APPENDIX 7

NATURAL ENVIRONMENT REPORT

NATURAL ENVIRONMENT REPORT

Swaley Drain Improvements Project
Township of Springwater
May 2020

RIVERSTONE
ENVIRONMENTAL SOLUTIONS INC.

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May 27, 2020
RS# 2017-068

Ken Smart
K Smart Associates
via email: ksmart@ksmart.ca

SUBJECT: Natural Environment Report
Swaley Municipal Drain Improvements Project
Township of Springwater

RiverStone Environmental Solutions Inc. is pleased to provide you with the attached report. A summary of the key results and recommendations are provided at the beginning of the report. Detailed descriptions of the work completed, and the findings are provided in the subsequent sections.

Please contact us if there are any questions regarding the report, or if further information is required.

Best regards,

RiverStone Environmental Solutions Inc.

Report prepared by:

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Senior Ecologist / Principal

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REPORT SUMMARY

Type of Study Natural Environment Report	**Date** May 27, 2020
	Proposal/Application Improvements to Swaley Drain and Muskrat Creek under The *Drainage Act*
Review Authorities Ministry of Natural Resources and Forestry Nottawasaga Valley Conservation Authority Township of Springwater	**Proponent/Agent** Township of Springwater / K. Smart Associates

Report Summary

The purpose of this study was to review the existing natural heritage features present in the areas of proposed drainage improvements to be completed under *The Drainage Act*. It is our recommendation that the project proceed in a phased approach, completing the Swaley Drain Improvements first, followed by the improvements at the Muskrat Creek remnants outlet, should monitoring show it is necessary. It was determined that potential impacts to the area adjacent to the Nottawasaga River was high enough to warrant this conservative approach.

Based on both desktop and on-site evaluations, RiverStone determined that

1. The proposed drainage works are located in the Minesing Wetlands complex. This area has been identified as a Provincially Significant Wetland and a Provincially Significant Life Science Area of Natural and Scientific Interest (ANSI). Impacts to these features can be minimized through project planning.
2. Potential and confirmed habitat of Species at Risk was documented on the property and can be protected with mitigation measures and timing restrictions.
3. Fish habitat associated with the proposed drainage work is considered suitable warmwater habitat: however impact to higher quality fish habitat located in the Nottawasaga River would require avoidance and mitigation measures to address if work were to be done in or at the River edge; however, work in or at the River is not recommended by this Report

To ensure that the area's significant features are protected, RiverStone has made a number of recommendations that are presented below.

RECOMMENDATIONS

Fish and Fish Habitat

The potential impacts on fish and fish habitat are expected to be low; however, best management practices need to be implemented during construction to ensure that the quality of water in the Swaley Drain and Muskrat Creek are maintained. Given the extent of wetland within the areas of proposed works, access to these areas by the heavy equipment required to complete the drain improvements will be challenging. To minimize the potential for impacts to fish and fish habitat resulting from the drain improvement works, RiverStone recommends the following:

- **All in-water improvement works are to be completed during winter months when the site is frozen. This timing will minimize the potential for impacts to fish and fish habitat while avoiding sensitive times of year (e.g., spawning).**

- **Disturbance and removal of riparian vegetation must be minimized, and all temporarily disturbed areas must be reinstated to original condition or better.**

- **Best Management practices should be utilized with all machinery operated within the study area to ensure that material and tracks are free from invasive species (*Phragmites australis*, etc.).**

- **Machinery should arrive on site in clean condition and is to be checked and maintained free of fluid leaks.**

- **Machinery must be refueled, washed and serviced a minimum of 30 m from wetlands that occur near the subject property boundary on adjacent lands.**

- **Locate all fuel and other potentially deleterious substances a minimum of 30 m from wetlands and drainage features. Minimize fuels and chemicals stored onsite and ensure a spills management plan and the associated spill response equipment is always available on-site for implementation in the event of a spill of deleterious material.**

Endangered and Threatened Species

As per **Table 3**, results of RiverStone's assessment of endangered and threatened species identified the potential for seven (7) endangered or threatened species and their habitat to be present within the areas of proposed improvements. The following provides an assessment of the potential impacts to these species and their habitats as a result of the proposed drainage improvements. In general, RiverStone recommends that:

- **The project details be submitted to MECP for review to ensure compliance with the provincial *Endangered Species Act*, 2007.**

During winter months, Blanding's Turtles and Spotted Turtles seek out areas of water within swamps, fens and marshes that are of sufficient depth to not freeze to the bottom. These areas typically contain soft substrates and woody vegetation. Within the Swaley study area, trees and woody vegetation is limited in the area of proposed improvements suggesting that this area has a lower potential to provide hibernation habitat for these species than other portions of the Minesing Wetlands complex. Given the type of habitat features present, and to minimize the potential for impacts to these species RiverStone recommends:

- **All improvements to the drains be completed during winter months (i.e., November 1 to March 31).**

- **Prior to commencing work, MECP be contacted to obtain direction on how to proceed in the unlikely event that a Blanding's Turtle or Spotted Turtle are encountered during the completion of the drainage works (i.e., excavation).**

By completing the works during winter months, impacts to vegetation and soil conditions within the agricultural fields will be minimized. Based on adherence to the recommended timing window of

completing the works during winter months, no impacts are anticipated to Bobolink or its habitat. To this end, RiverStone recommends that:

- **All improvements to the drains be completed during winter months (i.e., November 1 to March 31). Movement of heavy equipment through the agricultural communities adjacent to the improvement areas is to only occur during this time period.**

As previously discussed, completion of the improvement works during winter months will avoid the portion of the year when this species is present in Ontario. Additionally, this timing will minimize impacts to remaining vegetation as a result of heavy equipment movement and operation. Based on adherence to the recommended timing window of completing the works during winter months, no impacts are anticipated to Least Bittern or its habitat. To this end, RiverStone recommends that:

- **All improvements to the drains be completed during winter months (i.e., November 1 to March 31).**

Both options to outlet the Muskrat Creek, to the Nottawasaga and to the Downey Drain, were initially considered; however the connection to the Downey Drain is the preferred alternative if this work is considered. Although the outlet connections have differing impacts, getting the necessary heavy equipment to the lower reaches of the Muskrat Creek to complete the work, will have similar impacts for both options. The heavy equipment will need to cross the Downey Drain and traverse considerable wetland habitats. We expect that similar techniques used to access and complete the work further east on the Swaley Drain will also be employed for the Muskrat Creek work, with the recommendations noted above being applied. The following additional recommendations are provided, given the presence of Lake Sturgeon and their spawning habitat should the option to breach the Nottawasaga River be chosen for some unforeseen reason in the future:

- **All improvements be completed during winter months (i.e., November 1 to March 31).**

- **Prior to commencing work to remove the sediment berm, suitable sediment control measures (e.g., marine silt curtain, coffer dam, sheet piling, etc.) must be installed in the Nottawasaga River to ensure that sediment is not able to migrate downstream.**

- **Detailed design and phasing of the removal of the sediment berm must be submitted to DFO, MNRF, and MECP for review prior to commencing with any associated works.**

Provincially Significant Wetlands

The proposed drainage works will result in the removal of vegetation within the area of improvements. These activities will result in the partial loss of the ecological communities identified on **Figure 4** and **Figure 5**. To mitigate some of the ecological impacts associated with the loss of vegetation cover from wetland communities associated with the Swaley Drain and Muskrat Creek, RiverStone recommends the following:

- **Vegetation removal and disturbance outside of the proposed drain improvement areas should be minimized to the extent possible.**

- **All necessary vegetation removal (e.g., tree/shrub clearing, etc.) within any proposed excavation area should be completed outside of the primary breeding bird nesting window (i.e., between April 1 and August 31).**

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1 BACKGROUND

RiverStone Environmental Solutions Inc. (hereafter, "RiverStone") was retained by the Township of Springwater, through K Smart Associates, in 2017 to prepare a Natural Heritage Study (NHS) to provide background information to inform project design and support agency approvals as part of the Swaley Drain Improvements Project in Minesing, ON.

The Swaley Drain was originally constructed in 1898 to aid in draining farmland surrounding Minesing and the associated extensive wetland complex. Based on material provided by K Smart, the Swaley Drain was designed to serve over 1,000 hectares (2,600 acres) of land. The drain is an open channel that commences near the line between Lots 3 and 4, Concession 8 and flows southerly and then westerly across Highway 26, to and across County Road 28 and terminates west of the unopened 11th Line of the former Vespra Township (**Figure 1**). Historically the drain outletted to the Muskrat Creek which in turn outletted to the Nottawasaga River. According to historical records, scattered improvements to the Muskrat Creek were completed in the early 1900's. The remnants of the Muskrat Creek are no longer visible in most areas as it is covered by the Minesing Wetland.

Landowners within the watershed of the Swaley Drain rely on the channel to remove surface waters along the length of the channel to permit the cultivation of the surrounding lands. These landowners also rely on the channel to provide an outlet for subsurface or other tributary drainage so lands more removed from the channel can be cultivated as well. Drainage is necessary to have productive farming operations on the soils encountered in this watershed. Both the Swaley Drain outlet and the Muskrat Creek are located within the boundaries of the Minesing Wetlands.

The Minesing wetlands is an area of approximately 6,000 ha comprised of a diverse assemblage of fens, marshes, swamps, and bogs that support a network of flora and fauna, some of which are identified as rare or endangered in Ontario and Canada. Minesing wetlands are located on both private and public lands, some of which are owned by the Nottawasaga Valley Conservation Authority (NVCA) and the Ontario Ministry of Natural Resources and Forestry (MNRF). Both of these agencies have monitored aspects of the wetlands and have a vested interest in the ecology and biodiversity of the feature. The wetlands are recognized for their local benefits to the watershed, such as flood attenuation, nutrient cycling, wildlife habitat and recreation (Rootham and Featherstone, 2014).

Recently, local farmers have requested, through the *Drainage Act* process, that the Township of Springwater evaluate options improve the existing drainage condition at the Swaley Drain outlet. Several farm properties have noted that drainage has not been adequate to optimally farm their lands. The farm properties in question outlet to the Swaley Drain, in proximity to George Johnston Road, upstream of the Minesing Wetlands. Water levels in the Swaley Drain are elevated above the height of the tile drains later into the growing season, keeping the lands wet for too long, Improvements to the Swaley Drain and downstream have been requested to lower water levels earlier in the year.

As part of this process to evaluate the Swaley Drain and consider various alternatives to improve drainage, staff from K Smart and RiverStone met with representatives from NVCA and MNRF on May 23, 2017, to discuss the scope of natural heritage assessment work required to inform the project design and approvals process. Results of this meeting led to the development of a scope of work to direct the completion of the surveys and associated assessment completed herein. Given the remote nature of much of the lands associated with Muskrat Creek and the Swaley Drain, the complexity of the surveys required for this project are further hampered by the remote nature of the site and difficulties associated with accessing portions of the project area. As such, standard industry methods

for completing the following surveys have been employed to the extent possible, as well as some reliance on available data from the MNRF and NVCA, who have committed significant effort to gather ecological knowledge of the system.

Given the spatial extent of the Swaley Drain and Muskrat Creek within the Minesing Wetland, for the purposes of this report RiverStone has separated the study area into two (2) areas. The portion of the study area associated with the reach of the Swaley Drain extending from George Johnston Road to approximately 1000 m northwest of the existing open water portion of the drain will be referred to as the Swaley study area. The portion of the study area extending from the Nottawasaga River east and from the Downey Drain[1] south to the Muskrat Creek remnants will be referred to as the Muskrat Study Area (**Figure 1**).

Any improvements in the two study areas are proposed to be completed under the *Drainage Act*. The following report details the results of the background and field studies completed by RiverStone in 2018 and 2019 as well as recommendations to inform project design and the natural environment approvals process.

2 APPROACH AND METHODS

2.1 Guiding Environmental Legislation and Policy

The following policies (e.g., statutes, regulations, plans, guidance documents, etc.) were considered during both the field investigations and impact assessment:

- Federal *Migratory Birds Convention Act*, S.C. 1994, c. 22, including:
    - Migratory Birds Regulations.
- Federal *Fisheries Act*, R.S.C. 1985, c. F-14, including:
    - *Applications for Authorization under Paragraph 35(2)(b) of the Fisheries Act Regulations*, S.O.R/2013-191
    - Fisheries Protection Policy Statement (Oct. 2013)
- Federal *Species at Risk Act*, S.C. 2002, c. 29.
- *Provincial Policy Statement*, 2014, pursuant to the *Planning Act*, R.S.O. 1990, c. P.13, including:
    - Significant Wildlife Habitat Technical Guide (OMNR 2000)
    - Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 (OMNR 2010)
    - Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E, January 2015 (OMNRF 2015)
- Provincial *Endangered Species Act* (ESA), S.O. 2007, c. 6, including:
    - Ontario Regulation 230/08: Species at Risk in Ontario List

[1] The Downey Drain is a municipal drain constructed in the 1960's to the north of the Muskrat Creek, and in this area, exists along an unopened road allowance. It has a separate and more downstream outlet into the Nottawasaga River.

  - Ontario Regulation 242/08: General
- Provincial *Conservation Authorities Act*, R.S.O. 1990, c. C.27, including:
  - O. Reg. 172/06 – Nottawasaga Valley Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses

2.2 Information Sources Used to Assess Study Area Conditions

Background information pertaining to the natural features and functions of the study area was obtained from the following sources:

- **MNRF Natural Areas Mapping and Natural Heritage Information Centre (NHIC) database** regarding information on occurrences of species at risk (SAR) and provincially tracked species (squares: 17NK8720, 17NK8820, 17NK8920, 17NK9020, 17NK9120, 17NK8619, 17NK8719, 17NK8819, 17NK8919, 17NK9019, 17NK9119, 17NK,9219, 17NK9319, 17NK8618, 17NK8718, 17NK8818, 17NK8918, 17NK9018, 17NK9118, 17NK9218, 17NK9318, 17NK9418; accessed June 20, 2017 and October 28, 2019, at: http://www.giscoeapp.lrc.gov.on.ca/web/MNR/NHLUPS/NaturalHeritage/Viewer/Viewer.htm
- **Online databases of the Ontario Breeding Bird Atlas (OBBA) project and the Atlas of the Breeding Birds of Ontario, 2001–2005** (Cadman et al. 2007a) regarding birds that were documented to be breeding in the vicinity of the subject lands during the 2001–2005 period (atlas square numbers: 17NK81, 17NK82, 17NK91, 17NK92)
- **Ontario Reptile and Amphibian Atlas** database regarding records of reptiles and amphibians that have been observed within the vicinity of the study area (square: 17NK81, 17NK91; accessed June 20, 2017 and October 28, 2019 at http://www.ontarioinsects.org/herpatlas/herp_online.html).
- **Atlas of the Mammals of Ontario** (Dobbyn 1994) regarding records of mammals in the vicinity of the study area.
- **Physiography of Southern Ontario** (Chapman and Putnam 2007) for information pertaining to the physiography and soils within the vicinity of the study area.
- **Minesing Wetlands Biological Inventory** (Bowles et al. 2007) for information pertaining to the physiography, soils, flora, and fauna within the vicinity of the study area.
- **Great Lakes Conservation Blueprint for Terrestrial Biodiversity, Volume 2** (Henson and Brodribb 2005) regarding terrestrial biodiversity within Ecodistrict 6E-6 (Barrie).
- **Great Lakes Conservation Blueprint for Aquatic Biodiversity, Volume 2** (Phair et al. (2005) regarding aquatic biodiversity within tertiary watershed 2ED (Nottawasaga).
- **NVCA monitoring records, accessed through NVCA staff**
- **MNRF monitoring data, accessed through MNRF staff**
- **Digital Ontario Base Maps** (OBMs; 1:10,000)
- **Historical and Current Aerial Photographs** of the study areas.
- **Site Investigations** by RiverStone staff (see **Section 2.3**).

2.3 Site Investigations

Table 1 below details the site investigations and field surveys completed by RiverStone in 2017 and 2018.

Table 1. Site investigations and primary tasks.

Date	Primary Task(s)	Staff
May 23, 2017	Preliminary site walk with agency staff	A. Shaw G. Cunnington
May 28, 2018	Breeding Bird Survey, Turtle Basking Survey Vegetation Inventory, Vegetation community mapping, incidental wildlife observations	L. Wilson W. Barbour
June 1, 2018	Breeding Bird Survey, Turtle Basking Survey Vegetation Inventory, Vegetation community mapping, incidental wildlife observations	L. Wilson W. Barbour
June 7, 2018	Breeding Bird Survey, Turtle Basking Survey Vegetation Inventory, Vegetation community mapping, incidental wildlife observations	L. Wilson J. Gauthier
June 15, 2018	Turtle Basking Survey, Acoustic Monitor Deployment, incidental wildlife observations	W. Barbour J. Gauthier
June 26, 2018	Breeding Bird Survey, Turtle Basking Survey, Acoustic Monitoring Deployment, incidental wildlife observations	J. Gauthier Technician
July 6, 2018	Acoustic Monitor Retrieval, incidental wildlife observations	J. Gauthier Technician
October 26, 2018	Fall vegetation survey, incidental wildlife observations	W. Barbour C. Mann
June 12, 2019	Drain construction review, incidental wildlife observations, site walk	A. Shaw

Evidence for the presence of a species (or use of an area by a species) was determined from visual and/or auditory documentation (e.g., song, call) and/or observation of nests, tracks, burrows, browse, skins, and scats (where applicable). Natural features of conservation interest (e.g., SAR habitat, etc.) were digitized and delineated in the field with a high accuracy GPS. Features of interest were photographed, and all information collected was catalogued for future reference. Representative photographs detailing onsite conditions are provided in **Appendix 1**.

2.3.1 Habitat-based Approach

RiverStone's approach to site assessment is both field based and habitat-based. The habitat-based approach means that our field investigations first focus on evaluating the potential for features within an area of interest to function as habitat for species considered potentially present, rather than searching for live specimens. An area is considered potential habitat if it satisfies a number of criteria, usually specific to a species, but occasionally characteristic of a broader group (e.g., several turtles of conservation interest use sandy shorelines for nesting, numerous fish species use areas of aquatic vegetation for nursery habitat). Physical attributes of a site that can be used as indicators of its potential to function as habitat for a species include structural characteristics (e.g., physical dimensions of rock

fragments or trees, water depth), ecological community (e.g., meadow marsh, rock barren, coldwater stream), and structural connectivity to other habitat features required by the species. Species-specific habitat preferences and/or affinities are determined from status reports produced by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Cadman et al. (2007b), published and unpublished documents, and direct experience.

In instances where habitat features are such that either (i) a species presence cannot be easily determined through an assessment of habitat feature alone, or (ii) habitat features are such that they suggest a species may be present in an area where development is proposed and impacts are likely, RiverStone adds an additional level of rigor to our work by completing further species-specific assessments (e.g., Whip-poor-will call surveys, acoustic surveys for Bats, etc.) in accordance with applicable standard methods and protocols.

2.3.2 Vegetation

2.3.2.1 Vegetation Community Characterization

The ecological communities with the study areas were characterized in accordance with Ontario's Ecological Land Classification (ELC) system. The ELC system defines ecological units or communities based on bedrock, climate (temperature, precipitation), physiography (soils, slope, aspect), and corresponding vegetation. Use of the system permits biologists and other land managers to use a common language to describe ecological communities, which in turn facilitates the identification of communities likely to support features or functions of conservation interest. The ELC system is an organizational framework that can be applied at different scales. The ecological units most useful for site-specific evaluations are ecosites and vegetation types (also known as ecoelements). Vegetation types are the finest level of resolution in the ELC system and are recurring patterns found in the plant species assemblages that are associated with a particular ecosite (Lee et al. 1998).

The ELC system is continually evolving as provincial working groups strive to improve the classification to cover the full breadth of community diversity in Ontario. Since the publication of Lee et al. (1998), further designations have been developed for many communities not in the original classification system, and existing codes have been modified to convey additional information. To reflect these changes, we provide the new community names and codes where applicable, followed by the old codes from Lee et al. (1998) in square brackets. Forest communities were classified according to Chambers et al. (1997).

2.3.2.2 Vascular Plant Survey

A vascular plant survey consisting of a comprehensive area search (“wandering transects”) occurred in accessible portions of the project area. Additional effort was applied in areas with the greatest potential to support endangered and threatened species, as well as provincially rare species. Nomenclature and common names for the recorded vascular plant species are generally consistent with the Southern Ontario Vascular Plant Species List (Bradley 2013). Targeted searches for Butternut (*Juglans cinerea*) were completed in portions of the study area that contained trees using a wandering transect method.

2.3.3 Wildlife

2.3.3.1 Anuran Calling Surveys

Calling anuran surveys were conducted using a modified version of the Marsh Monitoring Program for Surveying Amphibians (Bird Studies Canada 2009). This protocol involves the completion of surveys between April and June from 30 minutes after sunset until approximately midnight. Appropriate weather conditions include no or very light precipitation and wind speed ≤3 on the Beaufort wind scale. Given difficulties and health and safety concerns with accessing the project site during the time of day required to complete anuran call surveys (i.e., evening/night), acoustic monitoring equipment (Wildlife Acoustics SM3) was used to record calling anurans on multiple evenings at each study area.

2.3.3.2 Breeding Birds

Breeding Birds Surveys

Breeding bird surveys were conducted in accordance with the Ontario Breeding Bird Atlas (OBBA) protocol (Bird Studies Canada et al. 2001). Surveys were designed to target forested portions of the project area between May 24–July 10. Each survey was completed between dawn and 5 hours after dawn under suitable weather conditions (i.e., no rain, wind speed ≤3 on the Beaufort Wind Scale).

Least Bittern and Marsh Bird Surveys

Surveys for Least Bittern (*Ixobrychus exilis*) and other Marsh Birds were completed using acoustic monitoring equipment. Given the difficulties in accessing the project area, acoustic monitoring equipment was employed to provide more data than typical auditory surveys, were conducted in accordance with the National Least Bittern Survey Protocol (Jobin et al. 2011). Typically, surveys for Least Bitterns involves the completion of three (3) surveys between approximately mid-May and mid-July from 30 minutes before sunrise to 10:00h. Each survey lasts thirteen (13) minutes and consists of five (5) minutes of passive listening, five (5) minutes of broadcasted Least Bittern “coo” calls, followed by a further three (3) minutes of passive listening.

The *Marsh Monitoring Program for Surveying Marsh Birds* (Bird Studies Canada 2008) involves completing two (2) surveys between May 20 and July 5 at least 10 days apart during the morning or evening under appropriate weather conditions (i.e., no precipitation, good visibility, wind speed ≤3 on the Beaufort wind scale). Each survey lasts fifteen (15) minutes, and consists of five (5) minutes of passive listening, five (5) minutes of broadcasted calls (Least Bittern, Sora, Virginia Rail, Common Moorhen/American Coot, Pied-billed Grebe), followed by a second five (5) minutes of passive listening.

To survey for both Least Bittern and Marsh Birds, RiverStone completed a total of three (3) surveys between mid-May and mid-July. Each survey consisted of recording ambient sounds for a total of three (3) hours for three (3) consecutive days resulting in a total of nine (9) survey hours per sampling station. Daily and seasonal timing of recordings were consistent with the National protocol. No call broadcast was included in this survey.

2.3.3.3 Turtles

Visual Encounter Surveys

Visual encounter surveys for turtles were conducted in accordance with both the *Occurrence Survey Protocol for Blanding's Turtle (Emydoidea blandingii) in Ontario* (OMNR 2014) and the *Occurrence Survey Protocol for Spotted Turtle (Clemmys guttata) in Ontario* (OMNR 2013). Notwithstanding a few small methodological differences, the Blanding's Turtle and Spotted Turtle protocols overlap considerably, allowing surveyors to complete both protocols at the same time. Both protocols involve conducting five (5) separate surveys spread out over a minimum three (3) week period between ice-out (i.e., April) and June 15 under appropriate weather conditions (e.g., generally sunny conditions, no rain). Although Spotted Turtle surveys can occur at temperatures of at least 6°C, all turtle visual encounter surveys were completed when air temperatures were at least 10°C since this is a requirement of the Blanding's Turtle survey protocol. Where possible, surveys were timed to target warm days following cool or inclement weather, which would increase the chances of encountering basking turtles. Vegetation communities and habitats with a potential to function as habitat (i.e., overwintering, basking, feeding) for species at risk turtles were surveyed.

2.3.3.4 Snakes

While incidental observations of snakes were recorded during the site investigations, targeted visual encounter surveys for snakes were completed in 2019. The goal of these surveys was to identify general locations where snakes are present during the active season.

2.3.3.5 Fish and Fish Habitat

When completing a fisheries assessment, it is recommended by the MNRF that the following be completed:

1) confirm the presence or absence of fish habitat
2) identify any potential fisheries features including intermittent watercourses and seasonally flooded areas, and assess their importance in terms of supporting fisheries functions
3) determine the fish communities located at a specific site and understand the life-cycle requirements
4) determine the sensitivity of the fish habitat on a site-specific basis

Where possible, aquatic features that were encountered were assessed for several important characteristics. Key characteristics assessed include the physical dimensions of the channel, thermal regime, groundwater sources, and adjacent vegetation. Site-specific information collected includes channel structure, instream cover, substrate type, stability, type and density of riparian vegetation, and location of groundwater upwellings.

Based on the observation of potential access points, in both the Swaley and Muskrat portions, accessing the creek within the wetland habitats was not possible with electrofishing equipment. Given these difficulties, fisheries data available from MNRF and NVCA from upstream areas were used to approximate the species presence within the open water sections of the Swaley Drain and Muskrat Creek.

2.4 Natural Features of Conservation Significance

"Natural features of conservation significance" represent natural heritage features and habitats that have recognized status within the relevant planning jurisdiction in which an activity is proposed. As noted previously given that the study area is located in Ecoregion 6E, significant natural features were identified through the background information sources outlined in **Section 2.2** of this report.

3 BIOPHYSICAL FEATURES AND FUNCTIONS

3.1 General Site Description

Minesing Wetlands are comprised of a mosaic of swamp, marsh, and fen communities. These wetlands extend over an area of approximately 6000 hectares (15,000 acres) on lands owned by private landowners, County of Simcoe, NVCA, and MNRF. According to the NVCA, the Minesing Wetlands are comprised of several unique communities that provide habitats similar to both boreal forests typically located much further north and swamps found much further south in the eastern United States (Bowles et al. 2007). These wetlands are comprised of a mosaic of communities that supports several rare vegetation communities and species. NVCA has identified the Minesing Wetlands as a major staging area for migratory birds and a diverse assemblage of breeding bird species (Bowles et al. 2007). During winter months the coniferous swamps located within the larger wetland complex are known to provide deer yard habitat. The Minesing Wetlands is identified as a Provincially Significant Wetland in Ontario, an Area of Natural and Scientific Interest,

3.1.1 Physiographic Setting

The Minesing Wetlands were formed during the retreat of the Wisconsin glaciers ~12,000 years ago (Bowles et al. 2007). The wetland communities emerged from Glacial Lake Algonquin approximately 8,000 years ago within the area now known as the Simcoe Lowlands (Chapman and Putnam 2007). Not surprisingly, the soils in this area are primarily influenced by glaciolacustrine deposits that resulted from retreat of the glaciers. Deep organic peat deposits dominate the wetlands, with portions of the western boundary of the wetlands being dominated by poorly drained silt/clay loam. Currently, water levels within the majority of the wetlands are controlled by flows entering this area from several watercourses and leaving the wetland through the Nottawasaga River. Water levels and flows in the eastern portion of the wetlands are sustained by groundwater discharge, that is isolated from the remainder of the wetlands to the west (Spoelstra and Post, 2012). The Nottawasaga River winds its way through the western portion of the Minesing Wetlands and contains natural flow constrictions that force spring runoff and storm event flows to back up into the wetlands (Bowles et al. 2007).

3.2 Vegetation

3.2.1 Vegetation Communities and Dominant Flora

Natural vegetation communities were characterized on several dates throughout 2018 and delineated through a combination of air-photo analysis and field investigations. Ecosite mapping is provided on **Figure 2** and **Figure 3**, and a general summary of the vegetation communities present within both study areas, Swaley and Muskrat) are provided below. A more comprehensive list of vegetation identified within the study areas is provided in **Appendix 2**.

3.2.1.1 Swaley Drain Outlet

Vegetation communities in the vicinity of the Swaley Drain outlet in the proposed project area are relatively consistent along both sides of the drain throughout the study area. This area is consistently flooded to various depths of water with numerous areas of deep organic and sink holes. Reed Canary Grass is the dominate vegetation species comprising of a very thick mat of dense grass with the vegetation community best represented by Reed-canary Grass Organic Meadow Marsh (MAN3-2). Additional species present in this community include scattered American Elm, and willow shrub. This community extends beyond the study area and transitions into a *Willow Organic Thicket Swamp (SWT3-2)*. To the south of this community, there seems to be a slight increase in elevation that has allowed a tree community of White Elm Mineral Deciduous Swamp (SWD4-2) community to establish. This community consists primarily of American Elm (*Ulmus americana*) that mostly look to be in a declining condition.

3.2.1.2 Muskrat (Adjacent to the River and the Downey Drain)

Three vegetation communities are present in the vicinity of the proposed access and construction activities along Muskrat Creek. From the east access point extending from Ronald Road, vegetation communities are very wet and seasonally flooded. The primary vegetation community to the east of the Nottawasaga River is a Swamp Maple Organic Deciduous Swamp (SWD6-3). This community is located to the north and south of the drain/berm along the access and extends to the south of Giffen/Downey Drain. Canopy species consist largely of large Freeman's Maple (*Acer X freemanii*), with Crack Willow (*Salix euxina*) and Shining Willow (*Salix lucida*) present. The shrub layer consisting primarily of willow species (Salix sp.) with Fowl Manna Grass (*Glyceria striata*), and Tall Manna Grass (*Glyceria grandis*) is abundant in the understory. In east-central portion the access route, there is a community of Willow Organic Thicket Swamp (SWT3-2) that is dominated by young willow species with regenerating maple species and Fowl Manna Grass, and Tall Manna Grass present. This community transitions into the SWD6-3 community in all directions.

Along the Nottawasaga River the topography is slightly elevated with depositional material along the shoreline, which is the subject of any proposed work along the river. This shoreline area seasonally floods. Consistent standing water within this community is largely present to the east of the shoreline allowing for slightly dryer conditions within close proximity to the berm and shore. The vegetation community that best represents the seasonally flooded area is a Bur Oak Mineral Deciduous Swamp (SWD1-2), recognising that there is a component of Common Hackberry (*Celtis occidentalis*) in the vegetation community. Species present in the canopy consist of Bur Oak (*Quercus macrocarpa*), Common Hackberry, Freeman's Maple, and Green Ash (*Fraxinus pennsylvanica*). The vegetation in the consistently flooded area to the east is similar to the vegetation community noted above for the Swaley Drain (Reed Canary Grass Organic Meadow Marsh, MAN 3-2)

3.3 Wildlife

3.3.1 Anurans

RiverStone completed acoustic surveys for anurans in June 2018. While this timing does not permit the detection of several early breeding species (e.g., Spring Peeper [*Pseudacris crucifer*] American Toad [*Anaxyrus americanus*], etc.) several species of anurans that require permanent bodies of water (e.g., Green Frogs, [*Lithobates clamitans*], Bullfrog [*Lithobates catesbeianus*]) breed during this period. Results of RiverStone's acoustic and onsite incidental observations documented, Green Frogs, Bullfrogs, Grey Treefrog (*Hyla versicolor*), Northern Leopard Frog (*Lithobates pipiens*), Wood Frog

(*Lithobates sylvaticus*), Spring Peeper, and American Toads (*Anaxyrus americanus*). These species were identified by sight or sound (i.e., call) with individuals of all species encountered being present in both study areas.

3.3.2 Breeding Birds

3.3.2.1 Breeding Bird, Least Bittern, and Marsh Bird Surveys

Breeding bird surveys and acoustic recorders were used to document avifauna present in both the Swaley and Muskrat study areas in 2018. The full results of these surveys are provided in **Appendix 3**.

A total of seventy-one (71) bird species were recorded during the breeding bird and acoustic surveys. The assemblage and abundance of birds recorded during these surveys generally reflects the prevailing structure and composition of on-site vegetation communities as characterized on **Figure 2** and**Figure 3**. Bird species that breed and forage in deciduous forests and swamps were generally the most widely documented and included Red-eyed Vireo (*Vireo olivaceus*), Veery (*Catharus fuscescens*), Great Crested Flycatcher (*Myiarchus crinitus*), and Yellow-bellied Sapsucker (*Sphyrapicus varius*). Areas with a greater abundance of woody understory vegetation and/or shrubs (i.e., thicket swamps or forest edges) contained species such as Common Yellowthroat (*Geothlypis trichas*), Chestnut-sided Warbler (*Setophaga pensylvanica*), and Swamp Sparrow (*Melospiza melodia*).

Four (4) significant bird species were recorded during the surveys. Eastern Wood-pewee (*Contopus virens*) is provincially designated as Special Concern and was recorded in both the Swaley and Muskrat study areas. Barn Swallow (*Hirundo rustica*) is provincially designated as Threatened and was recorded foraging over the fields and wetlands north of the Swaley Drain, likely associated with barn structures near the project site. Bobolink *(Dolichonyx oryzivorus*) is designated as Threatened in Ontario; this species was documented in the farm fields in the Swaley study area. Finally, Least Bittern (*Ixobrychus exilis*) another species listed as Threatened in Ontario was documented in both the Swaley and Muskrat study areas. Least Bittern was observed flying overhead at the Muskrat study area but was not documented actively using this area. Multiple Least Bitterns were documented in the tall emergent vegetation associated with the end of the open water portion of the Swaley Drain suggesting that this species is likely nesting in this area.

3.3.3 Turtles

Visual encounter surveys for basking turtles were completed in May and June of 2018. A total of five (5) separate visual encounter surveys were completed. Generally, observations of basking turtles were limited in 2018. Within the Swaley study area, both Snapping Turtles (*Chelydra serpentina*) and Painted Turtles (*Chrysemys picta*) were observed. Downstream in the Muskrat study area only Painted Turtles were documented. No Endangered or Threatened Turtle species were observed during targeted surveys. The limited number of species observed during targeted surveys for Turtles is likely related to the complexity of the habitat features present that make visual observations of individuals quite difficult and as such, we do not believe it is reflective of limited habitat, but limited success in observation for these species.

3.3.4 Snakes

No congregations of basking snakes or groupings of snakes were observed during onsite assessments or during any of the other surveys completed within the study areas. The targeted surveys did identify Northern Watersnakes (*Nerodia sipedon sipedon*) and Eastern Gartersnakes (*Thamnophis sirtalis*

sirtalis). Results of these surveys suggest that there is a low likelihood that any significant snake hibernacula are present within the proposed improvement areas. This observation is also reflective of the type of habitat found in the study areas.

3.3.5 Fish and Fish Habitat

3.3.5.1 Swaley

The open water portion of the Swaley Drain assessed by RiverStone extended from George Johnston Road to where the open drain effectively 'ends' in the larger wetland complex to the west. As is typical in drains, fish habitat structure was found to be limited with no complex features, such as course woody debris or rock features, which often conflict with the noted intent of municipal drains. The banks of the drains were stable and well vegetated. The drain lacks features that are typical of a riverine system (i.e., lack of pools, riffles, and runs) and was found to be more typical of wetland communities (i.e., open pools with limited flow velocity). Substrates within these features are dominated by organics with minimal sections of aquatic vegetation.

East of George Johnston Road, the Swaley Drain is in close proximity to Willow Creek, less than 100 m. Willow Creek winds its way south away from Swaley after passing under George Johnston Road before turning west and eventually north within the larger Minesing Wetland complex. The Willow Creek was excavated similar to a drain privately and not through the *Drainage Act*, across a full Concession, downstream of George Johnston Road. Willow Creek outlets into the Nottawasaga River upstream of the general vicinity of its confluence with Muskrat Creek. Based on communications with K Smart and NVCA Staff, RiverStone understands that in the spring high water conditions, the narrow strip of land at George Johnston Road separating the Swaley Drain and Willow Creek is not flooded; however, further downstream, there is a regular connection between the Swaley Drain and Willow Creek during flood conditions, Due to access and safety considerations, RiverStone was unable to complete targeted sampling of fish community within the Swaley Drain. Given the regular seasonal connection between the Swaley Drain and Willow Creek, it is assumed that the fish communities have previous mixed between these two features and therefore are similar. Fish community sampling data for Willow Creek downstream of George Johnston Road was provided by NVCA (**Table 2**) which suggests that these features contain a warmwater community.

Table 2. Fish collected by NVCA in Willow Creek between 2011-2014.

Common name	Scientific name
Black Crappie	*Pomoxis nigromaculatus*
Blacknose Dace	*Rhinichthys atratulus*
Bluntnose Minnow	*Pimephales notatus*
Brook Stickleback	*Culaea inconstans*
Central Mudminnow	*Umbra limi*
Common Shiner	*Luxilus cornutus*
Creek Chub	*Semotilus atromaculatus*

Common name	Scientific name
Fathead Minnow	*Pimephales promelas*
Johnny Darter	*Etheostoma nigrum*
Lamprey	*Petromyzontiformes sp.*
Mimic Shiner	*Notropis volucellus*
Mottled Sculpin	*Cottus bairdii*
Pumpkinseed	*Lepomis gibbosus*
Rock Bass	*Ambloplites rupestris*
Round Goby	*Neogobius melanostomus*
White Sucker	*Catostomus commersonii*

This is the type of community expected in an open drain habitat feature, which is typically slow moving and allows water to warm up. The appearance of the Mottled Sculpin suggests that there may be some groundwater influence at the data collection location as they do prefer cool/coldwater habitat. The Round Goby is an invasive species in Ontario and would have moved into the Swaley and Willow Creek watersheds possibly through their connection with Little Lake.

3.3.5.2 Muskrat

In the downstream portion of the study area associated with Muskrat Creek, the channel lacks definition in most areas as the remnants of the watercourse winds its way through the larger wetland community. Substrates in this area are dominated by organics; extensive and continuous areas of aquatic vegetation are also present. No formal connection between the Nottawasaga River and Muskrat Creek was documented; however, topography in this area is relatively flat suggesting that during high flows (e.g., spring runoff, storm events, etc.) these features are likely to become temporarily connected. The lack of a formal defined confluence between Muskrat Creek and the Nottawasaga River is a key component of this assessment and the overall drainage improvement project. It is expected that this is an area that if connected to the River with a defined channel, would promote additional drainage of water from the wetland and would provide a small reduction of the Muskrat creek remnant wetlands water level, downstream into the Nottawasaga River (150mm ±). This could assist in the lowering at the Swaley Drain outlet further upstream, although given the distance upstream, the effect may not be realized.

At the lower reaches of the Muskrat Creek, there is a short distance north to the Downey Drain. Agricultural lands to the south of Ronald, Fralick and Glengarry Lands Roads drain south to the Downey Drain, which flows northwest to its outlet with the Nottawasaga River. The outlet of the Downey Drain is further downstream on the Nottawasaga River, than the Muskrat Creek. Although we did not attend the outlet, it is our understanding that K Smart Associates observed that the Downey

Drain outlet is open and offers a direct connection for the movement of fish between the River and drain.

3.3.6 Habitat of Endangered and Threatened Species

The results of RiverStone's desktop, habitat-based, and targeted assessments for Endangered and Threatened species and their habitat are provided in **Appendix 4**. The preliminary screening identified the potential for twenty (20) Endangered or Threatened species to be present within the study areas based on existing records and/or range maps. This initial list of species was further refined to those that had the potential to be present or use communities within the study areas. Per the results of the targeted surveys (**Section 3.3**) and **Appendix 4**, Endangered and Threatened species that are present, or very likely present, and have the potential to be impacted by the proposed drainage works considered herein are identified below in **Table 3**. An impact assessment is provided for each species in **Section 5.2**.

Table 3. Endangered and Threatened species with the potential to be impacted by proposed improvement activities within the Swaley Drain and Muskrat Creek.

Species	**Status per the *Endangered Species Act* (O. Reg. 230/08)**
Blanding's Turtle (*Emydoidea blandingii*)	Threatened
Spotted Turtle (*Clemmys guttata*)	Endangered
Least Bittern (*Ixobrychus exilis*)	Threatened
Bobolink (*Dolichonyx oryzivorus*)	Threatened
Lake Sturgeon (*Acipenser fulvescens*)	Endangered
Little Brown Bat (*Myotis lucifugus*)	Endangered
Northern Long-eared Bat (*Myotis septentrionalis*)	Endangered

3.4 Natural Features of Conservation Interest

Based on the biophysical information collected during background information gathering (per **Section 2.2**) the following features of identified conservation interest are present within the study areas.

3.4.1 Provincially Significant Wetlands

The Minesing Wetlands have been identified as being Provincially Significant and are comprised of a mosaic of swamp, marsh, and fen communities (Bowles et al. 2007). This wetland is known locally as the Provincially Significant Minesing Swamp Complex (SP6). The significance of this wetland complex is associated with its large size and the presence of globally and provincially rare vegetation communities and species. Additionally, the wetland complex provides waterfowl staging areas, deer wintering habitat (i.e., Deer Yard), heronries that support populations of Great Blue Herons, the largest complex of fen communities in Ontario, and several unique/rare forest communities (Bowles et al. 2007).

3.4.2 Areas of Natural and Scientific Interest

The Minesing Wetland has been identified as a Provincially Significant Life Science Area of Natural and Scientific Interest (ANSI) (Bowles et al. 2007). The area encompassed by the ANSI designation includes both the proposed Swaley Drain and Muskrat River areas of proposed drain improvement.

4 PROPOSED IMPROVEMENTS

The Township of Springwater is seeking to address upstream high water level and drainage concerns proximate to the Swaley Drain by completing improvements to the Swaley Drain outlet and possibly to the downstream Muskrat Creek remnants. The following details the proposed improvements with locations and extents of proposed works provided on **Figure 4** and **Figure 5**.

4.1 Swaley Drain

Proposed works at the Swaley Drain are primarily associated with improvements to the downstream end of the drain. Currently, the open water portion of the drain ends abruptly within the larger Minesing Wetland complex (**Figure 4**). A small channel approximately 6 m in top width and approximately 0.5 m in depth is proposed to be excavated as a downstream continuation of the Swaley Drain. A 10 m wide path of wetland vegetation will need to be cleared in order to accommodate construction machinery to create the 6 m channel. This channel would extend west from the existing extent of open water, downstream approximately 550 m along the original route of the Swaley Drain (**Figure 4**), which is intended to improve connection with the Muskrat Creek remnants. An additional 450 m of channel in a north direction would then be excavated along the route of the Muskrat Creek remnants/former creek.

Choosing the preferred construction methodology required the consideration of a combination of safety, operator confidence, and environmental impact, which is discussed below.

Regardless of the proposed methodology, the expectation is that an excavator would be dredging a channel and the material would need to be disposed of, either onsite at the location of excavation creating a spoil berm, or moved to another location, outside of the wetland. It should be noted that the spoil berm would not exceed the depth of water and would therefore be submerged. It was determined that the removal of the material offsite was not feasible, given the difficulty and distance that material would need to be moved and the timeframe to do so, which would lead to a very large increase in cost.

At least five methods of completing the excavation have been contemplated and assessed for suitability and potential environmental impacts. These methods were as follows;

- Excavator alone, without the aid of any mats or substrate.
- Excavator alone, with the aid of mats.
- Use of high float excavator.
- Place excavator on a barge during spring, high-water conditions.
- Place excavator on a barge during winter, excavating additional material near the existing Swaley outlet (where wetland water depths are shallower) to allow the barge to move[2].

[2] This additional depth of excavation could serve as a deeper pool habitat

The five excavator methods have been evaluated by K. Smart Associates and RiverStone as follows:

Excavator alone with no mats or substrate
- Such is not possible due to continuous depths of wetland waters varying from 0.5m to 1.1m.
- Due to soft soils and the overlying water, a contractor would not try to do the work without at least mats.

Excavator alone on mats or other substrate
- An excavator can only work on mats if water depths are less than 0.6m.
- Most of the work at the Swaley end would be in depths greater than 0.6m and would prohibit this option here.
- The only other substrate considered at the Swaley end would be to construct a clay berm first on which the excavator could work. The initial, and permanent, additional disruption/destruction to the wetlands would not be desirable due to the greater width of disturbance and the permanent and evident berm along the channel. Much haulage in of imported materials would be necessary with even additional disruption.
- An excavator working on mats would be recommended for the work done at the Downey/Muskrat area since water depths there would be below 0.6m.
- Where an excavator can work on mats, disruption and costs are lower.

High Float Excavator
- This type of excavation would be possible and could be done without mats.
- The impacts and cost of doing the work by this method would be comparable to work by excavator on barge.
- Unfortunately there are no known high float excavators in Ontario or perhaps even in Canada at this time. Such equipment would have to be rented in, and transported from, the southern states of the U.S. at high cost.
- If a high float excavator could be made available in Ontario in the future, such could be considered when construction is being tendered.

Place Excavator on Barge and do work in Spring High Water Periods
- Performing the work at the Swaley outlet area by barge is the only viable option given the continuous wetland water depths.
- If the work were done in the spring, overdigging to allow the barge to work near the current Swaley end could be avoided.
- However, working in the spring is perhaps the least desirable time of year to work due to the impact on wetland species.
- This option could not be recommended from an environmental perspective.

Place Excavator on Barge and do work in Winter Periods
- This is the only viable means, at this time, of doing the work at the Swaley end and the work could be done in the most desirable time of year from an environmental perspective.
- Some channel enlargement would have to occur where the depths of wetland waters are less than 1.0m at the time of work since a barge requires 1.0m of water in order to work.

4.2 Muskrat Creek

At the lower end of the Muskrat Creek proximate to the Nottawasaga River, proposed improvements were initially largely focused on the reconnection of the creek to the larger river. Currently, a sediment levee blocks Muskrat Creek from outletting directly into the Nottawasaga in all but high-water events. The initial thoughts for the work would involve.

- The outlet of Muskrat Creek will be relocated to the north approximately 50 m and the sediment levee along the east bank of the Nottawasaga will be removed (**Figure 5**).
- Approximately 150 m of new channel will be north of the original 150 m of man-made channel and then 250 m further work would be excavated to connect to the creek (**Figure 5**).
- New connection to the River would allow wetlands waters at the Muskrat Creek remnants to lower by 150mm.
- Improvements within the Muskrat creek proper would be completed prior to relocating the outlet to the Nottawasaga.
- Improvements would be completed using heavy equipment that would access the project area via the Ronald Road allowance; a temporary culvert would be used to cross the Downey Drain before using mats to access Muskrat Creek remnants (**Figure 5**).

A second option for work at the lower end of the Muskrat Creek remnants has been more recently considered due to the negative impacts of making a new and direct connect to the Nottawasaga River. This second option would consider:

- Better connecting the lower reach of the Muskrat Creek remnants to the Downey Drain.
- The connection would be made in the location where the distance between the Muskrat Creek remnants and Downey Drain is a minimum.
- This option is intended to provide an alternative outlet that does not require any work at the Nottawasaga River, thereby minimizing any impacts in that regard.
- The outlet of the Downey Drain into the River is not blocked as it is for the Muskrat Creek and therefore does not require creating a new connection to the River.
- The connection to the River is also approximately one kilometre downstream of where a better Muskrat remnants connection to the Downey could be made.
- The survey work done by K Smart Associates Limited has identified that the Muskrat remnants wetlands waters already overflow to the Downey Drain.
- An improved connection of the Muskrat to the Downey Drain could lower the wetland waters by a similar 150 mm (or more even up to 300 mm if desired).

5 DISCUSSION, IMPACT ASSESSMENT AND RECOMMENDATIONS

Based on the results of the background information collected and site investigations detailed in **Section 3**, in concert with the proposed improvements activities outlined in **Section 4**, the following sections provide an overall assessment of potential impacts to the natural environment and identified natural features of conservation interest.

The overall purpose of the project is to lower water levels at the Swaley Drain outlet. The result of lowered water levels will be to permit lower water levels downstream and upstream of George

Johnston Road. Agricultural drain outlets on adjacent lands will then be able to function and suitably drain the associated agricultural lands.

In reviewing the potential impacts of the project, we reviewed the features and functions individually at both the Swaley Drain and Muskrat River project areas. In addition, the entire Minesing Wetlands was considered as a single functional unit. In reviewing the entire Minesing Wetlands, we carefully considered the findings of Rootham and Featherstone (2014).

Individually, each project area has several features and functions of interest that were considered, in order to recommend that the project move forward in each area. The project area at the east end of the wetlands is close to active agriculture and is within an Organic Meadow Marsh and Mineral Deciduous Swamp. These features contain a diverse vegetation community and considerable wildlife. The Swaley Drain essentially dead ends in the marsh habitat, forcing the water to slowly filter through the dense vegetation on its way downstream. This area functions as the initial filter for water going through the wetlands before eventually draining into the Nottawasaga River, and finally Georgian Bay. According to historical files, the Swaley Drain previously extended further into the marsh habitat than is currently seen on site.

At the western edge adjacent to the Nottawasaga River, the project area is covered by a deciduous swamp with the remnant channel of the Muskrat Creek. The lowest reach of the creek was not easily identified in the field as the channel is no longer defined. The area has been infilled and is continuous with the surrounding wetland; only a small depression through the higher lands through the east bank defines the former channel. A levee is also visible along the Nottawasaga River, severely constricting the movement of water form the wetland into the river. Our assessments at this study area found Least Bittern and Easter Wood Pewee, species classified as threatened and special concern, respectively, in Ontario. In the adjacent River, Lake Sturgeon are known to travel past the Minesing Wetlands on their spawning migration.

As a larger single wetland, the greater features and functions of the Minesing wetland should clearly be considered in the decision-making process. Following from Rootham and Featherstone (2014), the Minesing Wetlands are a significant local feature, functioning to cycle nutrients and provide critical wildlife habitat. It was also noted that the area provides considerable recreation opportunities and is a key component of flood attenuation for the watershed. Historically, a key component of the wetland was the coverage of deciduous and coniferous forest wetland complexes across the Minesing Wetland. Between 1953 and 2013, the loss of deciduous wetland forest was noted to be extensive, approximately 56% of total deciduous forest cover; converting to emergent marsh and thicket swamp wetland communities. This trend is expected to continue for the foreseeable future. A stable groundwater supply in the southeast has maintained the coniferous forest wetlands over the same time period.

The decline in deciduous forest cover was attributed to a few key items; Land use change, Dutch Elm disease, Hurricane Hazel, and climate change. Each of these key factors have acted together to increase water flow into the Minesing Wetlands and prolong the residence time, resulting in higher water levels over longer periods. These higher water levels have favoured open marsh and swamp habitats over the historic forested wetland communities. It has also been considered that the rising levels of the Nottawasaga River may be a factor.

In reviewing the potential impacts of completing the drain improvements at each study site, as detailed below, we are recommending a phased approach, working first at the upstream reach in the Swaley Drain. Following monitoring of the change in water levels for the affected farm lands, completion of

the drain improvement work at the Muskrat study site, by better connecting to the Downey Drain, may still be required to achieve the additional water level lowering at the drain outlets determined by K. Smart Associates. This could only be realized if the Downey Drain were not itself obstructed between the location of the proposed connection with the Muskrat Creek remnant and the connection with the Nottawasaga River. In our review, RiverStone did consider the potential benefits of undertaking the work at the Muskrat study site to better connect to the Downey Drain and formalize a channel outlet to more effectively drain water from the Minesing Wetlands; however, at this time we felt that the potential impacts of getting to the site with machinery through the wetland features and the unknown expected change in water levels throughout the wetland as a whole, lead us to prioritize the drain improvements at the Swaley site. Upon review by the NVCA, the potential benefits to the Minesing Wetlands by some additional lowering of the water levels at the Muskrat Creek may be weighed higher.

It is RiverStone's understanding that completing the proposed works at the Swaley Drain work area will achieve the majority of the intended objectives for the drainage improvements. Works proposed for the Muskrat Creek may achieve the remaining portion of the desired reduction in upstream water levels, but may not have an impact to water levels based on the dense wetland vegetation that holds water. As outlined below, the works proposed for Muskrat Creek have a higher potential to result in negative impacts to the natural features and their functions present within the study areas. The elevated risk for negative impacts is primarily associated with (1) the long distance through the wetland communities required to access the area of proposed works, and (2) the proximity of the works to the Nottawasaga River. Given these risks, from an ecological perspective, RiverStone would recommend that the works proposed for the Swaley Drain be completed first and the results of these works be reviewed for a period of time to determine if the works associated with Muskrat Creek remnants proximate to the /Downey Drain, are required.

The following assessment evaluates the potential for negative impacts resulting from the activities proposed in both the Swaley and Muskrat study areas. Where negative impacts are anticipated, recommendations to avoid, mitigate, and minimize impacts are provided.

5.1 Fish and Fish Habitat

The potential for negative impacts to fish and fish habitat comes primarily from land use change or construction practices that modify water quantity (baseflow), quality (chemical and thermal properties), or alters the physical structure both in-water (e.g., substrates, woody debris, aquatic vegetation, etc.) and within riparian buffers (e.g., removal of vegetation or soil).

Our assessment indicated that both the Swaley Drain and Muskrat Creek support communities of warmwater fish communities. These aquatic features have a permanent flow regime and provide direct aquatic habitat. As part of the proposed improvements, the extent of open water channel associated with both Swaley Drain and Muskrat Creek will be expanded through the excavation of the drains. While these new open water areas will provide direct fish habitat, as they are agricultural drains they will not likely contain in-water structural elements such as woody debris, rocks, etc. Over time it is anticipated that aquatic vegetation will establish within the new open water portions of the drains; this vegetation will provide opportunities for refugia and foraging for fish present within the system.

The potential impacts on fish and fish habitat are expected to be low; however, best management practices need to be implemented during construction to ensure that the quality of water in the Swaley Drain and Muskrat Creek are maintained. Given the extent of wetland within the areas of proposed

works, access to these areas by the heavy equipment required to complete the drain improvements will be challenging. To minimize the potential for impacts to fish and fish habitat resulting from the drain improvement works, RiverStone recommends the following:

- **All in-water improvement works are to be completed during winter months when the site is frozen. This timing will minimize the potential for impacts to fish and fish habitat while avoiding sensitive times of year (e.g., spawning).**
- **Disturbance and removal of riparian vegetation must be minimized, and all temporarily disturbed areas must be reinstated to original condition or better.**
- **Best Management practices should be utilized with all machinery operated within the study area to ensure that material and tracks are free from invasive species (*Phragmites australis*, etc.).**
- **Machinery should arrive on site in clean condition and is to be checked and maintained free of fluid leaks.**
- **Machinery must be refueled, washed and serviced a minimum of 30 m from wetlands that occur near the subject property boundary on adjacent lands.**
- **Locate all fuel and other potentially deleterious substances a minimum of 30 m from wetlands and drainage features. Minimize fuels and chemicals stored onsite and ensure a spills management plan and the associated spill response equipment is always available on-site for implementation in the event of a spill of deleterious material.**

5.2 Endangered and Threatened Species

As per **Table 3**, results of RiverStone's assessment of endangered and threatened species identified the potential for seven (7) endangered or threatened species and their habitat to be present within the areas of proposed improvements. The following provides an assessment of the potential impacts to these species and their habitats as a result of the proposed drainage improvements. In general, RiverStone recommends that:

- **The project details be submitted to MECP for review to ensure compliance with the provincial *Endangered Species Act*, 2007.**

5.2.1 Blanding's and Spotted Turtles

Blanding's Turtles and Spotted Turtles may be present within the study areas. While no individuals of these species were observed during targeted surveys, features present with the wetland communities are suitable to function as habitat for these species during both the active season and overwintering portions of the year. During the active season both of these species of turtles are anticipated to use the larger Minesing Wetland communities as basking, mating, and foraging habitat. Given the general lack of well drained areas with sandy, loamy, or gravel soils within the study areas, nesting habitat is not anticipated to be present.

During winter months, Blanding's Turtles and Spotted Turtles seek out areas of water within swamps, fens and marshes that are of sufficient depth to not freeze to the bottom. These areas typically contain soft substrates and woody vegetation. Within the Swaley study area, trees and woody vegetation is limited in the area of proposed improvements suggesting that this area has a lower potential to provide

hibernation habitat for these species than other portions of the Minesing Wetlands complex. Given the type of habitat features present, and to minimize the potential for impacts to these species RiverStone recommends:

- **All improvements to the drains be completed during winter months (i.e., November 1 to March 31).**

- **Prior to commencing work, MECP be contacted to obtain direction on how to proceed in the unlikely event that a Blanding's Turtle or Spotted Turtle are encountered during the completion of the drainage works (i.e., excavation).**

5.2.2 Bobolink

Bobolink is a species of songbird that is typically found in grasslands and hayfields. During spring and summer months, this species is found feeding on insects and seeds on the ground, using the tall grass and hay to conceal themselves and their nests. During targeted surveys in 2018, this species was detected in the agricultural fields adjacent to the study areas. Given the location of these observations, direct impacts as a result of improvements within the drains is not anticipated. However, the proposed access routes to transport heavy equipment to the working areas in the drains will traverse the adjacent agricultural areas. Based on the location of the habitat for these species, potential for impacts are associated with the movement of equipment through these areas. As per the recommendations outlined above to address impacts to fish and fish habitat, improvements to the drains are directed to occur during winter months. This timing will avoid the active season for Bobolink when individuals would be present. With the exception of traversing the habitat outside of the active season for this species, no impacts are anticipated. Additionally, by completing the works during winter months, impacts to vegetation and soil conditions within the agricultural fields will be minimized. Based on adherence to the recommended timing window of completing the works during winter months, no impacts are anticipated to this species or its habitat. To this end, RiverStone recommends that:

- **All improvements to the drains be completed during winter months (i.e., November 1 to March 31). Movement of heavy equipment through the agricultural communities adjacent to the improvement areas is to only occur during this time period.**

5.2.3 Least Bittern

Least Bittern are the smallest member of the heron family. This species is typically found in wetland communities showing a strong preference for cattail marshes with areas of open pools and channels. Lest Bittern construct nests above the water line in dense stands of cattails. Open water areas are required by this species for foraging as the favoured foods include frogs, small fish and aquatic invertebrates. During winter months, Least Bitterns migrate south to Mexico and Central America.

Least Bittern was documented during targeted surveys in both the Swaley Drain and Muskrat Creek study areas. As the proposed drain improvements include increasing the extent of open water areas with the larger Minesing Wetlands complex, the extent of suitable foraging habitat for this species will be expanded. As previously discussed, completion of the improvement works during winter months will avoid the portion of the year when this species is present in Ontario. Additionally, this timing will minimize impacts to remaining vegetation as a result of heavy equipment movement and operation. Based on adherence to the recommended timing window of completing the works during winter months, no impacts are anticipated to this species or its habitat. To this end, RiverStone recommends that:

- **All improvements to the drains be completed during winter months (i.e., November 1 to March 31).**

5.2.4 Little Brown and Northern Long-eared Bats

Both Little Brown and Northern Long-eared Bats are nocturnal, actively foraging for insects between April and October. During the day, these species seek out roosts in trees or building. In winter months these bats hibernate in caves or abandoned mines that contain temperatures that do not drop below freezing. In Ontario these species of bats are not at risk due to habitat factors as is typical with most endangered or threatened species. Dramatic reductions in bat populations are the result of White-nose Syndrome, which is a fungus that infects bats as they hibernate over winter. This fungus grows on their muzzle, ears and wing-membranes, continually waking them from hibernation, and causing dehydration which eventually results in mortality.

Within the study areas, habitat for these two species of bats are primarily associated with the mature trees in the Muskrat Creek study area that are proximate to the Nottawasaga River. No trees of sufficient size to provide roosting habitat for these species were identified in the Swaley Drain study area. Improvements to the mouth of Muskrat Creek and within the drain proper may result in damage to existing trees but is unlikely to require removal of a large number of trees. Small amounts of damage to limbs may result in additional roosting habitat for these species in this area. As previously discussed, completing the improvement works during winter months will avoid impacts to these species and their habitats. Based on this assessment, RiverStone is of the opinion that there is a low likelihood of Little Brown and/or Northern Long-eared Bats or their habitat being negatively impacted by the proposed drainage improvement works.

5.2.5 Lake Sturgeon

Lake Sturgeon are unlike other freshwater fish in that they have a skeleton made up of cartilage instead of bones. This species lives in freshwater lakes and rivers with soft substrates primarily dominated by mud, sand, and gravel. When not in their spawning habitat, Sturgeon are typically found in water depths between 5 and 20 m. Lake Sturgeon are present in Georgian Bay (Lake Huron) and are known to spawn in the Nottawasaga River. Research completed on Sturgeon in the Nottawasaga River identified spawning sites a considerable distance both upstream and downstream of the Muskrat Creek study area (Pers. Com. J. Benvenutti, MNRF). Young-of-year Sturgeon that hatch in spawning habitat upstream must travel downstream past the study area on their way to Georgian Bay. Adult and young-of-year Sturgeon are present within the Nottawasaga River during the ice-free season suggesting that the best time to complete in-water works would be during winter months.

As part of the proposed improvements include removing the existing sediment berm located at the mouth of Muskrat Creek which would functionally reconnect this feature to the Nottawasaga. An alternative being considered is to redirect the lower reach of the Muskrat Creek north, through a newly excavated channel, to empty into the Downey Drain before flowing into the Nottawasaga.
From an environmental perspective only, altering the flow path of the Muskrat to drain into the Downey Drain has much less impact than reconnecting the Muskrat Creek to the Nottawasaga. This is primarily due to not needing to alter the banks of the Nottawasaga River, which could potentially impact fish habitat and the habitat of Lake Sturgeon.

Both options to outlet the Muskrat Creek, to the Nottawasaga or to the Downey Drain, were initially considered; however the connection to the Downey Drain is the preferred alternative if this work is considered. Although the outlet connections have differing impacts, getting the necessary heavy equipment to the lower reaches of the Muskrat Creek to complete the work, will have similar impacts for both options. The heavy equipment will need to cross the Downey Drain and traverse wetland habitats. We expect that similar techniques used to access and complete the work further east on the Swaley Drain will also be employed for the Muskrat Creek work, with the recommendations noted above being applied. The following additional recommendations are provided, given the presence of Lake Sturgeon and their spawning habitat should the option to breach the Nottawasaga River be chosen for some unforeseen reason in the future:

- **All improvements be completed during winter months (i.e., November 1 to March 31).**
- **Prior to commencing work to remove the sediment berm, suitable sediment control measures (e.g., marine silt curtain, coffer dam, sheet piling, etc.) must be installed in the Nottawasaga River to ensure that sediment is not able to migrate downstream.**
- **Should the Detailed design and phasing of the removal of the sediment berm must be submitted to DFO, MNRF, and MECP for review prior to commencing with any associated works.**

5.3 Other Natural Features and Functions

5.3.1 Provincially Significant Wetlands

The proposed drainage works will result in the removal of vegetation within the area of improvements. These activities will result in the partial loss of the ecological communities identified on **Figure 4** and **Figure 5**. To mitigate some of the ecological impacts associated with the loss of vegetation cover from wetland communities associated with the Swaley Drain and Muskrat Creek, RiverStone recommends the following:

- **Vegetation removal and disturbance outside of the proposed drain improvement areas should be minimized to the extent possible.**
- **All necessary vegetation removal (e.g., tree/shrub clearing, etc.) within any proposed excavation area should be completed outside of the primary breeding bird nesting window (i.e., between April 1 and August 31).**

5.3.2 Areas of Natural and Scientific Interest

The drainage improvements project will require that work be completed within an area that has been identified as a provincially significant ANSI. Every effort should be made to ensure that impacts to the ecological features within the study areas is minimized to the extent possible. The Life Science ANSI associated with the Minesing Wetlands was identified due to the diversity and unique nature of the flora and fauna present in the area. The preceding sections of this impact assessment focus on features and species that were identified within the study areas; these species and their associated habitats are among those for which the ANSI designation was based on. Adherence to the recommendations made in the above sections to avoid, minimise, and mitigate potential for negative impacts will also reduce the likelihood of impacts to the ANSI.

6 APPLICABLE ENVIRONMENTAL LEGISLATION AND POLICIES

The following commentary summarizes the federal, provincial, and municipal environmental legislation and policies applicable to the proposed drainage improvement works considered herein and describes how the recommendations provided in this report will permit the proposed land use changes to address these provisions.

6.1 Federal *Fisheries Act*, R.S.C. 1985, c. F-14

The fish and fish habitat protection provisions of the *Fisheries Act* include:

- a prohibition against causing the death of fish, by means other than fishing (section 34.4)
- a prohibition against causing the harmful alteration, disruption or destruction of fish habitat (section 35)
- a framework of considerations to guide the Minister's decision-making functions (section 34.1)
- ministerial powers to ensure the free passage of fish or the protection of fish or fish habitat with respect to existing obstructions (section 34.3)

As long as the recommendations herein are followed, it is the opinion of RiverStone that activities proposed on this property will not contravene Section 35 (1) of the *Fisheries Act*, and that an authorization under the Section 35(2) is not likely required. Should however, during the course of this project, situations arise and lead to occurrences that result in "*serious harm to fish*", persons responsible for the project have a "duty to notify" DFO, take corrective actions, and provide written reports under Section 38 of the *Act*. As outlined in **Section 5.1**, works associated with Muskrat Creek adjacent to the Nottawasaga should be submitted to DFO for review to ensure consistency with the Federal Fisheries Act.

6.2 Federal *Migratory Birds Convention Act*, S.C. 1994, c. 22

Section 6 of the Migratory Birds Regulations per the *Migratory Birds Convention Act, 1994* (MBCA) prohibits the disturbance or destruction of nests, eggs, or nest shelters of a migratory bird. The provincial *Fish and Wildlife Conservation Act, 1997* (FWCA) extends the protection of bird nests and eggs to species that are not listed under the Migratory Birds Regulations (e.g., Corvids).

As recommended in **Section 5.3**, all clearing of vegetation required within the proposed extraction area should be restricted to times outside of the period April 1 to August 31 inclusive. This timing is suitable to avoid contravention of the *Migratory Birds Convention Act, 1994*.

6.3 Provincial *Endangered Species Act*, S.O. 2007, c. 6

The *Endangered Species Act, 2007* (ESA) protects designated Endangered and Threatened species in Ontario from being killed, harmed, or harassed (s. 9) or having their habitat damaged or destroyed (s. 10). As indicated in **Section 5.2**, several species protected under provisions of the ESA were determined to have confirmed or potential habitat on the study areas.

Projects that involve repair, maintenance, and improvement work under the Drainage Act fall under ESA Regulation 242/08 section 23.9 and are exempt from some of the prohibitions under the ESA. Under section 23.9 drainage works projects must be registered online with the province, steps must be taken to minimize the potential for impacts on individual species, and species-specific mitigation plans must be developed. The ESA requires that endangered and threatened species encountered during

works approved under the Drainage Act be reported and that for registered projects that annual reporting be completed. Adherence to the recommendations outlined in **Section 5.2** will help to ensure that the proposed improvements are consistent with the ESA. As outlined above, the project should be submitted to MECP for review under the ESA.

7 CONCLUSIONS

The project has two separate components that are intended to accomplish one goal; provide additional drainage capacity to farmlands downstream and upstream of George Johnston Road. Topography of the lands downstream of George Johnston Road and through the Minesing Wetlands dictates how any proposed works will influence farmland drainage upstream. Based on survey data and calculations from K Smart & Associates, much of the needed elevation drop can be gained by the proposed drainage works at the upstream end on the Swaley Drain. The flat topography through the majority of the Minesing Wetlands does not provide an opportunity for further drainage; however, the additional drainage capacity is possible by completing the drainage works at the downstream end of the wetlands, by connecting the Muskrat Creek and Downey Drain. From our assessments and an ecological perspective of impacts, the works at the upstream end on the Swaley Drain will accomplish most of the required drainage relief required for the project. In addition, it is expected that there will be no changes to the volume of water entering the wetlands. In contrast, the proposed drainage works to connect the Muskrat Creek remnants and Downey Drain has the potential to lower the water levels in the central portion of the Minesing Wetlands. Although calculations can be completed to estimate the change in water elevation, it is very much a guess given the expanse of the wetland and unknown connections and waterways that move water through the feature. As discussed, the elevated water level was identified as the reason for the loss of treed communities in the wetland. The reduction in water level expected from connecting the Muskrat Creek remnant and the Downey Drain may be suitable to prevent further loss of the treed wetland communities or perhaps allow them to return. The unknown aspect of the water level change and a cautious approach is why RiverStone is recommending that the work on the Swaley Drain be completed first, and water levels monitoring, before considering the need for the Muskrat Creek/Downey Drain works.

Based upon the findings presented in this report and contingent upon the implementation of the recommendations made herein, it is our conclusion that the proposed drainage improvement activities permissible will have a low likelihood of negatively impacting any significant natural heritage features and functions, and that negative impacts on the natural environment can be acceptably minimized. We advise that the recommendations in this report be incorporated into the design and phasing of the proposed drainage works. Additionally, as outlined in **Section 5**, given the location of the proposed drainage works and the surrounding natural heritage features, RiverStone recommends that this project be submitted to DFO, MECP, MNRF, and NVCA to ensure compliance with the applicable legislation.

8 REFERENCES

Bird Studies Canada. 2008. Marsh Monitoring Program Participant's Handbook for Surveying Marsh Birds. 17 pp.

Bowles, R. L., J. Laverty, and D. Featherstone. 2007. Minesing Wetlands biological inventory. Prepared for Friends of Minesing Wetalnds and Nottawasaga Valley Conservation Authority. 124 pp.

Cadman, M. D., D. A. Sutherland, G. G. Beck, D. Lepage, and A. R. Couturier editors. 2007a. Atlas of the Breeding Birds of Ontario, 2001–2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto.

Cadman, M. D., D. A. Sutherland, G. G. Beck, D. Lepage, and A. R. Couturier. 2007b. Atlas of the Breeding Birds of Ontario, 2001–2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, Ontario Nature, Toronto.

Chambers, B. A., B. J. Naylor, J. Nieppola, B. Merchant, and P. Uhlig. 1997. Field Guide to Forest Ecosystems of Central Ontario.

Chapman, L. and D. F. Putnam. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.

Dobbyn, J. 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists. Toronto.

Henson, B. L. and K. E. Brodribb. 2005. Great Lakes Conservation Blueprint for Terrestrial Biodiversity, Volume 2: Ecodistrict Summaries.

Jobin, B., R. Bazin, L. Maynard, A. McConnell, and J. Stewart. 2011. Least Bittern (Ixobrychus exilis) Survey Protocol. Waterbirds **34**:225-233.

Lee, H. T., W. D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. Ecological land classification for Southern Ontario: first approximation and its application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch.

OMNR. 2000. Significant wildlife habitat technical guide. Fish and Wildlife Branch (Wildlife Section) and Science Development and Transfer Branch, 151 pp. + 18 appendices.

OMNR. 2010. Natural heritage reference manual for natural heritage policies of the provincial policy statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp.

OMNR. 2013. Occurrence Survey Protocol for Spotted Turtle (*Clemmys guttata*) in Ontario 13 pp.

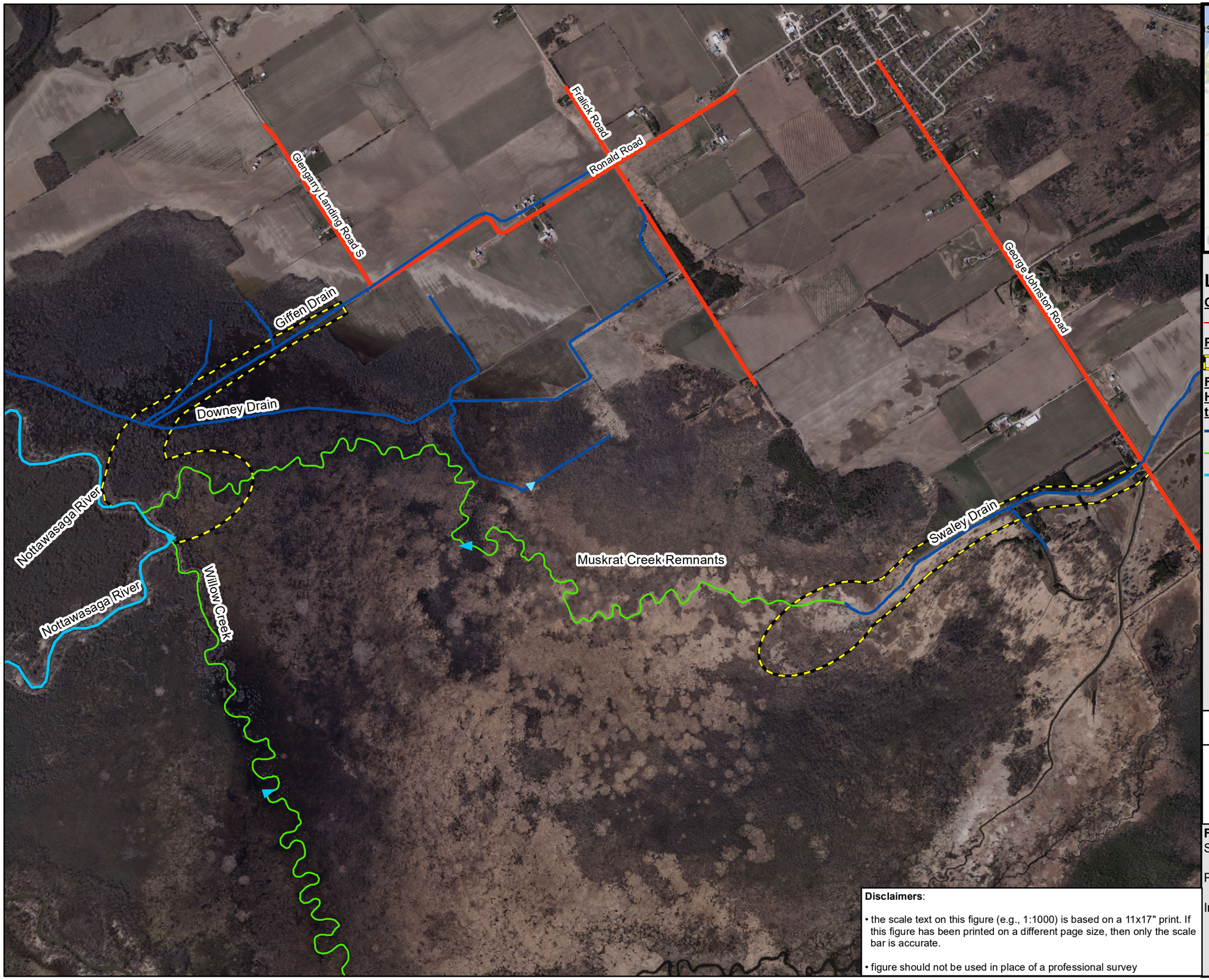
OMNR. 2014. Survey Protocol for Blanding's Turtle (*Emydoidea blandingii*) in Ontario. Ontario Ministry of Natural Resources, Species at Risk Branch. Peterborough, Ontario. ii + 18 pp.

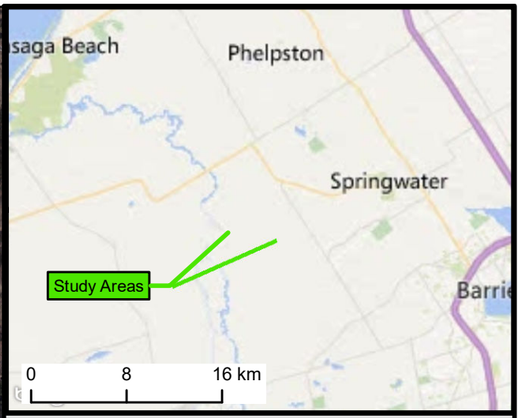
OMNRF. 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 5E.

Phair, C., B. L. Henson, and K. E. Brodribb. 2005. Great lakes conservation blueprint for aquatic biodiversity: volume 2 - tertiary watershed summaries. 454 pp.

Rootham S., and D. Featherstone, 2014. 60 years of forest change in the Minesing Wetlands (1953-2013): Causal factors, ecological implications and recommendations for reforestation. FOr Nottawasaga Valley OCnservation Auhtority and Friends of Minesing Wetlands.

Spoelstra, J., and R. Post,
2012. Hydrogeochemical characterization of the eastern Minesing Wetlands. National Water Research Institute, Report Number 12-001. Environment Canada. 20 pp.





Legend

N

Ontario Base Mapping (OBM)

- Roads

Planning Boundaries

- Study Areas

Features with Recognized High Natural Heritage Value - Identified by the Province or the Relevant Approval Authorities

- Municipal Drain
- Naturalized Watercourse
- Nottawasaga River

Orthorectified aerial photo - spring 2016

Scale	RS Project No.	Date Last Updated	By
1:18,000	2017-068	May 22, 2020	JG

0 270 540 Metres

RiverStone Environmental Solutions Inc.

Disclaimers:

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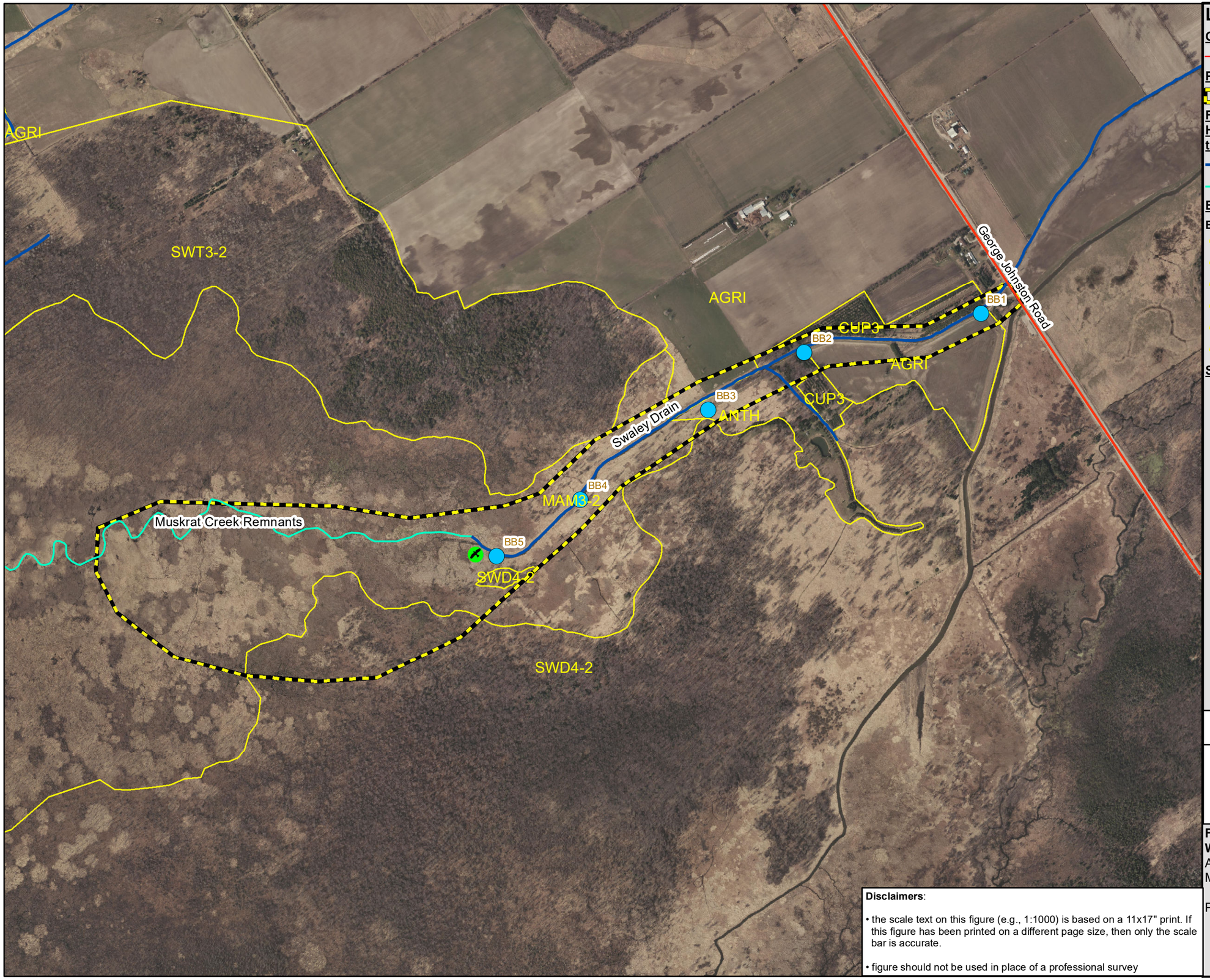
Figure 1. Location of Study Areas
Swaley Drain Improvements Project, Minesing, ON.

Prepared for Township of Springwater

Inset: General Location of Study Areas.



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Ontario Base Mapping (OBM)

- Roads

Planning Boundaries

- Study Area

Features with Recognized High Natural Heritage Value - Identified by the Province or the Relevant Approval Authorities

- Municipal Drain (NVCA)
- Naturalized Watercourse (NVCA)

Biophysical Features+Functions-RiverStone

Ecological Communities

- AGRI: Agricultural
- ANTH: Mowed Plantation
- CUP3: Coniferous Plantation
- MAM3-2: Reed Canary Organic Meadow Marsh
- SWD4-2: White Elm Mineral Deciduous Swamp
- SWT3-2: Willow Organic Thicket Swamp

Survey Stations

- Breeding Bird Survey Station
- Acoustic Monitoring Device (Breeding Birds June 15-June 26)

N

Orthorectified aerial photo - spring 2016

Scale	RS Project No.	Date Last Updated	By
1:10,000	2017-068	May 22, 2020	JG

0 150 300 Metres

RiverStone Environmental Solutions Inc.

Figure 2. Existing Conditions In Swaley Drain Work Area
As Part of the Swaley Drain Improvements Project, Minesing, ON.

Prepared for Township of Springwater

Disclaimers:

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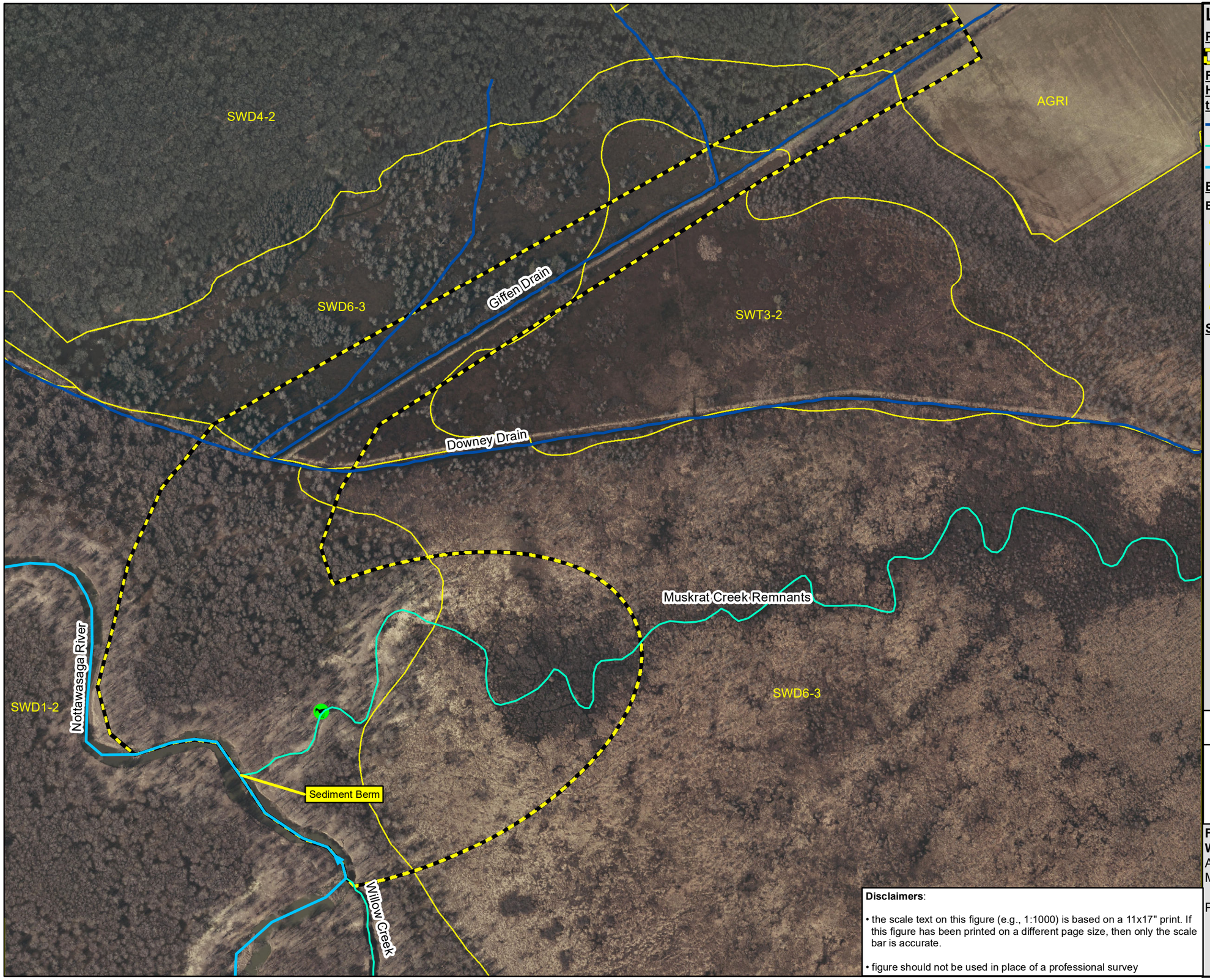

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N

Planning Boundaries

- Study Area

Features with Recognized High Natural Heritage Value - Identified by the Province or the Relevant Approval Authorities

- Municipal Drain (NVCA)
- Naturalized Watercourse (NVCA)
- Nottawasaga River (NVCA)

Biophysical Features+Functions-RiverStone

Ecological Communities

- AGRI: Agricultural
- SWD1-2: Bur Oak Mineral Deciduous Swamp
- SWD4-2: White Elm Mineral Deciduous Swamp
- SWD6-3: Swamp Maple Organic Deciduous Swamp
- SWT3-2: Willow Organic Thicket Swamp

Survey Stations

- Acoustic Monitoring Device (Breeding Birds June 26-July06)

Orthorectified aerial photo - spring 2012

Scale	RS Project No.	Date Last Updated	By
1:5,000	2017-068	May 22, 2020	JG

0 75 150 Metres

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Figure 3. Existing conditions in Muskrat Creek Work Area
As Part of the Swaley Drain Improvements Project, Minesing, ON.

Prepared for Township of Springwater

Legend

N

Ontario Base Mapping (OBM)

- Roads

Planning Boundaries

- Study Area

Features with Recognized High Natural Heritage Value - Identified by the Province or the Relevant Approval Authorities

- Municipal Drain (NVCA)
- Naturalized Watercourse (NVCA)

Biophysical Features+Functions-RiverStone

Ecological Communities

- AGRI: Agricultural Field
- ANTH: Mowed Plantation
- CUP3: Coniferous Plantation
- MAM3-2: Reed Canary Organic Meadow Marsh
- SWD4-2: White Elm Mineral Deciduous Swamp
- SWT3-2: Willow Organic Thicket Swamp

Proposed Drainage Improvement Works (K-Smart)

- General Construction Access Route
- New Channel To Be Excavated
- General Area Of Channel Excavation

Orthorectified aerial photo - spring 2016

Scale	RS Project No.	Date Last Updated	By
1:10,000	2017-068	May 22, 2020	JG

0 150 300 Metres

RiverStone Environmental Solutions Inc.

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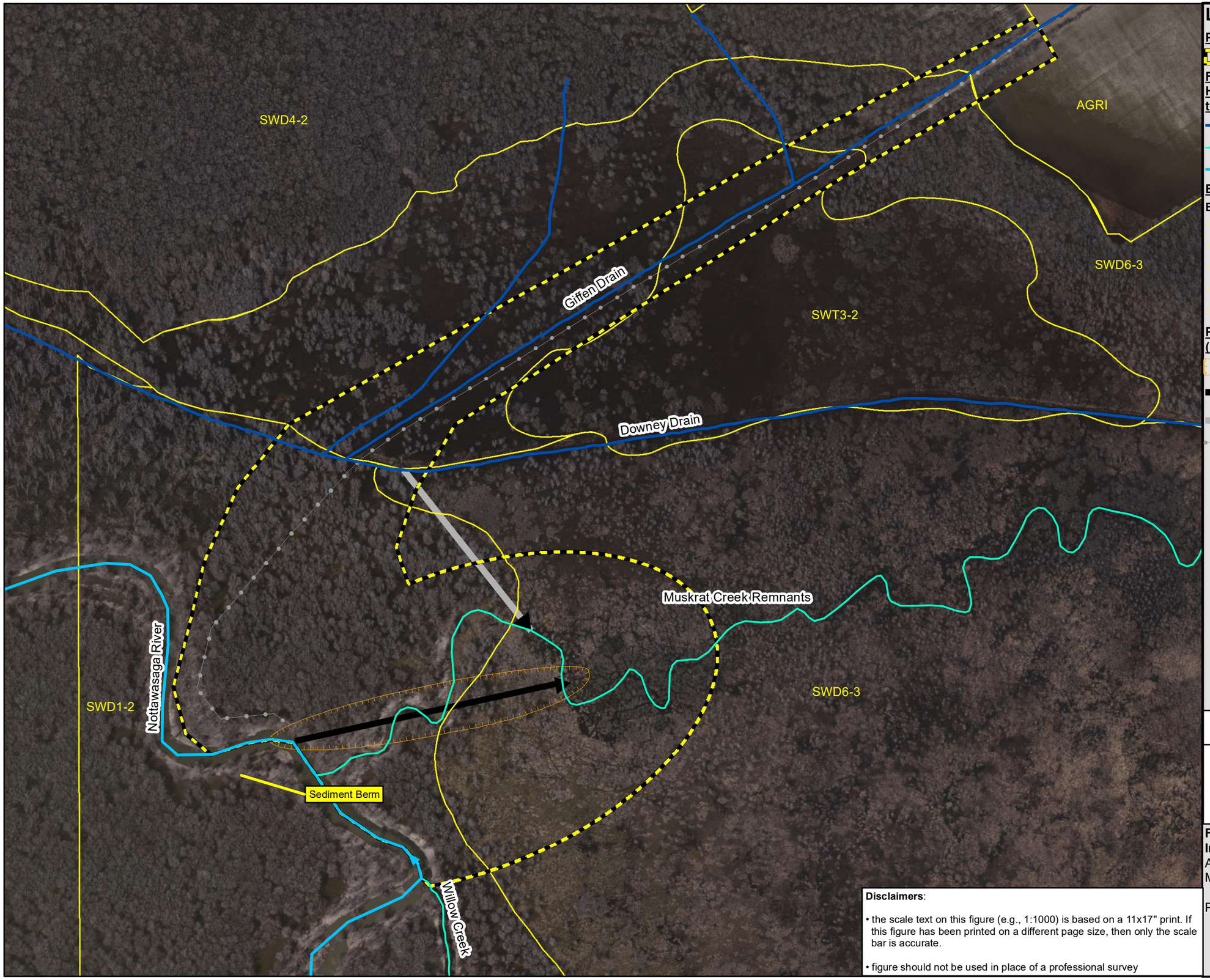
Figure 4. Proposed Drainage Improvement Works In Swaley Drain Work Area
As Part of the Swaley Drain Improvements Project, Minesing, ON.

Prepared for Township of Springwater



Legend

N

Planning Boundaries

- Study

Features with Recognized High Natural Heritage Value - Identified by the Province or the Relevant Approval Authorities

- Municipal Drain (NVCA)
- Naturalized Watercourse (NVCA)
- Nottawasaga River (NVCA)

Biophysical Features+Functions-RiverStone

Ecological Communities

- AGRI: Agricultural
- SWD1-2: Bur Oak Mineral Deciduous Swamp
- SWD4-2: White Elm Mineral Deciduous Swamp
- SWD6-3: Swamp Maple Organic Deciduous Swamp
- SWT3-2: Willow Organic Thicket Swamp

Proposed Drainage Improvement Works (K-Smart)

- General Area Of Channel
- Channel to River Considered for Excavation (not recommended)
- Channel to Downey Considered for Excavation
- General Construction Access Route

Orthorectified aerial photo - spring 2016

Scale	RS Project No.	Date Last Updated	By
1:5,000	2017-068	May 22, 2020	JG

0 75 150 Metres

RiverStone Environmental Solutions Inc.

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Figure 5. Proposed Drainage Improvement Works In Muskrat Creek Work Area
As Part of the Swaley Drain Improvements Project, Minesing, ON.

Prepared for Township of Springwater

Appendix 1. Select Site Photos

Swaley Drain

Photo 1. Swaley Drain flowing under George Johnston Road (May 29, 2018).

Photo 2. Swaley Drain downstream of George Johnston Road (May 29, 2018).

Photo 3. Swaley Drain adjacent to agricultural fields (May 23, 2017).

Photo 4. Agricultural field associated with access route and Bobolink observation (May 23, 2017).

Photo 5. Terminus of the open water portion of the Swaley Drain (May 23, 2017).

Photo 6. Wetland community at terminus of existing open water portion of the Swaley Drain (June 15, 2018).

Photo 7. Wetland community at terminus of existing open water portion of the Swaley Drain (June 15, 2018).

Photo 8. Larger wetland community associated with the Swaley Drain (May 13, 2017).

Muskrat Creek

Photo 9. Access route along existing secondary drain (June 7, 2018).

Photo 10. Access route at point of crossing Downey Drain (June 7, 2018).

Photo 11. Wetland community associated with Muskrat Creek upstream of the Nottawasaga River (June 7, 2018).

Photo 12. Wetland community associated with Muskrat Creek upstream of the Nottawasaga River (June 7, 2018).

Photo 13. Wetland community associated with Muskrat Creek upstream of the Nottawasaga River (June 7, 2018).

Photo 14. Wetland community associated with Muskrat Creek adjacent to the Nottawasaga River (June 7, 2018).

Photo 15. Wetland community associated with Muskrat Creek adjacent to the Nottawasaga River (June 7, 2018).

Photo 16. Approximate location of sediment berm adjacent to Nottawasaga River (June 7, 2018).

Photo 17. Nottawasaga River adjacent to the mouth of Muskrat Creek (June 7, 2018).

Photo 18. Nottawasaga River upstream of mouth of Muskrat Creek (June 7, 2018).

Appendix 2. Vegetation species documented during onsite investigations

Scientific Name	English Common Name	Family	S-Rank[1]
Acer x freemanii	Freeman's Maple	Aceraceae	SNA
Arctium minus	Common Burdock	Asteraceae	SNA
Arisaema triphyllum	Jack-in-the-pulpit	Araceae	S5
Celtis occidentalis	Common Hackberry	Ulmaceae	S4
Frangula alnus	Glossy Buckthorn	Rhamnaceae	SNA
Fraxinus pennsylvanica	Green Ash	Oleaceae	S4
Glyceria striata	Fowl Mannagrass	Poaceae	S5
Matteuccia struthiopteris	Ostrich Fern	Dryopteridaceae	S5
Menispermum canadense	Canada Moonseed	Menispermaceae	S4
Onoclea sensibilis	Sensitive Fern	Dryopteridaceae	S5
Parthenocissus quinquefolia	Virginia Creeper	Vitaceae	S4?
Phalaris arundinacea	Reed Canary Grass	Poaceae	S5
Plantago major	Common Plantain	Plantaginaceae	S5
Quercus macrocarpa	Bur Oak	Fagaceae	S5
Rhamnus cathartica	Common Buckthorn	Rhamnaceae	SNA
Salix euxina	Crack Willow	Salicaceae	SNA
Smilax herbacea	Herbaceous Carrionflower	Smilacaceae	S4
Thalictrum pubescens	Tall Meadow-rue	Ranunculaceae	S5
Tilia americana	American Basswood	Tiliaceae	S5
Toxicodendron radicans	Climbing Poison Ivy	Anacardiaceae	S5
Typha angustifolia	Narrow-leaved Cattail	Typhaceae	SNA
Ulmus americana	American Elm	Ulmaceae	S5
Urtica dioica ssp. dioica	European Stinging Nettle	Urticaceae	SNA
Vitis aestivalis	Summer Grape	Vitaceae	S4

[1]"S-ranks" are rarity ranks for native species set by the Natural Heritage Information Centre (NHIC)

S1 - Extremely Rare (usually 5 or fewer occurrances in Ontario)

S2 - Very Rare (usually between 5 and 20 occurrences in Ontario)

S3 - Rare to Uncommon (usuablly between 20 and 100 occurrences)

S4 - Common (apparently secure)

S5 - Very Common

Appendix 3. Results of breeding bird surveys

Appendix 3: List of Avian Species recorded during Targeted Surveys by Staff and Acoustic Equipment.

Swaley Drain

Scientific Name	English Common Name	Family	S-Rank
Fulica americana	American Coot	Rallidae	S4B,SZN
Corvus brachyrhynchos	American Crow	Corvidae	S5B
Spinus tristis	American Goldfinch	Fringillidae	S4
Turdus migratorius	American Robin	Turdidae	S5
Spizella arborea	American Tree Sparrow	Emberizidae	S4B
Hirundo rustica	**Barn Swallow**	**Hirundinidae**	**S4B**
Megaceryle alcyon	Belted Kingfisher	Alcedinidae	S5B,SZN
Coccyzus erythropthalmus	Black-billed Cuckoo	Cuculidae	S4B,SZN
Poecile atricapillus	Black-capped Chickadee	Paridae	S5
Setophaga virens	Black-throated Green Warbler	Parulidae	S5B
Cyanocitta cristata	Blue Jay	Corvidae	S5B
Dolichonyx oryzivorus	**Bobolink**	**Icteridae**	**S4B**
Branta canadensis	Canada Goose	Anatidae	S5
Cardinalis cardinalis	Cardinal	Cardinalidae	S4B
Bombycilla cedrorum	Cedar Waxwing	Bombycillidae	S5B,SZN
Spizella passerina	Chipping Sparrow	Emberizidae	S4B
Setophaga pensylvanica	Chestnut-sided Warbler	Parulidae	S5B
Quiscalus quiscula	Common Grackle	Icteridae	S5
Corvus corax	Common Raven	Corvidae	S5B
Geothlypis trichas	Common Yellowthroat	Parulidae	S5
Petrochelidon pyrrhonota	Cliff Swallow	Hirundinidae	S4B
Picoides pubescens	Downy Woodpecker	Picidae	S5
Contopus virens	**Eastern Wood-pewee**	**Tyrannidae**	**S4B**
Tyrannus tyrannus	Eastern Kingbird	Tyrannidae	S4B
Sayornis phoebe	Eastern Phoebe	Tyrannidae	S5B
Sturnus vulgaris	European Starling	Sturnidae	SE
Ardea herodias	Great Blue Heron	Ardeidae	S4B
Ardea alba	Great Egret	Ardeidae	S2B
Bubo virginianus	Great Horned Owl	Strigidae	S5
Butorides virescens	Green Heron	Ardeidae	S4B,SZN
Myiarchus crinitus	Great Crested Flycatcher	Tyrannidae	S4B
Picoides villosus	Hairy Woodpecker	Picidae	S5
Troglodytes aedon	House Wren	Troglodytidae	S5B
Passerina cyanea	Indigo Bunting	Cardinalidae	S5
Ixobrychus exilis	**Least Bittern**	**Ardeidae**	**S4B**
Cistothorus palustris	Marsh Wren	Troglodytidae	S4B
Anas platyrhynchos	Mallard	Anatidae	S5
Zenaida macroura	Mourning Dove	Columbidae	S5
Colaptes auratus	Northern Flicker	Picidae	S5
Accipiter gentilis	Northern Goshawk	Accipitridae	S4

Appendix 3: List of Avian Species recorded during Targeted Surveys by Staff and Acoustic Equipment.

Scientific Name	English Common Name	Family	S-Rank
Stelgidopteryx serripennis	Northern Ruffed-winged Swal	Hirundinidae	S4B
Dryocopus pileatus	Pileated Woodpecker	Picidae	S5
Sitta canadensis	Red-breasted Nuthatch	Sittidae	S5
Vireo olivaceus	Red-eyed Vireo	Vireonidae	S5B,SZN
Agelaius phoeniceus	Red-winged Blackbird	Icteridae	S5B,SZN
Pheucticus ludovicianus	Rose-breasted Grosbeak	Cardinalidae	S4B
Antigone canadensis	Sandhill Crane	Gruidae	S4B,SZN
Cistothorus stellaris	Sedge Wren	Troglodytidae	S4B
Melospiza melodia	Song Sparrow	Emberizidae	S5
Melospiza georgiana	Swamp Sparrow	Passerellidae	S5B,SZN
Passerculus sandwichensis	Savannah Sparrow	Passerellidae	S4B
Tachycineta bicolor	Tree Swallow	Hirundinidae	S4B
Cathartes aura	Turkey Vulture	Cathartidae	S5B
Catharus fuscescens	Veery	Turdidae	S5B
Vireo gilvus	Warbling Vireo	Vireonidae	S5
Gallinago delicata	Wilson's Snipe	Scolopacidae	S5
Aix sponsa	Wood Duck	Anatidae	S5B,SZN
Meleagris gallopavo	Wild Turkey	Phasianidae	S5
Setophaga petechia	Yellow Warbler	Parulidae	S5B,SZN
Setophaga coronata	Yellow-rumped Warbler	Parulidae	S5B
Sphyrapicus varius	Yellow-bellied Sapsucker	Picidae	S5B,SZN
Muskrat Drain			
Setophaga ruticilla	American Redstart	Parulidae	S5B
Turdus migratorius	American Robin	Turdidae	S5
Empidonax alnorum	Alder Flycatcher	Tyrannidae	S5B
Icterus galbula	Baltimore Oriole	Icteridae	S4B
Bombycilla cedrorum	Cedar Waxwing	Bombycillidae	S5B,SZN
Setophaga pensylvanica	Chestnut-sided Warbler	Parulidae	S5B
Quiscalus quiscula	Common Grackle	Icteridae	S5
Geothlypis trichas	Common Yellowthroat	Parulidae	S5
Picoides pubescens	Downy Woodpecker	Picidae	S5
Tyrannus tyrannus	Eastern Kingbird	Tyrannidae	S4B
Contopus virens	**Eastern Wood-pewee**	**Tyrannidae**	**S4B**
Sturnus vulgaris	European Starling	Sturnidae	SE
Dumetella carolinensis	Gray Catbird	Mimidae	S5
Ardea herodias	Great Blue Heron	Ardeidae	S4B
Myiarchus crinitus	Great Crested Flycatcher	Tyrannidae	S5
Picoides villosus	Hairy Woodpecker	Picidae	S5
Larus argentatus	Herring Gull	Laridae	S5b,S5N
Passerina cyanea	Indigo Bunting	Cardinalidae	S5

Appendix 3: List of Avian Species recorded during Targeted Surveys by Staff and Acoustic Equipment.

Scientific Name	English Common Name	Family	S-Rank
Ixobrychus exilis	**Least Bittern**	**Ardeidae**	**S4B**
Setophaga magnolia	Magnolia Warbler	Parulidae	S5B
Zenaida macroura	Mourning Dove	Columbidae	S5
Colaptes auratus	Northern Flicker	Picidae	S4B
Melanerpes carolinus	Red-bellied Woodpecker	Picidae	S5
Vireo olivaceus	Red-eyed Vireo	Vireonidae	S5B,SZN
Agelaius phoeniceus	Red-winged Blackbird	Icteridae	S5B,SZN
Pheucticus ludovicianus	Rose-breasted Grosbeak	Cardinalidae	S4B
Euphagus carolinus	Rusty Blackbird	Icteridae	S3
Antigone canadensis	Sandhill Crane	Gruidae	S4B,SZN
Melospiza melodia	Song Sparrow	Emberizidae	S5
Melospiza georgiana	Swamp Sparrow	Passerellidae	S5B,SZN
Tachycineta bicolor	Tree Swallow	Hirundinidae	S4B
Cathartes aura	Turkey Vulture	Cathartidae	S5B
Catharus fuscescens	Veery	Turdidae	S5B
Pooecetes gramineus	Vesper Sparrow	Passerellidae	S4B,SZN
Vireo gilvus	Warbling Vireo	Vireonidae	S5
Sitta carolinensis	White-breasted Nuthatch	Sittidae	S5
Setophaga petechia	Yellow Warbler	Parulidae	S5B
Setophaga coronata	Yellow-rumped Warbler	Parulidae	S5B
Sphyrapicus varius	Yellow-bellied Sapsucker	Picidae	S5B,SZN

[1]"S-ranks" represent rarity ranks for native species in Ontario set by the Natural Heritage Information Centre (NHIC)

S1 - Extremely Rare (usually 5 or fewer occurrances in Ontario)
S2 - Very Rare (usually between 5 and 20 occurrences in Ontario)
S3 - Rare to Uncommon (usuablly between 20 and 100 occurrences)
S4 - Common (apparently secure)
S5 - Very Common

Appendix 4. Assessment of Endangered and Threatened Species

Habitat-based Approach

Properly assessing whether an area is likely to contain species of conservation interest for the purposes of determining whether a proposed development is likely to have a negative impact is becoming more difficult as the number of listed species increases. Approaches that depend solely on documenting the presence of individuals of a species in an area almost always underrepresent the biodiversity actually present because of the difficulty of observing species that are usually rare and well camouflaged. Given these difficulties, and the importance of protecting habitats of SAR, fish, and other species of conservation interest, RiverStone's primary approach to site assessment is habitat-based. This means that our field investigations focus on *evaluating the potential for features within an area of interest to function as habitat for species considered potentially present*, *rather than searching for live specimens*. An area is considered potential habitat if it satisfies a number of criteria, usually specific to a species, but occasionally characteristic of a broader group (e.g., several turtles of conservation interest use sandy shorelines for nesting, numerous fish species use areas of aquatic vegetation for nursery habitat). Physical attributes of a site that can be used as indicators of its potential to function as habitat for a species include structural characteristics (e.g., physical dimensions of rock fragments or trees, water depth), ecological community (e.g., meadow marsh, rock barren, coldwater stream), and structural connectivity to other habitat features required by the species. Species-specific habitat preferences and/or affinities are determined from status reports produced by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Cadman et al. (2007), published and unpublished documents, and direct experience.

Table 1 provides RiverStone's desktop screening and on-site assessment for species- and ecological communities of conservation interest. RiverStone measures species- and feature-specific distances from the boundaries of proposed lots or development area(s)—rather than from the boundary of the significant natural heritage feature—and refers to this area as *adjoining lands* (AL). Evaluating the likelihood of species' presence and the potential for negative impacts using this approach ensures that the Adjacent Lands test of the PPS will be met.

For the purposes of RiverStone's assessment, the *study areas* as shown in **Figure 1** is referred to as the Area of Interest (AOI) and the adjoining lands (AL) extents were measured from the boundaries of the AOI.

Appendix 4: Table 1. Results of desktop screening and on-site assessment for species and ecological communities of conservation interest.

Common Name[1]	Scientific Name	Step 1 (Desktop): Rationale for considering	Step 2 (Desktop): Do site-specific attributes (e.g., ecological system and landscape configuration) assessed from aerial photography and other information sources indicate that potential habitat or communities might be present? Area of Interest (AOI)	Step 2 (Desktop): Adjoining Lands (AL)	Step 3 (On Site): Potential and/or confirmed habitat documented during on-site assessment Area of Interest (AOI)	Step 3 (On Site): Adjoining Lands (AL)	Step 4: Is there potential for the species, its habitat, or ecological community to be negatively impacted by the activities that would be permissible within the AOI?
Endangered & Threatened (Provincially): status from Species at Risk in Ontario List (O Reg 230/08); updated January 2019							
Spotted Turtle	*Clemmys guttata*	range map	YES, suitable wetland and/or aquatic communities are present.	YES, suitable wetland and/or aquatic communities are present.	YES, suitable wetland and/or aquatic communities are present; however, individuals of this species were not documented during targeted surveys.	YES, suitable wetland and/or aquatic communities are present.	YES, excavation activities within the wetland communities may result in impacts to the species and/or their habitat.
Blanding's Turtle	*Emydoidea blandingii*	range map	YES, suitable wetland and/or aquatic communities are present.	YES, suitable wetland and/or aquatic communities are present.	YES, suitable wetland and/or aquatic communities are present; however, individuals of this species were not documented during targeted surveys.	YES, suitable wetland and/or aquatic communities are present.	YES, excavation activities within the wetland communities may result in impacts to the species and/or their habitat.
Eastern Hog-nosed Snake	*Heterodon platirhinos*	range map	YES, a mosaic of open-canopy communities and mixed forest are present.	YES, a mosaic of open-canopy communities and mixed forest are present.	YES, potential foraging habitat is present.	YES, potential foraging, nesting, and hibernating habitat may be present.	NO, given that extent of suitable habitat is limited and open areas will remain, both the quantity and quality of habitat should remain the same; thus, likelihood of negative impacts is low.
Eastern Whip-poor-will	*Caprimulgus vociferus*	OBBA	YES, both natural and anthropogenic openings in canopy could provide suitable breeding and foraging habitat.	YES, both natural and anthropogenic openings in canopy could provide suitable breeding and foraging habitat.	NO, openings in the forest canopy are limited to wetlands an other communities unsuitable for use as nesting habitat by this species.	YES, both natural and anthropogenic openings in canopy could provide suitable breeding and foraging habitat.	NO, impacts from development within AOI unlikely to affect breeding habitat on AL, if present.
Bobolink	*Dolichonyx oryzivorus*	NHIC Databases	YES, suitable grassland or agricultural communities may be present.	YES, suitable grassland or agricultural communities may be present.	NO, suitable grassland or agricultural communities are absent.	YES, individuals of this species were documented in the farm fields north of Swaley Drain.	POSSIBLE, access to the improvements area associated with Swaley Drain may involve crossing habitat for this species.
Least Bittern	*Ixobrychus exilis*	OBBA	YES, suitable wetland communities (e.g., cattail marsh) may be present.	YES, suitable wetland communities (e.g., cattail marsh) may be present.	YES, suitable wetland communities are present and individuals were documented during targeted surveys in 2018.	YES, suitable wetland communities (e.g., cattail marsh) are present to the south of the AOI.	YES, excavation activities within the wetland communities may result in impacts to the species and/or their habitat.
Chimney Swift	*Chaetura pelagica*	OBBA	YES, dark sheltered hollow vertical structures (chimneys, smoke stacks, silos, large trees with cavities and rock crevices) suitable for nesting or roosting may be present.	YES, dark sheltered hollow vertical structures (chimneys, smoke stacks, silos, large trees with cavities and rock crevices) suitable for nesting or roosting may be present.	NO, natural or anthropogenic strucures with the potential to function as nesting habitat for this species are not present.	NO, natural or anthropogenic strucures with the potential to function as nesting habitat for this species were not documented within a distance that would be impacted by the proposed drainage works.	NO, see step 3.
Barn Swallow	*Hirundo rustica*	OBBA	YES, man-made or natural structures suitable for nesting may be present.	YES, man-made or natural structures suitable for nesting may be present.	YES, individuals of this species were documented forraging over the wetland communities and farm fields north of Swaley Drain.	POSSIBLE, suitable habitat for this species is present in the larger landscape surrounding the Swaley Drain study area.	NO, as nesting habitat was not documented within the AOI, the proposed drainage works are unlikely to negatively impact forraging habitat for this species.
Eastern Meadowlark	*Sturnella magna*	NHIC Databases	YES, suitable grassland or agricultural communities may be present.	YES, suitable grassland or agricultural communities may be present.	NO, this species was not documented during targeted surveys.	POSSIBLE, suitable habitat for this species is present in the larger landscape surrounding the Swaley Drain study area.	NO, impacts from development within AOI unlikely to affect breeding habitat on AL, if present.
Cerulean Warbler	*Setophaga cerulea*	NHIC Databases	YES, suitably sized area of intact forest is present.	YES, suitably sized area of intact forest is present.	NO, species not detected during targeted surveys.	YES, suitably sized area of intact forest is present.	NO, impacts from development within AOI unlikely to affect breeding habitat on AL, if present.
Bank Swallow	*Riparia riparia*	OBBA	YES, man-made or natural structures suitable for nesting may be present.	YES, man-made or natural structures suitable for nesting may be present.	NO, although areas of the AOI do not have have the physical characteristics necessary to function as nesting habitat for species and individuals were not documented during targeted surveys in 2018.	POSSIBLE, suitable nesting habitat for this species may be present in the larger landscape surrounding the AOI.	NO, impacts from development within AOI unlikely to affect breeding habitat on AL, if present.

[1]Shaded rows denote species or communities for which negative impacts have been deemed possible.

Appendix 4: Table 1. Results of desktop screening and on-site assessment for species and ecological communities of conservation interest.

Common Name[1]	Scientific Name	Step 1 (Desktop): Rationale for considering	Step 2 (Desktop): Do site-specific attributes (e.g., ecological system and landscape configuration) assessed from aerial photography and other information sources indicate that potential habitat or communities might be present? Area of Interest (AOI)	Step 2 (Desktop): Adjoining Lands (AL)	Step 3 (On Site): Potential and/or confirmed habitat documented during on-site assessment: Area of Interest (AOI)	Step 3 (On Site): Adjoining Lands (AL)	Step 4: Is there potential for the species, its habitat, or ecological community to be negatively impacted by the activities that would be permissible within the AOI?
Eastern Small-footed Myotis	*Myotis leibii*	range map	NO, natural structures (e.g., talus slopes, rocky ridges, rock outcrops, cliff crevices, rock fields) are absent.	NO, natural structures (e.g., talus slopes, rocky ridges, rock outcrops, cliff crevices, rock fields) are not present within a distance that would be impacted by activities permissible within the AOI.	NO, natural structures (e.g., talus slopes, rocky ridges, rock outcrops, cliff crevices, rock fields) are absent.	NO, natural structures (e.g., talus slopes, rocky ridges, rock outcrops, cliff crevices, rock fields) are not present within a distance that would be impacted by activities permissible within the AOI.	NO, see steps 2 and 3.
Little Brown Bat	*Myotis lucifugus*	range map	YES, dead or partially-decayed trees with crevices beneath exfoliating/peeling bark may be present.	YES, dead or partially-decayed trees with crevices beneath exfoliating/peeling bark may be present.	YES, trees suitable for roosting are present within the Muskrat study area.	YES, although specific large trees with cavities were not documented, the forest communities present have the potential to support trees with the characteristics necessary to function as gestating or roosting habitat.	YES.
Northern Long-eared Bat	*Myotis septentrionalis*	range map	YES, dead or partially-decayed trees with crevices beneath exfoliating/peeling bark may be present.	YES, dead or partially-decayed trees with crevices beneath exfoliating/peeling bark may be present.	YES, trees suitable for roosting are present within the Muskrat study area.	YES, although specific large trees with cavities were not documented, the forest communities present have the potential to support trees with the characteristics necessary to function as gestating or roosting habitat.	YES.
Tri-colored Bat	*Perimyotis subflavus*	range map	YES, trees suitable for roosting and open-canopy areas suitable for foraging (e.g., riparian and/or early successional communities) may be present.	YES, trees suitable for roosting and open-canopy areas suitable for foraging (e.g., riparian and/or early successional communities) may be present.	NO, oaks or maples with suitable 'witches broom' leaf clusters were not present within the AOI.	NO, forest communities containing suitable roosting tree structures and species were not documented.	NO, see step 3.
Butternut	*Juglans cinerea*	range map	YES, difficult to rule out without on-site assessment.	YES, difficult to rule out without on-site assessment.	NO, species not observed during targeted surveys.	NO, species nor suitable habitat conditions observed.	NO, see step 3.
Eastern Prairie Fringed-orchid	*Platanthera leucophaea*	range map	YES, fen or wet mesic prairie communities may be present.	YES, fen or wet mesic prairie communities may be present.	NO, suitable fen or wet mesic prairie communities are not present. In consulting with MNRF, this speices is not known to be present within the AOI.	POSSIBLE, suitable communties may be present south of the AOI within the larger Minesing wetland complex.	NO, impacts from development within AOI unlikely to affect habitat on AL, if present.
Hine's Emerald	*Somatochlora hineana*	Range map	NO, during pre-consultation with MNRF in 2018 it was determined that communities associated with this speices are not located within the AOI.	NO, during pre-consultation with MNRF in 2018 it was determined that communities associated with this speices are not located proximate to the AOI.	NO, during pre-consultation with MNRF in 2018 it was determined that communities associated with this speices are not located within the AOI.	NO, during pre-consultation with MNRF in 2018 it was determined that communities associated with this speices are not located proximate to the AOI.	NO, see steps 2 and 3.
Lake Sturgeon	*Acipenser fulvescens*	range map	YES, species was confirmed to be present in the Nottawasauga by MNRF.	YES, species was confirmed to be present in the Nottawasauga by MNRF.	YES, species was confirmed to be present in the Nottawasauga by MNRF.	YES, species was confirmed to be present in the Nottawasauga by MNRF.	YES, drain improvement works proximate to the Nottawasauga River may result in negative impacts to the species and/or its habitat.

[1]Shaded rows denote species or communities for which negative impacts have been deemed possible.