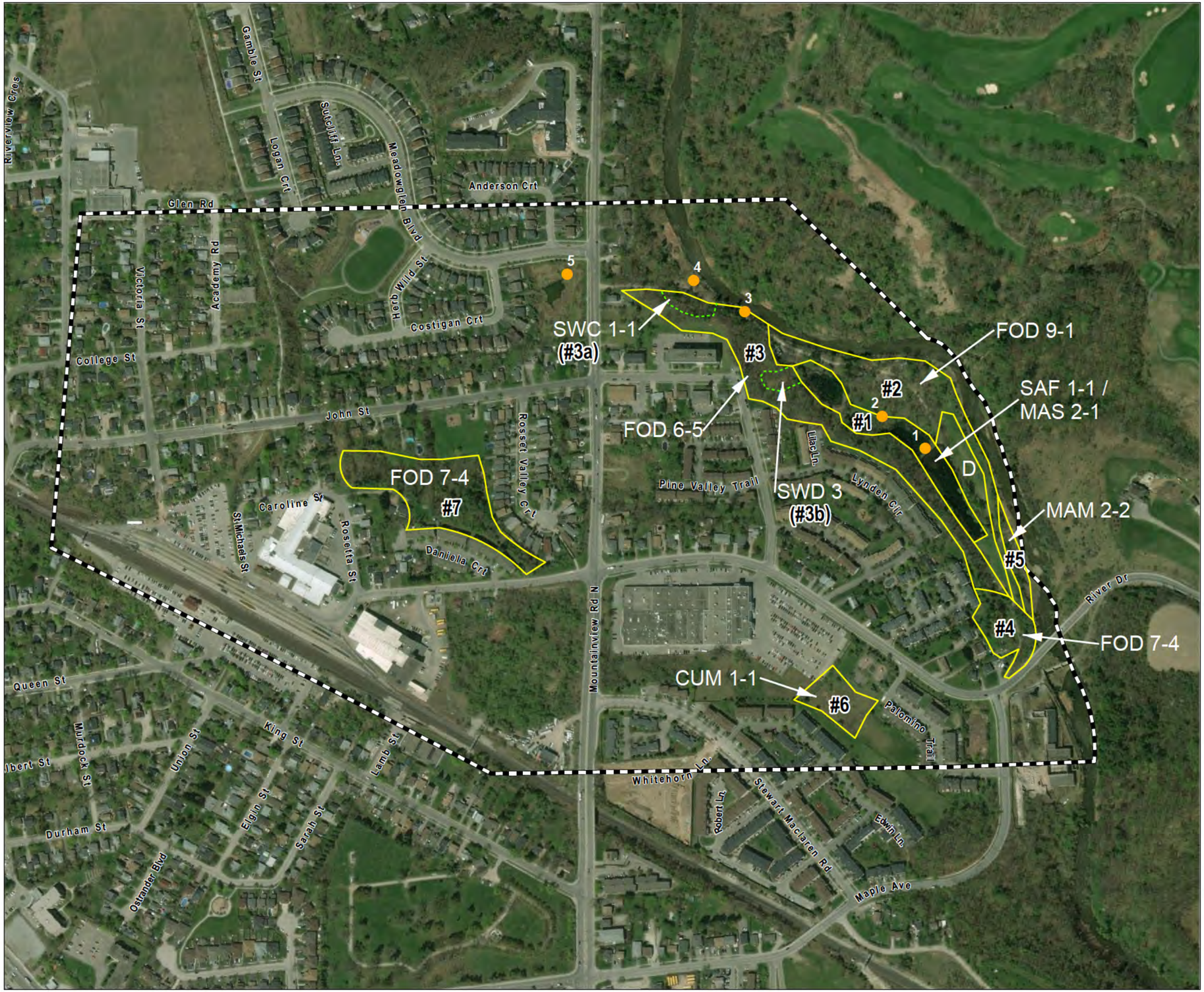
Lee, H.T, W.D. Bakowsky, J.L. Riley, J. Bowles, M. Puddister, P. Uhlig, S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Region, Science Development and Transfer Branch. Technical Manual ELC-005.

R.J. Burnside & Associates Limited

Senior Terrestrial Biologist

NJS:sr

Enclosure(s) Figure 2: Amphibian Survey Locations



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: -45	Scale Factor: 0.99960

Grid North

0 100 200 300 400
Metres

BURNSIDE

Client

THE REGIONAL MUNICIPALITY OF HALTON

Figure Title

JOHN ST WWPS EA

AMPHIBIAN SURVEY LOCATIONS

Drawn	Checked	Date	Figure No.
HN	NS	2018/02/05	2
Scale		Project No.	
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File Path: \\eimol\Shared Work Areas\039946 (John St WWPS)\Map\039946 Amphibian Survey Locations.mxd Print Date: 2018/02/05 Time: 12:51 PM

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Appendix A4

Bat and Bat Maternity Habitat

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Technical Memorandum

Date: January 29, 2018 **Project No.:** 300039946.0000

Project Name: John St WWPS Class EA - Bat Maternity Habitat

Client Name: Halton Region

Submitted To: Avid Bani Hashemi

Submitted By: Peter De Carvalho

Reviewed By: Nicholle Smith

1.0 Introduction

The Region's John Street Wastewater Pumping Station (WWPS) in Georgetown is nearing the end of its useful life. Accordingly, Halton Region has undertaken a Municipal Class Environmental Assessment (Class EA) Study to investigate the proposed capital upgrades in order to maintain the station in a state of good repair.

A wide range of WWPS and/or collection system upgrade alternatives were considered, in order to select the most appropriate station design concept that meets Halton Region's latest design standards, including provision for an emergency over flow to reduce the risk of a sewer surcharge in the event of WWPS system failure and/or during peak wet weather events. R.J. Burnside & Associates Limited (Burnside) has facilitated the EA on behalf of the Region.

The Study has been completed in accordance with the requirements of a Schedule B Undertaking as outlined in the Municipal Engineers Association Municipal Class Environmental Assessment Document (October 2000, as amended 2007, 2011 & 2015), which is an approved process under the Ontario Environmental Assessment Act.

As part of the EA Study, Burnside has completed a habitat assessment for Species at Risk bats within all naturally vegetated areas of the Site, focusing on the Credit River valley system and upland forested areas.

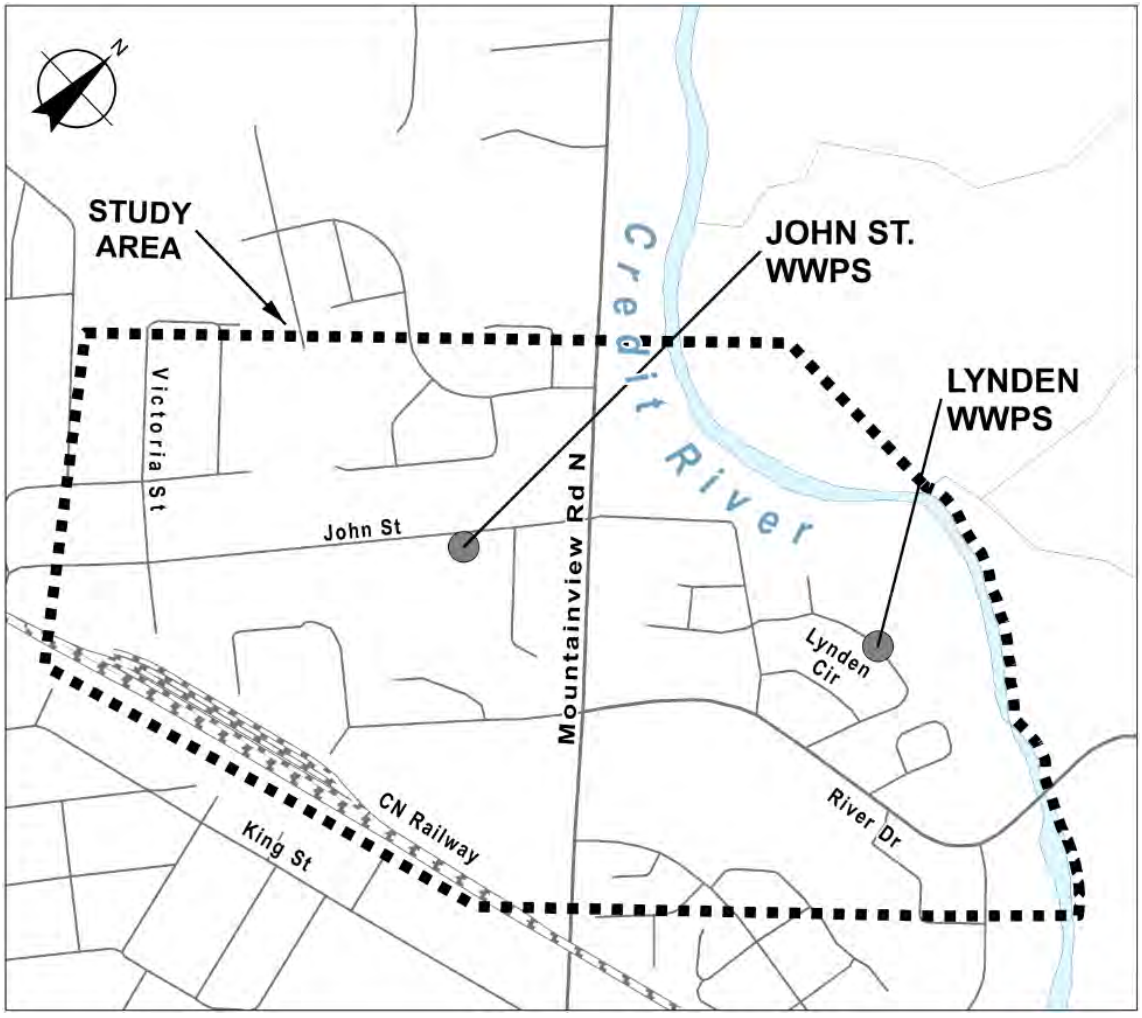
2.0 Study Area

The Study Area will be bounded roughly by Silver Creek to the west, CN rail line to the south, Credit River to the east and the Georgetown Urban Area boundary to the north. Please refer to Figure 1 for a depiction of these boundaries.

The John Street WWPS – built in 1970 - is situated in a residential area in the northeast corner of John Street Park in Georgetown, the property lands owned by Town of Halton Hills, close to the Hamlet of Glen Williams. The John Street Park includes a playground, manicured open space and a remnant urban forest with very little connectivity to the Credit River Valley system. The Study Area includes a privately owned (Wolf Leopold Estates) part of the Credit River Valley identified as a dense riparian treed corridor along the Credit River. This corridor embraces the Credit River Anglers Association (CRAA) Fish Hatchery which is located in the vicinity of the proposed emergency outflow location in Credit River Valley at the bend of John Street. The remainder of the Study Area is characterized by urban development.

The catchment area for the John Street WWPS is approximately 88 ha, with an estimated current average daily flow of 5 L/s and a peak hourly flow of 67 L/s. In addition to its own catchment area, the station collects wastewater from Lynden Circle WWPS. An estimated peak hourly flow for Lynden Circle WWPS is 27 L/s. The pumping station discharges through a single 250 mm diameter forcemain to a manhole at the intersection of Victoria Street and John Street, and flows into a 300 mm trunk sewer that connects to the Silver Creek trunk sewer.

Figure 1: Study Area



3.0 Ecological Analysis

The natural environment within the Study Area was assessed using a combination of background review and field studies. Works included identification of candidate Bat Maternity Habitat and subsequent acoustic monitoring.

4.0 Bat Habitat

In April 2017, the Ministry of Natural Resources and Forestry (MNRF) Guelph District released the *Survey Protocol for Species at Risk Bats within Treed Habitats* for three of Ontario's four Endangered bat species (Little Brown Myotis – *Myotis lucifugus*; Northern Myotis – *Myotis septontrionalis*; Tri-colored Bat – *Perimyotis subflavus*) (MNRF, 2017c). These three species, along with Eastern Small-footed Myotis (*Myotis leibii*) were designated as Endangered under the federal *Species at Risk Act* (2002) in 2014 after observations of dramatic population declines of these species throughout eastern North America (ECCC, 2015).

4.1 Methods

The 2017 protocol is separated into two sub-protocols, a "leaf-off" and a "leaf-on" survey which each target different species. These two surveys focus on treed habitat features, including forests, swamps and cultural woodlands. The findings of these two surveys resulted in the MNRF requirement for acoustic surveys to confirm the presence of endangered bat species within the area of study.

4.1.1 Leaf-off Survey

Leaf-off surveys of treed habitat for maternity / roosting bat colonies focus on Little Brown Myotis and Northern Myotis. These species roost in tree cavities or under loose bark. Leaf-off surveys were completed on April 28, 2017.

The initial step of the protocol is identifying treed areas that are facing potential disturbance, to be confirmed during field reconnaissance. With small areas (under 10 ha), a comprehensive walk-through of an area is conducted to look for snag trees, as opposed to larger sites where sub-samples and snag density surveys are more appropriate.

The quality of roosting habitat is dependent on 10 factors, which can be used to determine which snag trees from a survey are most suitable as bat maternity habitat. These factors are listed below in order of descending importance:

1. Tallest snag trees;

2. Snag exhibits cavities or crevices often originating as cracks, scars, knot holes or woodpecker cavities;

3. Snag has the largest diameter breast height (DBH) (>25 cm);

4. Snag is within the highest density of other snags;

5. Snag has the highest amount of loose, peeling bark (naturally occurring / due to decay);

6. Cavity or crevice is high on the tree (>10 m) or is chimney-like with a low entrance;

7. Tree is a species known to be rot-resistant (such as Black Cherry, Black Locust);

8. Tree species typically provides good cavity habitat (e.g., White Pine, Maple, Aspen, Ash, Oak);

9. Snag is located within an area where the canopy is more open; and

10. Snag exhibits early stages of decay (Decay Class 1-3).

With these factors in mind, we surveyed all treed habitat within the study area for traits that indicate potential BMH for Little Brown and Northern Myotis. We recorded for each candidate tree: species, DBH, canopy height class, approximate height, cavity type, the presence of other nearby snags, and decay class. These trees were each recorded with a GPS waypoint and photo records. Identified BMH tree listings can be found in Attachment 1.

4.1.2 Leaf-on Survey

Tri-colored Bat show strong preference to roosting in the foliage of oak and maple trees, especially those that feature dead or dying clusters of leaves. This survey protocol targets these genera specifically. Leaf-on Surveys were completed on May 25, 2017. The following trees were documented:

- Oaks ≥ 10 cm DBH;
- Maples ≥ 10 cm DBH **IF** the tree includes dead or dying leaf clusters; and
- Maples ≥ 25 cm DBH.

Areas with oak and maple trees were identified during the leaf-off phase of the BMH survey protocol. As such, survey efforts focused on the mixed and deciduous forest communities.

4.1.3 Acoustic Surveys

Following the screening of leaf-on and leaf-off surveys, candidate BMH trees were selected as potential acoustic monitoring station locations. Acoustic surveys were carried out by Natural Resource Solutions Inc (NRSI).

Five acoustic monitoring stations were selected by R.J. Burnside & Associates staff to assess the presence of SAR bats within the study area (Figure 2, attached). Details regarding the selection of the monitoring stations is outlined in a memorandum provided to the MNRF on June 13, 2017 (Attachment 2).

Passive acoustic monitoring was conducted between June 20 and July 5, 2017 for a total of 15 nights at all monitoring stations. Acoustic detectors were set to record bat passes for a total of five hours each night during the monitoring period, commencing at sunset.

4.2 Leaf-off and Leaf-on Surveys

Only treed ecosites within the Credit River valley were considered for potential BMH because no impact to treed ecosites is anticipated elsewhere in the Study Area. Within these polygons, 94 trees were identified during leaf-off surveys as candidate BMH for Little Brown Myotis and Northern Myotis. 276 trees were identified during leaf-on surveys as candidate BMH for Tri-colored Bat (Attachment 1).

4.3 Acoustic Monitoring

Acoustic monitoring station locations were chosen to target both areas with high density of quality habitat and areas most likely to be impacted by proposed works. Locations were also chosen to optimally capture multiple candidate BMH trees from both leaf-off and leaf-on surveys if possible to maximize the potential of detecting any of Ontario's Endangered Bats that may be utilizing the area as habitat. Monitoring locations can be seen in Figure 2.

Six bat species were identified through acoustic monitoring, including two SAR species (Little Brown Myotis and Eastern Small-footed Myotis (*Myotis leibii*). Eastern Small-footed Myotis typically prefer to roost in rocky habitats, but has also been known to utilize anthropogenic structures for maternity colonies. No suitable roosting habitat exists within the study area for this species, though foraging habitat is abundant due to the aquatic features on the Study Area. The external report concluded that the high incidence of this species is likely a result of proximity to the Niagara Escarpment, where suitable roosting habitat is abundant (Attachment 3).

High-quality habitat exists on the site for Little Brown Myotis, and approximately 12% of recorded bat calls were identified as being from this species. As such it is concluded that any cavity tree within the riparian corridor on the Study Area must be assumed as protected SAR habitat. Any proposed impacts to suitable BMH trees in this area will require correspondence and approval from an MNRF biologist.

5.0 Impact Assessment and Mitigation

5.1 Direct Impacts

Direct impacts to natural heritage features during the construction, operations, or maintenance phase of the project include:

- Removal of snag trees suitable as within the Credit River Valley feature;
- Alteration of water balance in forested wetland inclusions and/or open water marsh and pond areas; and

- Encroachment into identified groundwater discharge areas.

5.2 Indirect Impacts

Indirect impacts to natural heritage features during the construction, operations, or maintenance phase of the project must also be considered.

- Contamination of surface water features containing fish within the Credit River Valley feature through project construction activities, works, utilization, and maintenance.

Impacts from the WWPS and maintenance have the potential to adversely affect natural features and their ecological functions in the Study Area. Impacts with farther-reaching implications include surface-water runoff and emergency discharge events.

In summary, both the direct and indirect impacts will have no net impact overall to the existing natural environment. The proposed WWPS and outfall is not anticipated to impact the form and function of vegetation, wildlife habitat and headwater drainage features.

6.0 Impact Assessment and Mitigation

6.1 Impacts

Direct or indirect impacts to SAR bats or their habitats during the construction, operations, or maintenance phase of the project include:

- Incidental mortality, breeding disturbance, or general harassment of wildlife in the vicinity of project works;
- Removal of snag trees, reducing the overall quantity of BMH habitat;
- Contamination of surface water features and substrates, including wetlands, that may support the life processes of SAR bats through project construction activities, works, utilization, and maintenance;
- Alteration of water balance in forested wetland inclusions and/or open water marsh and pond areas; and
- Removal of root cover which may compromise integrity of the underlying soil matrix and increase the potential for soil loss or erosive action;

6.2 Mitigation

Strategies to avoid impacts to the natural environment include:

- Choose a design alternative with the lowest impact to sensitive habitats;
  - Restrict work to the John Street Right-of-Way or other disturbed areas wherever possible.
- Fueling and maintenance of construction equipment should occur in designated areas only. Designated fueling and maintenance areas should be as far from sensitive habitats as possible.

- Disturbance to natural areas should be minimized wherever possible through the use of underground directional drilling;
  - Compensatory plantings for removed trees should be discussed with regulatory biologists.
- Compensation for removal of bat habitat must be discussed with MNRF biologists during the SAR permitting process;
  - Compensation strategies can include the installation of bat boxes, bat hotels, or artificial bark.
- All works that may disrupt roosting bats should take place outside of the active bat breeding season (May 15 to July 31).

7.0 Conclusion

Surveys to identify potential maternity habitat for SAR bats identified suitable habitat for three of Ontario's four Endangered species (Little Brown Myotis, Northern Myotis, and Tri-colored Bat). Subsequent acoustic monitoring identified two SAR bat species as present within the Credit River riparian corridor. No suitable roosting habitat was present for one of these species (Small-footed Myotis); it was concluded that this species was utilizing the Study Area for forage only. Suitable habitat was confirmed for the second identified species (Little Brown Myotis). Forested habitats within the riparian corridor have therefore been confirmed as protected SAR habitat; any impacts to forested ecosites will require correspondence and approval from MNRF biologists.

Mitigation strategies to minimize impacts to SAR bats include choosing design alternatives with lowest impact to sensitive habitats, underground directional drilling, restricting works that may impact bats to outside of the active bat breeding season, and determining appropriate compensation for removed bat habitat.

8.0 References

Environment and Climate Change Canada (ECCC). 2015. Recovery Strategy for Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Canada. Accessed June 20, 2017 from: http://www.registrelep-sararegistry.gc.ca/document/default_e.cfm?documentID=2475.

Ministry of Natural Resources and Forestry (MNRF). 2017. *Species at Risk in Ontario (SARO) List.* Ontario Ministry of Natural Resources. Accessed December 22, 2017 from www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/246809.html.

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R.J. Burnside & Associates Limited

Peter De Carvalho, B.Sc. (Bio), B.Eng. (Env), Rest. Cert. EIT
Engineering Assistant/Terrestrial Ecologist

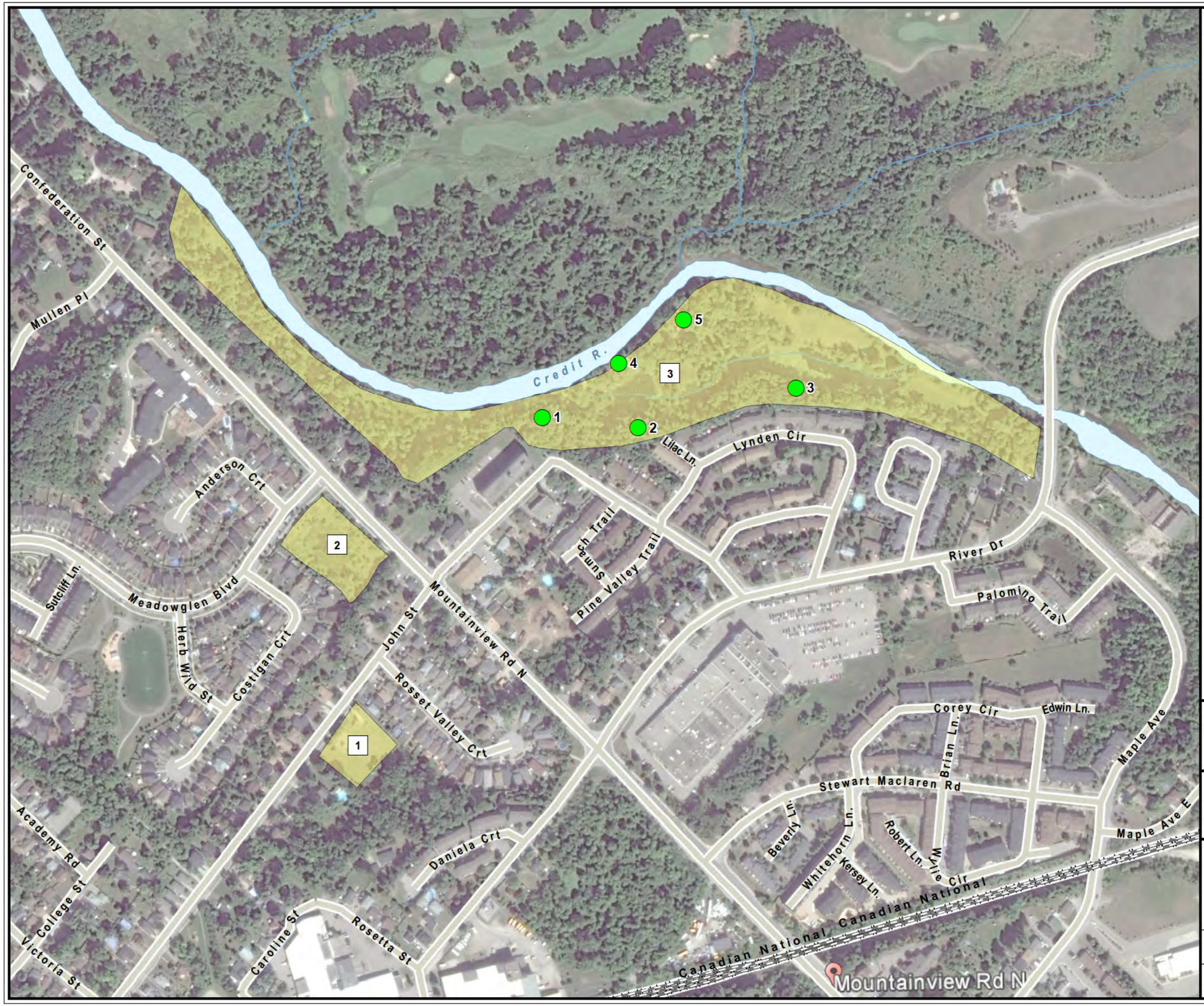
PFD:sr

Enclosure(s) Figure 2 – Proposed BMH Acoustic Monitoring Stations
Attachment 1 – BMH Survey Results
Attachment 2 – MNRF Bat Correspondence
Attachment 3 – Acoustic Monitoring Report

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Figure



- Proposed Acoustic Station
- Bat Areas Surveyed
- Rail Line: Operational
- Road
- Rail
- Waterbody: Permanent
- Stream: Permanent

Sources

1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.
3. Background 2015 Air Photo obtained from Google Earth Professional / DigitalGlobe © Google Earth, use of products are subject to the Terms and Conditions of Licensed Google Earth Software.

N
Grid North

Datum: North American 1983 CSRS

Coord. System: NAD 1983 CSRS UTM Zone

0 50 100 150 200 250 300
Metres

BURNSIDE

Client

THE REGIONAL MUNICIPALITY OF HALTON

Figure Title

JOHN STREET WWPS CLASS ENVIRONMENTAL ASSESSMENT

PROPOSED BMH ACOUSTIC MONITORING STATIONS

Drawn	Checked	Date	Figure No.
CD	PD	June 2017	2
Scale		Project No.	
1:4,000		300039946	

File Path: \\Elm\gis\Project\300\039946 (John St WWPS EA)\039946 Bat Acoustic Mapping.mxd Print Date: 2017/06/09 Time: 03:18 PM

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Attachment A

BMH Survey Results

LEAF ON

Tree Species ID	DBH (cm)	Approx. Height (m)	Lat	Lon
Red Maple	57	16	43.661608	-79.917366
Red Maple	59	16	43.661608	-79.917366
Sugar Maple	55.5	17	43.662115	-79.916597
Sugar Maple	54.5	17	43.662249	-79.915194
Sugar Maple	62	18	43.662264	-79.914959
Oak Burr	74	18	43.662371	-79.914875
Sugar Maple	33	15	43.662371	-79.914875
Red Oak	79	18	43.662374	-79.914596
Sugar Maple	61.5	17	43.662738	-79.914044
Manitoba Maple	31	16	43.662713	-79.913917
Sugar Maple	85	21	43.6631	-79.913896
Red Oak	74.5	18	43.663142	-79.91362
Burr Oak	20	8	43.663265	-79.91353
? Burr Oak?	22	8	43.663265	-79.91353
Sugar Maple	51	23	43.663086	-79.913585
Sugar Maple	36	20	43.663086	-79.913585
Sugar Maple	31.5	20	43.663086	-79.913585
Sugar Maple	56	25	43.663118	-79.913495
Sugar Maple	56	18	43.663066	-79.913456
Sugar Maple	61.5	25	43.662681	-79.913541
Sugar Maple	37	17	43.663053	-79.913413
Red Oak	67	21	43.662945	-79.913239
Sugar Maple	63.5	21	43.662919	-79.91345
Sugar Maple	40	22	43.662919	-79.91345
Red Oak	100	24	43.662881	-79.913693
Sugar Maple	39	21	43.662799	-79.913441
Sugar Maple	35	21	43.663119	-79.913261
Sugar Maple	36	20	43.663082	-79.913124
Sugar Maple	45.5	15	43.663075	-79.913324
Manitoba Maple	34	12	43.662991	-79.913089
Manitoba Maple	43	10	43.66312	-79.913093
Sugar Maple	37	20	43.663166	-79.913392
Manitoba Maple	53	9	43.663213	-79.913255
Manitoba Maple	29.5	15	43.663103	-79.912964
Manitoba Maple	32.5	15	43.663103	-79.912964
Manitoba Maple	34	15	43.663103	-79.912964
Manitoba Maple	29	15	43.663103	-79.912964
Manitoba Maple	29	15	43.663103	-79.912964
Manitoba Maple	51	20	43.66319	-79.912885
Manitoba Maple	41.5	6	43.663013	-79.912948
Manitoba Maple	51	22	43.662903	-79.912958
Burr Oak	46	20	43.662682	-79.912682
Sugar Maple	39.5	22	43.662773	-79.912685
Manitoba Maple	30.5	19	43.662596	-79.912691
Sugar Maple	44	18	43.662876	-79.912675

BURNSIDE

LEAF ON

Tree Species ID	DBH (cm)	Approx. Height (m)	Lat	Lon
Buckthorn	79	22	43.663122	-79.912374
Manitoba Maple	29.5	19	43.662847	-79.912424
Manitoba Maple	31	19	43.662847	-79.912424
Manitoba Maple	43	19	43.662847	-79.912424
Manitoba Maple	27.5	17	43.662053	-79.911514
Manitoba Maple	33	17	43.662519	-79.911418
Sugar Maple	42	20	43.662327	-79.911007
Manitoba Maple	29.5		43.662479	-79.910942
Manitoba Maple	30		43.662479	-79.910942
Manitoba Maple	38.5		43.662465	-79.91086
Manitoba Maple	26		43.662365	-79.910768
Manitoba Maple	29.5		43.662365	-79.910768
Manitoba Maple	31		43.662365	-79.910768
Manitoba Maple	37.5		43.66232	-79.910579
Manitoba Maple	28.5		43.662126	-79.910455
Manitoba Maple	26		43.662126	-79.910455
Manitoba Maple	33		43.66218	-79.910449
Manitoba Maple	34.5	20	43.66218	-79.910449
Manitoba Maple	48.5	23	43.662292	-79.910139
Manitoba Maple	33	22	43.662413	-79.909987
Manitoba Maple	29.5	22	43.662413	-79.909987
Manitoba Maple	48	23	43.661837	-79.909731
Manitoba Maple	35.5	20	43.661928	-79.90992
Manitoba Maple	39.5	20	43.661928	-79.90992
Silver Maple	47.5	26	43.661778	-79.909721
Silver Maple	44.5	26	43.661778	-79.909721
Silver Maple	30	26	43.661778	-79.909721
Silver Maple	36	26	43.661778	-79.909721
Silver Maple	38	26	43.661778	-79.909721
Manitoba Maple	30	28	43.661567	-79.909184
Manitoba Maple	43	21	43.661559	-79.909293
Manitoba Maple	30	18	43.661559	-79.909293
Manitoba Maple	43	21	43.661559	-79.909293
Manitoba Maple	28.5	16	43.661559	-79.909293
Manitoba Maple	36	8	43.661725	-79.909729
Manitoba Maple	30.5	18	43.661723	-79.909687
Manitoba Maple	31.5	18	43.661723	-79.909687
Manitoba Maple	28.5	15	43.661711	-79.909907
Manitoba Maple	36.5	22	43.661711	-79.909907
Sugar Maple	41	24	43.661911	-79.910261
Sugar Maple	45	26	43.661842	-79.910458
Sugar Maple	39	26	43.661861	-79.910486
Manitoba Maple	32	24	43.6621	-79.910471
Sugar Maple	57	25	43.661961	-79.910524
Sugar Maple	85	24	43.661967	-79.911088

BURNSIDE

LEAF ON

Tree Species ID	DBH (cm)	Approx. Height (m)	Lat	Lon
Sugar Maple	25.5	24	43.662006	-79.911013
Sugar Maple	37	27	43.662109	-79.911233
Sugar Maple	37	26	43.662098	-79.911399
Sugar Maple	38	26	43.662098	-79.911399
Red Oak	45	25	43.662052	-79.911391
Sugar Maple	30	24	43.662043	-79.91159
Sugar Maple	40.5	24	43.66197	-79.911467
Sugar Maple	36	26	43.66197	-79.911467
Red Oak	34.5	24	43.662016	-79.911469
Red Oak	41.5	24	43.662016	-79.911469
Red Oak	27.5	20	43.662253	-79.911666
Sugar Maple	35.5	15	43.662212	-79.911664
Sugar Maple	78	25	43.662123	-79.912006
Sugar Maple	33	26	43.66211	-79.911851
Sugar Maple	81	28	43.661986	-79.912295
Red Oak	31	27	43.662095	-79.912148
Red Oak	41	26	43.662095	-79.912148
Sugar Maple	43	24	43.662027	-79.912184
Red Oak	19	24	43.662151	-79.91236
Red Oak	53.5	24	43.662151	-79.91236
Red Oak	24	24	43.662151	-79.91236
Red Oak	27.5	25	43.662051	-79.912302
Red Oak	29	24	43.662051	-79.912302
Red Oak	17	20	43.66222	-79.912329
Red Oak	35.5	18	43.662241	-79.91233
Sugar Maple	25	16	43.662196	-79.912562
Sugar Maple	32.5	19	43.66218	-79.912515
Sugar Maple	66.5	26	43.662252	-79.912601
Sugar Maple	58	26	43.662159	-79.912654
Sugar Maple	37	21	43.662281	-79.912586
Sugar Maple	94	27	43.662129	-79.912743
Sugar Maple	67	24	43.662194	-79.912757
Sugar Maple	86	28	43.662283	-79.913018
Sugar Maple	96	27	43.662078	-79.91301
Sugar Maple	39.5	26	43.662198	-79.912919
Sugar Maple	85	29	43.662035	-79.913468
Sugar Maple	19	22	43.662098	-79.913539
Sugar Maple	37.5	20	43.661968	-79.913483
Red Oak	92.5	32	43.661812	-79.913649
Sugar Maple	25.5	22	43.66215	-79.913883
Sugar Maple	36	21	43.66215	-79.913883
Red Oak	63	22	43.661842	-79.914161
Sugar Maple	27.5	16	43.662028	-79.91389
Sugar Maple	76	26	43.661906	-79.913978
Red Oak	38	22	43.661635	-79.913973

BURNSIDE

LEAF ON

Tree Species ID	DBH (cm)	Approx. Height (m)	Lat	Lon
Red Oak	44	23	43.661635	-79.913973
Red Oak	45	21	43.661635	-79.913973
Red Oak	58.5	26	43.661991	-79.914179
Red Oak	32.5	24	43.661671	-79.914191
Red Oak	33	23	43.661671	-79.914191
Sugar Maple	59	25	43.661857	-79.914356
Sugar Maple	66	26	43.661932	-79.914128
Sugar Maple	54	24	43.661932	-79.914128
Sugar Maple	38	23	43.661817	-79.914454
Sugar Maple	29	20	43.661807	-79.914262
Sugar Maple	39	21	43.661807	-79.914262
Sugar Maple	34	18	43.661559	-79.914342
Sugar Maple	28	19	43.661559	-79.914342
Sugar Maple	62	23	43.661458	-79.914283
Red Oak	48	23	43.661683	-79.914109
Sugar Maple	66	22	43.661759	-79.914278
Red Oak	47	18	43.661759	-79.914278
Sugar Maple	66	23	43.661838	-79.914175
Sugar Maple	38	21	43.661838	-79.914175
Sugar Maple	39.5	22	43.661762	-79.914342
Sugar Maple	29.5	20	43.661762	-79.914342
Sugar Maple	57	25	43.661922	-79.914119
Sugar Maple	47.5	22	43.662144	-79.914528
Sugar Maple	54	23	43.661858	-79.914379
Red Oak	22.5	18	43.661848	-79.914574
Sugar Maple	35.5	24	43.661761	-79.914631
Sugar Maple	50	23	43.661761	-79.914631
Sugar Maple	101	26	43.661748	-79.914506
Sugar Maple	46	24	43.661657	-79.914518
Red Oak	45.5	22	43.66158	-79.914535
Sugar Maple	51	27	43.661789	-79.914669
Sugar Maple	38	26	43.661724	-79.914666
Sugar Maple	32	25	43.661634	-79.914672
Sugar Maple	31	22	43.661621	-79.91485
Sugar Maple	27	21	43.661621	-79.91485
Sugar Maple	33	20	43.661276	-79.914611
Sugar Maple	27	22	43.661276	-79.914611
Sugar Maple	28	19	43.661276	-79.914611
Sugar Maple	50	24	43.661669	-79.914878
Sugar Maple	65	22	43.661611	-79.914753
Sugar Maple	95	26	43.661431	-79.914806
Red Oak	68	18	43.661561	-79.915072
Red Oak	31.5	20	43.661586	-79.915098
Sugar Maple	41	22	43.661646	-79.91515
Sugar Maple	39	24	43.661674	-79.914996

BURNSIDE

LEAF ON

Tree Species ID	DBH (cm)	Approx. Height (m)	Lat	Lon
Sugar Maple	75.5	25	43.661633	-79.915188
Sugar Maple	36	26	43.661634	-79.914952
Burr Oak	60	27	43.661754	-79.91498
Sugar Maple	40	20	43.662034	-79.915004
Sugar Maple	32	19	43.661864	-79.915039
Sugar Maple	26.5	20	43.661743	-79.915234
Sugar Maple	56	25	43.661908	-79.914986
Sugar Maple	29	23	43.661908	-79.914986
Sugar Maple	46	23	43.661787	-79.915273
Sugar Maple	43	21	43.661709	-79.915157
Sugar Maple	36.5	22	43.661709	-79.915157
Red Oak	60	22	43.661746	-79.915168
Sugar Maple	57	22	43.661817	-79.915267
Sugar Maple	28	22	43.661756	-79.915206
Sugar Maple	83	20	43.661793	-79.915423
Red Oak	91.5	24	43.661781	-79.915452
Sugar Maple	84	24	43.661752	-79.915474
Sugar Maple	70	25	43.661582	-79.9156
Sugar Maple	81	18	43.661582	-79.9156
Red Oak	101	26	43.66178	-79.915702
Sugar Maple	65	18	43.661672	-79.915839
Red Oak	72	22	43.661672	-79.915839
Red Oak	49	24	43.661815	-79.915668
Sugar Maple	65	24	43.661815	-79.915668
Sugar Maple	63	26	43.66197	-79.915556
Sugar Maple	36.5	22	43.661896	-79.915335
Sugar Maple	70	24	43.662034	-79.91555
Sugar Maple	35.5	21	43.661879	-79.915411
Sugar Maple	37	23	43.661985	-79.915705
Red Oak	113	26	43.662157	-79.91556
Red Oak	84	26	43.662157	-79.91556
Sugar Maple	54	24	43.661909	-79.915659
Sugar Maple	85	24	43.661853	-79.915754
Sugar Maple	40	24	43.661951	-79.915709
Sugar Maple	43	19	43.661637	-79.915957
Red Oak	72	22	43.662015	-79.915913
Sugar Maple	58	22	43.662015	-79.915913
Sugar Maple	37	23	43.661966	-79.915891
Sugar Maple	45	22	43.661966	-79.915891
Red Oak	70	24	43.661813	-79.916009
Red Oak	60	23	43.661813	-79.916009
Red Oak	44	23	43.661892	-79.916349
Red Oak	55	24	43.661722	-79.916262
Red Oak	53	22	43.661722	-79.916262
Red Oak	56	24	43.661686	-79.916255

BURNSIDE

LEAF ON

Tree Species ID	DBH (cm)	Approx. Height (m)	Lat	Lon
Sugar Maple	75	24	43.661549	-79.916576
Red Oak	73	24	43.661549	-79.916576
Red Oak	97	24	43.661549	-79.916576
Red Oak	64	23	43.661607	-79.916716
Red Oak	47.5	24	43.661607	-79.916716
Red Oak	31	24	43.661558	-79.916657
Red Oak	20.5	18	43.661582	-79.916698
Red Oak	29	18	43.661582	-79.916698
Red Oak	23.5	18	43.661582	-79.916698
Red Oak	44.5	18	43.661582	-79.916698
Red Oak	55	24	43.661626	-79.916769
Red Oak	63	26	43.661735	-79.916829
Red Oak	46	24	43.661735	-79.916829
Sugar Maple	49	24	43.661698	-79.91689
Sugar Maple	70	24	43.661826	-79.916732
Red Oak	85	24	43.661838	-79.916818
Red Oak	59.5	24	43.661676	-79.916644
Red Oak	80	24	43.661607	-79.916937
Red Oak	26.5	18	43.661559	-79.916815
Sugar Maple	26.5	18	43.661595	-79.916964
Sugar Maple	26	18	43.661642	-79.916985
Sugar Maple	42.5	22	43.661575	-79.916618
Red Oak	113.5	26	43.6616	-79.917095
Red Oak	116	24	43.6616	-79.917095
Red Oak	43	24	43.661598	-79.917017
Sugar Maple	35	24	43.661644	-79.916946
Red Oak	88.5	23	43.661753	-79.916901
Red Oak	91.5	24	43.661525	-79.91713
Sugar Maple	30	20	43.661593	-79.9171
Red Oak	38	22	43.66158	-79.91723
Red Oak	90	24	43.661393	-79.917144
Sugar Maple	37	22	43.66214	-79.915056
Red Oak	51.5	22	43.662165	-79.915155
Manitoba Maple	29.5	18	43.662236	-79.91517
Manitoba Maple	29	18	43.662236	-79.91517
Manitoba Maple	48	16	43.662284	-79.914331
Manitoba Maple	39.5	16	43.662294	-79.913296
Manitoba Maple	62	18	43.662508	-79.913531
Manitoba Maple	44.5	15	43.662235	-79.913444
Manitoba Maple	28	10	43.662235	-79.913444
Manitoba Maple	44	15	43.662191	-79.913418
Manitoba Maple	32	10	43.662242	-79.913439
Manitoba Maple	28	13	43.662242	-79.913439
Manitoba Maple	35	14	43.662242	-79.913439
Manitoba Maple	40.5	15	43.662401	-79.913242

LEAF ON

Tree Species ID	DBH (cm)	Approx. Height (m)	Lat	Lon
Manitoba Maple	29	15	43.662401	-79.913242
Manitoba Maple	42	20	43.662799	-79.913029
Sugar Maple	39.5	22	43.662783	-79.912761
Manitoba Maple	30.5	17	43.662715	-79.912701
Sugar Maple	43	19	43.662838	-79.912572
Sugar Maple	61	20	43.662568	-79.913648
Sugar Maple	45.5	20	43.662882	-79.913588
Sugar Maple	56	20	43.662882	-79.913588
Red Oak	83	24	43.662652	-79.914333
Red Oak	63	20	43.662172	-79.915215

BURNSIDE

LEAF OFF

Tree Species ID	DBH (cm)	Approx. Height (m)	Cavity Heights (m)	Lat	Lon
Black Cherry	52	17	10+;5	43.66145906	-79.9177147
Red Oak	42	15	10	43.66153713	-79.91762979
Deciduous (dead)	37	7	2,5,6	43.66153713	-79.91762979
Manitoba Maple	44	5	2-4;2-4	43.66154346	-79.91741748
Red Cedar	34	15	10+	43.66225437	-79.91726032
Red Cedar	27.5	9	8	43.66212169	-79.91754857
Red Pine	60.5	28	9,10	43.66186772	-79.91749593
paper birch	17	12	6,8,10;all	43.66186772	-79.91749593
paper birch	20.5	8	4 to 6	43.6619807	-79.91757925
paper birch	29	12	all	43.66216431	-79.91663486
Sugar Maple	63.5	17	7, 15	43.66223442	-79.91509812
Red Maple	55.5	22	18, all	43.66236388	-79.91483778
Burr Oak	70	25	11	43.6624236	-79.91483937
Red Oak	77.5	22	15+;15+	43.66247138	-79.91455891
Deciduous (dead)	55	20	1 to 20	43.66257712	-79.91428767
Beech	39.5	15	8	43.66273331	-79.91413529
Beech	65	15	8,14	43.66285213	-79.91389951
Beech	35.5	20	14	43.66290141	-79.91359717
Red Oak	72	22	15+,15+	43.66312249	-79.91345275
Red Oak	57.5	18	8,10;12+	43.66308171	-79.91341587
Red Maple	36	22	18	43.66297693	-79.91321412
Sugar Maple	44.5	19	10;10-12	43.66297693	-79.91321412
Sugar Maple	34	15	10	43.66287497	-79.9129288
Manitoba Maple	48.5	20	10,14	43.66298641	-79.91301337
Red OAk	44	16	12	43.66293515	-79.91293349
White Ash	50.5	16	2;5;5	43.66287262	-79.91335661
Manitoba Maple	43	7	3;3;3	43.66287262	-79.91335661
Manitoba Maple	65	12	1,3,6	43.66291453	-79.91241432
Manitoba Maple	30	8	1-3,5	43.66281261	-79.91147982
Manitoba Maple	33	8	1 to 7	43.66281261	-79.91147982
Manitoba Maple	24	11	7	43.66248052	-79.91096852
Manitoba Maple	18	10	7	43.66248052	-79.91096852
Salix c.f. alba	157,62,68,110	18	14; 8	43.66231422	-79.91084824
Salix c.f. alba	109	24	15, 17, 19	43.6624552	-79.9111536
Salix c.f. alba	98,76	22	18; 12, 14; 12, 14	43.66248454	-79.911209
Sugar Maple	24	11	5	43.66263252	-79.91269444
Manitoba Maple	22	9	4;6	43.66269304	-79.91260467
White Ash	23	8	6	43.66280163	-79.91275211
Manitoba Maple	21	7	3,5	43.66215329	-79.91002967
Manitoba Maple	48	12	5	43.66202165	-79.90980478
Manitoba Maple	44	12	5,7	43.66176512	-79.90939365
Manitoba Maple	30	8	5;8	43.66176512	-79.90939365
Manitoba Maple	28	7	5	43.66170523	-79.90955609
Manitoba Maple	27	8	4 to 7	43.66195594	-79.91094003

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LEAF OFF

Tree Species ID	DBH (cm)	Approx. Height (m)	Cavity Heights (m)	Lat	Lon
Manitoba Maple	23	10	7	43.66191444	-79.91064104
Manitoba Maple	85	24	8,10;10,12	43.66209361	-79.91087892
Red Pine	70	22	6,8,8,12	43.66215262	-79.91148351
Manitoba Maple	80	25	14	43.66211867	-79.91172507
Sugar Maple	78	24	6	43.66218996	-79.91211534
Deciduous (dead)	83	18	8-14;12-16	43.66221716	-79.91223444
Deciduous (dead)	70	16	4 to 14	43.66221716	-79.91223444
Sugar Maple	95	24	8;20	43.66229356	-79.91258229
Sugar Maple	48	28	26	43.66231652	-79.91316307
Red Oak	59	20	1,4,8,18	43.66213891	-79.91344345
Manitoba Maple	60	22	10	43.66207337	-79.91343247
Manitoba Maple	23	16	9	43.66207337	-79.91343247
Red Cedar	34	18	1,2	43.66203091	-79.91351897
Red Pine	27	15	2 to 8	43.66192773	-79.91355199
Ironwood	34	24	18	43.6618989	-79.91392264
Manitoba Maple	21.5	17	4,8,10	43.66183125	-79.914143
Red Cedar	56.5	18	1-8;1-6	43.6618683	-79.914129
Sugar Maple	118	26	5	43.66185648	-79.9143041
Sugar Maple	60.5	24	8,10,14;2,8,16	43.66183645	-79.91426555
Deciduous (dead)	48	6	0 to 6	43.66188473	-79.91446286
Sugar Maple	26.5	24	6; 0-6	43.66180393	-79.9145025
Black Cherry	28.5	18	3	43.66173222	-79.91430008
Red Maple	90	22	1,7,16	43.66161777	-79.91450845
Red Oak	47	25	5	43.66164618	-79.91473493
Sugar Maple	32	18	6	43.66163763	-79.91472345
White Ash	32.5	19	3 to 7	43.66166286	-79.91483761
Manitoba Maple	33	8	1 to 7	43.66173826	-79.91495253
White Ash	29	19	1, 4, 6	43.66169241	-79.91498614
Sugar Maple	52.5	18	8	43.66172527	-79.91522678
Sugar Maple	81.5	20	10	43.66172912	-79.91544295
Sugar Maple	88	22	12	43.66181457	-79.91569818
Beech	29.5	16	9	43.66195652	-79.91528696
Red Oak	111.5	23	12-16;12-16	43.66196826	-79.91555745
Red Maple	61	26	8	43.66212827	-79.91553255
Black Cherry	26	5	3	43.66219268	-79.91550506
Eastern Hemlock	32	18	2,8,12,14	43.66219323	-79.91559248
Beech	39	20	2,4,10	43.6620641	-79.91571545
Eastern Hemlock	40	16	13 to 15	43.66210383	-79.91572835
Red Oak	38	22	0 to 4	43.66209436	-79.91575434
Sugar Maple	76	21	0-3,6, 8	43.66209436	-79.91575434
Sugar Maple	80	23	18	43.66162016	-79.91720986
Red Maple	65	6	2 to 6	43.66167782	-79.91719259
Red Oak	39	15	1, 2, 14	43.66185665	-79.91657929
Eastern Hemlock	31	12	3,4	43.66167782	-79.91719259

LEAF OFF

Tree Species ID	DBH (cm)	Approx. Height (m)	Cavity Heights (m)	Lat	Lon
Deciduous (dead)	60	23	5, 18	43.66167782	-79.91719259
Deciduous (dead)	65	12	6, 8, 10	43.66185665	-79.91657929
Sugar Maple	54	16	1,4	43.6623985	-79.91453318
White Ash	28	11	3 to 8	43.66229343	-79.91310138
Beech	57	18	6 to 10	43.66270628	-79.91347496
Beech	63	13	2, 8-12	43.66264124	-79.91401308

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Attachment B

MNRF Bat Correspondence

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Memorandum

Date: June 5, 2017 **Project No.:** 300039946.0000

Project Name: John Street WWPS Class Environmental Assessment

Client Name: Regional Municipality of Halton

To: MNRF – Aurora District

From: Peter DeCarvalho

R.J. Burnside and Associates Limited (Burnside) has been retained by the Regional Municipality of Halton to complete an Environmental Assessment relating to proposed upgrades to the wastewater infrastructure of Halton Hills in Georgetown (Figure 1). Proposed developments include improvements / potential relocation of the pumping station at John Street Park as well as an emergency overflow which will route towards the Credit River Valley. Some of the areas currently being considered for development are treed forest / woodlot communities which have potential to provide Bat Maternity Habitat (BMH) for three of the four Endangered bat species in Ontario regulated under the *Endangered Species Act* (ESA) (2007).

Terrestrial ecologists have completed leaf-off and leaf-on surveys for BMH in forest / woodlot areas within the project study area that have potential to be impacted by the proposed expansions. We are currently seeking guidance from the Ministry of Natural Resources and Forestry (MNRF) regarding our current findings as well as the appropriate next steps given the specifics of this project. The surveys followed leaf-off and leaf-on protocols from the MNRF Guelph District Survey Protocol for Species at Risk within Treed Habitats (Little Brown Myotis, Northern Myotis and Tri-colored Bat) dated April 2017, as outlined below.

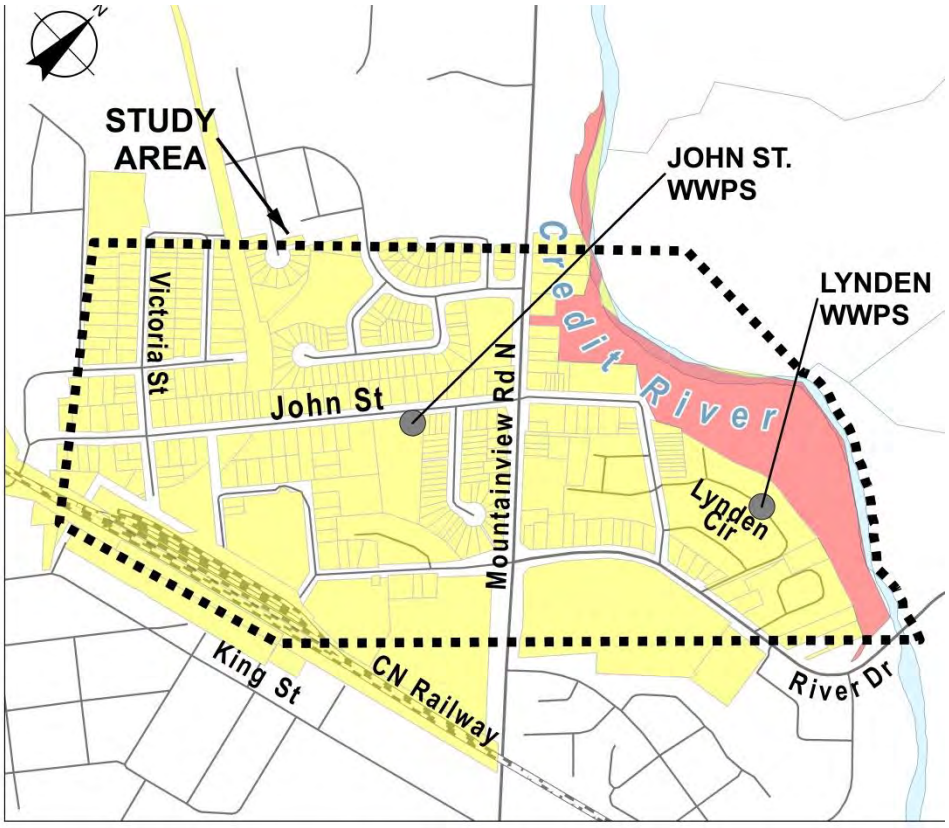

Figure 1: Project Area for John Street Pumping Station, Halton Hills

Methodology

Leaf-off Surveys

Leaf-off surveys of treed habitat for maternity / roosting colonies focus on Little Brown Myotis (*Myotis lucifugus*) and Northern Myotis (*Myotis serpentrionalis*). These species prefer to roost in tree cavities or under loose bark.

The initial step of the MNRF protocol is to conduct a site reconnaissance in treed areas that may be disturbed as a result of the proposed works and identify any candidate BMH. With small areas (under 10 ha), a comprehensive walkthrough of an ecosite is conducted to look for snag trees, as opposed to larger sites where sub-samples and snag density surveys are more appropriate. As each ecosite potentially impacted by these developments were under 10 ha, walkthrough surveys were completed. The three areas surveyed for BMH were the wooded area adjacent to the existing wastewater pumping station at John Street Park, a stormwater management pond / parkette located at the corner of Mountainview Road North and Meadowglen Boulevard, and approximately 800 m of the Credit River riparian corridor ending at River Drive (survey areas #1, 2, and 3, respectively on Figure 2).

According to the protocol, there are 10 criteria for evaluating the suitability of a snag for BMH. These criteria are listed below in order of importance:

1. Tallest snag trees;
2. Snag exhibits cavities or crevices often originating as cracks, scars, knot holes or woodpecker cavities;
3. Snag has the largest diameter breast height (DBH) (>25 cm);
4. Snag is within the highest density of other snags;
5. Snag has the highest amount of loose, peeling bark (naturally occurring / due to decay);
6. Cavity or crevice is high on the tree (>10 m) or is chimney-like with a low entrance;
7. Tree is a species known to be rot-resistant (such as Black Cherry, Black Locust);
8. Tree species typically provides good cavity habitat (e.g. White Pine, Maple, Aspen, Ash, Oak);
9. Snag is located within an area where the canopy is more open; and
10. Snag exhibits early stages of decay (Decay Class 1-3).

These criteria were recorded for each tree identified as candidate BMH. Each tree was recorded with a GPS waypoint and photo records.

Leaf-on Surveys

Tri-colored Bat show strong preference to roosting in the foliage of oak and maple trees, especially those that feature dead or dying clusters of leaves. The leaf-on survey protocol targets these genera specifically. The following trees were documented:

- **Oaks ≥ 10 cm DBH**;
- **Maples ≥ 10 cm DBH IF the tree includes dead or dying leaf clusters**; and
- **Maples ≥ 25 cm DBH**.

No dead-hanging foliage was recorded for any trees at the site that were identified as candidate habitat. As such, they were assessed for habitat suitability purely based on DBH.

Areas that feature oak and maple trees within the potential development areas were identified during the leaf-off phase of the BMH survey protocol. As such, survey efforts focused on the treed riparian corridor of the Credit River valley (survey area #3).

Survey area #1 was not surveyed during the leaf-on period because the mature woodlot that may offer potential as BMH is set back far enough from areas being considered for development that no disturbance to trees is expected. In the event that development does threaten to impact treed ecosites in these areas, additional surveys for BMH will need to be considered.

Survey area #2 was not surveyed during the leaf-on period because the stormwater management pond is too high in elevation when considering alternatives for potentially relocating the John Street pumping station to this location.

Figure 2: John Street EA with Site Surveys for Bat Maternity Habitat Outlined / Hatched in Red

Data

Bat maternity surveys were conducted at Halton Hills on April 28th (leaf-off) and May 25th (leaf on), 2017. The results are presented below in Tables 1 to 4.

Table 1: Leaf-off Survey (John Street Park)

Tree Species ID	DBH (cm)	Height Class (1-4)	Approximate Height (m)	Cavity Type (1-4)	Cavity Heights (m)	Decay Class
Sugar Maple	13.5	1	6	2	1 to 2	3
Sugar Maple	10	1	6	2	0 to 1	3
Manitoba Maple	37	1	10	4	1, 2, 4	2
Manitoba Maple	80	1	12	4; 2	2, 4; 3-4	2

Table 2: Leaf-off Survey (Stormwater Management Parkette)

Tree Species ID	DBH (cm)	Height Class (1-4)	Approximate Height (m)	Cavity Type (1-4)	Cavity Heights (m)	Decay Class
Manitoba Maple	37	1	8	1;3	1;2	2
Red Pine	43	1	20	2	8, 10, 12	4
Red Pine	33.5	1	20	2	9, 12, 15	4
Red Pine	55.5	1	18	2	4, 5	2
White Ash	30	1	15	2;3	14;9	2
Black Cherry	72.5	1	25	2;4	12;15	2
White Ash	68	1	28	1;3	5;12	3
Manitoba Maple	29	2	10	1	1;6	2

Table 3: Leaf-off Survey (Riparian corridor)

Tree Species ID	DBH (cm)	Height Class (1-4)	Approximate Height (m)	Cavity Type (1-4)	Cavity Heights (m)	Decay Class
Black Cherry	52	1	17	1;2	10+;5	2
Red Oak	42	2	15	1	10	5
Deciduous (dead)	37	3	7	1	2,5,6	6
Manitoba Maple	44	4	5	2;3	2-4;2-4	2
Red Cedar	34	1	15	1	10+	3
Red Cedar	27.5	2	9	1	8	2
Red Pine	60.5	1	28	1	9,10	1
paper birch	17	4	12	1;2	6,8,10;all	6
paper birch	20.5	3	8	2	4 to 6	3
paper birch	29	1	12	2	all	1
Sugar Maple	63.5	1	17	1	7, 15	2
Red Maple	55.5	1	22	1;2	18, all	2

Tree Species ID	DBH (cm)	Height Class (1-4)	Approximate Height (m)	Cavity Type (1-4)	Cavity Heights (m)	Decay Class
Burr Oak	70	1	25	1	11	3
Red Oak	77.5	1	22	1;2	15+;15+	2
Deciduous (dead)	55	1	20	1	1 to 20	6
Beech	39.5	3	15	1	8	2
Beech	65	1	15	1	8,14	2
Beech	35.5	1	20	1	14	2
Red Oak	72	1	22	1;2	15+,15+	2
Red Oak	57.5	3	18	1;2	8,10;12+	4
Red Maple	36	2	22	2	18	1
Sugar Maple	44.5	1	19	2;3	10;10-12	2
Sugar Maple	34	2	15	3	10	2
Manitoba Maple	48.5	1	20	2	10,14	3
Red OAk	44	1	16	2	12	3
White Ash	50.5	1	16	1;2;3	2;5;5	2
Manitoba Maple	43	3	7	1;2;3	3;3;3	2
Manitoba Maple	65	1	12	1	1,3,6	1
Manitoba Maple	30	1	8	2	1-3,5	4
Manitoba Maple	33	1	8	2	1 to 7	3
Manitoba Maple	24	1	11	2;3	7	2
Manitoba Maple	18	1	10	2;3	7	2
Salix c.f. alba	157,62,68,110	1	18	2;3	14; 8	2
Salix c.f. alba	109	1	24	3	15, 17, 19	2
Salix c.f. alba	98,76	1	22	1;2;3	18; 12, 14; 12, 14	2
Sugar Maple	24	1	11	1	5	4
Manitoba Maple	22	1	9	1;3	4;6	2
White Ash	23	1	8	1	6	4
Manitoba Maple	21	2	7	3	3,5	2
Manitoba Maple	48	1	12	3	5	2
Manitoba Maple	44	1	12	4	5,7	2
Manitoba Maple	30	3	8	3;4	5;8	2
Manitoba Maple	28	1	7	3	5	2
Manitoba Maple	27	4	8	2	4 to 7	6
Manitoba Maple	23	1	10	3	7	2
Manitoba Maple	85	1	24	2;3	8,10;10,12	2
Red Pine	70	1	22	4	6,8,8,12	1
Manitoba Maple	80	1	25	1	14	1
Sugar Maple	78	1	24	3	6	1
Deciduous (dead)	83	2	18	2;3	8-14;12-16	3
Deciduous (dead)	70	3	16	3	4 to 14	5
Sugar Maple	95	1	24	1;2	8;20	3
Sugar Maple	48	1	28	1	26	1
Red Oak	59	3	20	1	1,4,8,18	5

Tree Species ID	DBH (cm)	Height Class (1-4)	Approximate Height (m)	Cavity Type (1-4)	Cavity Heights (m)	Decay Class
Manitoba Maple	60	1	22	1	10	2
Manitoba Maple	23	3	16	1	9	2
Red Cedar	34	2	18	1	1,2	2
Red Pine	27	1	15	2	2 to 8	4
Ironwood	34	1	24	3	18	2
Manitoba Maple	21.5	1	17	2	4,8,10	4
Red Cedar	56.5	2	18	1;2	1-8;1-6	4
Sugar Maple	118	1	26	1	5	1
Sugar Maple	60.5	1	24	1;2	8,10,14;2,8,16	2
Deciduous (dead)	48	4	6	3	0 to 6	6
Sugar Maple	26.5	1	24	1;3	6; 0-6	2
Black Cherry	28.5	2	18	1	3	1
Red Maple	90	1	22	1	1,7,16	1
Red Oak	47	1	25	1	5	2
Sugar Maple	32	2	18	4	6	1
White Ash	32.5	1	19	1	3 to 7	3
Manitoba Maple	33	4	8	2	1 to 7	4
White Ash	29	2	19	1	1, 4, 6	3
Sugar Maple	52.5	1	18	1	8	2
Sugar Maple	81.5	1	20	1	10	2
Sugar Maple	88	1	22	1	12	1
Beech	29.5	2	16	1	9	1
Red Oak	111.5	1	23	1;3	12-16;12-16	2
Red Maple	61	1	26	1	8	1
Black Cherry	26	4	5	1	3	6
Eastern Hemlock	32	1	18	1	2,8,12,14	1
Beech	39	2	20	1	2,4,10	1
Eastern Hemlock	40	3	16	1	13 to 15	5
Red Oak	38	1	22	1	0 to 4	1
Sugar Maple	76	1	21	1	0-3,6, 8	1
Sugar Maple	80	1	23	4	18	2
Red Maple	65	4	6	1	2 to 6	6
Red Oak	39	2	15	1	1, 2, 14	4
Eastern Hemlock	31	3	12	1	3,4	3
Deciduous (dead)	60	1	23	1	5, 18	
Deciduous (dead)	65	4	12	1	6, 8, 10	6
Sugar Maple	54	1	16	1	1,4	2
White Ash	28	1	11	2	3 to 8	5
Beech	57	1	18	1	6 to 10	2
Beech	63	1	13	1	2, 8-12	3

Table 4: Leaf-on Survey (Riparian corridor)

Tree Species ID	DBH (cm)	Height Class (1-4)	Approximate Height (m)
Red Maple	57	1	16
Red Maple	59	1	16
Sugar Maple	55.5	1	17
Sugar Maple	54.5	1	17
Sugar Maple	62	1	18
Oak Burr	74	1	18
Sugar Maple	33	2	15
Red Oak	79	1	18
Sugar Maple	61.5	1	17
Manitoba Maple	31	1	16
Sugar Maple	85	1	21
Red Oak	74.5	1	18
Burr Oak	20	2	8
? Burr Oak?	22	3	8
Sugar Maple	51	1	23
Sugar Maple	36	1	20
Sugar Maple	31.5	1	20
Sugar Maple	56	1	25
Sugar Maple	56	1	18
Sugar Maple	61.5	1	25
Sugar Maple	37	2	17
Red Oak	67	1	21
Sugar Maple	63.5	1	21
Sugar Maple	40	1	22
Red Oak	100	1	24
Sugar Maple	39	2	21
Sugar Maple	35	2	21
Sugar Maple	36	2	20
Sugar Maple	45.5	1	15
Manitoba Maple	34	2	12
Manitoba Maple	43	2	10
Sugar Maple	37	1	20
Manitoba Maple	53	2	9
Manitoba Maple	34	1	15
Manitoba Maple	51	3	20
Manitoba Maple	41.5	1	6
Manitoba Maple	51	1	22
Burr Oak	46	1	20
Sugar Maple	39.5	1	22
Manitoba Maple	30.5	1	19
Sugar Maple	44	1	18

Buckthorn	79	1	22
Manitoba Maple	43	1	19
Manitoba Maple	27.5	1	17
Manitoba Maple	33	2	17
Sugar Maple	42	2	20
Manitoba Maple	30	1	16
Manitoba Maple	38.5	1	16
Manitoba Maple	31	1	10
Manitoba Maple	37.5	1	18
Manitoba Maple	34.5	1	20
Manitoba Maple	48.5	1	23
Manitoba Maple	33	1	22
Manitoba Maple	29.5	1	22
Manitoba Maple	48	1	23
Manitoba Maple	35.5	1	20
Manitoba Maple	39.5	1	20
Silver Maple	47.5	1	26
Silver Maple	44.5	1	26
Silver Maple	30	1	26
Silver Maple	36	1	26
Silver Maple	38	1	26
Manitoba Maple	30	1	28
Manitoba Maple	43	1	21
Manitoba Maple	28.5	3	16
Manitoba Maple	36	1	8
Manitoba Maple	31.5	1	18
Manitoba Maple	28.5	1	15
Manitoba Maple	36.5	1	22
Sugar Maple	41	1	24
Sugar Maple	45	1	26
Sugar Maple	39	1	26
Manitoba Maple	32	1	24
Sugar Maple	57	1	25
Sugar Maple	85	1	24
Sugar Maple	25.5	1	24
Sugar Maple	37	1	27
Sugar Maple	37	1	26
Sugar Maple	38	1	26
Red Oak	45	1	25
Sugar Maple	30	1	24
Sugar Maple	40.5	1	24
Sugar Maple	36	1	26
Red Oak	34.5	1	24
Red Oak	41.5	1	24
Red Oak	27.5	1	20

Sugar Maple	35.5	1	15
Sugar Maple	78	1	25
Sugar Maple	33	1	26
Sugar Maple	81	1	28
Red Oak	31	1	27
Red Oak	41	1	26
Sugar Maple	43	1	24
Red Oak	53.5	1	24
Red Oak	24	1	24
Red Oak	27.5	1	25
Red Oak	29	1	24
Red Oak	17	1	20
Red Oak	35.5	1	18
Sugar Maple	25	1	16
Sugar Maple	32.5	1	19
Sugar Maple	66.5	1	26
Sugar Maple	58	1	26
Sugar Maple	37	1	21
Sugar Maple	94	1	27
Sugar Maple	67	1	24
Sugar Maple	86	1	28
Sugar Maple	96	1	27
Sugar Maple	39.5	1	26
Sugar Maple	85	1	29
Sugar Maple	19	1	22
Sugar Maple	37.5	1	20
Red Oak	92.5	1	32
Sugar Maple	25.5	1	22
Sugar Maple	36	1	21
Red Oak	63	1	22
Sugar Maple	27.5	1	16
Sugar Maple	76	1	26
Red Oak	38	1	22
Red Oak	44	1	23
Red Oak	45	1	21
Red Oak	58.5	1	26
Red Oak	32.5	1	24
Red Oak	33	1	23
Sugar Maple	59	1	25
Sugar Maple	66	1	26
Sugar Maple	38	1	23
Sugar Maple	39	1	21
Sugar Maple	34	1	18
Sugar Maple	28	1	19
Sugar Maple	62	1	23

Red Oak	48	1	23
Sugar Maple	66	1	22
Red Oak	47	1	18
Sugar Maple	66	1	23
Sugar Maple	38	1	21
Sugar Maple	39.5	1	22
Sugar Maple	57	1	25
Sugar Maple	47.5	1	22
Sugar Maple	54	1	23
Red Oak	22.5	1	18
Sugar Maple	35.5	1	24
Sugar Maple	50	1	23
Sugar Maple	101	1	26
Sugar Maple	46	1	24
Red Oak	45.5	1	22
Sugar Maple	51	1	27
Sugar Maple	38	1	26
Sugar Maple	32	1	25
Sugar Maple	31	1	22
Sugar Maple	27	1	21
Sugar Maple	33	1	20
Sugar Maple	27	1	22
Sugar Maple	28	1	19
Sugar Maple	50	1	24
Sugar Maple	65	1	22
Sugar Maple	95	1	26
Red Oak	68	2	18
Red Oak	31.5	1	20
Sugar Maple	41	1	22
Sugar Maple	39	1	24
Sugar Maple	75.5	1	25
Sugar Maple	36	1	26
Burr Oak	60	1	27
Sugar Maple	40	1	20
Sugar Maple	32	1	19
Sugar Maple	26.5	1	20
Sugar Maple	56	1	25
Sugar Maple	29	1	23
Sugar Maple	46	1	23
Sugar Maple	43	1	21
Sugar Maple	36.5	1	22
Red Oak	60	1	22
Sugar Maple	57	1	22
Sugar Maple	28	1	22
Sugar Maple	83	1	20

Red Oak	91.5	1	24
Sugar Maple	84	1	24
Sugar Maple	70	1	25
Sugar Maple	81	1	18
Red Oak	101	1	26
Sugar Maple	65	1	18
Red Oak	72	1	22
Red Oak	49	1	24
Sugar Maple	65	1	24
Sugar Maple	63	1	26
Sugar Maple	36.5	1	22
Sugar Maple	70	1	24
Sugar Maple	35.5	1	21
Sugar Maple	37	1	23
Red Oak	113	1	26
Red Oak	84	1	26
Sugar Maple	54	1	24
Sugar Maple	85	1	24
Sugar Maple	40	1	24
Sugar Maple	43	1	19
Red Oak	72	1	22
Sugar Maple	58	1	22
Sugar Maple	37	1	23
Sugar Maple	45	1	22
Red Oak	70	1	24
Red Oak	60	1	23
Sugar Maple		1	
Red Oak	44	1	23
Red Oak	55	1	24
Red Oak	53	1	22
Red Oak	56	1	24
Sugar Maple	75	1	24
Red Oak	97	1	24
Red Oak	64	1	23
Red Oak	47.5	1	24
Red Oak	31	1	24
Red Oak	20.5	1	18
Red Oak	29	1	18
Red Oak	23.5	1	18
Red Oak	44.5	1	18
Red Oak	55	1	24
Red Oak	63	1	26
Red Oak	46	1	24
Sugar Maple	49	1	24
Sugar Maple	70	1	24

Red Oak	85	1	24
Red Oak	59.5	1	24
Red Oak	80	1	24
Red Oak	26.5	1	18
Sugar Maple	26.5	1	18
Sugar Maple	26	1	18
Sugar Maple	42.5	1	22
Red Oak	113.5	1	26
Red Oak	116	1	24
Red Oak	43	1	24
Sugar Maple	35	1	24
Red Oak	88.5	1	23
Red Oak	91.5	1	24
Sugar Maple	30	1	20
Red Oak	38	1	22
Red Oak	90	1	24
Sugar Maple	37	1	22
Red Oak	51.5	1	22
Manitoba Maple	29.5	1	18
Manitoba Maple	29	1	18
Manitoba Maple	48	1	16
Manitoba Maple	39.5	1	16
Manitoba Maple	62	1	18
Manitoba Maple	44.5	1	15
Manitoba Maple	28	1	10
Manitoba Maple	44	1	15
Manitoba Maple	32	1	10
Manitoba Maple	28	1	13
Manitoba Maple	35	1	14
Manitoba Maple	40.5	1	15
Manitoba Maple	29	1	15
Manitoba Maple	42	1	20
Sugar Maple	39.5	1	22
Manitoba Maple	30.5	1	17
Sugar Maple	43	1	19
Sugar Maple	61	1	20
Sugar Maple	45.5	1	20
Sugar Maple	56	1	20
Red Oak	83	1	24
Red Oak	63	1	20

[1] Height Class: **1** = Dominant (above canopy); **2** = Co-dominant (canopy height); **3** = Intermediate (just below canopy); **4** = Suppressed (well below canopy)
[2] Indicate all Cavity Types (habitat feature) present – **1** = Cavity; **2** = Loose Bark; **3** = Cracks; **4** = Knot Holes.
[3] Decay Class: **1** = Healthy, live tree; **2** = Declining live tree, part of canopy lost; **3** = Very recently dead, no canopy, bark intact, branches intact; **4** = Recently dead, bark peeling, only large braches intact; **5** = Older dead tree, 90 % of bark lost, few branch stubs, broken top; **6** = Very old dead tree, advanced decay, no branches, parts of the stem has rotted away.

Analysis

The highest quality candidate BMH was identified in the treed riparian corridor of the Credit River (survey area #3). The leaf-off surveys revealed 94 snag trees with characteristics that indicate potential for BMH. No instances of dead-hanging leaves were observed during the leaf-on survey, but an inventory of 263 assorted oaks greater than 10 DBH and maples greater than 25 DBH were recorded within the corridor.

Within survey area #3, most of the mature, high DBH trees were identified along the perimeter of the survey area, bordering residential yards to the south. Closer to the river, there are more disturbed areas, manicured lawns, and smaller trees. It is our opinion that the swath of mature trees on the southern edge of the treed riparian corridor exhibits characteristics indicative of BMH.

Conclusion

We are seeking direction from the MNRF for the appropriate next steps to take given our findings from the leaf-off and leaf-on surveys. The number of large trees within survey area #3 strongly suggests that there is potential for BMH within the treed riparian corridor of the Credit River. Depending on the final location of the emergency wastewater outfalls within survey area #3, trees will be removed to accommodate these outfalls. Given the unlikelihood of disturbance to high DBH, mature trees in survey areas #1 and #2, the potential for BMH at these sites is not considered relevant moving forward.

Mitigation measures that could potentially be used to limit impacts to candidate BMH include: avoiding harm or removal of trees by modifying proposed development envelopes, adhering to tree clearing timing windows outside of the bat active season (i.e., fall/winter), retaining candidate trees, where possible, and compensation for habitat removal through the installation of tree plantings and/or bat boxes.

PD:sr

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Memorandum

Date: June 13, 2017 **Project No.:** 300039946.0000

Project Name: John Street WWPS Class Environmental Assessment

Client Name: Regional Municipality of Halton

To: MNRF – Aurora District

From: Peter DeCarvalho

R.J. Burnside and Associates Limited (Burnside) has been retained by the Regional Municipality of Halton to complete an Environmental Assessment relating to proposed improvements to the existing John Street wastewater pumping station (WWPS) and associated emergency outflow as per Municipal and Regional standards. This emergency overflow will route towards the Credit River Valley. Some of the areas associated with proposed works are treed forest / woodlot communities which have potential to provide Bat Maternity Habitat (BMH) for the three of the four Endangered bat species in Ontario regulated under the *Endangered Species Act*, 2007 (Little Brown Myotis, Northern Myotis and Tri-colored Bat).

Burnside submitted a memo to MNRF on June 6, 2017 detailing the results of the leaf-off and leaf-on surveys for Little Brown Myotis, Northern Myotis and Tri-colored Bat based on the MNRF Guelph District Survey Protocol for Species at Risk within Treed Habitats: Little Brown Myotis, Northern Myotis and Tri-colored Bat (April 2017). The data have been assessed based on MNRF recommendation to conduct acoustic surveys within the project area. We have determined the location for 5 acoustic monitoring stations within the riparian property adjacent to the Credit River. Proposed acoustic station placement for BMH can be seen on Figure 1, with justification to follow.

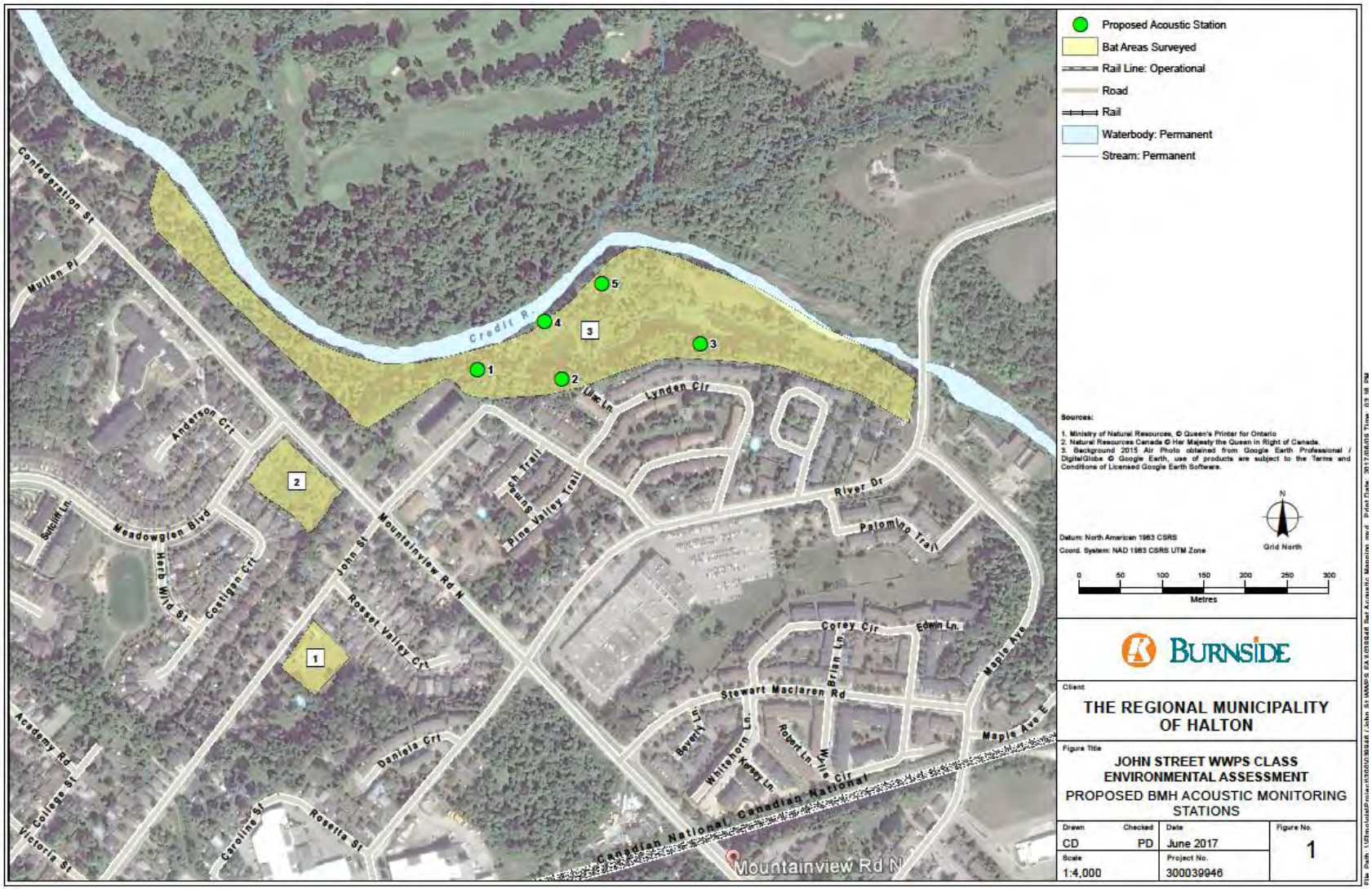

Figure 1: BMH Survey Areas and Proposed Acoustic Stations

Data

The BMH trees identified during field surveys were assessed for potential quality as habitat. Proposed acoustic station trees were determined based on tree quality (height, DBH, species, position relative to other candidate trees) and can be seen below in Table 1 and spatially on Figure 1.

Table 1: Leaf-off Survey (John Street Park)

Tree #	Tree Species ID	DBH (cm)	Height Class[1] (1-4)	Approx. Height (m)	Cavity Tree	Latitude	Longitude
1	Red Oak	111.5	1	23	Yes	43.66197	-79.915557
2	Sugar Maple	118	1	26	Yes	43.66186	-79.914304
3	Deciduous (Dead)	83	1	18	Yes	43.66222	-79.912234
4	Red Oak	77.5	1	22	Yes	43.66247	-79.914559
5	Red Oak	100	1	24	No	43.66288	-79.913693

[1] Height Class: **1** = Dominant (above canopy); **2** = Co-dominant (canopy height); **3** = Intermediate (just below canopy); **4** = Suppressed (well below canopy)

Analysis

It has been noted that much of the riparian property is disturbed with walking trails, a privately-maintained gravel road, stormwater management ponds, human fixtures (trailers, patio stone areas, sitting areas) and extensive manicured lawns with no canopy cover. We are currently proposing 5 acoustic monitoring stations to be placed in the river valley property focusing on areas likeliest to be impacted by proposed works. It is our objective with the placement of these acoustic stations to maximize our coverage to the natural areas and the highest abundance of surrounding potential BMH trees, while still capturing candidate areas in disturbed sections of the property.

There is additional potential for development at a Stormwater Management Pond (SWMP) that is not forested, but does contain two Manitoba Maple (*Acer negundo*) that were measured at 37 DBH and 80 DBH, respectively, and approximately 10 m and 12 m in respective height. These trees contain cavities, but they are at or below 4 m. This SWMP corresponds to the

southwestern BMH survey area. It was determined that since this is an open, partially-manicured area with isolated trees, these individual maples would not be considered potential BMH. Any other regional or municipal restrictions or policies regarding tree removal, as well as the *Migratory Birds Convention Act* (1994) will still be considered in the event that development impacts these trees

Conclusion

It is our opinion that the proposed acoustic monitoring stations represent a balance between high-quality habitat and spatial coverage to assess presence / absence of Ontario's Endangered bat species for the John Street WWPS improvements project.

If any of the Endangered bat species are recorded during acoustic surveys, the forested ecosites with confirmed presence will be treated as habitat for Endangered species, protected under the ESA. Consultation with the MNRF will be necessary to determine how best to proceed with this project.

PD:sr

039946_John Street WWPS Bat Memo_Acoustic
6/13/2017 10:22 AM

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Attachment C

Acoustic Monitoring Report

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Memo

Project No. 1956

To: **Peter DeCarvalho, R.J. Burnside & Associates**

From: **Heather Fotherby**

Date: **September 5, 2017**

Re: **John Street Waste Water Pumping Station Environmental Assessment**
203 Mountainview Road North, Georgetown, ON, L7G 4T8
Bat Acoustic Monitoring Results

Natural Resource Solutions Inc. (NRSI) was retained by R.J. Burnside & Associates in June 2017 to complete acoustic monitoring for bat Species at Risk (SAR) as part of the John Street Waste Water Pumping Station (WWPS) Environmental Assessment (EA). Based on previously completed field investigations, it was determined through discussions with Ministry of Natural Resources and Forestry (MNRF) staff that acoustic monitoring would be necessary to address potential impacts to SAR bats and associated habitats as a result of the proposed improvements to the existing John St. WWPS.

This memo provides a summary of the results of the acoustic monitoring completed to assess the potential presence of bat SAR and their use of available habitats within the study area.

Methods

Acoustic monitoring for bats was completed within the study area following guidance as outlined within the MNRF Survey Protocol for Species at Risk (SAR) Bats within Treed Habitats: Little Brown Myotis, Northern Myotis & Tri-Coloured Bats (MNRF 2017).

Acoustic Monitoring Station Locations

Five acoustic monitoring stations were selected by R.J. Burnside & Associates staff to assess the presence of SAR bats within the study area (Map 1). Details regarding the selection of the monitoring stations is outlined in a memorandum provided to the Regional Municipality of Halton on June 13, 2017 (DeCarvalho 2017).

Acoustic Monitoring Frequency and Timing

Passive acoustic monitoring was conducted between June 20 and July 5, 2017 for a total of 15 nights at all monitoring stations. Acoustic detectors were set to record bat passes for a total of five hours each night during the monitoring period, commencing at sunset.

Acoustic Data Analysis

The acoustic recorders employ direct digital recording technology and are designed to collect records from the full spectrum of bat calls (15-120kHz) for the entire duration of the monitoring period. This allows for a full analysis of activity in the vicinity of each acoustic monitoring station. Identification of call sequences to species level are typically possible with a quality ultrasound microphone (as used in this study) when recordings of bat echolocation calls are made in the open, the bat approaches close to the microphone, the bat produces echolocation calls typical for that species, and there are few things interfering with the passage of ultrasound from the bat to the microphone (wind, proximity to the ground, type and abundance of vegetation, etc.). However, this perfect scenario rarely exists. All of the above factors can influence the ability to identify a call sequence to the species level. In addition to these conditional factors, many of the sounds produced by a particular species of bat are also produced by other species, i.e. they have overlapping ranges of call characteristics. The degree of overlap in call characteristics varies by species. These factors must all be taken into consideration when acoustic bat monitoring is undertaken. Table 1 provides a summary of the classifications to species or group of bat species that are used by NRSI biologists.

Bat echolocation calls recorded between June 20 and July 1, 2017 during passive acoustic surveys were visualized with the software program SonoBat for the US North Northeast and Ontario Region v3.1 and identified to species with the SonoBat auto-classifier. Settings for the auto-classification were the default and included the following:

- Maximum number of calls to consider per file: 8 (8 best calls in the sequence);
- Acceptable call quality: 0.80;
- Decision threshold: 0.90; and
- Acceptable quality to tally passes: 0.20.

Upon review of the auto-classification results, all call sequences classified by the software with the following features were manually vetted by NRSI biologists to bat species or species grouping:

- No consensus decision was made regarding identification to bat species or species grouping;
- Species identification was based on 4 or fewer call pulses; and
- Call pulse characteristics within the sequence overlapped with more than 1 bat species.

Table 1. Call Classifications for Ontario Bat Species

Species Groupings			Species	Typical Characteristic Frequency (kHz)	Call Sequence Classification			
20 kHz			**Hoary Bat** (*Lasiurus cinereus*)	20 (~to 30)	Low Frequency			Hoary Bat
30 kHz			**Big Brown Bat** (*Eptesicus fuscus*)	~30		30 kHz		Big Brown Bat
			Silver-haired Bat (*Lasionycteris noctivagans*)	~30				Silver-haired Bat
40 kHz	Species at Risk		**Eastern Red Bat** (*Lasiurus borealis*)	~40	High Frequency	40 kHz		Eastern Red Bat
			Tricoloured Bat (*Perimyotis subflavus*)	~40				Tri-coloured Bat
		Myotis	**Eastern Small-footed Bat** (*Myotis leibii*)	~40			Myotis sp.	Eastern small-footed bat
			Little Brown Myotis (*Myotis lucifugus*)	~40				Little Brown Myotis
			Northern Myotis (*Myotis septentrionalis*)	~40				Northern Myotis

Results

A total of six bat species were documented during passive acoustic monitoring conducted within the study area in June 2017 including two Endangered species, Little Brown Myotis (*Myotis lucifugus*) and Eastern Small-footed Myotis (*Myotis leibii*). A summary of the classification of bat pass sequences collected during the monitoring period is provided below in Figure 1.

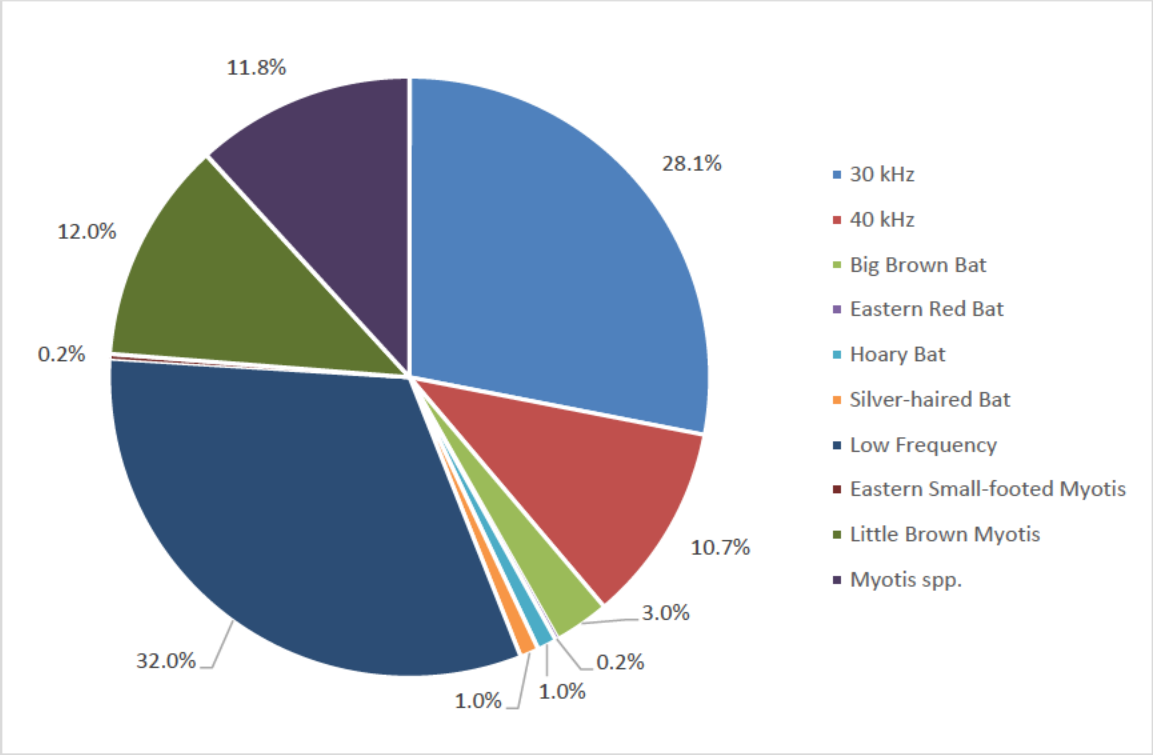

Figure 1. Bat Species Classification (All Stations)

The majority of recorded bat call sequences were classified to the Low Frequency (32%) and 30 kHz (28.1%) species groupings. Several recorded call sequences were classified to the species level as Little Brown Myotis (12%), and to the species groupings, Myotis species (11.8%), and 40 kHz (10.7%). A small proportion of calls were classified to the species level as Eastern Small-footed Myotis (0.2%), Silver-haired Bat (1%), Hoary Bat (1%), and Eastern Red Bat (0.2%). While SAR bats are included in the 40 kHz species grouping, this species grouping also includes non-SAR bats and should not be considered probable evidence of the presence of SAR.

In total, 5,913 bat pass sequences were recorded between June 20 and July 1, 2017. Acoustic monitoring stations BAT-001 and BAT-003 had the highest total number of sequences recorded with 1269 and 1669 recorded at each station, respectively. Monitoring stations BAT-002 and BAT-004 had fewer recorded calls, while station BAT-005 had the lowest number of recorded bat passes. Figure 2 provides a summary of bat species and relative species abundances documented at each station.

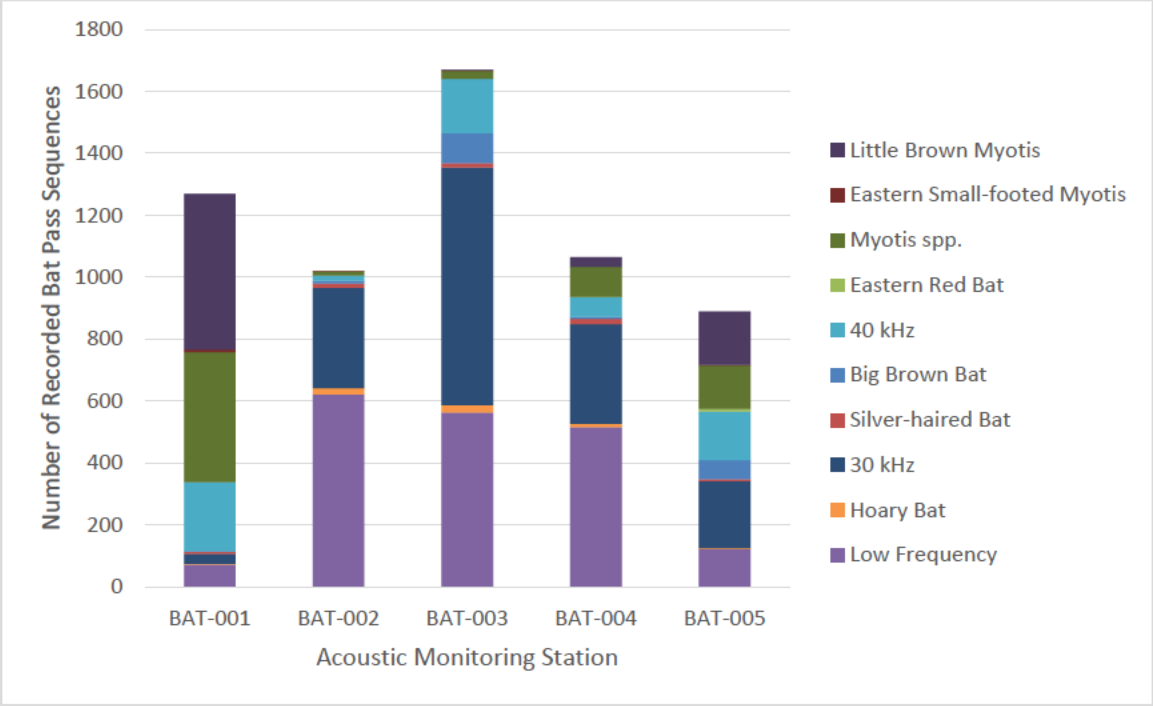

Figure 2. Bat Species and Relative Abundance per Station

Slight differences in species detected and the number of call sequences recorded was noted among all five monitoring stations as illustrated in Figure 2. The following sections provides a more detailed description of the results for each monitoring station.

Acoustic Monitoring Station BAT-001

A total of five bat species were confirmed as present through passive acoustic monitoring at station BAT-001, including Little Brown Myotis and Eastern Small-footed Myotis. Relatively high numbers of Little Brown Myotis bat pass sequences were recorded each night throughout the monitoring period at this station with the exception of the first night of monitoring where no sequences were classified to this species. On average, 45 bat pass sequences were classified to Little Brown Myotis on each monitoring night with a maximum number of 221 sequences recorded on the evening of June 28, 2017. Small numbers of Eastern Small-footed Myotis bat pass sequences were recorded on 55% of the monitoring nights. Bat pass sequences classified to the species grouping, Myotis species, were recorded on each night throughout the monitoring period with an average of 38 recorded sequences per monitoring night. The majority of bat pass sequences classified to Little Brown Myotis, and the species grouping, Myotis species, were recorded between 23:00 and 01:00 hrs. Figures 3 and 4 provide a summary of the bat species detected at acoustic monitoring station BAT-001 by monitoring night and hour, respectively.

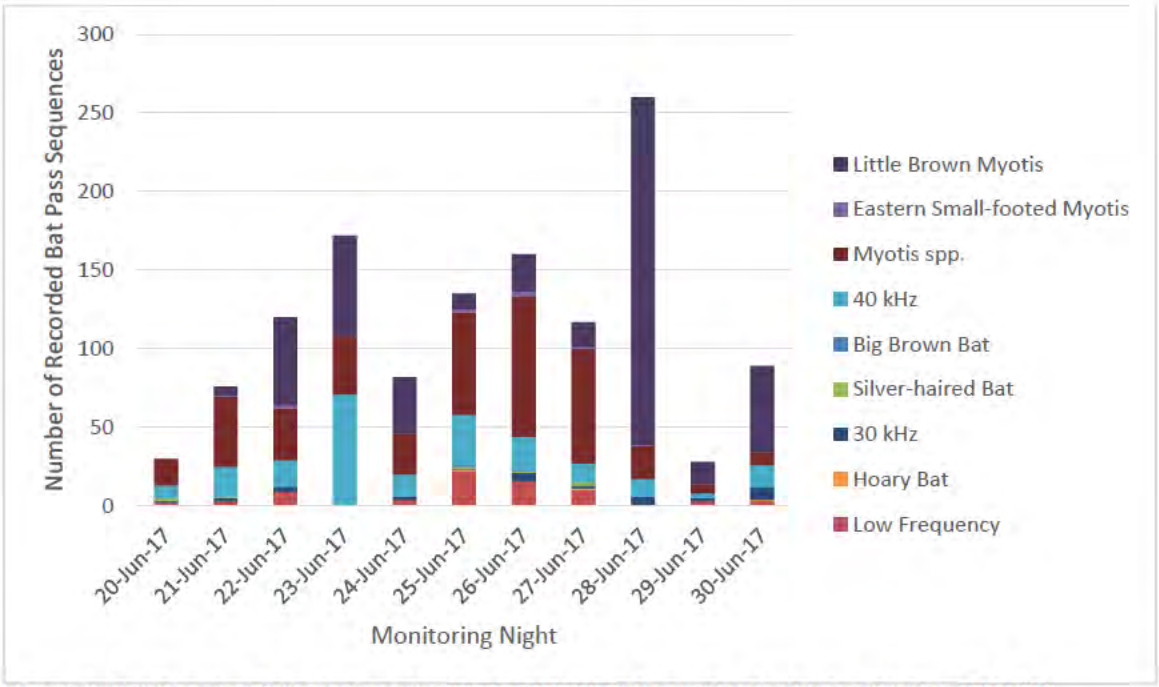

Figure 3. Bat Species Detected per Monitoring Night at Acoustic Monitoring Station BAT-001

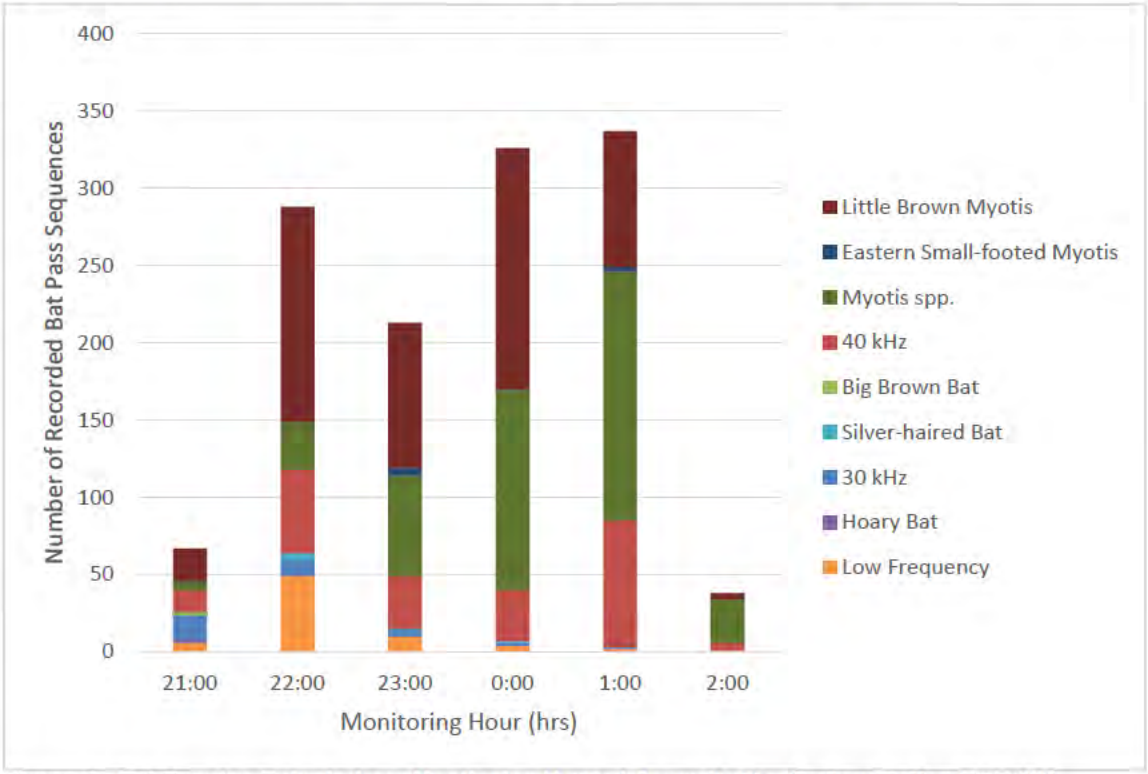

Figure 4. Bat Species Detected per Monitoring Hour at Acoustic Monitoring Station BAT-001

Acoustic Monitoring Station BAT-002

A total of four bat species were confirmed as present through passive acoustic monitoring at station BAT-002, including Eastern Small-footed Myotis. Only one bat pass sequence was classified to Eastern Small-footed Myotis at this station on the evening of June 21, 2017. Small numbers of bat pass sequences were classified to the species grouping, Myotis species. Calls classified to Myotis species were detected on 82% of the monitoring nights throughout the monitoring period. All bat pass sequences classified to Eastern Small-footed Myotis and Myotis species were recorded between 22:00 and 01:00 hrs. Figures 5 and 6 provide a summary of the bat species detected at acoustic monitoring station BAT-002 by monitoring night and hour, respectively.

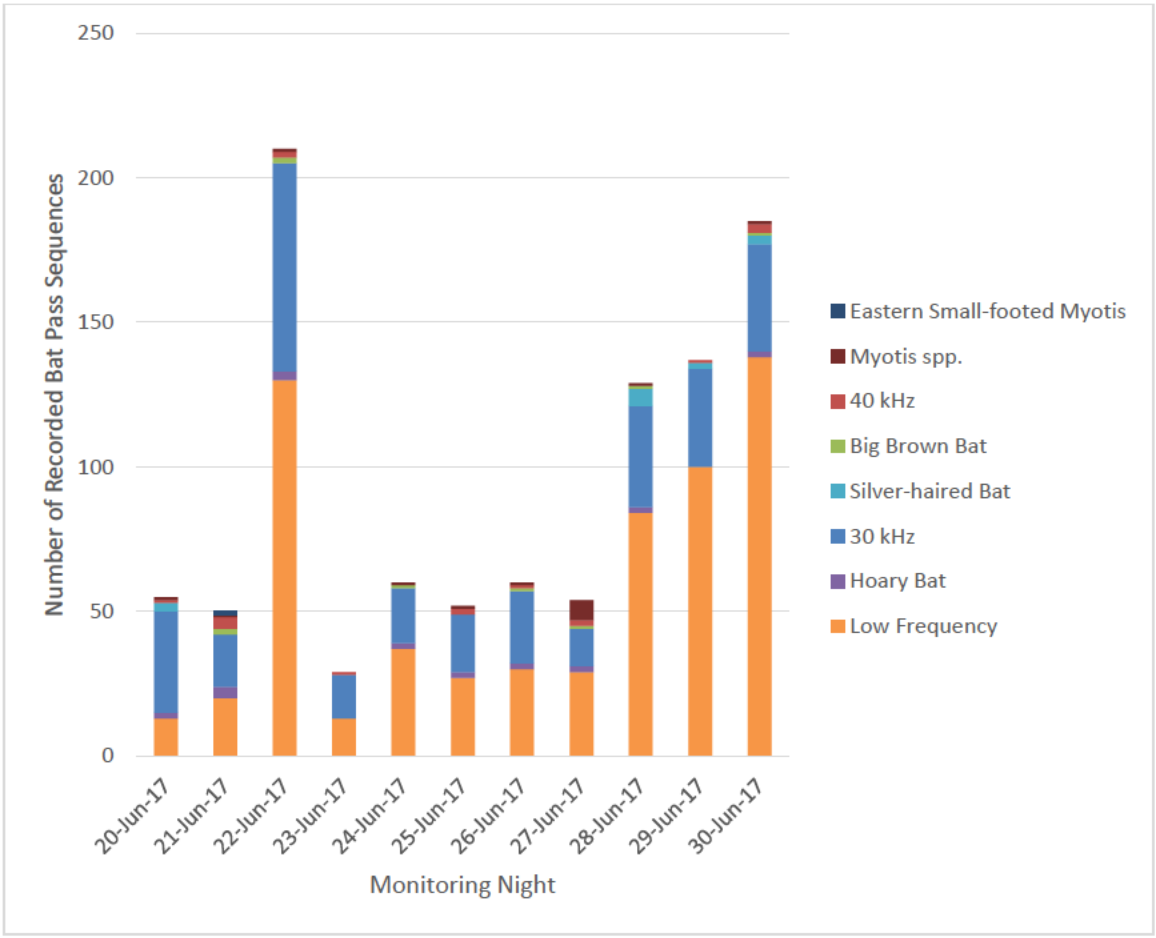

Figure 5. Bat Species Detected per Monitoring Night at Acoustic Monitoring Station BAT-002

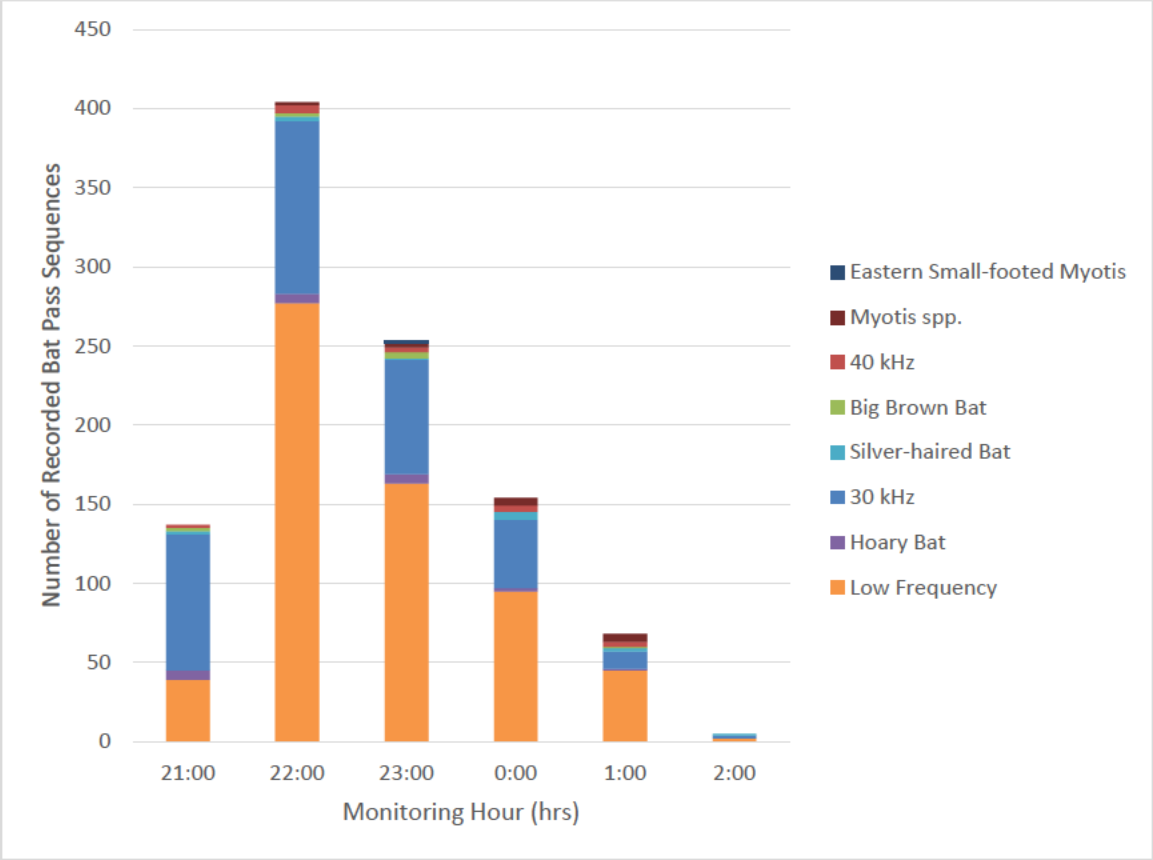

Figure 6. Bat Species Detected per Monitoring Hour at Acoustic Monitoring Station BAT-002

Acoustic Monitoring Station BAT-003

A total of five bat species were confirmed as present through passive acoustic monitoring at station BAT-003, including Little Brown Myotis and Eastern Small-footed Myotis. Small numbers of bat pass sequences were classified to Little Brown Myotis and Eastern Small-footed Myotis on two evenings within the monitoring period. Slightly higher numbers of sequences were classified to Myotis species and detected on 72% of the evenings within the monitoring period. Sequences classified to the 40 kHz species grouping were recorded on all but one night within the monitoring period. The majority of bat pass sequences classified to Little Brown Myotis, Myotis species, and 40 kHz were recorded between 22:00 and 01:00 hrs. The single sequence classified as Eastern Small-footed Myotis was recorded at 21:30 hrs. Figures 7 and 8 provide a summary of the bat species detected at acoustic monitoring station BAT-003 by monitoring night and hour, respectively.

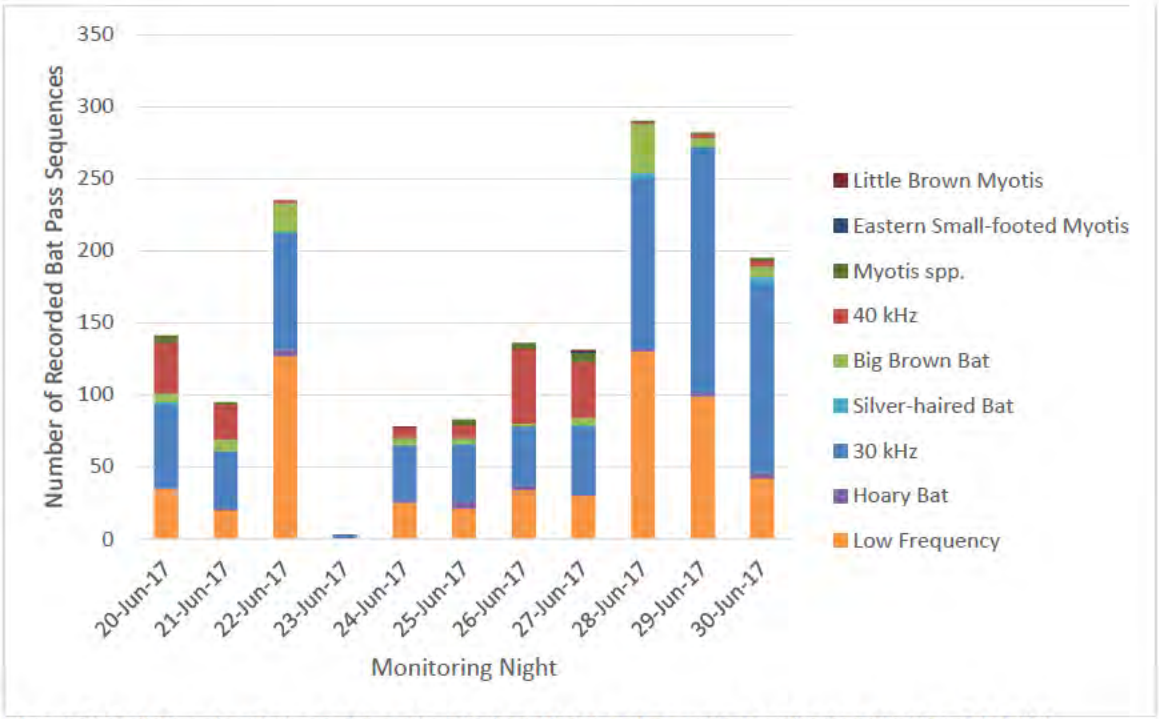

Figure 7. Bat Species Detected per Monitoring Night at Acoustic Monitoring Station BAT-003

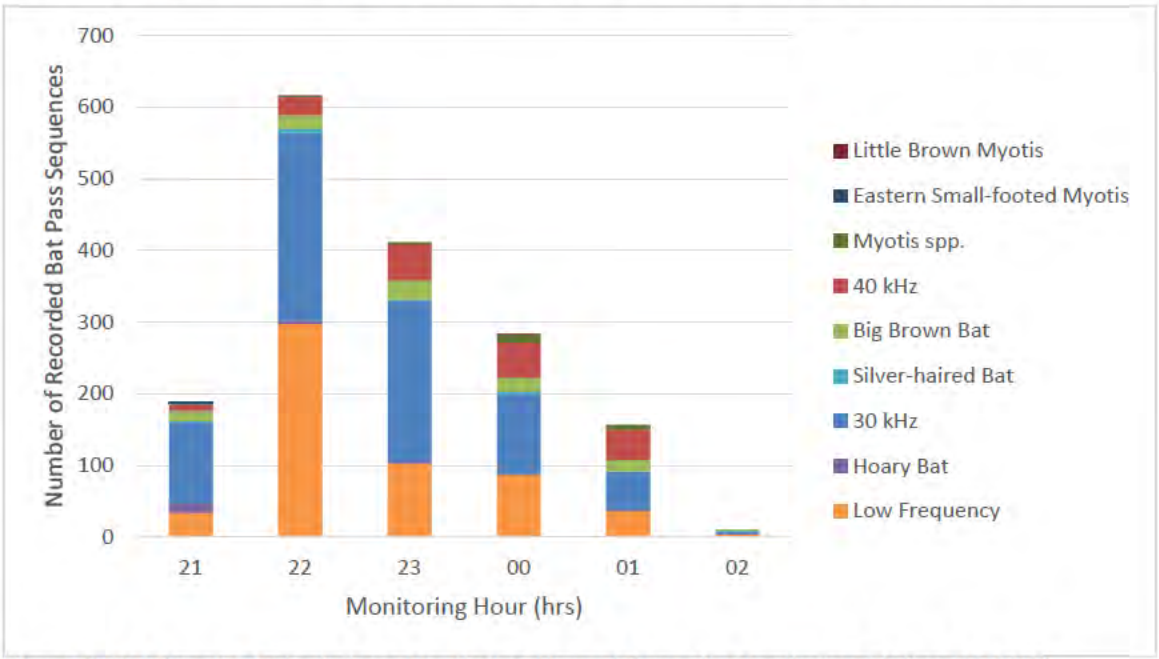

Figure 8. Bat Species Detected per Monitoring Hour at Acoustic Monitoring Station BAT-003

Acoustic Monitoring Station BAT-004

A total of five bat species were confirmed as present through passive acoustic monitoring at station BAT-004, including Little Brown Myotis. Small numbers of bat pass sequences were classified to Little Brown Myotis at this station and were detected on all but two evenings within the monitoring period. Slightly higher numbers of bat pass sequences were classified to the species grouping, Myotis species, of which were also detected on all but two evenings within the monitoring period. Bat pass sequences were also classified to the 40 kHz species grouping at this station and were detected on all but one monitoring night. One bat pass sequence was classified to the species level as Eastern Red Bat on the evening of June 30, 2017. The majority of bat pass sequences classified to Little Brown Myotis, Myotis species, and 40 kHz were recorded between 22:00 and 01:00 hrs. Figures 9 and 10 provide a summary of the bat species detected at acoustic monitoring station BAT-004 by monitoring night and hour, respectively.

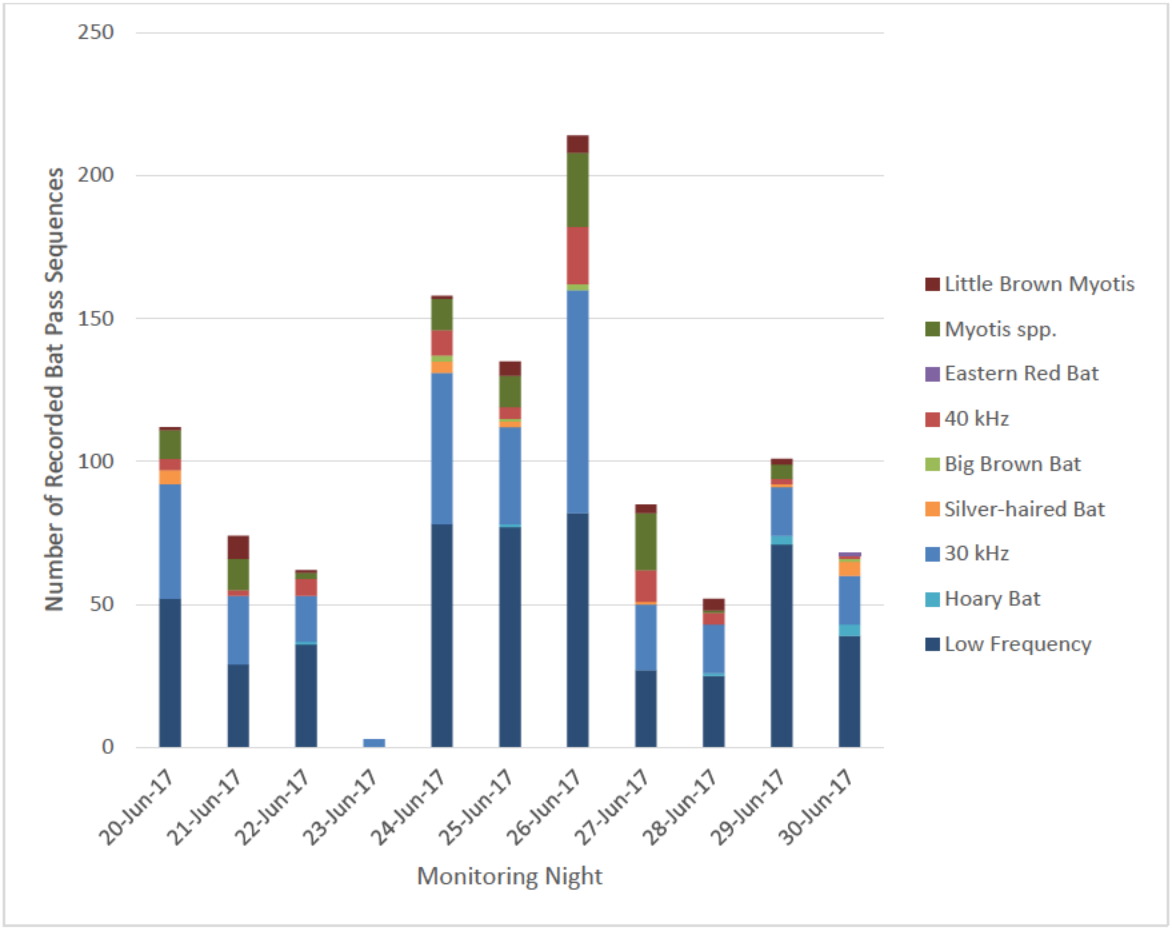

Figure 9. Bat Species Detected per Monitoring Night at Acoustic Monitoring Station BAT-004

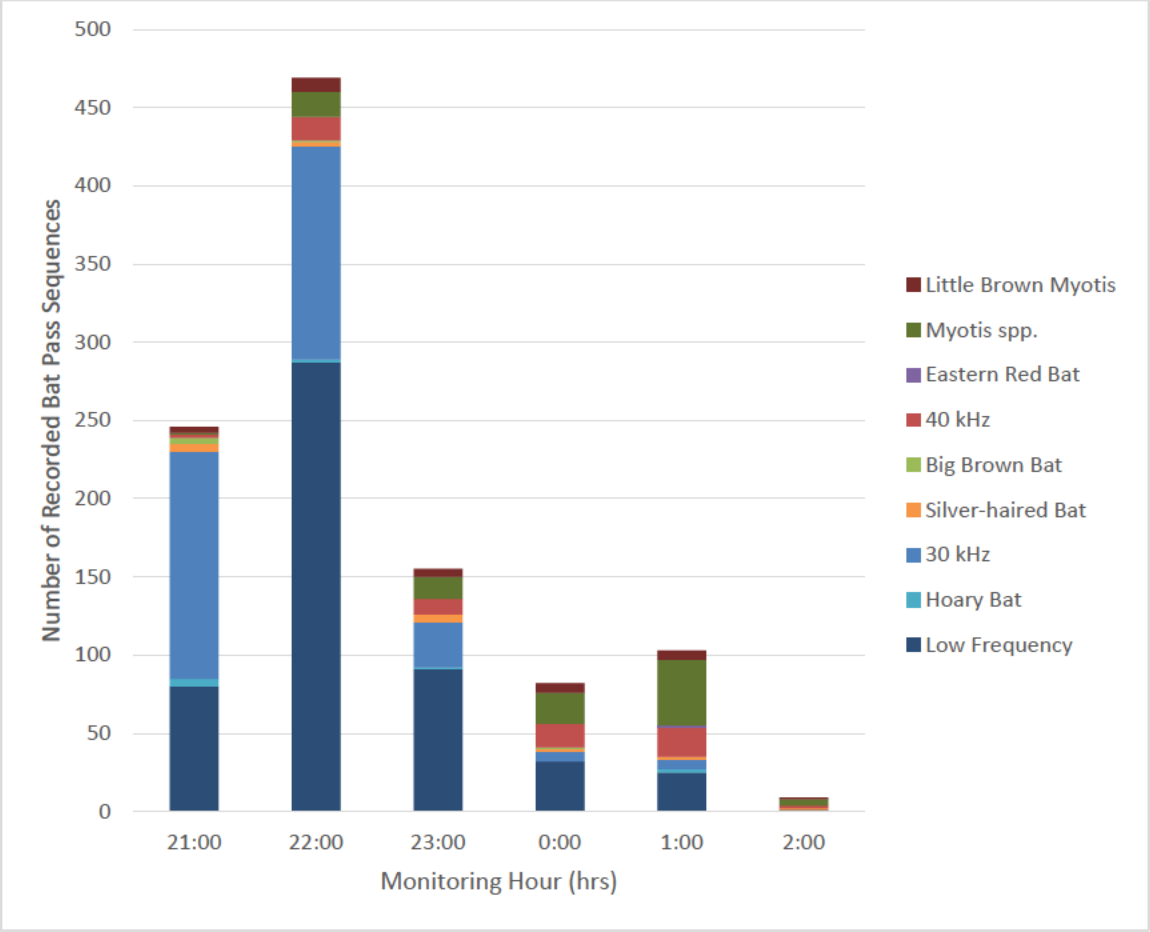

Figure 10. Bat Species Detected per Monitoring Hour at Acoustic Monitoring Station BAT-004

Acoustic Monitoring Station BAT-005

A total of six bat species were confirmed as present through passive acoustic monitoring at station BAT-005, including Little Brown Myotis and Eastern Small-footed Myotis. Only two bat pass sequences were classified to Eastern Small-footed Myotis on one evening within the monitoring period. Bat call sequences classified to Little Brown Myotis and the species groupings, Myotis species and 40 kHz, were recorded on all nights throughout the monitoring period. Small numbers of Eastern Red Bat were recorded on the last 3 evenings in June. The majority of bat pass sequences classified to Little Brown Myotis, Myotis species, and 40 kHz were recorded between 22:00 and 01:00 hrs. Figures 11 and 12 provide a summary of the bat species detected at acoustic monitoring station BAT-004 by monitoring night and hour, respectively.

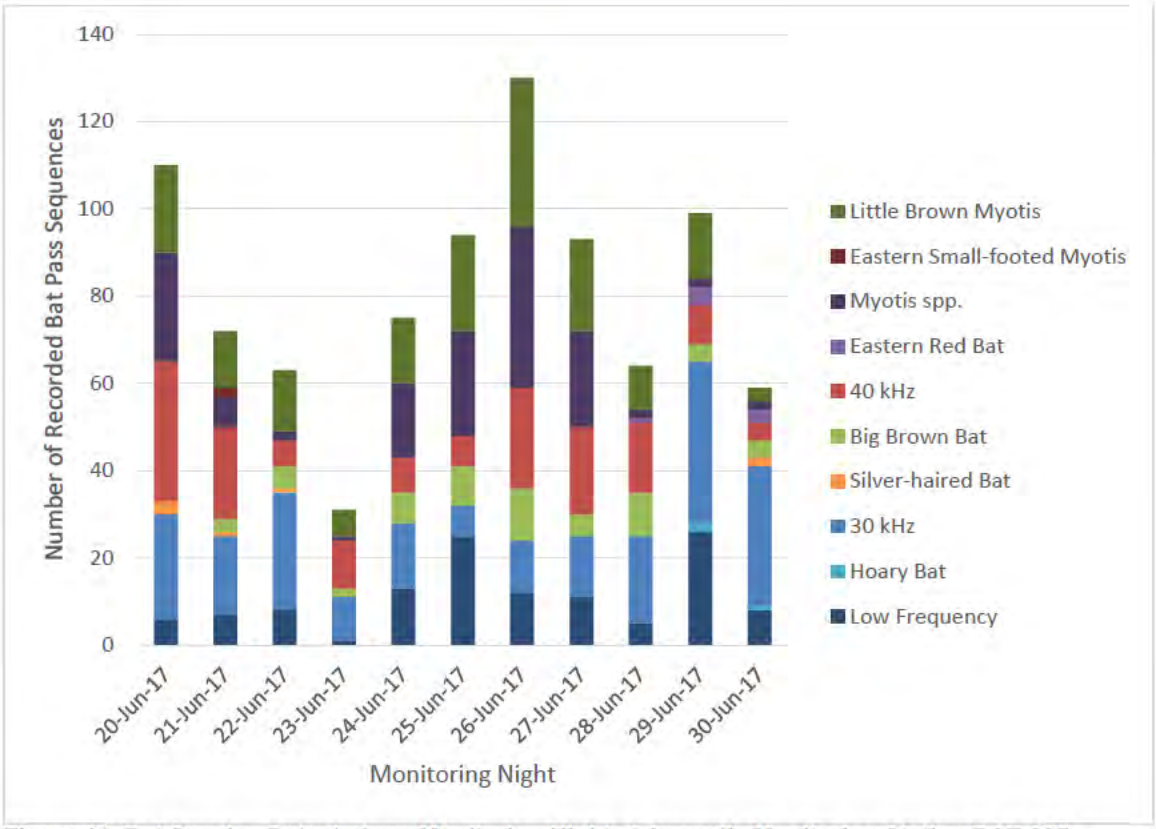

Figure 11. Bat Species Detected per Monitoring Night at Acoustic Monitoring Station BAT-005

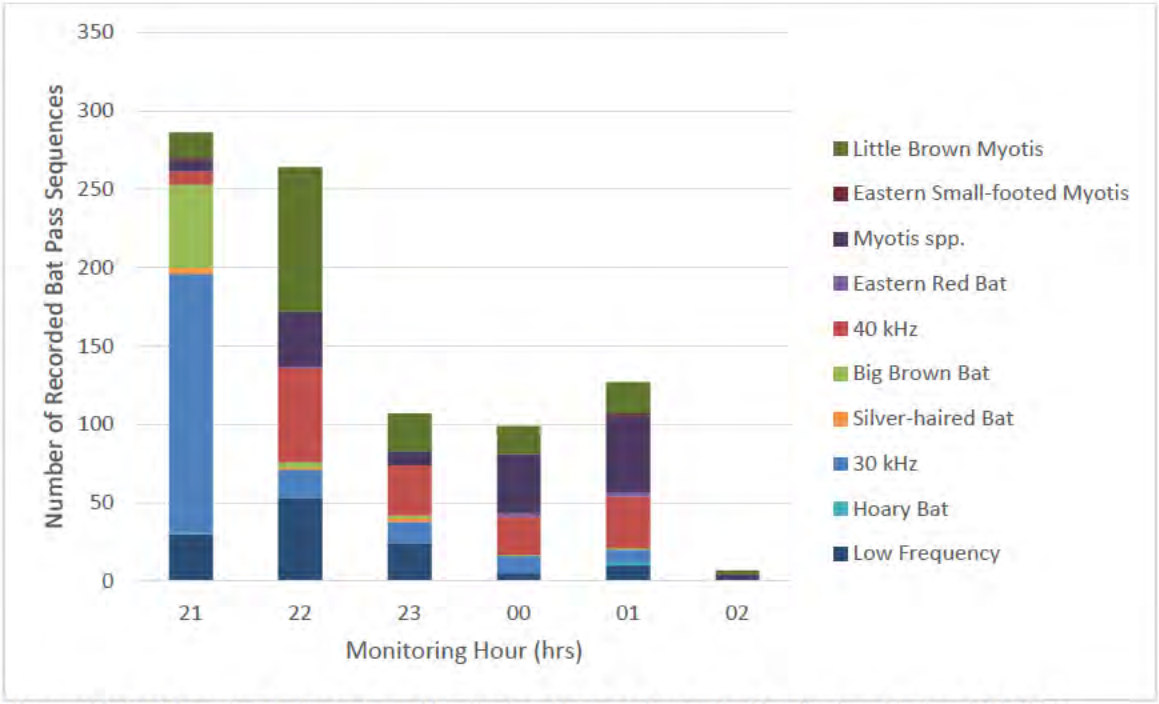

Figure 12. Bat Species Detected per Monitoring Hour at Acoustic Monitoring Station BAT-005

Summary and Conclusions

Acoustic monitoring within the study area identified the presence of six species of bats including two Endangered species, Little Brown Myotis and Eastern Small-footed Myotis, as well as the following four species considered common in Ontario: Big Brown Bat, Silver-haired Bat, Hoary Bat, and Eastern Red Bat.

Eastern Small-footed Myotis are known to form small maternity colonies within crevices on rock faces, cliffs, and in rock barren habitats and although rarely observed, may also form maternity colonies in buildings or anthropogenic structures (Humphrey 2016). Males of this species have been observed to roost individually in similar habitats as those used by females. Eastern Small-footed Myotis prefer to forage over water bodies and riparian forests and may also forage over open fields (Humphrey 2016). No rocky habitats exist within the study area. A total of 10, the largest number of bat pass sequences classified to this species at any one of the monitoring stations, were recorded at Station BAT-001. Due to a lack of preferred rocky habitats and the low number of recorded sequences classified to this species, it is assumed that Eastern Small-footed individuals are not using the study area as maternity and/or roosting habitat. The study area is in close proximity to the Niagara Escarpment where suitable maternity and roosting habitat is known to exist for this species. Eastern Small-footed Myotis individuals are therefore likely only traveling through the study area between roosting and foraging habitats.

Relatively large numbers of bat call sequences were classified to Little Brown Myotis at acoustic monitoring stations BAT-001 and BAT-005. Such high numbers were consistently documented each monitoring night, suggesting a continual presence of individuals of this species within the vicinity of these two monitoring stations. This species was also documented at all hours each night at both stations BAT-001 and BAT005. Detection in the early evening suggests individuals of this species are roosting near the monitoring stations. Detection at all hours each evening further suggests individuals are foraging within the vicinity of the stations and potentially not moving far from their roost sites. It is therefore assumed that the SAR bat, Little Brown Myotis, is using available habitats within the study area, especially within the vicinity of acoustic monitoring stations BAT-001 and BAT-005. It should be noted that Little Brown Myotis can use a network of trees that are in close proximity to each other and may therefore be using more than a few trees within the study area throughout the maternity period (Slough 2009, Olsen and Barclay 2013).

References

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Ministry of Natural Resources and Forestry. 2017. Survey Protocol for Species at Risk Bats within Treed Habitats for Little Brown Myotis, Northern Myotis, and Tri-colored Bat. April 2017. 13pp.

Olson, C. R. and R. M. Barclay. 2013. Concurrent changes in group size and roost use by reproductive female little brown bats (*Myotis lucifugus*). Canadian Journal of Zoology 91(3): 149-155.

Slough, B. G. 2009. Behavioral thermoregulation by a maternity colony of little brown bats in the Yukon. Northwestern Naturalist: 47-51.

MAP

587400 587500 587600 587700

4835100

4835000

4834900

BAT-004

BAT-005

BAT-003

BAT-001

BAT-002

LYNDEN CIRCLE

LILAC LANE

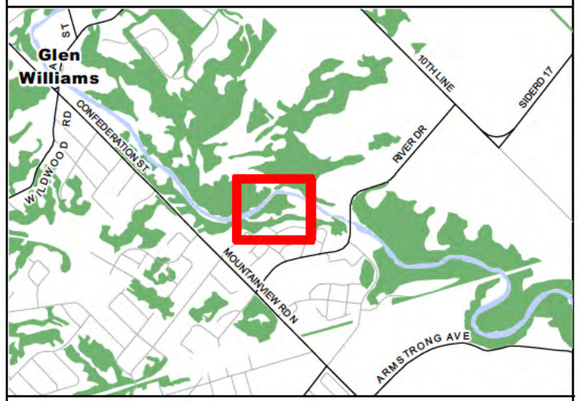
JOHN STREET

Path: X:\1956_Mountainview_Rd_NNRSI_1956_Map1_WildlifeMonitoring_2K_2017_08_31_GCS.mxd

Map 1

John Street WWPS EA

Wildlife Monitoring Stations



Legend

- Bat Acoustic Monitoring Station
- Secondary Road

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 1956 Date: August 31, 2017	NAD83 - UTM Zone 17 Size: 11x17" 1 1,200

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Appendix A5

Aquatic Assessment and Fish Habitat

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Technical Memorandum

Date: January 25, 2018 **Project No.:** 300039946.0000

Project Name: John Street WWPS Class EA - Aquatic Assessment

Client Name: Halton Region

Submitted To: Avid Bani Hashemi

Submitted By: Devin Soeting, C.E.T, CAN-CISEC, Aquatic Ecologist

Reviewed By: Christopher Pfohl, C.E.T., EP, CAN-CISEC, Senior Aquatic Ecologist

1.0 Introduction

The Region's John Street Wastewater Pumping Station (WWPS) in Georgetown is nearing the end of its useful life. Accordingly, Halton Region has undertaken a Municipal Class Environmental Assessment (Class EA) Study to investigate the proposed capital upgrades in order to maintain the station in a state of good repair.

A wide range of WWPS and/or collection system upgrade alternatives were considered, in order to select the most appropriate station design concept that meets Halton Region's latest design standards, including provision for an emergency over flow to reduce the risk of a sewer surcharge in the event of WWPS system failure and/or during peak wet weather events. R.J. Burnside & Associates Limited (Burnside) has facilitated the EA on behalf of the Region.

The Study has been completed in accordance with the requirements of a Schedule B Undertaking as outlined in the Municipal Engineers Association Municipal Class Environmental Assessment Document (October 2000, as amended 2007, 2011 & 2015), which is an approved process under the *Ontario Environmental Assessment Act*.

As part of the EA Study, Burnside has completed a review of historical records for aquatic habitat present within the study area, as well as an aquatic habitat assessment and mapping study.

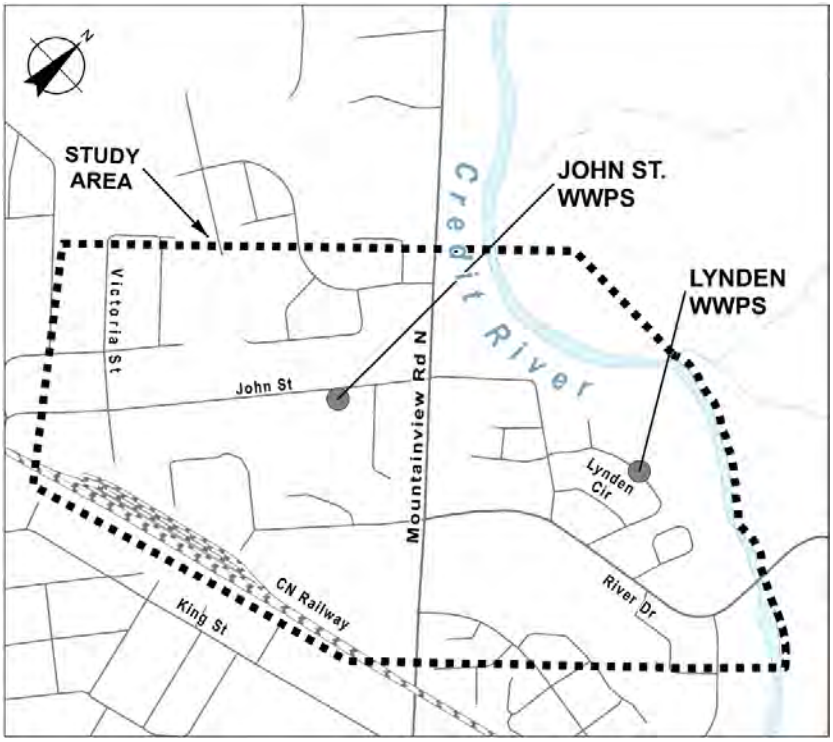
2.0 Study Area

The Study Area will be bounded roughly by Silver Creek to the west, CN rail line to the south, Credit River to the east and the Georgetown Urban Area boundary to the north. Please refer to Figure 1 for a depiction of these boundaries.

The John Street WWPS – built in 1970 – is situated in a residential area in the northeast corner of John Street Park in Georgetown, the property lands owned by Town of Halton Hills, close to the Hamlet of Glen Williams. The John Street Park includes a playground, manicured open space and a remnant urban forest with very little connectivity to the Credit River Valley system. The Study Area includes private property that is part of the Credit River Valley identified as a dense riparian treed corridor along the Credit River. This corridor embraces the Credit River Anglers Association (CRAA) Fish Hatchery which is located in the vicinity of the proposed emergency outflow location in the Credit River Valley at the bend of John Street. The remainder of the study area is characterized by urban development.

The catchment area for the John Street WWPS is approximately 88 ha, with an estimated current average daily flow of 5 L/s and a peak hourly flow of 67 L/s. In addition to its own catchment area, the station collects wastewater from Lynden Circle WWPS. An estimated peak hourly flow for Lynden Circle WWPS is 27 L/s. The pumping station discharges through a single 250 mm diameter forcemain to a manhole at the intersection of Victoria Street and John Street, and flows into a 300 mm trunk sewer that connects to the Silver Creek trunk sewer.

Figure 1: Study Area



3.0 Methodology

An aquatic assessment was required based on the proximity of the potential works to several watercourses and potential fish habitat, as well as Ontario Regulation 160/06, *Development, Interference with Wetlands & Alteration to Shorelines & Watercourses Regulation,* administered by Credit Valley Conservation Authority (CVCA). A comprehensive desktop review of background information was completed to compile and review existing information of the local aquatic environment available for the Study Area. In addition to information requests from CVC and the Ministry of Natural Resources and Forestry (MNRF), publicly available data sources that were reviewed included:

- Natural Heritage Information Centre (2016);
- Ministry of Agriculture, Food, and Rural Affairs Mapping (2015);
- Aerial orthophotography (2015);
- Credit River Fisheries Management Plan (2002);
- Credit Valley Source Protection Area Assessment Report (2015);
- CVC Integrated Watershed Monitoring Program Biennial Report 2014 and 2015 (2016);
- MNRF Aquatic Resource Area mapping (2015);
- Fisheries and Oceans Canada (DFO) Aquatic Species at Risk mapping (2015 and 2016); and
- DFO Critical SAR Habitat mapping (2017).

Site reconnaissance was also conducted to confirm and add to the information gathered through the review of background sources, and to determine the existing on-site conditions. Information for the fieldwork component of the aquatic habitat assessment was collected with the use of the Ministry of Transportation (MTO) / DFO / MNRF Fisheries Protocol (2009).

4.0 Information Review Summary

The Study Area is located in the Glen Williams to Norval Subwatershed within the middle tier of the Credit River Watershed. Major features within the middle tier of the Credit River Watershed include the Niagara Escarpment, the mainstem of the Credit River, as well as two of its major tributaries; Silver Creek and Black Creek. Both of these tributaries originate above the Escarpment within headwater wetland complexes (Credit River Fisheries Management Plan, 2002). The Credit River is situated adjacent to several urban centres and in the case of this project, adjacent to the community of Georgetown. Since several of the potential alternative options for the emergency outflow location involve the watercourses and waterbodies within and adjacent to the riparian corridor and the Credit River, the majority of the information review efforts were focussed there. The sources were reviewed for information regarding watercourse management, resident fish species and habitat, as well as water quality within the mainstem of the Credit River in the region of the Study Area.

The review of aerial photography identified the presence of several relatively large ponds within the riparian corridor that could potentially be connected to the Credit River. Burnside also notes

that the Credit River Anglers Association (CRAA) fish hatchery is located west of these ponds, adjacent to the Credit River and could potentially interact with the river or the ponds themselves. The aerial photography also showed that the Credit River generally meanders from northwest to southeast along the northern perimeter of the Study Area before flowing beneath River Road and over the Paper Mill Dam, at the east end of the Study Area.

Being one of the most populated watersheds in Southern Ontario, the Credit River has had long-standing issues related to water quality impacts from agriculture and urban environments throughout the watershed, both of which can impact the aquatic environment through sedimentation, thermal changes, as well as man-made contaminants from urban runoff (i.e., refuse, heavy metals, petroleum hydrocarbons). Though relatively little specific information regarding the water quality within the Study Area was found in the reviewed background information, water quality within the mainstem of the Credit River is monitored by the CVC at locations upstream and downstream of the Study Area. The Integrated Watershed Monitoring Program Biennial Report 2014 and 2015 (CVC, 2016) shows that the water chemistry Water Quality Index (WQI) status for a location approximately 8 km upstream of the Study Area as "Good", while a location at the Highway 7 crossing, approximately 6 km downstream of the Study Area as "Marginal". This indicates that water quality within the mainstem of the Credit River is likely impacted as it flows between the two locations, through the community of Georgetown.

However, despite the moderately impacted water quality, the Credit River remains a very well-known and productive sportfish fishery, providing habitat to several sought-after fish species including brown and rainbow trout, Pacific salmon, as well as stocked Atlantic salmon. Rehab and stocking efforts over a number of years within the Credit River has increased the quality of the fishery to a point where an Atlantic Salmon fry, an offspring of one of the stocked fish, have again been recorded in the river, upstream of the Study Area (The Globe and Mail, July 29, 2011, available at: https://beta.theglobeandmail.com/news/toronto/after-more-than-a-century-atlantic-salmon-return-to-credit-river/article601030/?ref=http://www.theglobeandmail.com&). This as well as other sportfish species are managed within the Study Area as per the Credit River Fisheries Management Plan. According to the reviewed background information the Credit River within the Study Area is considered to be classified as a cool / mixed water watercourse and is to be managed as a mixed cool / cold-water fishery.

A review of the MNRF Aquatic Resource Area (ARA) Mapping provided a summary of potential fish species present within the main branch of the Credit River and are shown within Table 1, below.

Table 1: Summary of Fish Species Present Within the Credit River in the Study Area (1999)

Species Name	Scientific Name	Thermal Regime Preference
Brown Bullhead	*Ameiurus nebulosus*	Warm
Rock Bass	*Ambloplites rupestris*	Cool
Goldfish	*Carassius auratus*	Warm

Species Name	Scientific Name	Thermal Regime Preference
White Sucker	*Catostomus commersonii*	Cool
Brook Stickleback	*Culaea inconstans*	Cool
Rainbow Darter	*Etheostoma caeruleum*	Cool
Fantail Darter	*Etheostoma flabellare*	Cool
Johnny Darter	*Etheostoma nigrum*	Cool
Northern Hog Sucker	*Hypentelium nigricans*	Warm
Pumpkinseed	*Lepomis gibbosus*	Warm
Common Shiner	*Luxilus cornutus*	Cool
Stonecat	*Noturus flavus*	Warm
Rainbow Trout	*Oncorhynchus mykiss*	Cold
Bluntnose Minnow	*Pimephales notatus*	Warm
Fathead Minnow	*Pimephales promelas*	Warm
Longnose Dace	*Rhinichthys cataractae*	Cool

Within the Study Area, north of the main branch of the Credit River an unnamed tributary of the Credit flows into the river. Historical fish capture records for this tributary were available and a summary of the fish species found is provided in Table 2. The MNRF ARA Mapping indicates the unnamed tributary of the Credit River is also classified as a cool water system.

Table 2: Summary of Fish Species Present Within the Unnamed Tributary of the Credit River (2005)

Species Name	Scientific Name	Thermal Regime Preference
Creek Chub	*Semotilus atromaculatus*	Cool
Eastern Blacknose Dace	*Rhinichthys atratulus*	Cool
Mottled Sculpin	*Cottus bairdii*	Cool
White Sucker	*Catostomus commersonii*	Cool
Rainbow Darter	*Etheostoma caeruleum*	Cool
Fantail Darter	*Etheostoma flabellare*	Cool
Johnny Darter	*Etheostoma nigrum*	Cool
Northern Hog Sucker	*Hypentelium nigricans*	Warm
Pumpkinseed	*Lepomis gibbosus*	Warm
Common Shiner	*Luxilus cornutus*	Cool
Stonecat	*Noturus flavus*	Warm
Rainbow Trout	*Oncorhynchus mykiss*	Cold
Bluntnose Minnow	*Pimephales notatus*	Warm
Longnose Dace	*Rhinichthys cataractae*	Cool

Potential fish SAR records within the Study Area Vicinity were reviewed through the 2017 DFO Aquatic SAR Maps. The review of the DFO SAR mapping (2017) did not indicate any aquatic SAR present within the Study Area. However, Burnside notes that Redside Dace (*Clinostomus elongatus)* were identified as potentially inhabiting Silver Creek, which generally flows north to south in the reach west of John Street, outside the Study Area. This was also identified in correspondence with the MNRF, who noted that it is known that Redside Dace (*Clinostomus elongatus)* exist within this watershed.

5.0 Existing Aquatic Conditions

Burnside ecology staff conducted site reconnaissance on June 20, 2017 to assess the existing conditions and determine the form, function and morphology of the watercourses and waterbodies present within the Study Area. In total, two watercourses and a pond system consisting of four connected ponds were examined as part of the aquatic habitat assessment. The ponds (1, 2, 3, and 4, respectively) are located south of the Credit River, north of Lynden Court and are aligned in a west to east configuration. Photos taken during the June 20, 2017 site visit are shown on the attached photo pages (Photos 1 to 3). Figure 2 (appended to the end of this document) depicts the configuration and locations of the aquatic features within the Study Area.

5.1 Credit River

The mainstem of the Credit River was observed flowing northwest to southeast through the Study Area. The morphology of the upstream section of the Credit River within the Study area was characterized as a run-type morphology for approximately 140 m then flows through a riffle section. The substrate within this section was predominantly cobble, with gravel and sand. The wetted and bankfull widths within the run were approximately 17 m and 25 m, respectively. While the wetted depth generally ranged between 0.6 m to 1.5 m and bankfull depth was approximately 2.8 m. Downstream of the riffle, the Credit River enters a run section again. Within the run the water was flowing with an increased velocity and the there was more gravel than cobble within this section of the river. The wetted width in this section of the river was approximately 22 m and the bankfull width was approximately 31 m. The northern bank was eroded and relatively steep. The wetted depth within the run was shallower than the upstream run, was approximately 0.9 m deep. The water at the time of the site reconnaissance was flowing with a velocity of approximately 0.7 m/s. Prior to flowing over the Paper Mill Dam and out of the Study Area, the Credit River flows into a deep scour pool section, between the River Road Bridge and Paper Mill Dam. Water depth within the pool could not be determined at the time of the Site visit although appeared to be over 2.0 m deep.

Burnside also notes that there had been recent shoreline stabilization measures in the form of large boulders constructed along portions of the southern banks within the riparian corridor (Photos 1 and 2). Active erosion was also noted along the outside meanders, downstream of the shoreline stabilization measures. A limited amount of large instream woody debris were present within the river, with the majority of in-stream cover being represented as boulders and large cobble. Overhanging riparian vegetation was observed along the shorelines through grasses, forbs, as well as mature shrubs and trees along the stream banks; however due to its width, only a relatively minor percentage of the watercourse was shaded. Undercut banks were also noted within Site, with a higher presence of them along the northern bank of the Credit River. Photos of the Credit River taken during the June 20, 2017 site visit are shown on the attached photo pages (Photos 1 to 3).

5.2 Unnamed Tributary of the Credit River

Property access restrictions prevented Burnside staff from assessing the subject unnamed tributary of the Credit River, discharging into the Credit River along its northern bank, approximately 380 m downstream of the western extent of the Study Area. However, on-site observations made from the southern bank of the Credit River indicated that not only does this watercourse contribute to the water quantity and quality within the Credit River, it also likely conveys allochthonous material to the system.

A review of background information sources and aerial photographs revealed this watercourse is a warm to cool-water meandering stream that flows through mature forests, a golf course, and agricultural areas prior to discharging to the Credit River. Nutrient inputs and runoff from these sources potentially impact the downstream Credit River. The fish species historically found within the unnamed tributary of the Credit River are listed above, within Table 2.

5.3 Stormwater Drain

A stormwater drain was observed flowing from south to north between Pond 1 and Pond 2, north of Lilac Lane. This stormwater drainage enters the property from a concrete pipe outfitted with a debris cage, which emerges from a ravine slope north of Lilac Lane (Photo 4). The watercourse appeared to be hardened and channelized, flowing in a relatively straight path prior to discharging into the Credit River through a corrugated steel pipe (CSP). Two pedestrian bridges were noted across the channel, providing access between Ponds 1 and 2. The substrate within the drainage channel consisted of sand, silt, and gravel, with large cobble noted at the outlet of the upstream culvert. At the time of the site visit, a relatively little amount of water was observed to be flowing from the culvert outlet, and it is likely that the quantity is supplemented by localized groundwater leaking to the system. Small intermittent sections of the watercourse were also noted as containing watercress, likely indicating a groundwater contribution to the channel. No fish were observed within this channel and it was not directly connected to any of the ponds. The discharge of stormwater drainage to the Credit River is accomplished through a hanging, compressed CSP culvert which flows beneath the roadway within the property. The CSP discharges the flow to a small concrete spillway approximately 1.2 m above the water level at the time of the Site visit (Photo 5). The configuration of the discharge of this channel is considered a barrier to fish movement and is not considered to provide direct fish habitat.

5.4 CRAA Hatchery

The CRAA Hatchery is located south of the private property’s driveway and the forested ravine slopes of the corridor. It consists of several closed tanks and pens as well as a pond feature (approximately 25 m x 30 m) which is located around its tanks (Photo 6). This waterbody did not appear to be flowing and was connected to the western extent of Pond 1 though a narrow and short wooded area. Substrate within the waterbody consisted of sand, silt, gravel and the

water was noted as being very clear. The water within this area appeared to be supplemented with groundwater, which supports the hatchery operation by providing a source of clean, cold water that is used to rear juvenile salmonids from eggs collected from mature adult salmonids spawning in the Credit River. Several fish (unknown salmonid species) were observed within the waterbody and appeared to likely be escapees of the hatchery tanks.

5.5 Pond 1

Pond 1 is the western most of the four on-site ponds and is connected to the CRAA Hatchery through a narrow and short wooded area. The dimensions of this pond were noted as being approximately 30 m x 50 m, while the maximum depth was visually estimated to be approximately 2.5 m. Substrate within the pond is primarily comprised of detritus and muck, as well as sand and gravel nearer the banks. Mature trees are present throughout the southern banks of Pond 1, while manicured lawn was observed along the northern banks. There is minor instream large woody debris. Cattails are present within the eastern end of the pond, and lilly pads are present around the edges of the pond (Photo 7). Submergent aquatic macrophytes, chara and curly-leaf pond weed, are present within Pond 1. Largemouth bass (*Micropterus salmoides*) and sunfish species (*Lepomis sp.*) were observed within this pond and it has been noted that they have been stocked and are not resident species of the Credit River. The water level in Pond 1 appeared to be maintained through natural groundwater contributions likely flowing from the toeslope south of the pond and flows north, toward the river. At the eastern end of Pond 1 a 15 cm diameter PVC pipe conveys flow downstream to Pond 2, and crosses the on-site stormwater drain.

5.6 Pond 2

As mentioned above, Pond 2 is located east of Pond 1 and is approximately 32 m long and 21 m wide, while the maximum depth was approximately 1.2 m (Photo 8). Reeds are located within the northwestern portion of this pond while lily pads were identified as being intermittently dispersed throughout. The substrate within Pond 2 primarily consisted of detritus, sand and gravel. Submergent aquatic macrophytes, chara and curly-leaf pond weed, were observed within Pond 2. The southern bank of Pond 2 is densely vegetated with forbs, grasses and mature trees. The eastern, western, and northern banks are vegetated by manicured lawn. Similar to Pond 1, Largemouth Bass and sunfish species were present within Pond 2 and largemouth bass spawning beds were observed near the eastern pond shore (Photo 9). At the eastern end of Pond 2 a 15 cm diameter iron pipe conveys flow downstream to a small man-made channel which flows to Pond 3.

The discharge flows through a small sinuous channel comprised of a sand, gravel, and cobble substrate that is well shaded with overhanging trees along its northern bank (Photo 10). Manicured lawn with a thin riparian barrier of grasses and forbs forms the adjacent lands to the south. The morphology of the small channel was characterized as a flat with water flowing approximately 0.01 m/s.

5.7 Pond 3

Pond 3 is located downstream, east, of Pond 2. Pond 3 is approximately 60 m long and 30 m wide. A maximum depth could not be reliably estimated at Pond 3 due to visual obstructions, however due to the observed vegetation growth, it is thought that the maximum depth would be in the range of 2 m to 3 m. Lily pads were noted to be densely dispersed along all of the shorelines of the Pond (Photo 11). Submerged algae was also densely dispersed throughout the entirety of Pond 3 while other submergent aquatic macrophytes, chara and curly-leaf pond weed, were also present within Pond 3. The northern shoreline of Pond 3 was vegetated with trees, shrubs, forbs and grasses, while the southern and eastern shorelines of Pond 3 were characterized by manicured lawn. Largemouth bass and sunfish species along with spawning beds were observed in the southeastern corner of Pond 3. A man-made causeway separates Ponds 3 and 4. This causeway is covered with a manicured lawn and is approximately 32 m long (Photo 12). The flow of Pond 3 is conveyed to Pond 4 through a 15 cm diameter iron pipe that is located beneath the causeway.

5.8 Pond 4

Pond 4 is the largest of the ponds with a length of approximately 130 m and a width of approximately 35 m while the maximum depth of Pond 4 was estimated to be approximately 3 m to 4 m. There were areas of emergent large lily pad beds noted within the shallow areas of Pond 4 (Photo 13). Submergent aquatic macrophytes, chara and curly-leaf pond weed, were also present within Pond 4. Portions of the northern and southern shorelines of Pond 4 were vegetated with large mature riparian trees although the majority of the shoreline was characterized by grasses and forbs. Similar to the other ponds, largemouth bass and sunfish species were observed within Pond 4. Within the northeastern corner of Pond 4 there is a 15 cm diameter iron pipe that conveys flow northeast, to the Credit River (Photo 14). This pipe was observed to be flowing slowly and discharges to the bank of the Credit River. Fish passage upstream to Pond 4 would not be possible due to the elevation change between the river and the pond.

6.0 Fish Habitat

As discussed in the sections above, several species of fish are known to inhabit the Credit River and the ponds, within the Study Area. The section of the Credit River within the Study Area is capable of providing habitat to several economically and ecologically important fish species, which use different areas of the watercourse during different times of year. The Credit River is a well-known recreational sport fishery which provides important ecological functions to resident and migratory fish species.

An important man-made feature of the Credit River within the Study Area is the Paper Mill Dam, which acts a barrier to potential fish migration upstream to the majority of the Credit River within the Study Area and its headwaters. The Norval Dam located downstream of the Paper Mill Dam

is the main barrier to upstream migration of salmonids (including Rainbow Trout) entering the Credit River from Lake Ontario in search of spawning grounds. This barrier, though restrictive, preserves the upstream sections of the Credit River for resident native trout species such as brown trout as well as stocked Atlantic salmon. It is our understanding that migratory salmonids (Rainbow Trout) are lifted from Norval Dam in the spring to spawning tributaries (Silver and Black Creeks) and complete only downstream migration back to Lake Ontario. No fall spawning species are lifted over the Norval Dam based on correspondence with CRAA. Additional information may be available regarding Atlantic Salmon movements in the Credit River from MNRF.

The watercourse morphology of the Credit River within the Study Area allows for the capability of providing important fish habitat to all of its resident fish species including nursing and rearing areas, as well as refuge and over-wintering habitat in the deeper sections (near the Paper Mill Dam). The section of the Credit River within the Study Area also conveys flow which contributes to downstream habitat used by fish species that cannot access the waters upstream of the Paper Mill Dam. It provides water quantity, nutrients, and contributes to water quality to downstream environments which are considered direct fish habitat.

As mentioned above, the CRAA operates a fish hatchery within the Study Area. This hatchery raises steelhead (migratory rainbow trout), brown trout and Atlantic salmon. The hatchery is fed by groundwater sources which provide the required water quantity and quality to raise these fish species. During a June 15, 2017 phone conversation with the CRAA it was noted that resident brown trout inhabit the Credit River within the Study Area and that Atlantic salmon migrate to Lake Ontario through the Study Area after being stocked in the Credit River within the Forks of the Credit. The review of background sources (MNRF ARA Mapping) did not indicate that these species are present within the river, however through correspondence with CRAA it is noted that these species are present within the Study Area. The on-site ponds also provide fish habitat, however they contain stocked largemouth bass and sunfish species and are not directly connected to the Credit River, restricting potential fish migration upstream from the Credit River, into the ponds.

Based on this assessment, the Credit River is classified as a “recreational, commercial, and aboriginal fishery” as described in the *Fisheries Act*. Though the on-site ponds are privately owned and fish passage is restricted from the Credit River, upstream to the ponds, the on-site ponds do minimally contribute to water quality and quantity in the Credit River and are considered to be part of that “fishery”. It is also possible for fish within the ponds to pass downstream to the Credit River is also considered to be protected by the *Fisheries Act*.

7.0 Incidental Wildlife Sightings

During the site reconnaissance a predated Snapping Turtle (*Chelydra serpentina*) nest was spotted approximately 6 m north of Pond 4 (Photo 15). Several Green Frogs (*Lithobates clamitans*) were also heard calling during the site reconnaissance. Canadian Geese were also observed using the ponds.

8.0 Recommended Mitigation Measures for the Preferred Alternative 3

The Preferred Alternative 3 involves constructing a replacement pumping station at the existing location including the provision of emergency storage and an emergency outflow to the Credit River, upstream of the hatchery. Alternative 3 requires tree / vegetation removals at the pumping station site and emergency overflow location as well as modifications to the existing southern bank of the watercourse.

In order to mitigate impacts to the existing groundwater conditions in the area of the discharge pipe, it is recommended that trenchless technology / horizontal directional drilling (HDD) be utilized. HDD is a trenchless installation method that can be used to install the piping within the subsurface, without requiring an open excavation and the environmental impacts that go along with it (i.e., tree removal, infrastructure impacts / removals). HDD does not require the installation of coarse and loose bedding material that can act as a conduit for groundwater migration, which can alter existing shallow groundwater conditions.

In order to mitigate potential impacts to the Credit River and the resident and downstream fish species during construction, the following mitigation measures should be included:

- In-water work will respect timing windows to protect fish;
- In-water activities will be conducted in isolation of flowing water to maintain natural flow downstream and avoid introducing sediment to the watercourse;
- A spill management plan (SMP) and Erosion and Sediment Control (ESC) Plan will be developed;
- Riparian vegetation clearing will be kept to a minimum;
- Minimize the removal of bank material – any removed material will be set aside and returned to the original location to restore a similar contour and gradient of the bank;
- Disturbed banks will be stabilized immediately through re-vegetation of suitable native species and where necessary, appropriately-sized clean rock;
- Wet weather restrictions will be applied during site preparation and excavation. Work will be avoided near watercourses and groundwater discharge areas during periods of significant precipitation and/or significant snow melt;
- Horizontal Directional Drilling (HDD) will be implemented where practicable to minimize potential disturbance to existing vegetation and existing groundwater conditions;
- If temporary dewatering is required, implement appropriate energy dissipation and settling / filtration measures for discharge to prevent erosion and sediment release to watercourses;
- If required, fish will be rescued from construction zones in accordance with MNRF collector's license;
- Compliance with the *Ontario Water Resources Act, 1990* will be maintained with respect to the quality of water discharging into natural receivers;
- Any equipment refueling and chemical storage will take place in designated areas at least 30 m from the watercourse; and

- An Environmental Inspector will regularly monitor construction activities to confirm the requirements outlined in the SMP and ESC plans are followed. Workers shall report any instances of spills or impacts to surface water features.

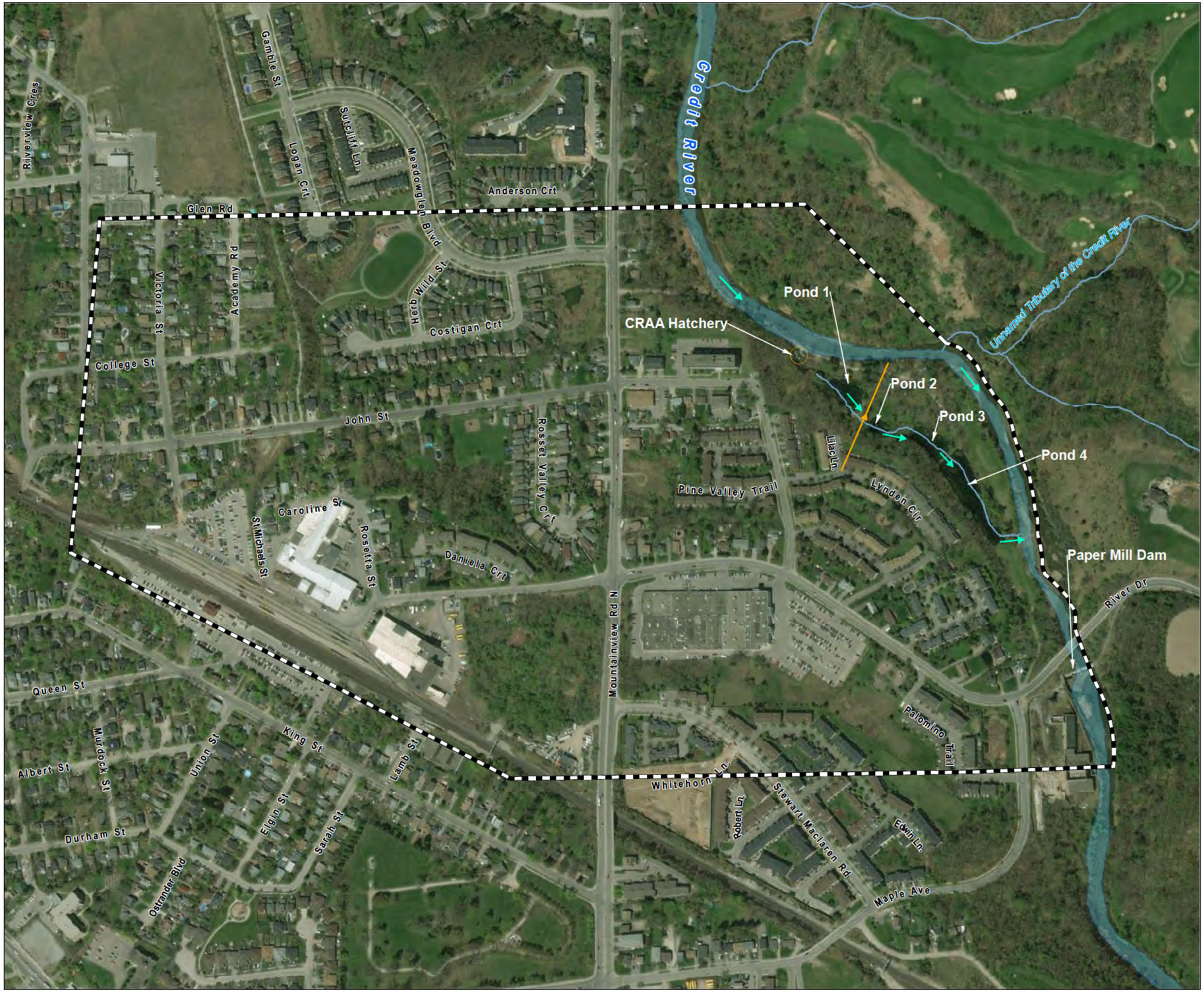
The impacts and mitigation measures relevant to the Preferred Alternative should be re-visited during the detailed design stage to accurately reflect the design approach.

R.J. Burnside & Associates Limited

Devin Soeting, C.E.T, CAN-CISEC, Aquatic Ecologist
Aquatic Ecologist

DS:sr

Enclosure(s) Figure 2 – Aquatic Features Configuration
Photos 1 to 15



General Flow Direction

Stormwater Drain

Study Area

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

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Projection: Transverse Mercator	
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False Easting: 500,000m	False Northing: 0m
Rotation: -45	Scale Factor: 0.99960

Grid North

0 100 200 300 400

Metres

BURNSIDE

Client

THE REGIONAL MUNICIPALITY OF HALTON

Figure Title

JOHN ST WWPS EA

AQUATIC FEATURES CONFIGURATION

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Photo 1: Credit River – Looking upstream from area of shoreline stabilization near CRAA Hatchery

Photo 2: Credit River – Looking downstream from area of shoreline stabilization near CRAA Hatchery

Photo 3: Paper Mill Dam at downstream end of Study Area

Photo 4: Stormwater outlet between Pond 1 and Pond 2

Photo 5: Stormwater discharge to Credit River

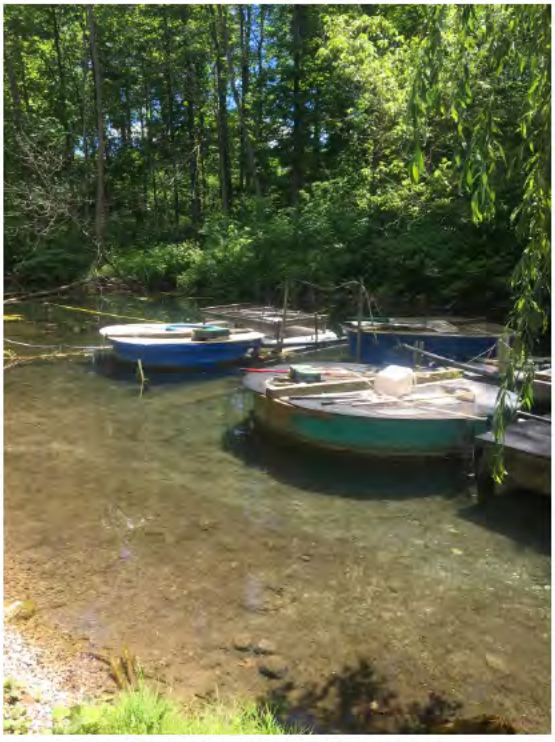

Photo 6: CRAA Hatchery

Photo 7: Looking east at Pond 1

Photo 8: Looking east at Pond 2

Photo 9: Largemouth bass spawning bed in Pond 2

Photo 10: Looking upstream (west) at watercourse linking Pond 2 and 3

Photo 11: Looking west at Pond 3

Photo 12: Looking north at the causeway between Pond 3 (left) and Pond 4 (right)

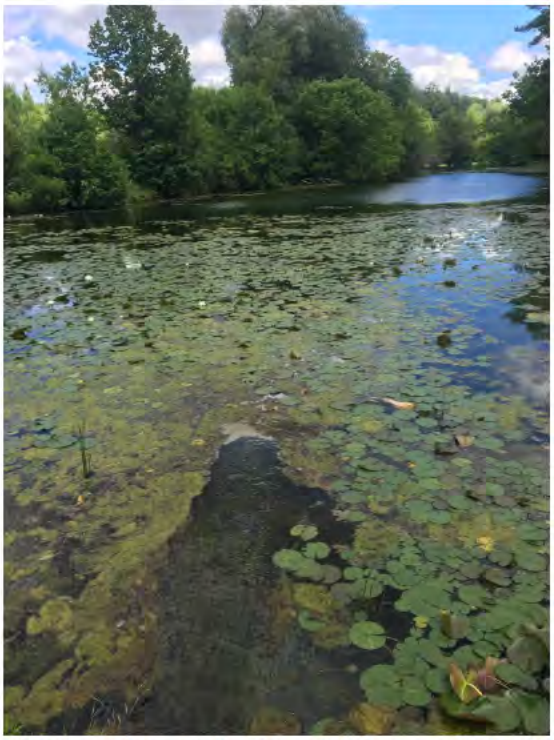

Photo 13: Looking east at Pond 4 from outlet of Pond 3

Photo 14: Outlet of Pond 4 discharging to the Credit River

Photo 15: Predated snapping turtle nest observed north of Pond 4