Supporting Document 1-6

Ecological Environment Existing Conditions Report

Eastern Ontario Waste Handling Facility Future Development Environmental Assessment

GFL Environmental Inc.

Moose Creek, Ontario

November 8, 2022

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Eastern Ontario Waste Handling Facility Future Development Environmental Assessment

Report

March 3, 2022
Revised November 8, 2022

Prepared for:

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Version History

Version	Date	Description of Revisions
Final	March 3, 2022	Final version to GFL Environmental Inc. based on suggested revisions from HDR Inc.
Final revised	November 7, 2022	Revised final, based on consideration of input on the EOWHF effects assessment. Revision of Barn Swallow discussions.

EXECUTIVE SUMMARY

Kilgour & Associates Ltd. (KAL) was retained by GFL Environmental Inc. to perform baseline ecological inventories on properties associated with future expansion of the Eastern Ontario Waste Handling Facility (EOWHF), an active landfill. The existing EOWHF is located on the western half of Lot 16 and Lots 17 and 18, Concession 10, Township of North Stormont, United Counties of Stormont, Dundas, and Glengarry, near the intersection of Highway 417 and 138. A portion of land associated with the existing EOWHF and lands to the east of the existing EOWHF are being considered for future development ("Future Development Lands") and include the eastern half of Lot 16, Lots 14 and 15, and the majority of Lot 13 of Concession 10.

This report documents existing ecological conditions within On-Site and Off-Site Study Areas based on desktop reviews, previous ecological work performed in the area, and field campaigns performed by KAL in 2019, 2020, and 2021. This report includes records of provincially and federally protected species at risk (SAR) and provides professional opinions on the potential presence of SAR, their habitat, fish habitat, and areas of ecological value that may interact with future development of the EOWHF. This Ecological Environment Existing Conditions Report is one component of the Environmental Assessment process and will be included with the final EOWHF Future Development Environmental Assessment.

The On-Site Study Area encompasses the existing EOWHF and the Future Development Lands. The Off-Site Study Area is comprised of a 1 km buffer around the On-Site Study Area. The Future Development Lands are 243 ha in size and are dominated by sod fields. Several watercourses occur within the On-Site Study Area, including the Fraser Municipal Drain, the Upper Tayside Municipal Drain, the Roxborough Plantagenet Municipal Drain, and the Albert Fahey Award Drain. The Study Areas fall within the Moose Creek Subwatershed of the lower South Nation Watershed. Moose Creek (the watercourse) is located within the Off-Site Study Area, west of the On-Site Study Area. A portion of Moose Creek Wetland is located within the Off-Site Study Area, directly southwest of the On-Site Study Area. Moose Creek Wetland is a locally significant wetland, a Significant Woodland, an Area of Natural and Scientific Interest (ANSI), and contains Significant Wildlife Habitat.

This report describes terrestrial and wetland habitats and associated flora and fauna in the On-Site and Off-Site Study Areas. The approach to characterize these habitats was focused on identifying potential SAR habitat and Significant Wildlife Habitat through Ecological Land Classification and conducting focused studies on SAR that are considered the most likely to occur in the On-Site Study Area. The On-Site Study Area is mostly non-natural (i.e., of anthropogenic nature) and is therefore not suitable habitat for most SAR known to occur or to potentially occur in the area.

Three SAR protected under the provincial *Endangered Species Act* (ESA) were observed in the Study Areas during field surveys: Bank Swallow (Off-Site Study Area), Barn Swallow (On-Site and Off-Site Study Areas), and Little Brown Myotis (On-Site Study Area). Foraging habitat for Bank Swallow (i.e., the area within 500 m of a nest) slightly overlaps with the Future Development Lands and is protected under the ESA. This habitat cannot be significantly altered without permission from the Ministry of Environment, Conservation and Parks (MECP). A Barn Swallow nest was previously observed adjacent to the Future Development Lands at the EOWHF but was no longer present at the time of writing this report. Barn

Swallow were reclassified from Threatened to Special Concern by COSSARO. That reclassification has implications for projects interacting with Barn Swallow habitat. As of January 2023, there will be no requirement under the *Endangered Species Act* to consult with MECP for interactions with Barn Swallow foraging habitat, however interactions with active nests will remain prohibited under the *Migratory Birds Convention Act*. Little Brown Myotis was detected via acoustic monitors deployed on the western edge of the Future Development Lands; this at-risk bat species may forage over the Future Development Lands and/or roost nearby. MECP should be consulted if trees cannot be removed outside of the bat roosting season.

Western Chorus Frog (not listed under the ESA; Threatened under the federal *Species at Risk Act* (SARA)) was observed along the western edge of the Future Development Lands and along the northern border of the EOWHF lands (On-Site Study Area). Western Chorus Frog is protected under SARA as it applies to projects on federal lands or projects involving or funded by federal authorities, but not on private land. Snapping Turtle (listed as Special Concern under the ESA and SARA) was also observed on the Future Development Lands; this species does not receive habitat or individual protection under the ESA or SARA, but individuals receive protection under the *Fish and Wildlife Conservation Act*. The habitat in which Snapping Turtle was observed qualifies as Significant Wildlife Habitat for Special Concern Species and protecting it as such would be determined by the municipality.

The Study Areas are part of a larger natural heritage feature that spans to the north as identified at the landscape level by the Ontario Ministry of Natural Resources and Forestry (MNRF). This natural heritage feature and therefore the Study Areas include a Migratory Bird Staging and Migration Stopover Area as it pertains to Snow Geese and Canada Geese for both spring and fall, as well as a Raptor Wintering Area for various species including Snowy Owls and Rough-legged Hawks. These habitat features are considered candidate Significant Wildlife Habitats by MNRF. Field studies performed by KAL for the Study Areas indicate that these habitat features do not meet the MNRF criteria to qualify as Significant Wildlife Habitat.

Fish communities of watercourses in the Study Areas were assessed in the summer of 2019 and in the spring of 2021 using non-lethal backpack electrofishing. Fish were collected from four watercourses in the Study Areas: the Roxborough Plantagenet Boundary Municipal Drain, the Fraser Municipal Drain, the Upper Tayside Municipal Drain, the Albert Fahey Award Drain, and Moose Creek. The Fraser Municipal Drain and the Upper Tayside Municipal Drain are the only watercourses that fall on the Future Development Lands and contain water in the summer. The thermal regimes of these two municipal drains were classified using nomograms of water and air temperature data collected in August 2019. The Fraser Municipal Drain was classified as suitable for a mostly cool-warm water fishery and the Upper Tayside Municipal Drain was classified as suitable for a warm water (i.e., tolerant) fishery. All collected fish species are typical of the Moose Creek area. No provincially and/or nationally listed (SAR) fish species were captured. No critical habitat for aquatic SAR or sensitive spawning habitat was identified within the Study Areas during field work conducted by KAL or others. Considering this, minor alterations to fish habitat areas in the Study Areas (e.g., addition of a culvert crossing) would require review by the appropriate agencies, but would likely be approved through the design and implementation of standard mitigation measures such as performing in-water works outside of the spawning period.

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1.0 INTRODUCTION

1.1 Project Rationale

Kilgour & Associates Ltd. (KAL) was retained by GFL Environmental Inc. to perform baseline ecological inventories on properties associated with future expansion of the Eastern Ontario Waste Handling Facility (EOWHF), an active landfill. The existing EOWHF is located on the western half of Lot 16 and Lots 17 and 18, Concession 10, Township of North Stormont, United Counties of Stormont, Dundas, and Glengarry, near the intersection of Highway 417 and 138. A portion of land associated with the existing EOWHF and lands to the east of the existing EOWHF are being considered for future development ("Future Development Lands") and include the eastern half of Lot 16, Lots 14 and 15, and the majority of Lot 13 of Concession 10, with expansion to commence in 2025.

This report documents existing ecological conditions within On-Site and Off-Site Study Areas based on desktop reviews, previous ecological work performed in the area, and field campaigns performed by KAL in 2019, 2020, and 2021. This report includes records of provincially and federally protected species at risk (SAR) and provides professional opinions on the potential presence of SAR, their habitat, fish habitat, and areas of ecological value that may interact with future development of the EOWHF. This Ecological Environment Existing Conditions Report is one component of the Environmental Assessment process and will be included with the final EOWHF Future Development Environmental Assessment.

1.2 Study Areas

The Study Areas addressed in this report include an On-Site Study Area and an Off-Site Study Area (Figure 1). The On-Site Study Area encompasses the existing EOWHF and the Future Development Lands. The Off-Site Study Area is comprised of a 1 km buffer around the On-Site Study Area. This buffer was considered to be the maximum potential extent of possible terrestrial impacts related to the proposed development of the EOWHF.

The Future Development Lands are 243 ha in size and are dominated by sod fields. Several watercourses occur within the On-Site Study Area, including the Fraser Municipal Drain, the Upper Tayside Municipal Drain, the Roxborough Plantagenet Municipal Drain, and the Albert Fahey Award Drain (Figure 1).

The Future Development Lands are bordered by:

- Agricultural lands and Highway 417 to the north.
- Highway 138 and agricultural lands to the east.
- Lafleche Road, sod fields, and peat extraction lands to the south.
- The EOWHF, agricultural lands, and Moose Creek (the watercourse) to the west.

The Study Areas fall within the Moose Creek Subwatershed of the lower South Nation Watershed. A portion of Moose Creek (the watercourse) is located within the Off-Site Study Area, west of the On-Site Study Area. A portion of Moose Creek Wetland is also located within the Off-Site Study Area, directly southwest of the

Figure 1 Map of the Study Areas

Legend

- Eastern Ontario Waste Handling Facility
- Future Development Lands
- On Site Study Area
- Off Site Study Area
- Water

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0 500 m

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Universal Transverse Mercator - Zone 18 (N)
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On-Site Study Area. Moose Creek Wetland is a locally significant wetland, a Significant Woodland, an Area of Natural and Scientific Interest (ANSI), and contains Significant Wildlife Habitat. ANSI mapping by the United Counties of Stormont, Dundas, and Glengarry (2018; Schedule B3) shows that this feature spans the EOWHF (i.e., the boundaries of the feature are outdated). This is no longer the case as demonstrated through mapping presented in this report.

1.3 Objectives

The objective of this report is to provide a description of existing conditions for the ecological environment that can be used in support of the Environmental Assessment for the expansion of the EOWHF. To that end, this report describes terrestrial and aquatic environments as well as the associated flora and fauna in the Study Areas, with an emphasis on the Future Development Lands. The focus in this report is primarily on SAR, including those associated with terrestrial and aquatic environments, as well as fish and fish habitat.

2.0 METHODS

2.1 Terrestrial & Wetland Habitats

The approach to characterize terrestrial and wetland habitats was focused on identifying potential SAR habitat and conducting focused studies on SAR that were considered the most likely to occur in the Study Areas. More specifically, this approach involved conducting: (1) Ecological Land Classification to determine the habitats available to SAR; and (2) a desktop assessment of the SAR that have some likelihood of occurrence in the Study Areas on the basis of known ranges and documented observations; followed by (3) focused field surveys of SAR considered most likely to occur in the Study Areas based on the results of (1) and (2). Since KAL did not have permission to access most of the Off-Site Study Area, these areas were characterized as best as possible from the perimeter of the On-Site Study Area, through desktop reviews, and from information from previous work performed in the area.

GFL Environmental Inc. contracted KAL to perform ecological environmental inventories for the Study Areas on June 17, 2019, after most ecological monitoring timing windows were finished for the year. As such, KAL was limited to a truncated field season in 2019 to characterize existing ecological conditions. Consequently, additional spring field surveys were conducted in 2020 and in 2021 in an effort to document ecological environment features that may have been missed in the truncated 2019 field season.

2.1.1 Ecological Land Classification

Vegetation communities in the Study Areas were identified and mapped in the field on June 28, 2019 using standard Ecological Land Classification (ELC) methods for Ontario (Lee *et al.,* 1998). This method provides a consistent approach to identify, describe, name, and map vegetation communities or physiographic features on the landscape based on soils and plant species composition. This method results in a standardized description of each vegetation community to determine the natural diversity and variability of communities within a site, and to provide insight into available habitat and the type of species that may be present. More specifically, the classifications from ELC provide a basis for determining whether potential habitat for a given SAR or other ecological value may be present. Where possible, communities were mapped to the most detailed ELC level of “vegetation type”. In some cases, where a suitable vegetation type did not exist, or mapping to this level did not provide a great deal of additional or appropriate information, communities are

described using the higher ELC level of "ecosite". Some land cover units in the Study Areas do not fall under any level of ELC (i.e., no appropriate ecosite due to their anthropogenic nature) and so these units are given generic names based on their land use.

Under standard ELC methods, soils are an important component of determining the classification of vegetation communities. However, soil cores were not sampled on the Future Development Lands to avoid damage to active sod operations. Similarly, portions of the Off-Site Study Area not owned by GFL Environmental Inc. were not sampled for soils, but the soil profiles in most of these areas can be assumed based on their land use and vegetation cover. Soils were therefore not necessary to determine ELC designations for these areas. ELC information for the Off-Site Study Area was complemented by other work performed by KAL (2021) and Niblett Environmental Associates Inc.'s (NEA) ELC delineation in their Ecological Environment Existing Conditions Report for the existing EOWHF (2018). Desktop reviews of available aerial imagery (Google Earth Pro) and preliminary field visits further informed how the Study Areas may be divided into ecosites based on variation in land cover and vegetation structure. The dominant plant species were recorded within each proposed ecosite to further divide ecosites into vegetation types (the finest resolution in ELC), where possible. Representative photos of each ELC unit in the On-Site Study Area were taken and are included with the community descriptions in this report. Note that there are no photos for properties in the Off-Site Study Area that are not owned by GFL Environmental Inc.

During the field visits throughout the late spring and summer of 2019, a detailed vegetation inventory of vascular plants for the Future Development Lands was developed. Where identification was uncertain, specimens were collected and identified later using conventional taxonomic literature and detailed examination as required. At-risk vegetation species with the potential to occur in the Study Areas were specifically looked for. Vegetation species and communities of significance (federal, provincial, regional, or local) were determined using accepted status lists and publications. The presence of provincially and federally significant species was based on species listed under the provincial *Endangered Species Act* (ESA) and the federal *Species at Risk Act* (SARA), respectively. Non-SAR species that are tracked by the Natural Heritage Information Centre (Ministry of Natural Resources and Forestry (MNRF), 2021a) are also considered provincially significant. Regionally and locally significant species are those that occur in few populations or in very restricted distribution on a regional and local scale, respectively. Regional and local significance was determined based on *Vascular Plants of Eastern Ontario* (Cuddy, 1998).

2.1.2 Identification of Key Species for Focused Study

To identify SAR that have the potential to occur within the Study Area, we conducted a desktop assessment of species listed under the provincial ESA and the federal SARA having some potential to occur within 10 km of the Study Areas. Existing information, such as species range maps and occurrences, was obtained from online sources, which include but are not limited to:

- Fisheries and Oceans Canada ("DFO") Aquatic Species at Risk Map (DFO, 2019)
- Ontario Ministry of Natural Resources and Forestry (MNRF):
    - Natural Heritage Information Centre (MNRF, 2021a)
    - Land Information Ontario Provincially Tracked Species Grid Detail (MNRF, 2021b)

  - *Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Perimyotis subflavus*) in Ontario* (Humphrey & Fotherby, 2019)

  - *Recovery Strategy for the Eastern Small-footed Myotis (*Myotis leibii*) in Ontario* (Humphrey, 2017)

- Species at Risk in Ontario (Ministry of Environment, Conservation and Parks (MECP), 2021)
- Species at Risk Public Registry (Government of Canada, 2021)
- Atlas of the Breeding Birds of Ontario 2001-2005 (Bird Studies Canada *et al.,* 2009)
- Herp Atlas (Ontario Nature, 2019)
- iNaturalist (California Academy of Sciences and National Geographic Society, 2021)
- eBird (Cornell Lab of Ornithology, 2021)
- Bumble Bee Sightings Map (Bumble Bee Watch, 2021)
- *Environmental Impact Study: Lands South of the Eastern Ontario Waste Handling Facility in Moose Creek* (KAL, 2021a)
- *Ecological Environment Existing Conditions Report: Eastern Ontario Waste Handling Facility Landfill Expansion Environmental Assessment* (NEA, 2018)
- Range Map Extents for SAR in Canada (Environment and Climate Change Canada (ECCC), 2021); and

Vascular Plants of Eastern Ontario (Cuddy, 1998).

2.1.3 Focused Species at Risk Surveys

Breeding bird surveys and acoustic bat monitoring were performed for the On-Site Study Area in the late spring and summer of 2019. Turtle surveys and anuran surveys were conducted in the spring of 2020.

2.1.3.1 Breeding Birds

Morning breeding bird surveys were performed in 2019 via point count surveys following the Ontario Breeding Bird Atlas Guide for Participants (Bird Studies Canada *et al.,* 2001). Breeding bird surveys are to be completed from survey stations that, combined, provide suitable viewing of all habitats on a site on calm weather days with light wind (less than 3 on the Beaufort scale[1]) and no precipitation. A total of six breeding bird survey stations were established in representative habitats in the Study Areas (Figure 2). Five of these survey stations were located directly on the Future Development Lands while one was in the Off-Site Study

[1] The Beaufort Wind Force Scale is an empirical measure that relates wind speed to observed conditions at sea or land. The scale is as follows: **0**: calm, smoke rises vertically, wind speed <1km/hr; **1**: light air, smoke drift indicates wind direction, leaves and wind vanes are stationary, wind speed = 1.1-5.5km/hr; **2**: light breeze, wind felt on exposed skin, leaves rustle, wind vanes begin to move, wind speed = 5.6-11km/hr, **3**: gentle breeze, leaves and small twigs constantly moving, light flags extended, wind speed = 12-19km/hr.

Figure 2 Map showing the locations of Breeding Bird Survey Stations, Acoustic Bat Monitors, Amphibian Survey Stations, and Turtle Survey Stations (2019 and 2020)

Legend

- 2020 Basking Turtle Survey Station
- 2020 Amphibian Monitoring Station
- 2019 Breeding Bird Survey Station
- Acoustic Bat Monitor
- Eastern Ontario Waste Handling Facility
- Future Development Lands
- On Site Study Area
- Off Site Study Area
- Water

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Universal Transverse Mercator - Zone 18 (N)
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Area in between buildings of the EOWHF and peat extraction lands to the south. This survey station in the Off-Site Study Area was specifically intended to capture potential Barn Swallow habitat (nesting potential on buildings of the EOWHF) and Bank Swallow habitat (nesting potential in peat mounds/cut banks on peat lands). These bird species are both listed as Threatened under the ESA and were assessed as having potential to occur on the Future Development Lands (details in Section 3.1.2).

Per Bird Studies Canada *et al.* (2001), two rounds of surveys must take place between sunrise and five hours after sunrise between May 24 and July 10, with a minimum of 15 days between survey dates. Since two at-risk bird species were assessed as having a moderate to high potential of occurring on the Future Development Lands (details in Section 3.1.2), an extra (third) survey round was conducted on the Future Development Lands to increase detectability of these species. The addition of the third survey is also consistent with monitoring requirements for some listed grassland bird species under Ontario Regulation 242/08, which details standard practices for activities under the ESA. All incidental observations were recorded while moving between survey points as well as during other field visits. Birds were identified by song and/or direct visual observation.

Breeding bird surveys were conducted on May 29, June 21, June 28, and July 4, 2019. Note that breeding bird surveys took place over four days, with all five stations on the Future Development Lands being surveyed three times (BBS2-1 to BBS2-5) and the one station in the Off-Site Study Area being surveyed twice. The one station in the Off-Site Study Area (BBS1-7) was only surveyed twice because breeding evidence of SAR was confirmed at this station before or during the second visit to this station. Note that Bird Studies Canada *et al.* (2001) recommend a minimum of 15 days between survey dates. It was not feasible to perform all rounds of surveys 15 days apart due to logistical considerations.

The presence of regionally rare bird species was based on an analysis of data from the Atlas of Breeding Birds of Ontario (Cadman *et al.,* 1987) based on Hill's Site Regions, now Ecoregions. The presence of provincially and federally significant species was based on species listed under the ESA and SARA, respectively, and any other non-SAR species that are tracked by the Natural Heritage Information Centre (these species are considered provincially significant; MNRF, 2021a).

Note that nightjar (Common Nighthawk (*Chordeiles minor*; Special Concern under ESA) and Eastern Whip-poor-will (*Antrostomus vociferus;* Threatened under ESA) surveys were not conducted for this study given the lack of suitable habitat for both species on the Future Development Lands. Eastern Whip-poor-will was previously documented in Moose Creek Wetland in the Off-Site Study Area where habitat is highly suitable for that species (KAL, 2021a). There is no typical Common Nighthawk habitat on the Future Development Lands and confirmed Eastern Whip-poor-will habitat in the Off-Site Study Area is located far enough away that it would not be impacted by development of the Future Development Lands (i.e., Category 3 habitat for Eastern Whip-poor-will does not overlap with the Future Development Lands; KAL, 2021a). No Common Nighthawks were heard during any of KAL's surveys for the current Study Areas or for the property south of the EOWHF (KAL, 2021a). Ultimately, nightjars are not a concern for this project.

Owl surveys were also deemed unnecessary given the lack of suitable habitat for at-risk owls in the Study Areas. Short-eared Owl (*Asio flammeus*; Special Concern under ESA) is the only at-risk owl species that may occur in the broader area based on its range; KAL did not observe this species during evening owl, anuran, or nightjar surveys for the property south of the EOWHF (KAL, 2021a) or during evening anuran surveys conducted for the Study Areas in 2020 (present study). There are also no occurrence records for Short-eared

Owl within 10 km of the Study Areas. KAL (2021) did hear a Barred Owl (*Strix varia*) calling from south of peat fields south of the EOWHF and a Northern Saw-whet Owl (*Aegolius acadicus*) calling from the southwestern edge of Moose Creek Wetland, beyond the Off-Site Study Area. One of the owl stations from these surveys falls within the current Study Areas (KAL, 2021a). No owls were heard at this station or nearby evening anuran survey stations for that project, further confirming the absence of owls in the Study Areas during the breeding season (KAL, 2021a).

2.1.3.2 Bats and Other Mammals

Bat monitoring was completed in 2019 following acoustic surveys under the MNRF's Survey Protocol for Species at Risk Bats within Treed Habitats (2017a). This is currently the recommended protocol for confirming the presence/absence of Little Brown Myotis, Northern Myotis, and Tri-coloured Bat, where it is determined that potentially suitable habitat for the establishment of maternity roosts is present.

Tree cover directly on the Future Development Lands is limited to a sparse cluster of mainly Manitoba Maple (*Acer negundo*) on the Manderley Turf Products property in the southeastern corner of the Future Development Lands (17289 Lafleche Road), scatted tree cover in a thicket swamp within the northeastern corner of the EOWHF, and a hedgerow along the western edge of the Future Development Lands. Some trees in these areas are potentially suitable for bat roosting because they have a diameter at breast height greater than 25 cm, have crevices and loose bark, and are in the early stages of decay (MNRF 2015a; 2017a). The adjacent open sod fields on the Future Development Lands provide suitable foraging habitat for some species of bats if they were to roost in the area. Buildings associated with Manderley Turf Products in the southeastern corner of the Future Development Lands may provide roosting habitat, but these buildings were not specifically surveyed for bats in part because the Manderley Turf Products property was not included as part of the Future Development Lands until after the field studies were completed. Regardless, buildings are not protected as roosting habitat under the ESA (Humphrey and Fotherby, 2019), nor are buildings considered Significant Wildlife Habitat (MNRF, 2015a). Wooded areas in the Off-Site Study Area may provide maternity roosting habitat, but these areas were not specifically surveyed to determine roosting potential given their physical distance from the Future Development Lands.

All species of bats that may occur in the Study Areas are detectable following MNRF (2017a) protocols if ultrasonic acoustic monitors are used and the signal to noise ratio can be analyzed from oscillogram displays to identify bat calls to species level. Under this protocol, acoustic monitors are to be installed for a minimum of 10 nights between June 1 and June 30, with recordings commencing after dusk and continuing for five hours. However, due to the late start of field surveys in 2019, most of this bat monitoring window was missed. Consequently, acoustic monitors were installed on the Future Development Lands on June 28 and removed on July 4, 2019 to capture seven nights of data. Although this does not meet the 10-night minimum required by the protocol, these data still provide insight into the species present on the Future Development Lands. Further, even though the data span a few days beyond the cut-off date for the protocol (June 30), they are still useful in determining the bat community on the Future Development Lands, especially in a year when breeding periods for most animals were delayed due to a late spring as in 2019. Based on the analyses and interpretation of bat acoustic data collected in 2019, the collection of additional data in following survey years was not warranted.

KAL installed two acoustic monitors (Song Meter SM3, Wildlife Acoustics) on June 28, 2019 on trees located on a hedgerow on the northwestern edge of the Future Development Lands (Figure 2). One monitor was

placed on the northern tip of this hedgerow ("AM-4"; 18T 499905 5018518) and the other was installed close to the where the hedgerow meets the southern extent of a thicket swamp on the EOWHF property ("AM-3"; 18T 500110 5018142). Acoustic monitors were placed in these locations to capture the best potential bat habitat on the Future Development Lands (potential foraging habitat in sod fields and potential roosting habitat in the hedgerow and thicket swamp) and to increase the likelihood of detecting bats based on their echolocating behavior. Bats use echolocation more frequently in cluttered environments (Falk *et al.*, 2014), so installing monitors along the hedgerow rather than in the middle of the open sod fields likely increased bat detectability.

Incidental observations of other mammals present in the Study Areas were collected during all field visits. Mammal observations were limited to sightings of scat, tracks, dens, and in some cases, direct observations.

2.1.3.3 Anurans

Anuran (frog and toad) surveys were performed in 2019 following the Marsh Monitoring Program (Bird Studies Canada et al., 2008). This protocol calls for multiple survey stations at a site to capture spatial and habitat variability. Accordingly, anuran surveys were performed at eight stations (MMP1 – 8) throughout the On-Site Study Area (Figure 2). The Marsh Monitoring Program advises that each station be visited a minimum of three times at night, no less than 15 days apart, during the spring and early summer.

Following this protocol, the timing of the three anuran surveys is based on nighttime air temperature:

- Early breeders (Wood Frog, Western Chorus Frog, Spring Peeper): above 5°C;
- Mid-season breeders (Mink Frog, American Toad, Gray Treefrog): above 10°C; and
- Late breeders (Green Frog, Bullfrog): above 17°C.

Anuran surveys began one half hour after sunset and ended before 1:00 am on evenings with appropriate temperatures and light winds.

Additional observations of amphibians were made throughout the spring and summer during other field visits. Rocks, fallen wood, and other debris were turned over to check for salamanders throughout the field campaign.

2.1.3.4 Reptiles

Visual encounter surveys were completed in 2020 following MNRF's Survey Protocol for Blanding's Turtle in Ontario (2015b). Although this protocol is intended primarily for Blanding's Turtle (*Emydoidea blandingii*), all turtle species generally occurring in the area would be detectable under this protocol.

This protocol requires that potential habitat for turtles be visited under the following conditions:

- After ice off, and no later than June 15;
- If air temperature is between 5 and 15˚C, surveys are to take place during sunny periods, between 10:00am and 5:00pm, when basking sites are receiving full sunlight;

- If air temperature is between 15 and 25˚C, surveys are to take place during sunny periods between 8:00am and 12:00pm, when basking sites are receiving full sunlight or during overcast periods from 9:00am until 4:00pm if air temperature is higher than water temperature; and

- Five surveys must be spread over a period of at least three weeks, at sites with no previous documentation of the species.

Five rounds of turtle surveys were completed via foot along all surface water features in the Study Areas that were considered, at a minimum, marginal turtle habitat and/or travel corridors (Figure 2). During turtle surveys, surveyors stopped and scanned areas of interest with binoculars from a distance of approximately 50 m to prevent any turtles from being startled before being observed. The limited vegetation present along these surface water features allowed them to be effectively scanned with binoculars from a distance.

Any additional observations of reptiles were recorded during other field visits. Rocks, fallen wood, and other debris were turned over to check for snakes throughout the field campaigns. Potential basking sites for snakes were also investigated.

2.2 Aquatic Environment

As part of the comprehensive characterization of the ecology of the Study Areas, an objective of this study was to determine the use of the area by aquatic species that pose development constraints, such as SAR and fish. A desktop review of existing data and field surveys were conducted to determine the use of surface water features by fish as well as to characterize the fish community.

Multiple watercourses have been identified within and around the EOWHF and are included in this report, including Moose Creek, multiple drains, and unnamed tributaries (Figure 1):

- The Fraser Municipal Drain exists along the western edge of the Future Development Lands. It flows from the southeast towards the northwestern corner of the Future Development Lands, where it meets the Roxborough-Plantagenet Boundary Municipal Drain which flows from the east along the northern edge of the Future Development Lands. At the confluence of the Roxborough-Plantagenet Boundary Municipal Drain, the Fraser Municipal Drain takes a 90° bend to flow west along the northern boundary of the EOWHF property until it outlets into Moose Creek in the Off-Site Study Area, which flows in a northwestern direction.

- The Upper Tayside Municipal Drain flows from south of Lafleche Road, north along the eastern portion of the Future Development Lands for approximately 1 km then takes a 90° bend to flow northeast for approximately 175 m before flowing under Highway 138 in the Off-Site Study Area.

- The Albert Fahey Award Drain exists directly south of the EOWHF and is influenced by a subcatchment divide. The eastern portion of the drain (a reach of approximately 250 m) flows east into the Fraser Municipal Drain south of the Future Development Lands, and the remaining 1.5 km western reach drains west into Moose Creek.

- Ditches/trenches throughout peat extraction lands and sod fields.

2.2.1 Existing Data

An overview of available information on the aquatic habitat in the vicinity of the EOWHF included reviewing a previously completed Biological Impact Assessment report (NEA, 1998), relevant data from South Nation Conservation (SNC, 2017), an Ecological Environment Existing Conditions Report (NEA, 2018), water quality data collected for the Fraser Municipal Drain and the Albert Fahey Award Drain (CanDetec Inc., 2021), a Biological Monitoring Report for the EOWHF (KAL, 2021b),and a summer 2022 survey for freshwater mussels (Unionidae) carried out by WSP Golder (2022).

2.2.2 Field Surveys

2.2.2.1 Field Surveys Conducted in Summer of 2019

Fish communities of the Fraser Municipal Drain and Upper Tayside Municipal Drain were assessed by KAL from late July to early August of 2019 (Figure 3). Non-lethal backpack electrofishing was used to assess the resident fish community in two ~50 m reaches of the Fraser Municipal Drain and one ~50 m reach in the Upper Tayside Municipal Drain. Backpack electrofishing is effective at depths >0.1 m. Captured fish were enumerated and identified to species before being returned to water. Effort was recorded at each reach as electrofishing seconds and used to estimate catch per unit effort (CPUE). Supporting information collected during the fish surveys included *in situ* water chemistry (temperature, dissolved oxygen, pH, and specific conductivity), depth, and width of water. Temperature loggers (N = 2) were also installed on August 8, 2019 to monitor hourly variations in water temperatures in both the Fraser and Upper Tayside Municipal Drains (Figure 3). Loggers were retrieved on October 17, 2019.

2.2.2.2 Field Surveys Conducted in Spring of 2021

2.2.2.2.1 Northern Pike Spawning Surveys

Northern Pike spawning surveys were conducted by visually inspecting watercourses for eggs and/or spawning adults during the 2021 spawning season. This involved walking the length of watercourses while wearing polarized sunglasses and visually scanning for suitable spawning habitat. In general, Northern Pike spawn in shallow water over vegetation in the spring shortly after ice-out, when these shallows have warmed to approximately 4-11°C (Scott and Crossman, 1973). Northern Pike typically migrate up tributaries to flooded marshes and wetlands or shallow shoreline inundations for spawning. Optimal spawning substrate is flooded vegetation in shallow, sheltered areas. Grasses and sedges are the preferred substrate, but other vegetation may be used (Casselman and Lewis, 1996). Accordingly, in-stream areas with vegetated hummocks, mats, and other flooded areas with vegetation were specifically targeted for surveys.

The following watercourses were surveyed for evidence of Northern Pike spawning: the Fraser Municipal Drain, the Roxborough-Plantagenet Boundary Municipal Drain, the Upper Tayside Municipal Drain, and the Albert Fahey Award Drain (Figure 4). These watercourses were surveyed on four dates in 2021: April 6, 8, 15, and 16. Water temperature, pH, dissolved oxygen, and specific conductance were measured at each station shown in Figure 4 during each survey.

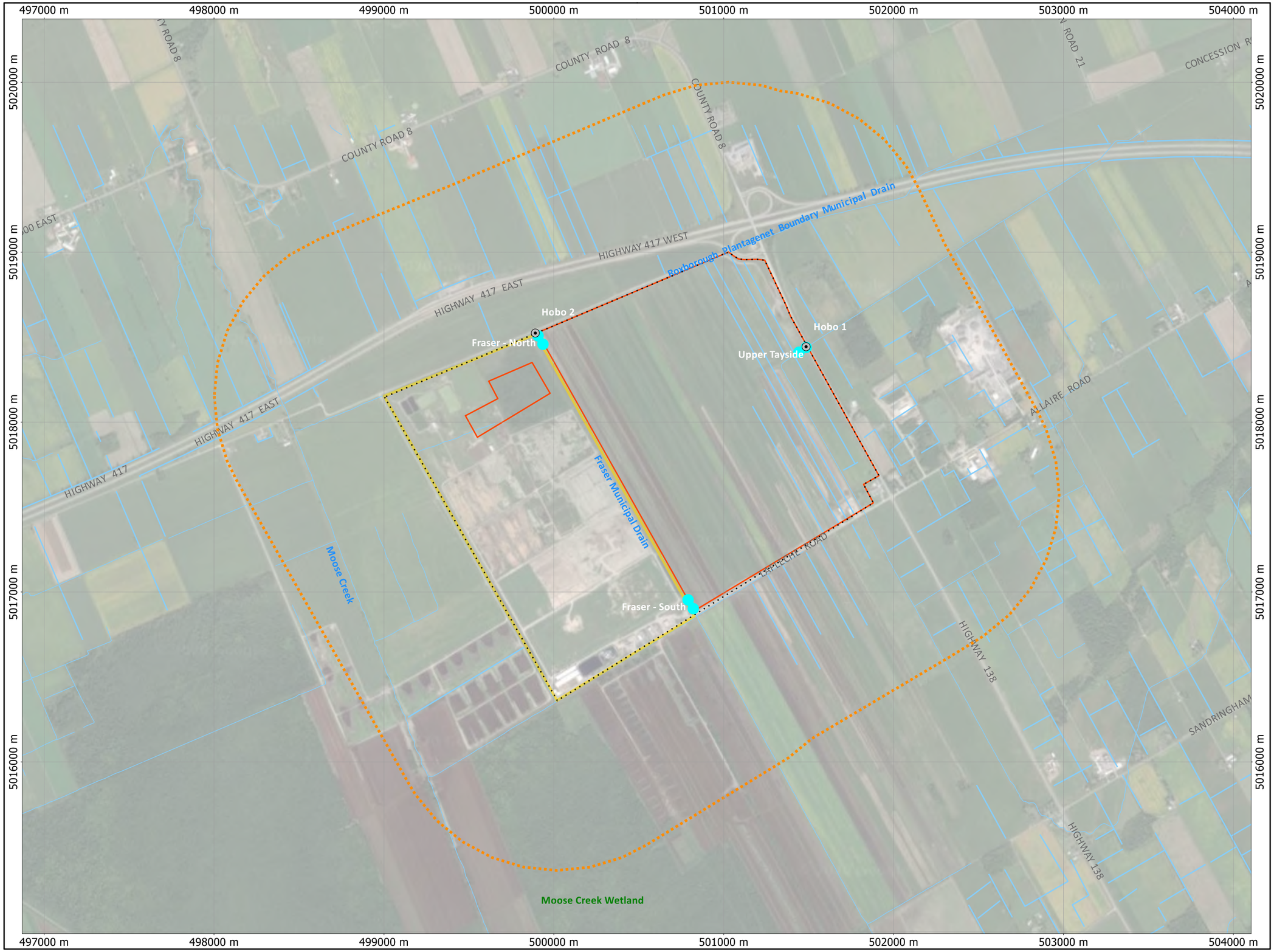

Figure 3 Map showing electrofishing and temperature locations on the Future Development Lands, 2019

Legend

- Fishing Transect
- Temperature Logger Locations
- Eastern Ontario Waste Handling Facility
- Future Development Lands
- On Site Study Area
- Off Site Study Area
- Water

N

0 500 m

Project: GFL 1188
Created By: RH
Checked By: KB
Universal Transverse Mercator - Zone 18 (N)
Printed on: 2022-01-01

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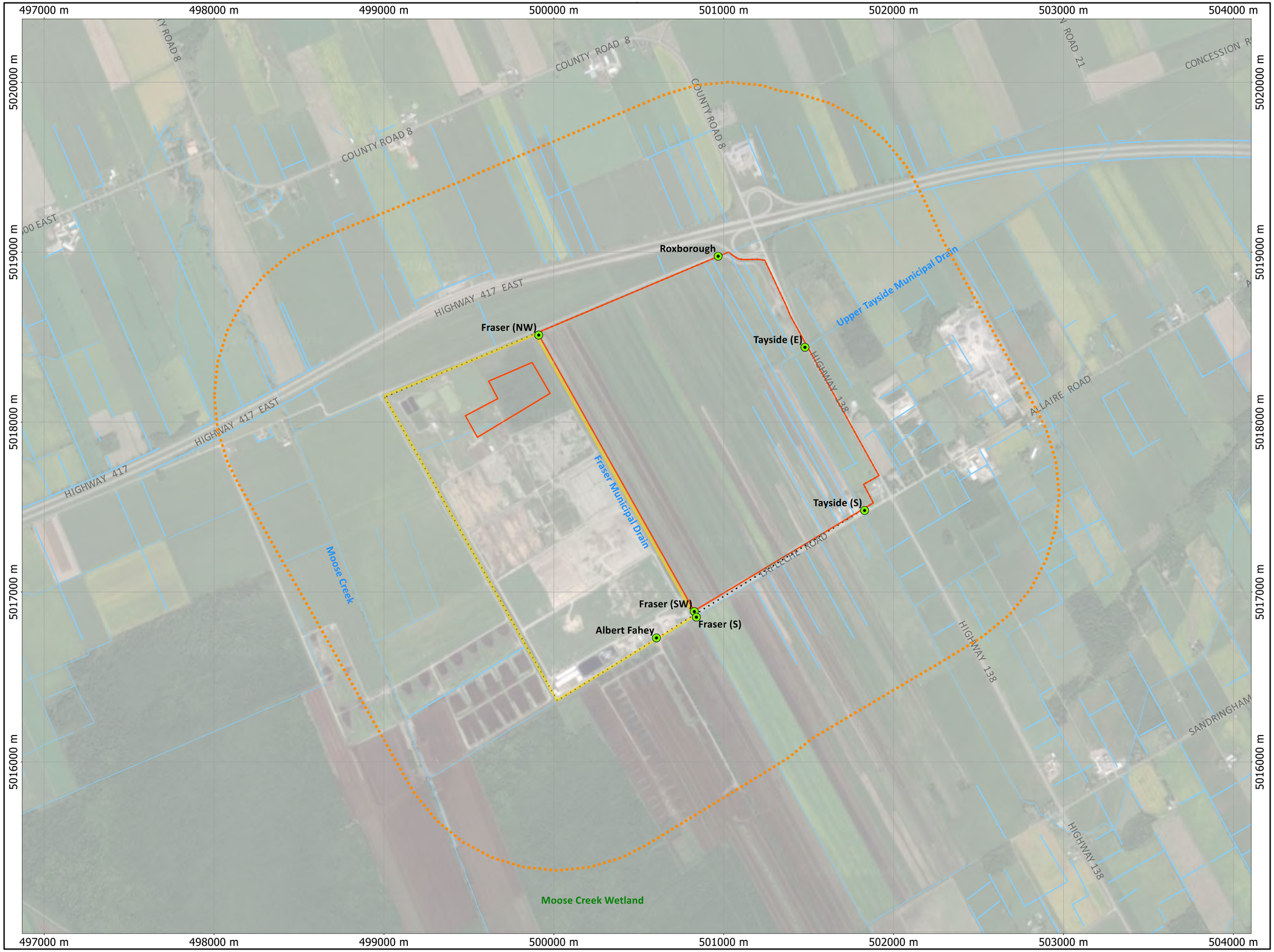
Figure 4 Map showing the locations of Northern Pike spawning surveys, 2021



Legend

- Pike Station
- Eastern Ontario Waste Handling Facility
- Future Development Lands
- On Site Study Area
- Off Site Study Area
- Water

N

0 500 m

Project: GFL 1188
Created By: RH
Checked By: KB
Universal Transverse Mercator - Zone 18 (N)
Printed on: 2022-03-01

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2.2.2.2.2 Electrofishing Surveys

Spring electrofishing surveys were completed via backpack electrofishing on May 10, 2021 shortly after the Northern Pike spawning season. A total of 11 sites were surveyed, including two sites in Moose Creek (MC1 and MC2), three in the Fraser Municipal Drain (FD1, FD2, and FD3), two in the Albert Fahey Award Drain (AF1 and AF2), two in the Upper Tayside Municipal Drain (T1 and T2), one in the Roxborough-Plantagenet Boundary Municipal Drain (RPB1), and one in an unnamed surface water feature/ditch (Sod 1; Figure 5). Each electrofishing site consisted of a reach approximately 50 m long.

Quantitative and qualitative water quality and habitat assessment surveys were conducted to compliment spring fish community data. Supporting measurements included channel morphology information such as mean wetted depth, mean wetted width, mean bankfull width, and mean bankfull depth, along with a general description of substrate, channel anatomy, bank stability, vegetation cover, migratory obstructions, and surrounding land use. Water temperature, pH, dissolved oxygen, and specific conductance were measured at each station shown in Figure 5.

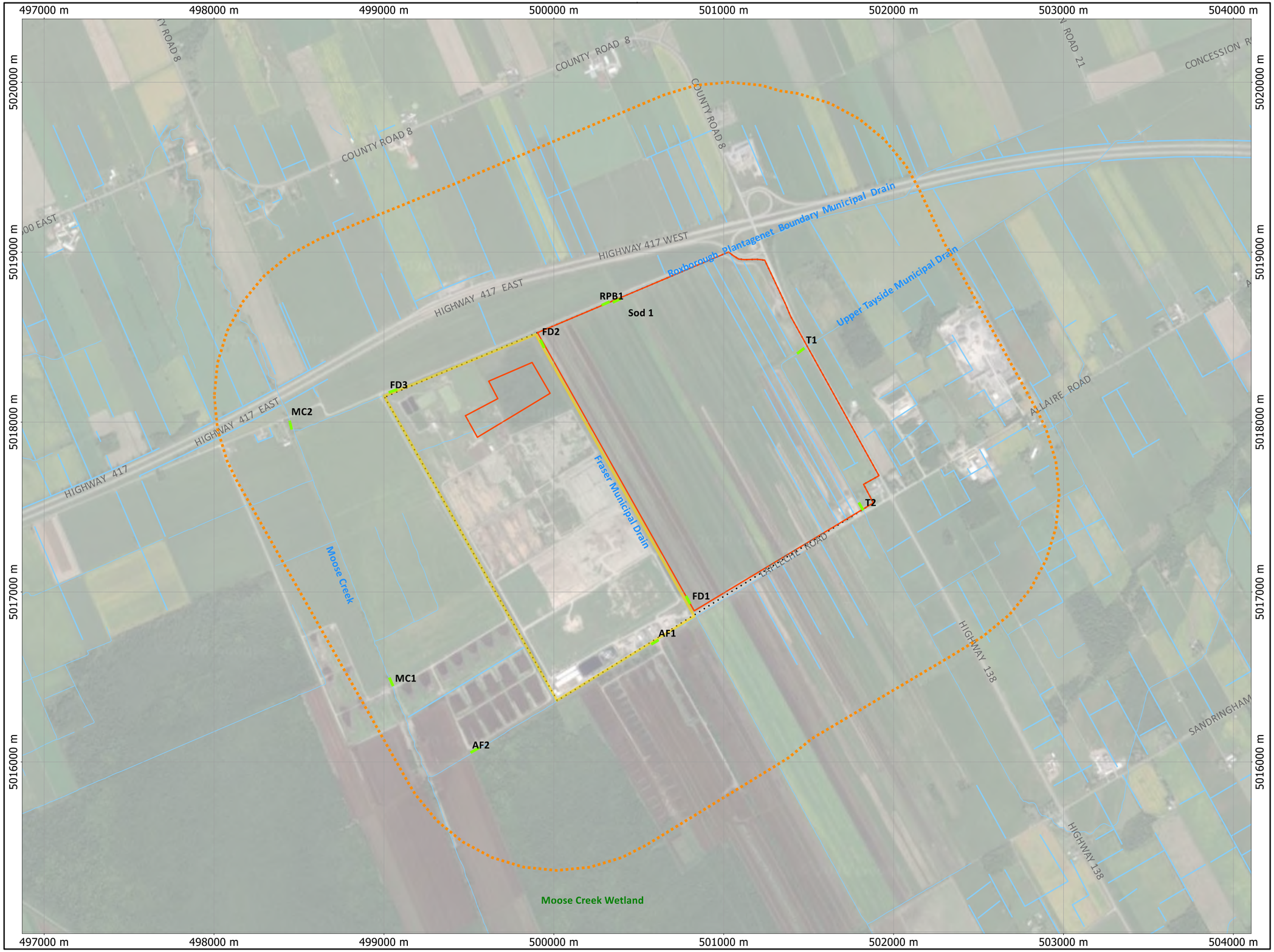

Figure 5 Map shpowing the locations of electrofishing surveys, 2021

Legend

- Fishing Transect
- Eastern Ontario Waste Handling Facility
- Future Development Lands
- On Site Study Area
- Off Site Study Area
- Water

N

0 500 m

Project: GFL 1188
Created By: RH
Checked By: KB
Universal Transverse Mercator - Zone 18 (N)
Printed on: 2022-01-01

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3.0 RESULTS

3.1 Terrestrial & Wetland Habitats

3.1.1 Ecological Land Classification

Sixteen distinct ELC units (ecosites, vegetation types, or other) were delineated for the Study Areas (Figure 6). Only four of these units fall on the Future Development Lands, highlighting the homogeneity of land cover here. Seven of the 16 ELC units are of anthropogenic nature (e.g., landfill, industrial, agricultural) which further illustrates how much of the land cover in the Study Areas is non-natural. Eleven of these ELC units are terrestrial classifications and five are wetland (swamp) classifications. Each ELC unit and the dominant vegetation therein (if appropriate) is described in detail below. The ELC designations below were used in subsequent analyses to identify potential habitat that may be used by species of interest (i.e., SAR) occurring or potentially occurring in the Study Area.

A list of vascular plant species occurring on the Future Development Lands compiled from the detailed vegetation inventory is available in Appendix A. No SAR or federally, provincially, regionally[2], or locally significant vegetation species or unique communities were identified on the Future Development Lands.

[2] NEA (2018) indicated Field Mustard (*Brassica rapa*), present in the area, as regionally rare based on Cuddy (1991). Field Mustard was observed during the present field studies, but it is no longer considered rare as per Cuddy's updated list (Cuddy, 1998).

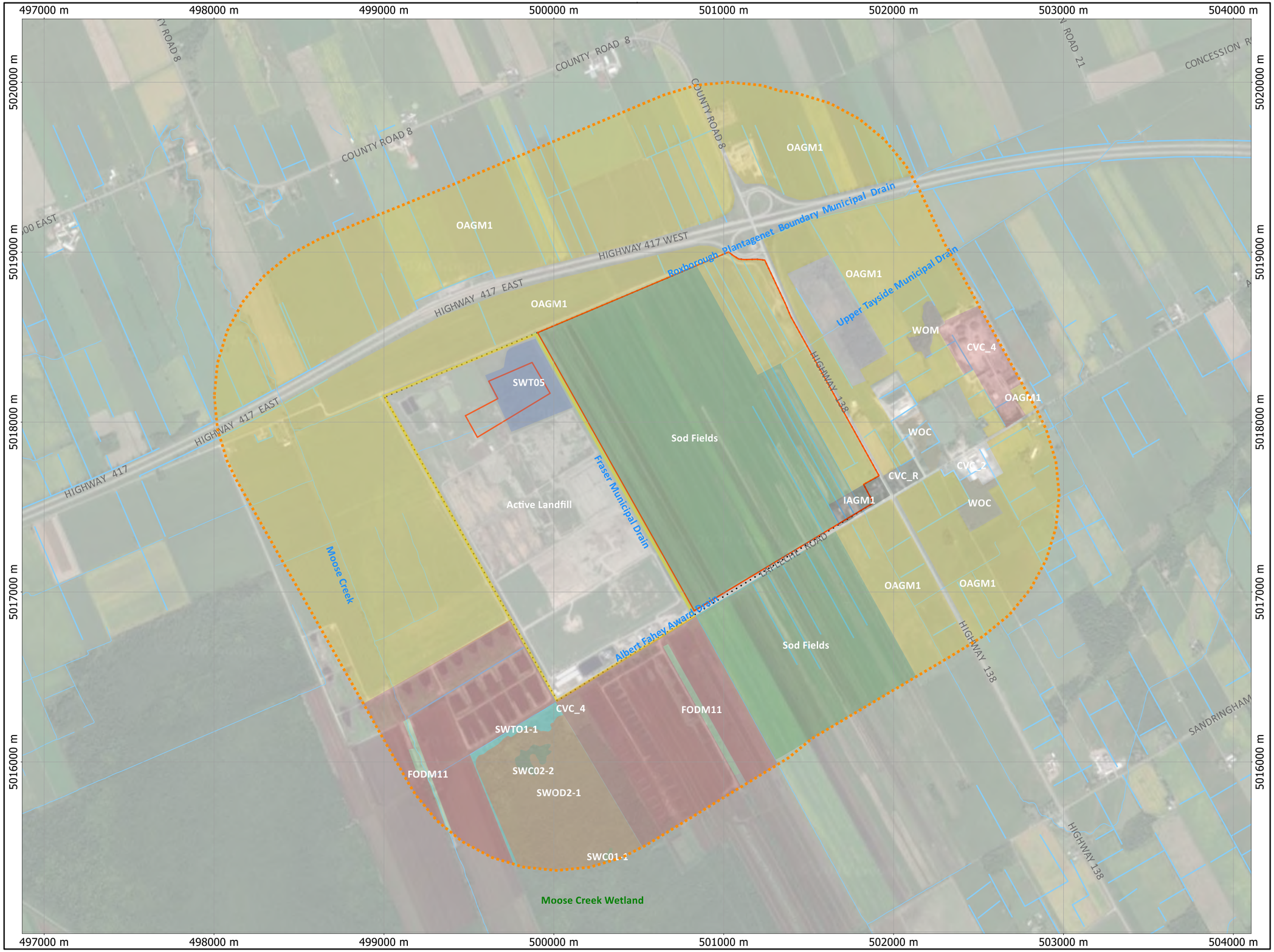

Figure 6 Map showing Ecological Land Classifications for the Study Areas, 2019

Legend

ELC Codes

- Active Landfill
- CVC_2
- CVC_4
- CVC_R
- FODM11
- IAGM1
- OAGM1
- SWC01-1
- SWC02-2
- SWOD2-1
- SWT05
- SWTO1-1
- Sod Fields
- WOC
- WOD
- WOM

- Eastern Ontario Waste Handling Facility
- Future Development Lands
- On Site Study Area
- Off Site Study Area
- Water

N

0 500 m

Project: GFL 1188
Created By: RH
Checked By: KB
Universal Transverse Mercator - Zone 18 (N)
Printed on: 2022-03-01

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Sod Fields (no applicable ELC code)

This ELC unit corresponds with the expansive sod fields that dominate the Future Development Lands and the sod fields to the south in the Off-Site Study Area (Figure 7). These fields are heavily dominated by Kentucky Bluegrass (*Poa pratensis*) which appears to be the only grass species being used for sod operations in these fields. There are several narrow and linear drainage ditches dispersed throughout the sod fields, some of which are unvegetated and some of which contain mainly Barnyard Grass (*Echinochloa* sp.). Large swaths of sod are removed from the fields throughout the growing season, leaving large linear strips of exposed soil throughout the fields. This ELC unit includes roadside ditches, stretches of the Roxborough Plantagenet Boundary Municipal Drain, the Fraser Municipal Drain, and the Upper Tayside Municipal Drain.

Figure 7 Photo of the sod field on the Future Development Lands taken July 26, 2019

Annual Row Crops Ecosite (OAGM1)

This ecosite is made up of mainly soybean and corn fields that surround the sod fields on the Future Development Lands and occur within the Off-Site Study Area. The annual row crop area within the Future Development Lands contained soybeans during the 2019, 2020, and 2021 field campaigns with remnant corn stalks from previous growing seasons (Figure 8).

Figure 8 Photo of the annual row crop ecosite (OAGM1) on the Future Development Lands taken June 28, 2019

Active Landfill Area (no applicable ELC code)

This ELC unit is composed of the large active landfill area of the EOWHF; an area in the northeastern portion of the EOWHF is considered as part of the Future Development Lands in this study. For the purposes of this report, a smaller GFL Environmental Inc. facility east of the Future Development Lands that deals with contaminated soils has been grouped into this ELC unit. The landfill and soils facilities contain GFL Environmental Inc. offices and parking lots, several storage and warehouse buildings, waste management areas, compost facilities, wastewater treatment facilities, and stormwater management ponds/ditches. Remaining vegetation in these areas are mainly limited to small areas of mowed lawn and grassy areas of the landfill that have been capped.

Organic Deciduous Thicket Swamp Ecosite (SWTO5)

The Organic Deciduous Thicket Swamp Ecosite consists of a dense stand of mostly Common Buckthorn (*Rhamnus cathartica*) located in the northeastern corner of the property containing the EOWHF (Figure 9). This ecosite makes up the dominant land cover of the portion of the Future Development Lands that occurs on the EOWHF property. The thicket swamp contains scattered cover of Trembling Aspen (*Populus tremuloides*), Red Maple (*Acer rubrum*), Tamarack (*Larix laricina*), and White Birch (*Betula papyrifera*). These trees are relatively young and are mostly less than 25 centimetres in diameter at breast height. The shrub layer also contains Alder Buckthorn (*Frangula alnus*), willow (*Salix* spp.) shrubs, and Pin Cherry (*Prunus pensylvanica*). There is essentially no ground cover within the thicket swamp due to the dense shrub layer. The margins of the thicket swamp are disturbed from surrounding landfill operations and are dominated by Common Reed (*Phragmites australis*) and contain patches of Black Raspberry (*Rubus occidentalis*). The northern edge of the thicket swamp borders a stormwater management pond that was constructed during KAL's field campaign. The thicket swamp has organic soils to a depth of greater than 40 cm and the water table is above the surface in the spring. Under ELC, the combination of these characteristics designates the area as a wetland (swamp) ecosite rather than a terrestrial ecosite.

NEA (2018) previously classified this area as a Red Maple swamp with an abundance of fern species. The difference in classifications between KAL and NEA are perhaps due to changes in the moisture regime of the area and surrounding land use since NEA's field investigations. Additionally, the aggressive and invasive nature of Common Buckthorn has likely allowed this species to quickly dominate the area.

Figure 9 Photo of the Organic Deciduous Thicket Swamp Ecosite (SWTO5) in the On-Site Study Area taken on October 19, 2021

Naturalized Deciduous Hedgerow Ecosite (FODM11)

This ecosite is composed of three naturalized deciduous hedgerows: one on the western edge of the Future Development Lands between sod fields in the east and the EOWHF to the west ("FODM11-A"), one that runs parallel to the eastern edge of the property south of the EOWHF that is used for peat operations in the Off-Site Study Area ("FODM11-B"), and one that runs along Moose Creek in the Off-Site Study Area ("FODM11-C"; Figure 10).

FODM11-A is on the western edge of the Fraser Municipal Drain. It is approximately 1.7 km long and 30 m wide at its widest point and is dominated by Manitoba Maple (*Acer negundo*) and includes Crack Willow (*Salix fragilis*; Figure 10). The understory of FODM11-A (i.e., the riparian vegetation of the Fraser Municipal Drain here) is predominantly Reed Canary Grass (*Phalaris arundinacea*) but also includes common vegetation found along the banks of drains in the area, such as Wild Parsnip (*Pastinaca sativa*) and Purple Loosestrife (*Lythrum salicaria*).

FODM11-B is bordered by peat operations on the east and west and is dominated by Trembling Aspen and contains Red Maple, White Cedar (*Thuja occidentalis*), White Birch, and several dying/dead Green Ash (*Fraxinus pennsylvanica*). The understory of FODM11-B is dominated by Black Raspberry and Canada Goldenrod (*Solidago canadensis*). The portion of FODM11-B that falls within the Off-Site Study Area is approximately 870 m long and 29 m wide at its widest point.

FODM11-C has a very similar species composition to FODM11-A.

Figure 10 Photo of FODM11-A (Naturalized Deciduous Hedgerow Ecosite) in the On-Site Study Area taken July 26, 2019

Red Maple Organic Deciduous Swamp Type (SWDO2-1; SWD6-1 under older versions of ELC)

This vegetation type dominates the wooded area of Moose Creek Wetland in the Off-Site Study Area. Vegetation cover here is dominated by Red Maple and includes Trembling Aspen, White Birch, and Alder Buckthorn (Figure 11). Ground cover is dominated by ferns, mainly Cinnamon Fern (*Osmundastrum cinnamomeum*) and Royal Fern (*Osmunda regalis* var. *spectabilis*). Other ground cover species with relatively high cover include Goldthread (*Coptis trifolia*), Starflower (*Trientalis borealis*), Dwarf Raspberry (*Rubus pubescens*), and Wild Sarsaparilla (*Aralia nudicaulis*). This area has organic soils to a depth of greater than 40 cm, making it a wetland (swamp). However, based on the species present (i.e., >50% are not obligate wetland species), this area is likely transitioning into more of a terrestrial woodland rather than a swamp. It is possible that this swamp has been drained because of surrounding land use, making it more suitable for woodland species rather than typical swamp species. The water table here was below the surface throughout the 2019 field campaign. Dead/dying trees with snags and/or loose bark were observed throughout this vegetation type.

Figure 11 Photo of the Red Maple Organic Deciduous Swamp Type (SWDO2-1) in the Off-Site Study Area taken on July 26, 2019

Speckled Alder Organic Deciduous Thicket Swamp Type (SWTO1-1)

This vegetation type consists of the northern edge of the Moose Creek Wetland in the Off-Site Study Area and is co-dominated by Speckled Alder (*Alnus incana*) and Alder Buckthorn (Figure 12). The understory is thick with dense cover of these shrubs. Ground cover is dominated by Speckled Alder and Alder Buckthorn saplings as well as Early Meadow-rue (*Thalictrum dioicum*). Soils here are organic to a depth beyond 40 cm, indicating wetland soils.

Figure 12 Photo of the Speckled Alder Organic Deciduous Swamp Type (SWTO1-1) in the Off-Site Study Area taken on July 26, 2019

Tamarack Organic Coniferous Swamp Type (SWCO2-2)

The SWCO2-2 type exists as a pocket within the larger SWDO2-1 unit in the portion of Moose Creek Wetland that falls in the Off-Site Study Area. The Tamarack Organic Coniferous Swamp Type consists of a stand of mainly Tamarack and is approximately 2 ha in size. The understory is dominated by Speckled Alder and Alder Buckthorn saplings and Early Meadow-rue. Soils are organic to a depth beyond 40 cm.

White Cedar Organic Coniferous Swamp Type (SWCO1-1)

A small pocket of White Cedar Organic Coniferous Swamp Type exists within the larger SWDO2-1 type within Moose Creek Wetland on the edge of the Off-Site Study Area. This pocket is dominated by White Cedar and includes Red Maple and White Birch. The understory is relatively open and ground cover is dominated by ferns, mainly Cinnamon Fern and Royal Fern. Soils here are organic to a depth beyond 40 cm.

Extraction Ecosite (CVC_4)

The Extraction Ecosite includes peat operations on lands owned by GFL Environmental Inc. (operated by Calco Soil) southwest of the Future Development Lands and quarry operations east of the Future Development Lands located at 17423 Allaire Road (Martin Quarry, operated by A.L. Blair Construction Ltd.). These areas are in the Off-Site Study Area and are largely unvegetated, with the peat extraction areas being dominated by exposed peat (Figure 13) and the quarry mainly consisting of piles of construction aggregate. Vegetation was not specifically investigated at the quarry, but the peat extraction areas contain remnant patches of Speckled Alder, Southern Wild-raisin (*Viburnum cassinoides*), Canada Goldenrod, Black Raspberry, Colts-foot (*Tussilago farfara*), and weeds common to disturbed areas such as Common Dandelion (*Taraxacum officinale*) and Field Mustard (*Brassica rapa*). The lands used for peat extraction contain many ditches/trenches to improve drainage on the property; this ecosite also encompassed the Albert Fahey Award Drain. All these ditches have clay substrates, and most are unvegetated, though some of the larger depressions on the eastern side of the property contain Broadleaf Cattail (*Typha latifolia*) and Common Reed.

Figure 13 Photo showing peat excavation operations (CVC_4) off-Site taken April 23, 2019

Woodlands in the Off-Site Study Area (WOC, WOM, and WOD Ecosites)

There are four woodlands distributed throughout the agricultural lands east of the Future Development Lands in the Off-Site Study Area. These wooded areas were not specifically investigated by KAL during the field campaigns due to access restrictions, but general observations regarding their characteristics were made from aerial imagery (Google Earth Pro). These wooded areas range in size from approximately 3 ha to 19 ha. Two of these woodlands are conifer-dominated (WOC; located on the north and south sides of Allaire Road), one is dominated by deciduous trees (WOD; located north of GFL Environmental Inc.'s soils facility; note that more than half of this woodland is young, regenerating trees), and one is a mixed-woodland (WOM; located along the northwestern edge of the Martin Quarry). The mixed woodland is mapped as containing an approximately 0.8 ha unevaluated wetland (MNRF, 2021a).

Agricultural (IAGM1) and Light Industrial Infrastructure (CVC_2) and Rural Residential Properties (CVC_R)

Sod facilities and buildings associated with Manderley Turf Products at 17269 Lafleche Road that fall within the Future Development Lands were classified as Agricultural Infrastructure (IAGM1). There are several properties containing agricultural facilities (IAGM1), light industrial businesses (CVC_2), and rural properties (CVC_R) on lands east to southeast of the Future Development Lands in the Off-Site Study Area. These properties contain houses, storage buildings, warehouses, mowed lawn, barns, and/or open pasture.

3.1.2 Identification of Key Species for Focused Study

Table 1 indicates the SAR (along with their provincial and federal statuses) that had occurrence records within 10 km of the Study Areas based on the desktop review.

Table 1 Species at risk with occurrence records within 10 km of the Study Areas

Species Name (*Taxonomic name*)	Occurrence Record Sources (within 10 km)	Provincial Status (ESA)	Federal Status (SARA)
BIRDS			
Bald Eagle (*Haliaeetus leucocephalus*)	NEA (2018)	Special Concern	Not at Risk
Bank Swallow *(Riparia riparia)*	KAL (2021a), NEA (2018), Bird Studies Canada *et al.* (2009)	Threatened	Threatened
Barn Swallow *(Hirundo rustica)*	KAL (2021a), NEA (2018), Bird Studies Canada *et al.* (2009)	Threatened	Threatened
Bobolink *(Dolichonyx oryzivorus)*	Cornell Lab of Ornithology (2021), MNRF (2021b), NEA (2018), Bird Studies Canada *et al.* (2009)	Threatened	Threatened
Eastern Meadowlark (*Sturnella magna*)	MNRF (2021a,b), Bird Studies Canada et al. (2009)	Threatened	Threatened
Eastern Whip-poor-will *(Caprimulgus vociferous)*	KAL (2021a), Bird Studies Canada *et al.* (2009)	Threatened	Threatened
Eastern Wood-Pewee *(Contopus virens)*	KAL (2021a), NEA (2018), Bird Studies Canada *et al.* (2009)	Special Concern	Special Concern

Species Name (*Taxonomic name*)	Occurrence Record Sources (within 10 km)	Provincial Status (ESA)	Federal Status (SARA)
Golden Eagle (*Aquila chrysaetos*)	NEA (2018)	Endangered	Not at Risk
Peregrine Falcon *(Falco peregrinus)*	NEA (2018)	Special Concern	Special Concern
Rusty Blackbird *(Euphagus carolinus)*	NEA (2018)	Special Concern	Special Concern
Wood Thrush *(Hylocichla mustelina)*	KAL (2021a)	Special Concern	Threatened
MAMMALS			
Eastern Small-footed Myotis *(Myotis leibii)*	KAL (K. Black) personal communication with MECP (C. Hann) on January 5, 2021	Endangered	Not at Risk
Little Brown Myotis *(Myotis lucifugus)*	KAL (2021a)	Endangered	Endangered
Northern Long-eared Bat (*Myotis septentrionalis)*	KAL (K. Black) personal communication with MECP (C. Hann) on January 5, 2021	Endangered	Endangered
Tri-coloured Bat (*Perimyotis subflavus*)	KAL (K. Black) personal communication with MECP (C. Hann) on January 5, 2021	Endangered	Endangered
REPTILES			
Eastern Ribbonsnake *(Thamnophis sauritus)*	KAL (2021a)	Special Concern	Threatened
Midland Painted Turtle (*Chrysemys picta*)	KAL (2021a), Ontario Nature (2019)	Not at Risk	Special Concern
Milksnake (*Lampropeltis triangulum*)	KAL (2021a)	Not at Risk	Special Concern
Snapping Turtle *(Chelydra serpentine)*	KAL (2021a), MNRF (2021a,b), Ontario Nature (2019), NEA (2018)	Special Concern	Special Concern
AMPHIBIANS			
Western Chorus Frog (*Pseudarcris triseriata*)	KAL (2021a), Ontario Nature (2019), NEA (2018)	Not at Risk	Threatened
UNKNOWN			
Restricted species	MNRF (2021a,b)	Unknown	Unknown

SAR that are listed as Special Concern or are not listed under the ESA but are listed under SARA would not normally be protected on privately owned land. However, the Federal Minister of the Environment and Climate Change can and has imposed SARA protections on private projects planned within habitat areas for species that are regionally highly significant. Species listed as Special Concern under the ESA may be protected by the municipality if habitat areas meet the criteria for Significant Wildlife Habitat for Special Concern Species (MNRF, 2015a).

MNRF (2021a,b) indicated an occurrence record for a "restricted species" within 5 km of the Study Areas. An occurrence of a "restricted species" represents a species with publicly restricted access to taxonomic and locational information due to its sensitive nature (MNRF, 2021a). Examples of "restricted species" include American Ginseng (*Panax quinquefolius*) and Spotted Turtle (*Clemmys guttata*) which are frequently illegally

collected for root harvesting and the pet trade, respectively. Since KAL does not have access to details regarding the "restricted species", we are unable to perform an assessment on its potential to occur in the Study Areas. Details regarding the "restricted species" may be obtained directly from the MNRF and/or MECP.

Table 2 summarizes the habitat preferences, potential habitat areas in the Study Areas, and appropriate survey approaches to confirm the presence/absence of the SAR listed in Table 1. These approaches were implemented for field surveys as described in Section 2.1.

Table 2 Habitat preferences, potential habitat areas in the Study Areas, and study approaches for species at risk with occurrence records within 10 km of the Study Areas

Species	Habitat Preferences	Potential Habitat in the Study Areas	Study Approach
Birds			
Bald Eagle (*Haliaeetus leucocephalus*)	Nest in mature forests near open water. In large trees such as pine and poplar.	No typical habitat within the Study Areas, but this species may be artificially attracted to waste and prey at the EOWHF.	Bald Eagle would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Bank Swallow *(Riparia riparia)*	Colonial nester; burrows in eroding silt or sand banks, sand pit walls, and other similar habitats, including those created by anthropogenic earth works.	Peat mounds and cut banks on the lands used for peat extraction in the Off-Site Study Area (CVC_4) provide suitable nesting habitat. The open sod fields and agricultural fields (OAGM1) on the Future Development Lands and in the Off-Site Study Area provide suitable foraging habitat.	Bank Swallow would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Barn Swallow *(Hirundo rustica)*	Nests on barns and other structures. Forages in open areas for flying insects. Lives in close association with humans and prefers to nest on structures such as open barns, under bridges, and in culverts.	A variety of buildings on the Future Development Lands and Off-Site Study Area may provide suitable nesting habitat. The open sod fields and agricultural fields (OAGM1) on the Future Development Lands and in the Off-Site Study Area provide suitable foraging habitat.	Barn Swallow would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Bobolink *(Dolichonyx oryzivorus)*	Periodically mown, dry meadow for nesting. Habitat (meadow) should be >10 ha, and preferably >30 ha before Bobolink are attracted to the area. Not near tall trees.	None directly on the Future Development Lands. At the time of writing this report, most agricultural fields in the Study Areas were used for annual row crops (corn and soybeans) and not hay. Bobolink has been recorded feeding in soybean fields (Renfrew, 2007), but it does not typically occupy fields of row crops (Sample, 1989; Jobin et al., 1996).	Bobolink would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Eastern Meadowlark (*Sturnella magna*)	Periodically mown, dry meadow for nesting. Habitat (meadow) should be >10 ha, and preferably >30 ha before Eastern Meadowlark are attracted to the area. Not near tall trees.	None directly on the Future Development Lands. At the time of writing this report, most agricultural fields in the Study Areas were used for annual row crops (corn and soybeans) and not hay. Eastern Meadowlarks have been observed nesting in soybean and corn fields and row crops are considered low-quality habitat for this species (Cadman *et al.*, 2007).	Eastern Meadowlark would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.

Species	Habitat Preferences	Potential Habitat in the Study Areas	Study Approach
Eastern Whip-poor-will *(Caprimulgus vociferous)*	Nests on the ground in open deciduous or mixed woodlands with little underbrush.	No suitable habitat on the Future Development Lands. Wooded areas in the Off-Site Study Area provide suitable habitat.	Eastern Whip-poor-will would be observable following the Draft Survey Protocol for Eastern Whip-poor-will in Ontario (MNRF, 2014). However, given the very low likelihood of encountering Eastern Whip-poor-will on the Future Development Lands and recent surveys documenting the presence of the species in the Off-Site Study Area (KAL, 2021a), specific surveys for Eastern Whip-poor-will are not necessary.
Eastern Wood-pewee *(Contopus virens)*	Woodland species often found in the mid-canopy layer near clearings and edges of deciduous and mixed forests.	No suitable habitat on the Future Development Lands. Wooded areas in the Off-Site Study Area provide suitable habitat.	Eastern Wood-pewee would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Golden Eagle (*Aquila chrysaetos*)	Nest in remote, undisturbed areas, usually building their nests on ledges on a steep cliff/riverbank or large trees if needed. Most hunting is done near open areas such as large bogs or tundra.	No typical habitat within the Study Areas, but this species may be artificially attracted to waste and prey at the EOWHF.	Golden Eagle would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Peregrine Falcon *(Falco peregrinus)*	Nests on tall, steep cliff ledges close to large bodies of water. Urban peregrines raise their young on ledges of tall buildings, even in busy downtown areas.	No typical habitat within the Study Areas, but this species may be artificially attracted to waste and prey at the EOWHF.	Peregrine Falcon would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Rusty Blackbird *(Euphagus carolinus)*	Prefers wet wooded or shrubby areas (nests at edges of boreal wetlands and coniferous forests). These areas include bogs, marshes, and beaver ponds.	No suitable habitat on the Future Development Lands. Wooded areas in the Off-Site Study Area may provide suitable habitat.	Rusty Blackbird would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Wood Thrush *(Hylocichla mustelina)*	Lives in mature deciduous and mixed (conifer-deciduous) forests. They seek moist stands of trees with well-developed undergrowth and tall trees for singing and perching. Usually build nests in Sugar Maple or American Beech.	No suitable habitat on the Future Development Lands. Wooded areas in the Off-Site Study Area provide suitable habitat.	Wood Thrush would be observable following standard breeding bird survey protocols (Bird Studies Canada *et al.,* 2001) and through incidental observations.
Mammals			
Eastern Small-footed Myotis *(Myotis leibii)*	In the spring and summer, roosts in a variety of habitats, including in or under rocks, in rock outcrops, in buildings, under bridges, or in caves, mines, or hollow trees. Overwinters in caves and abandoned mines.	Buildings on the Future Development Lands may provide roosting habitat. Wooded areas in the Off-Site Study Area provide suitable roosting habitat. The open sod, peat, and agricultural fields throughout the Study Areas provide suitable foraging habitat.	Eastern Small-footed Myotis would be detectable via acoustic surveys following the Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF, 2017a).

Species	Habitat Preferences	Potential Habitat in the Study Areas	Study Approach
Little Brown Myotis *(Myotis lucifugus)*	The most widespread SAR bat. During the day they roost in trees and buildings. They often select attics, abandoned buildings, and barns for summer colonies where they can raise their young. They can squeeze through very tiny spaces (as small as six millimetres across) allowing them access to many different roosting areas.	Limited tree cover and buildings on the Future Development Lands may provide marginal roosting habitat. Wooded areas in the Off-Site Study Area provide suitable roosting habitat. The open sod, peat, and agricultural fields throughout the Study Areas provide suitable foraging habitat if the species is roosting nearby.	Little Brown Myotis would be detectable via acoustic surveys following the Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF, 2017a).
Northern Long-eared Bat (*Myotis septentrionalis)*	Roosts in tree crevices, hollows, under bark of live and dead trees, and in buildings. Forages in cluttered environments (within forest edges).	Limited tree cover and buildings on the Future Development Lands may provide marginal roosting habitat. Wooded areas in the Off-Site Study Area provide suitable roosting habitat. The open sod, peat, and agricultural fields throughout the Study Areas provide suitable foraging habitat if the species is roosting nearby.	Northern Long-eared Bat would be detectable via acoustic surveys following the Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF, 2017a).
Tri-colored Bat (*Perimyotis subflavus*)	Roosts within live and dead foliage within or below the tree canopy. Prefers oak trees. Forages along forested riparian corridors, over water, and within gaps in forest canopies.	Limited tree cover and buildings on the Future Development Lands may provide marginal roosting habitat. Wooded areas in the Off-Site Study Areas provide suitable roosting habitat. The open sod, peat, and agricultural fields throughout the Study Areas provide suitable foraging habitat if the species is roosting nearby.	Tri-coloured Bat would be detectable via acoustic surveys following the Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF, 2017a).
Reptiles			
Eastern Ribbonsnake *(Thamnophis sauritus)*	The Eastern Ribbonsnake is semi-aquatic. It is most frequently found along the edges of shallow ponds, streams, marshes, swamps, or bogs bordered by dense vegetation that provides cover. Abundant exposure to sunlight is also required. Adjacent upland areas may be used for birthing and/or overwintering.	The Future Development Lands are not considered typical habitat for the species. This species was previously observed in the Off- Site Study Area south of the EOWHF, basking on a peat bank (KAL, 2021a). Wooded areas in the Off-Site Study Area provide suitable birthing/overwintering habitat.	Eastern Ribbonsnake would be observable following the Survey Protocol for Ontario's Species at Risk Snakes (MNRF, 2016). However, given the low likelihood of encountering this species on the Future Development Lands due to a lack of suitable habitat combined with the species' listed status under the ESA (Special Concern), specific surveys for this species are unnecessary. This species would be observable through incidental observations.
Midland Painted Turtle (*Chrysemys picta*)	Inhabits waterbodies such as ponds, marshes, lakes and slow-moving creeks that have a soft bottom and provide abundant basking sites and aquatic vegetation. Often basks on shorelines or on logs and rocks that protrude from the water. Hibernates on the bottom of waterbodies.	The surface water features in the Study Areas are not typical turtle habitat as they are heavily disturbed and shallow. They are shallow enough that they can be expected to freeze to bottom, eliminating them as potential overwintering habitat for all turtle species in the region. No open water wetlands or quiet marshes with slow flowing water ideal for turtles exist in the Study Areas. Surface water features associated with the Future Development Lands may provide suitability as travel corridors, foraging	Midland Painted Turtle would be observable following visual encounter surveys per the Survey Protocol for Blanding's Turtle (MNRF, 2015b) and through incidental observations. Although this protocol is intended for Blanding's Turtle, this species would be detectable using this protocol.

Species	Habitat Preferences	Potential Habitat in the Study Areas	Study Approach
		resources, and short-term refugia, but are highly unlikely to provide critical habitat.	
Milksnake (*Lampropeltis triangulum*)	Found in variety of habitats but tend to use open habitats such as rocky outcrops, fields, and forest edges. May be common in rural areas, especially around barns where they can thrive on abundant mice.	The Future Development Lands are not considered typical habitat for the species. This species was previously observed in the Off-Site Study Area south of the EOWHF, basking on a peat bank (KAL, 2021a). Wooded areas in the Off-Site Study Area provide suitable birthing/overwintering habitat.	Milksnake would be observable following the Survey Protocol for Ontario's Species at Risk Snakes (MNRF, 2016). However, given the low likelihood of encountering this species on the Future Development Lands due to a lack of suitable habitat combined with the species not being listed under the ESA, specific surveys for this species are unnecessary. This species would be observable through incidental observations.
Snapping Turtle *(Chelydra serpentine)*	A wide range of freshwater habitats characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation. Can use habitats ranging in size from lakes to ditches. Hibernates in mud or silt bottoms of lakes and rivers. Uses gravel or sandy areas near aquatic habitats for nesting.	The surface water features in the Study Areas are not typical turtle habitat as they are heavily disturbed and shallow. They are shallow enough that they can be expected to freeze to bottom, eliminating them as potential overwintering habitat for all turtle species in the region. No open water wetlands or quiet marshes with slow flowing water ideal for turtles exist in the Study Areas. Surface water features associated with the Future Development Lands may provide suitability as travel corridors/short-term refugia but are highly unlikely to provide critical habitat.	Snapping Turtle would be observable following visual encounter surveys as per the Survey Protocol for Blanding's Turtle (MNRF, 2015b) and through incidental observations. Although this protocol is intended for Blanding's Turtle, this species would be detectable using this protocol.
Amphibians			
Western Chorus Frog (*Pseudarcris triseriata*)	Inhabits forest openings around woodland ponds but can also be found in or near damp meadows, ditches, marshes, bottomland swamps, temporary ponds in open country, and even urban areas. Overwinters underground or under surface cover such as fallen logs.	Drains, ditches, and swamp habitats in the Study Areas provide suitable habitat.	Western Chorus Frog would be observable following amphibian surveys under the Marsh Monitoring Program (Bird Studies Canada *et al.,* 2008) and through incidental observations.

3.1.3 Focused Species at Risk Surveys

3.1.3.1 Breeding Birds

Weather conditions associated with morning breeding bird surveys are summarized in Table 3.

Table 3 Dates, weather conditions, and stations visited during breeding bird surveys in 2019

Date	Cloud Cover (%)	Air Temperature (°C)	Wind (Beaufort)	Stations Visited
2019-05-29	100	12 to 15	0 to 1	BBS1-7
2019-06-21	0	17 to 18	1 to 2	BBS2-1 to BBS2-5
2019-06-28	10	22 to 26	0 to 1	BBS2-1 to BBS2-5 and BBS1-7
2019-07-04	20 to 25	19 to 24	0	BBS2-1 to BBS2-5

A total of 32 bird species were observed in the Study Areas via the morning breeding bird surveys and incidental observations. A complete list of all species observed throughout the 2019 field campaign is available in Appendix B. The most frequently observed species during breeding bird surveys was European Starling (*Sturnus vulgaris*), followed by Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospiza melodia*), and Savannah Sparrow (*Passerculus sandwichensis*). The most abundant species on the Future Development Lands was Snow Goose (*Anser caerulescens*), with over 500 individuals incidentally observed on the sod fields outside of the breeding bird surveys on April 10, 23, 25, 29, and May 8, 2019. No regionally rare bird species (Cadman *et al.*, 1987) were observed.

Two listed SAR, Bank Swallow and Barn Swallow, were observed during the morning breeding bird surveys and through incidental observations. One active Barn Swallow nest was found on the exterior of the GFL Environmental Inc. office at the EOWHF (18T 500761 5016877) on May 29, 2019. Barn Swallows were also observed flying in and out of a Manderley Turf Products building in the southeastern corner of the Future Development Lands on June 21, June 28, and July 4, 2019 (near 18T 501751 5017491). Following the addition of the Manderley Turf Products property to the Future Development Lands and receiving access permission in fall 2020, the property was thoroughly inspected by KAL, including the exterior and interior of the buildings. No Barn Swallow nests were found on the property. The Barn Swallow nest that was observed on the exterior of the GFL Environmental Inc. office during the breeding bird surveys in 2019 was no longer present in the fall of 2020. An active Barn Swallow nest was incidentally observed in the box culvert at the Moose Creek crossing at Concession Road 7 (near the northwest corner of the Off-Site Study Area; 18T 498438 5018022; Figure 14) on May 10, 2021.

A colony of approximately 10 Bank Swallows had nests in a vertical bank of peat in the Off-Site Study Area located at 18T 500543 5016659 (Figure 14). Adults were seen flying in and out of approximately five nest cavities in the peat bank on June 28 and July 4, 2019.

Figure 14 Map showing the locations of Bank and Barn Swallow nests in the Study Areas and the associated habitat categories, 2021

Legend

Barn Swallow
- Category 1 & 2 Habitat
- Category 3 Habitat

Bank Swallow
- Category 1 Habitat
- Category 2 Habitat
- Category 3 Habitat

- Eastern Ontario Waste Handling Facility
- Future Development Lands
- On Site Study Area
- Off Site Study Area
- Water

N

0 500 m

Project: GFL 1188
Created By: RH
Checked By: KB
Universal Transverse Mercator - Zone 18 (N)
Printed on: 2022-03-01

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3.1.3.2 Bats and Other Mammals

During the seven nights of data collection via acoustic monitoring (June 28 to July 4, 2019), five species of bats were recorded on the acoustic monitors installed along the northwestern edge of the Future Development Lands (Table 4). All survey nights were warm (temperature >15°C) with low wind and no precipitation. Most recorded bat echolocations were made by Hoary Bats (*Lasiurus cinereus;* 296 recordings total) and Silver-haired Bats (*Lasionycteris noctivagans;* 263 recordings total). Big Brown Bats (*Eptesicus fuscus*) and Eastern Red Bats (*Lasiurus borealis*) were also observed (114 and five total recordings, respectively). One listed SAR, Little Brown Myotis, was observed. Acoustic monitoring captured a total of nine recordings of Little Brown Bat (three at AM-3 and six at AM-4). AM-4 (the northern acoustic monitor) recorded more than 10 times the number of recordings from AM-3 (the southern acoustic monitor).

Note that the number of recordings obtained is not directly equivalent to the number of bats present in an area. A single bat may pass the monitor many times during an evening, triggering multiple recordings, while other bats foraging just beyond the monitor range may never trigger recordings. Very generally, however, the number of recordings per species can be indicative of relative abundances.

Table 4 Number of bat recordings from acoustic monitoring performed June 28 to July 4, 2019

Date	Big Brown Bat		Eastern Red Bat		Hoary Bat		Silver-haired Bat		Little Brown Myotis	
Station	**AM-3**	**AM-4**	**AM-3**	**AM-4**	**AM-3**	**AM-4**	**AM-3**	**AM-4**	**AM-3**	**AM-4**
2019-06-28		18			3	32		1		
2019-06-29	1	10			1	100	1	5		1
2019-06-30	3	7			3	58	1	11		1
2019-07-01	2	24	2	1	5	29	2	94		2
2019-07-02	2	16	1		2	24	2	37		
2019-07-03	3	17			6	22	8	96	1	
2019-07-04	4	7	1		4	7	1	4	2	2
Total	**15**	**99**	**4**	**1**	**24**	**272**	**15**	**248**	**3**	**6**
Total Both Stations	**114**		**5**		**296**		**263**		**9**	

In addition to the bat species noted above, the following mammals and/or signs of them were observed in the On-Site Study Area: Muskrat (*Ondatra zibethicus*) and Coyote (*Canis latrans*).

3.1.3.3 Anurans

A total of six anuran species were observed during evening aural surveys (Table 5; see Appendix C for the degree of anuran calling). Western Chorus Frog (*Pseudacris* triseriata; not listed under ESA; listed as Threatened under SARA) was observed in low abundance within the Fraser Municipal Drain along the western edge of the Future Development Lands and along the northern edge of the EOWHF property. A maximum of three Western Chorus Frogs were observed at a survey station. Relatively low abundances of anurans were observed in general; American Toad (*Anaxyrus americanus*) and Gray Treefrog (*Hyla versicolor*) were the only

species observed at Call Code Level 3 (i.e., full chorus) during evening aural surveys. Choruses of these species were only heard during one round of surveys (June 17, 2020) and from only three out of 10 stations.

Table 5 Summarized results of evening anuran surveys conducted in 2020

Date	Species	Station(s) Observed	Cloud Cover (%)		Air Temperature (°C)		Wind (Beaufort)	
			Start	End	Start	End	Start	End
2020-04-25	American Toad	MMP-B	5	5	13	5	1	1
	Spring Peeper	MMP-C, MMP-D						
	Wood Frog	MMP-B, MMP-G, MMP-I						
2020-05-21	American Toad	MMP-A.1, MMP-A.2, MMP-B, MMP-C, MMP-D, MMP-E, MMP-G, MMP-H, MMP-I	5	5	18	14	1	2
	Spring Peeper	MMP-A.1, MMP-A.2, MMP-B, MMP-C, MMP-E, MMP-G, MMP-H, MMP-I						
	Western Chorus Frog	MMP-A.1, MMP-G						
2020-06-17	American Toad	MMP-A.1, MMP-A.2, MMP-C, MMP-G, MMP-H, MMP-I	10	10	25	20	1	1
	Gray Treefrog	MMP-A.1, MMP-A.2, MMP-D, MMP-G, MMP-H, MMP-I						
	Green Frog	MMP-D, MMP-H						

No amphibians were observed incidentally on the Future Development Lands in 2019 or 2020. Northern Leopard Frog (*Lithobates pipiens*) was incidentally observed along the Fraser Municipal Drain bordering the Future Development Lands during spring fish surveys in 2021.

No salamanders were observed in the Study Areas. Herp Atlas (Ontario Nature, 2019) indicates the following salamander species have been observed in the 10 x 10 km atlas square that contains the Study Areas: Blue-spotted Salamander (*Ambystoma laterale*), Eastern Red-backed Salamander (*Plethodon cinereus*), and Northern two-lined Salamander (*Eurycea bislineata*). None of these salamander species are at risk but all are Specially Protected Amphibians under the provincial *Fish and Wildlife Conservation Act*, which provides protection to individuals but not their habitats. It is considered unlikely that salamanders would interact with the expansion of the EOWHF given the lack of suitable salamander habitat on the Future Development Lands.

3.1.3.4 Reptiles

Two turtles were observed over the five rounds of visual encounter turtle surveys conducted in 2020 (Table 6). A Midland Painted Turtle (not listed under the ESA, Special Concern under SARA) was observed in a stormwater management ditch along the southwestern edge of the EOWHF (station T2) on April 6, 2020. This ditch is a linear surface water feature with dense stands of Common Reed and Broadleaf Cattail on the edges along with some woody shrub cover.

Table 6 Summarized results of turtle surveys conducted in 2020

Date	Species	Station(s) Observed	Cloud Cover (%)		Air Temperature (°C)		Wind (Beaufort)		Water Temperature (°C)
			Start	End	Start	End	Start	End	
2020-04-06	Midland Painted Turtle	T2	5	25	13	16	1	1	T2 = 4
2020-04-28	Snapping Turtle	T6	5	5	12	14	1	1	T6 = 6
2020-04-29	None observed	N/A	80	80	14	14	3	3	Average = 7
2020-05-13	None observed	N/A	0	20	14	15	1	1	Average = 11
2020-05-14	None observed	N/A	0	20	16	10	1	1	Average = 11

Table Notes: N/A = not applicable

A Snapping Turtle (Special Concern under ESA and SARA) was observed in the Roxborough-Plantagenet Boundary Municipal Drain along the northern edge of the Future Development Lands (station T6) on April 28, 2020. The channel of this drain where the Snapping Turtle was observed was heavily vegetated. The southern bank here consists of sod fields and the northern bank contains a narrow band of graminoids and Common Reed before Concession Road 7.

Note that the turtle survey on April 29, 2020 was not conducted under conditions recommended by MNRF (2015b). This day was overcast (cloud cover estimated at 80%) with an air temperature of 14°C. MNRF (2015b) indicates that surveys can be performed on partially cloudy or overcast days only when air temperature is above 15°C and is higher than water temperature. The air temperature during the survey on April 29, 2020 therefore varied from the protocol by one degree Celsius. However, the water temperature at each of the survey locations was lower than 14°C (average water temperature = 7°C). As such, there was still a thermal gradient on April 29 that would have promoted turtle basking (MNRF, 2015b) and turtles would have been visually detectable on April 29 had they been present and basking. Turtles were not observed during subsequent surveys conducted under more ideal conditions, suggesting that turtles previously observed may have been transient.

The surface water features of the Study Areas are not typical turtle habitat as they are heavily disturbed and shallow (Table 7). The tributaries examined in this study are shallow enough that they can be expected to freeze to bottom, eliminating them as potential overwintering habitat for all turtle species in the region. No open water wetlands or quiet marshes with slow flowing water ideal for turtles exist in the Study Areas. Surface water features associated with the Future Development Lands may provide suitability as travel corridors/short-term refugia but are highly unlikely to provide critical habitat.

Table 7 Habitat description for surface water features surveyed for turtles in the Study Areas in 2020

Station	Habitat Description
T1 & T2	Stormwater management ditches on the EOWHF property. Narrow, linear surface water features with an open water channel with predominantly Common Reed on the edges. Limited basking structures.
T3	Leachate pond on the EOWHF property.
T4	Moose Creek (Off-Site Study Area). Deep, fast flowing channel underlain by clay. Limited basking structures.
T5	Moose Creek (Off-Site Study Area). Deep, fast flowing channel underlain by clay. Limited basking structures.

Station	Habitat Description
T6 & T7	Portions of the Fraser Municipal Drain along the edge of the Future Development Lands and the EOWHF. Fast flowing channel in the spring and then slows in the summer. Most areas of the channel lack in-stream vegetation. Limited basking structures. Underlain by clay.
T8	Portion of the Upper Tayside Municipal Drain that falls on the Future Development Lands. Fast flowing channel in the spring then slows in the summer; underlain by clay. Limited basking structures.

Table Notes: See Figure 2 for turtle survey station locations.

Blanding's Turtle is the only turtle species that occurs within the general region that would receive individual and habitat protection under the ESA due to its Threatened status. However, Blanding's Turtle has a very low likelihood of occurring in the Study Areas; the distributional range of the species is 20 km from the Study Areas (ECCC, 2021; Ontario Nature, 2019; MNRF, 2021b). It is considered highly unlikely that future development of the EOWHF would interact with Blanding's Turtles.

An Eastern Gartersnake (*Thamnophis sirtalis sirtalis*), an Eastern Ribbonsnake, and a Milksnake were all observed basking on exposed peat along an access road just south of the EOWHF in the Off-Site Study Area on July 4, 2019. Eastern Gartersnake is not a SAR. Eastern Ribbonsnake is listed as Special Concern under the ESA and SARA while Milksnake is not listed under the ESA and is listed as Special Concern under SARA.

3.2 Aquatic Environment

3.2.1 Existing Data

3.2.1.1 Fish Data

Fish communities in the Fraser Municipal Drain and Upper Tayside Municipal Drain were documented by SNC in 2009 and 2012 (SNC, 2017). NEA (1998) conducted fish community surveys in Moose Creek in 1991 and 1996 as part of the Biological Impact Study for Phase 1 of the EOWHF. A total of 27 species were documented for both drains and Moose Creek, including both cool and warm-water species (Table 8). All of the captured species are common to the Moose Creek watershed and are widely distributed throughout southeastern Ontario.

Table 8 Fish species captured in waterbodies in the Study Areas from previous studies

MNRF Code	Common Name	Scientific name	Moose Creek (NEA, 1998)		Fraser Municipal Drain (SNC, 2017)		Upper Tayside Municipal Drain (SNC, 2017)
			1991	1996	2009	2012	2012
131	Northern Pike	*Esox lucius*	X	X			
141	Central Mudminnow	*Umbra limi*	X	X	X		X
163	White Sucker	*Catostomus commersonii*	X	X	X		
171	Shorthead Redhorse	*Moxostoma macrolepidotum*	X	X			
182	Northern Redbelly	*Chrosomus eos*	X	X			
186	Common Carp	*Cyprinus carpio*	X	X			
189	Brassy Minnow	*Hybognathus hankinsoni*	X	X			
192	Hornyhead Chub	*Nocomis biguttatus*				X	
194	Golden Shiner	*Notemigonus crysoleucas*	X				
196	Emerald Shiner	*Notropis Atherinoides*	X				
198	Common Shiner	*Luxilus cornutus*	X	X		X	
200	Blacknose Dace	*Rhinichthys obtusus*			X	X	
203	Spotfin Shiner	*Notropis hudsonius*	X				

MNRF Code	Common Name	Scientific name	Moose Creek (NEA, 1998)		Fraser Municipal Drain (SNC, 2017)		Upper Tayside Municipal Drain (SNC, 2017)
			1991	1996	2009	2012	2012
208	Bluntnose Minnow	*Pimephalus notatus*	X	X		X	
209	Fathead Minnow	*Pimephalus promelas*	X	X			
211	Longnose Dace	*Rhinichthys cataractae*	X	X	X	X	
212	Creek Chub	*Semotilus atromaculatus*	X	X	X		X
213	Fallfish	*Semotilus corporalis*	X	X			
214	Pearl Dace	*Margariscus nachtriebi*	X				
216	Central Stoneroller	*Campostoma anomalium*			X	X	
233	Brown Bullhead	*Ameiurus nebulosus*	X				
235	Stonecat	*Noturus flavus*	X				
281	Brook Stickleback	*Culaea inconstans*	X	X			X
291	Trout Perch	*Percopsis omiscomaycus*	X	X			
311	Rock Bass	*Ambloplites rupestris*	X	X		X	
313	Pumpkinseed	*Lepomis gibbosus*		X			
316	Smallmouth Bass	*Micropterus dolomieu*	X	X			
-	Darter sp.	*Etheostoma sp.*					X
341	Johnny Darter	*Etheostoma nigrum*	X	X	X		
342	Logperch	*Percina caprodes*	X	X			
334	Walleye	*Sander vitreus*	X	X			

3.2.1.2 Benthos Data

A benthic invertebrate survey was carried out in the fall of 2020 as part of an ongoing monitoring program to characterize potential effluent-related impacts of the EOWHF on aquatic communities (KAL, 2021b). The landfill discharges into the Fraser Municipal Drain along the northern edge of the EOWHF property, and the Fraser Municipal Drain then discharges into Moose Creek. Three Surber samples were collected from five stations in Moose Creek in the Off-Site Study Area and three stations in the Fraser Municipal Drain (one in the On-Site Study Area, four in the Off-Site Study Area). Survey stations were selected to represent aquatic environment conditions upstream and downstream of the landfill discharge point.

Benthic invertebrate communities of Moose Creek and the Fraser Municipal Drain were each diverse and contained a variety of organisms typical of low-order streams, including several representatives of taxa known to be sensitive to disturbance including Ephemeroptera, Plecoptera, and Trichoptera (i.e., EPT). The data collected in 2020 demonstrated that indices of composition (density, richness, evenness, and diversity) were similar to prior years of sampling (i.e., 2005, 2006, 2008, 2010, 2012, 2014, 2016, and 2018), with the exception of % EPT taxa which was higher in 2020. The proportion of EPT taxa in both Moose Creek and the Fraser Municipal Drain increased over time from 2005 to 2020, indicating improvements in water quality over that time. In general, densities and composition in 2020 were similar in Moose Creek both upstream and downstream of the EOWHF, suggesting no landfill-related effects on benthic communities (KAL, 2021b).

3.2.1.3 Water Quality Data

Detailed water quality monitoring (i.e., beyond point measurements with a handheld meter) was not conducted for the present study. Detailed water quality data collected for the Fraser Municipal Drain and the Albert Fahey Award Drain by CanDetec Inc. (2021) on behalf of GFL Environmental Inc. are summarized below. These data were collected for a surface water assessment for an amendment of the Environmental Compliance Approval for the expansion of the leachate treatment facility at the EOWHF.

3.2.1.3.1 Fraser Municipal Drain

Leachate from the EOWHF is collected in two aeration ponds located adjacent to compositing facilities at the south end of the facility. From the aeration ponds, leachate is pumped to a tertiary wastewater treatment facility. Treated effluent is pumped to two effluent storage ponds where it is sampled and confirmed to meet effluent discharge limits before discharging to the Fraser Municipal Drain (CanDetec Inc., 2021).

Water quality sampling has been conducted for the Fraser Municipal Drain at Lafleche Road on a quarterly basis from 1996 through to the spring of 2019 (CanDetec Inc., 2021). Since May 2019, water quality and quantity measurements have been collected at this location a total of 34 times in association with synoptic sampling within the Fraser Municipal Drain and the Moose Creek subwatershed. Reach location identifier "Fraser (South)" as shown in Figure 3 is considered to be representative of baseline conditions upstream of the EOWHF and, based on the sampling since May 2019, the average water quality for this location meets Provincial Water Quality Objectives (PWQOs) except for iron (Fe), total phosphorus (TP), and phenols (CanDetec Inc., 2021). These conditions illustrate effects on the water quality from agricultural drainage, drainage from the peatlands, and low or stagnant flow conditions.

Discharge in the Fraser Municipal Drain at Lafleche Road at the time of CanDetec Inc.'s (2021) sampling ranged from nil or unmeasurable to as much as 248 L/sec. Unmeasurable flows are common during the summer period and are characterized by higher-than-average concentrations of Fe and TP (CanDetec Inc., 2021). Higher than normal concentrations of soluble water quality indicators such as boron, chlorides, conductivity, and ammonia indicative of stagnant water are also observed during these periods. Boron and chloride levels were, however, below Canadian Council of Ministers of the Environment (CCME) guidelines and unlikely to pose risks to aquatic organisms. Fe levels in 2019 averaged about 0.34 mg/L, which is just above the PWQO of 0.3 mg/L and can be anticipated to pose modest risks to aquatic organisms. Given the presence of peat, the waters have high concentrations of organic carbon (upwards of 10 mg/L of total organic carbon; KAL, 2021a) which significantly ameliorates the toxicity of Fe (ECCC, 2019). The Fraser Municipal Drain (as others in the area) also has a relatively high pH (~8) which also ameliorates toxicity of Fe to aquatic organisms (ECCC, 2019). Fe is not considered to be a significant concern in the Fraser Municipal Drain. Mean conductivity in the Fraser Municipal Drain was somewhat variable over the last two years at 450±111 µS/cm, but there are no guideline values for conductance.

3.2.1.3.2 Albert Fahey Award Drain

The Albert Fahey Award Drain has been sampled approximately 200 m upstream of the confluence with Moose Creek a total of 21 times since May 2019 through to December 2020 (CanDetec Inc., 2021). Contributing areas to this drain include peatlands, agricultural fields, and Moose Creek Wetland. Water quality in this drain appears to be affected noticeably by drainage from peatlands and Moose Creek Wetland with mean concentrations exceeding PWQOs for Fe, TP, and phenols. Mean concentrations of Fe and TP in the Albert Fahey Award Drain exceeded concentrations in the Fraser Municipal Drain at Lafleche Road by 3 and 1.5 times, respectively (CanDetec Inc., 2021). Fe levels (~0.06 mg/L; Table 17 in CanDetec Inc., 2021) are below the PWQO of 0.3 mg/L, and can be anticipated to pose negligible risks to aquatic organisms. TP levels in the Albert Fahey Award Drain were about 0.06 mg/L (Table 17 in CanDetec Inc., 2021), or about two times the CCME guideline of 0.03 mg/L, and can be anticipated to support modest growth of aquatic algae and macrophytes.

Discharge in the Albert Fahey Award Drain at the time of CanDetec Inc.'s (2021) sampling ranged from 2 to 100 L/sec. The presence of sustained low flow in the Albert Fahey Award Drain, even during the summer, suggests greater storage of water within the undisturbed parts of the subcatchment with less variable water quality throughout the year than seen for some indicators in the Fraser Municipal Drain. Mean conductivity

in the Albert Fahey Award Drain was lower and more consistent than the Fraser Municipal Drain at 373±75 µS/cm.

3.2.2 Field Surveys

3.2.2.1 Field Surveys Conducted in Summer of 2019

Fish were collected via electrofishing from both the Fraser Municipal Drain and the Upper Tayside Municipal Drain in summer of 2019; all other surface water features in the On-Site Study Area were either dry or too shallow (depth ≤0.01 m) to survey at the time of assessment. *In situ* water quality and general habitat characteristics of the areas fished in the Fraser Municipal Drain in 2019 are provided in Table 9. *In situ* water chemistry data were not collected for the Upper Tayside Municipal Drain.

Table 9 *In situ* characteristics of the Fraser Municipal Drain and Upper Tayside Municipal Drain, 2019

Reach Characteristics	Fraser Municipal Drain		Upper Tayside Municipal Drain
	South Reach	North Reach	
Date Sampled	2019-07-26	2019-07-26	2019-08-08
Temperature (°C)	22	26	-
Dissolved Oxygen (mg/L)	11	12	-
pH	8.3	9.1	-
Specific Conductivity (µS/cm)	527	515	-
Reach Depth (m)	0.85	0.30	0.50
Reach Width (m)	1.2	1.7	2.0
Dominant Substrate	Clay	Clay	Clay/Silt

Daily variations in water temperature in both the Fraser Municipal Drain and the Upper Tayside Municipal Drain are demonstrated in Figures 15 and 16, respectively. Between the period of August 9 to October 17, 2019, water temperatures ranged between 4.5-24.6°C in the Fraser Municipal Drain and between 4.6-29.6°C in the Upper Tayside Municipal Drain. Variations in water temperature were greater in the Upper Tayside Municipal Drain. The thermal regime of each drain was classified using the water temperature logger data collected in summer (i.e., August) of 2019 and air temperature data downloaded from Environment and Natural Resources (Government of Canada, 2019). The relationships between daily maximum water temperature and daily maximum air temperature in each drain were plotted on a revised nomogram developed by Chu *et al*. (2009) for the province of Ontario to approximate the thermal regime of each drain. The five potential thermal regimes include: cold, cold-cool, cool, cool-warm, and warm waters. The Fraser Municipal Drain appears to provide mostly cool-warm water (Figure 17), while the Upper Tayside Municipal Drain appears to provide more warm water (Figure 18).

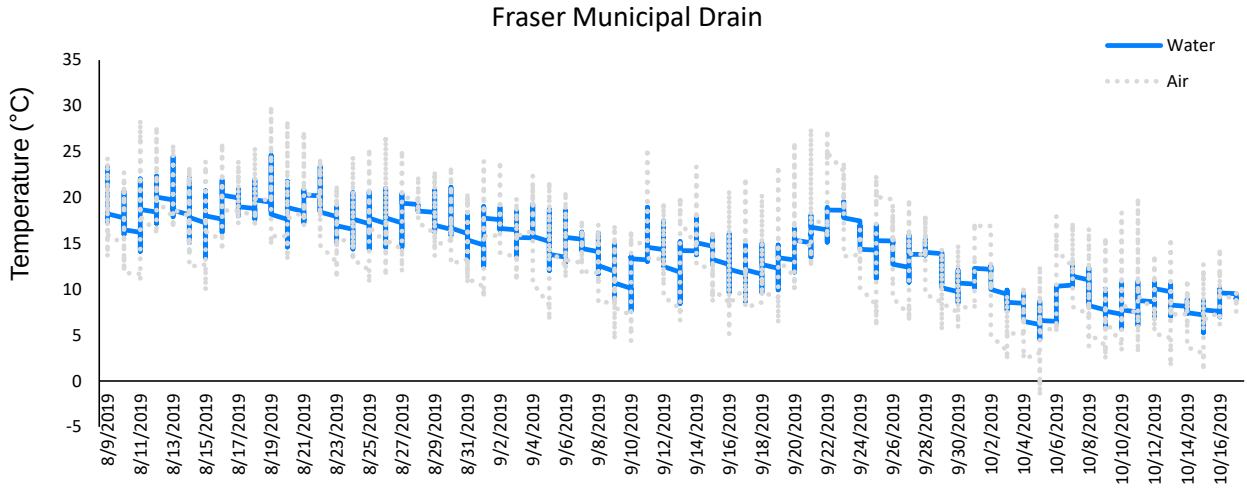

Figure 15 Hourly variations in water and air temperatures within the Fraser Municipal Drain from August to October, 2019

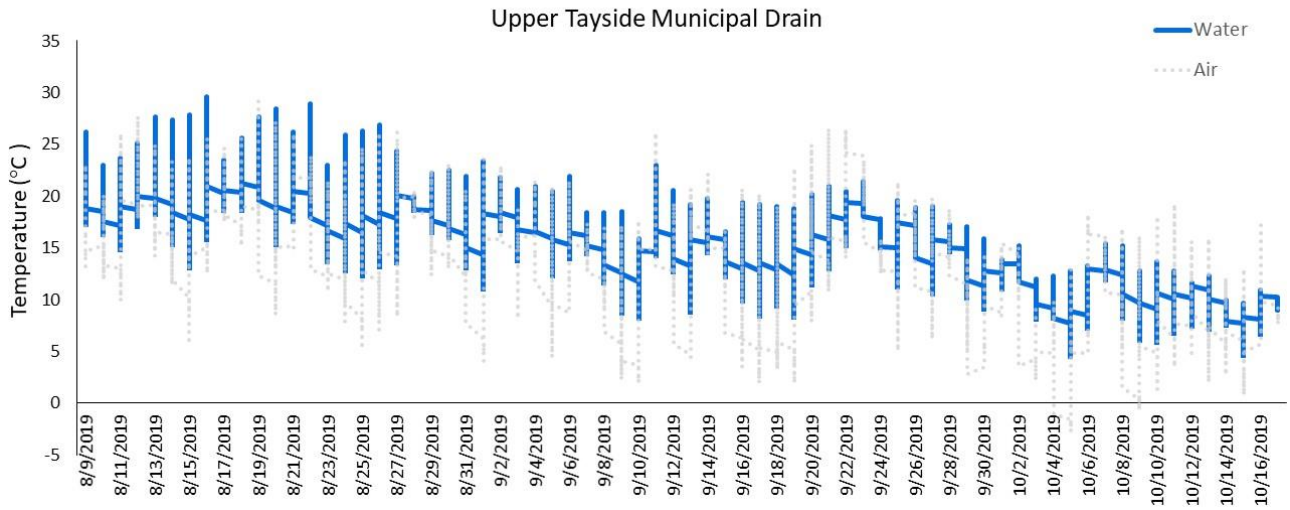

Figure 16 Hourly variations in water and air temperatures within the Upper Tayside Municipal Drain from August to October, 2019

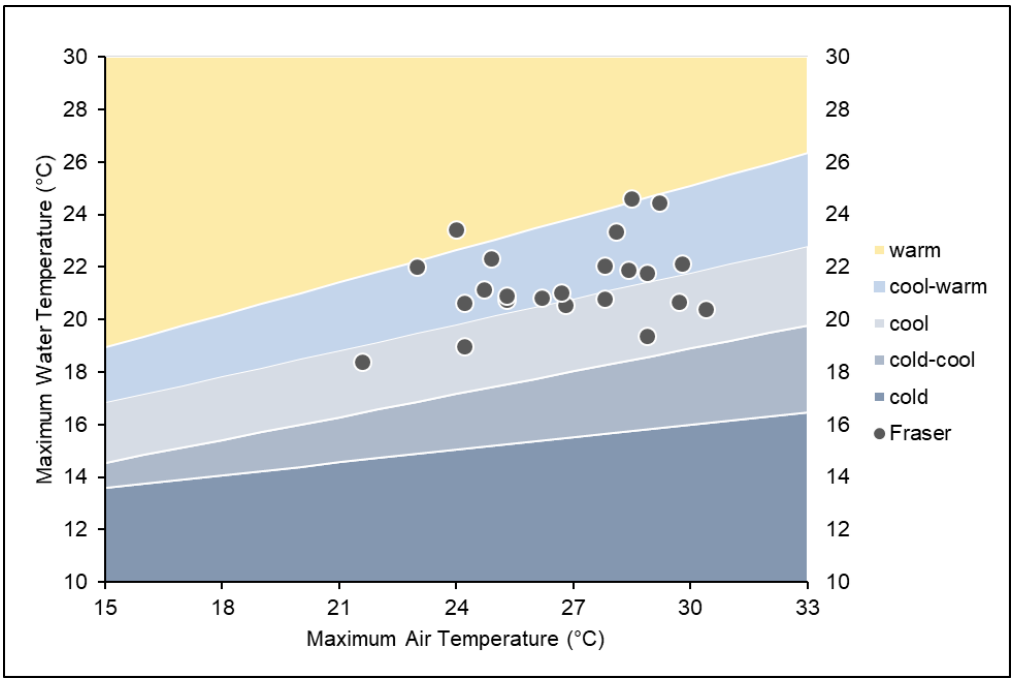

Figure 17 Nomogram for the Fraser Municipal Drain, 2019

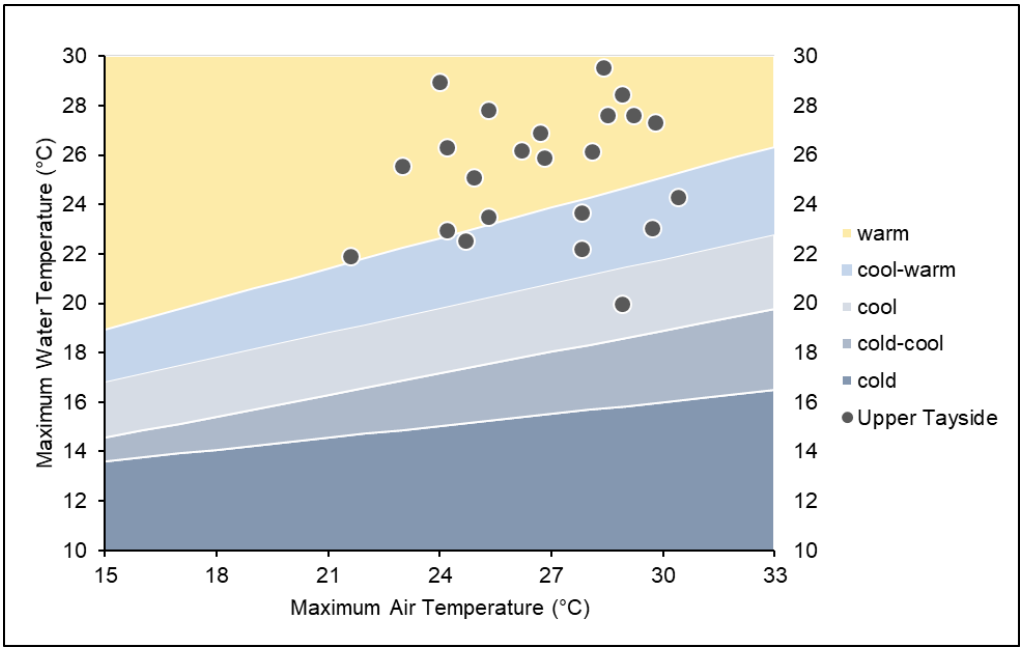

Figure 18 Nomogram for the Upper Tayside Municipal Drain, 2019

A total of ten different species were captured during electrofishing sampling of the Fraser Municipal Drain and Upper Tayside Municipal Drain in 2019 (Table 10). This included seven species of minnows (Cyprinidae), one stickleback species (Gasterosteidae), one sucker species (Catostomidae) and one species of perch (Percidae). CPUE was 0.068 and 0.048 fish/second in the south and north reaches of the Fraser Municipal Drain, respectively. CPUE was 0.569 fish/second in the Upper Tayside Municipal Drain. Catch rates were highest for Creek Chub (*Semotilus atromaculatus*) within the Fraser Municipal Drain in 2019, consisting of 25% of the total catch. Catch rates were highest for Northern Redbelly Dace (*Chrosomus eos*) in the Upper Tayside Municipal Drain in 2019, consisting of 89% of the total catch in this drain.

Table 10 Fish species captured in the Fraser Municipal Drain and Upper Tayside Municipal Drain, 2019

MNR Code	Species		Fraser Municipal Drain	Upper Tayside Municipal Drain
141	Central Mudminnow	*Umbra limi*	4	
163	White Sucker	*Catostomus commersonii*	2	1
182	Northern Redbelly Dace	*Chrosomus eos*	2	71
198	Common Shiner	*Luxilus cornutus*	8	
208	Bluntnose Minnow	*Pimephales notatus*	5	
209	Fathead Minnow	*Pimephales promelas*	3	1
211	Longnose Dace	*Rhinichthys cataractae*	15	
212	Creek Chub	*Semotilus atromaculatus*	18	4
281	Brook Stickleback	*Culaea inconstans*	2	2
341	Johnny Darter	*Etheostoma nigrum*	12	1
Number of Species			10	6
Total Catch			71	80
Effort (seconds)			1208	140.6
CPUE (fish/seconds)			0.059	0.569

3.2.2.2 Field Surveys Conducted in Spring 2021

3.2.2.2.1 Northern Pike Spawning Surveys

No evidence of Northern Pike spawning was observed (i.e., no adults or eggs were seen) during spring surveys conducted in 2021. Weather conditions and water quality data for each survey station are summarized in Table 11.

Table 11 Summary of weather conditions and water quality during Northern Pike spawning surveys, 2021

Date	Weather Conditions	Survey Station	Water Quality			
			Temperature (°C)	Specific Conductance (µS/cm)	pH	Dissolved Oxygen (mg/L)
2021-04-06	Air temperature: 10°C, cloud cover: 0%, wind: 2 on Beaufort Scale, precipitation: none	Fraser (SW)	11.0	436	7.4	11.4
		Fraser (NW)	8.2	527	7.7	11.3
		Roxborough	7.3	1089	7.6	7.3
		Fraser (S)	15.2	436	8.0	9.7
		Tayside (E)	14.2	704	7.8	9.4
		Tayside (S)	14.4	688	7.9	11.3
		Albert Fahey	15.3	367	7.9	10.6
2021-04-08	Air temperature: 21°C, cloud cover: 75-100%, wind: 4 on Beaufort Scale, precipitation: none	Fraser (SW)	20.4	450	8.1	9.8
		Fraser (NW)	16.8	519	7.8	9.6
		Roxborough	9.4	2459	7.4	11.8
		Fraser (S)	16.5	396	8.0	8.7
		Tayside (E)	21.2	709	7.9	9.2
		Tayside (S)	16.3	662	7.6	7.5
		Albert Fahey	19.9	481	7.9	5.9
2021-04-15	Air temperature: 9°C, cloud cover: 100%, wind: 4 on Beaufort Scale, precipitation: light rain	Fraser (SW)	12.6	418	7.9	10.0
		Fraser (NW)	10.4	441	7.8	9.7
		Roxborough	8.9	3302	7.3	8.4
		Fraser (S)	11.4	425	7.8	9.1
		Tayside (E)	12.2	669	8.1	10.7
		Tayside (S)	11.6	580	7.9	9.1
		Albert Fahey	10.6	402	8.0	10.0
2021-04-16	Air temperature: 4°C, cloud cover: 100%, wind: 4 on Beaufort Scale, precipitation: light rain	Fraser (SW)	8.2	471	8.3	11.1
		Fraser (NW)	7.2	488	8.1	10.3
		Roxborough	7.2	2956	7.6	7.5
		Fraser (S)	8.0	480	8.1	9.1
		Tayside (E)	7.9	751	8.0	9.7
		Tayside (S)	7.7	823	7.9	10.2
		Albert Fahey	7.6	413	8.0	10.0

Most reaches of surveyed watercourses did not appear to provide optimal spawning habitat for Northern Pike due to a lack of flooded vegetation after the spring freshet. Additional details regarding vegetation cover within watercourses associated with the EOWHF are presented in Section 3.2.2.2.2 below.

3.2.2.2.2 Electrofishing Surveys

Electrofishing sampling effort within Moose Creek, the Fraser Municipal Drain, the Upper Tayside Municipal Drain, and the Albert Fahey Award Drain resulted in the capture of 477 fish belonging to 21 different species (Table 12). The 10 fish species that were captured in the summer of 2019 (Table 10) were captured again in the spring of 2021, with an additional 11 species captured in 2021. The ditch along the northern edge of the sod field east of the EOWHF (Sod 1) was dry and therefore could not be electrofished. Water depth was shallow but sufficient for electrofishing in the nearby Roxborough-Plantagenet Boundary Municipal Drain, but no fish were caught here during the 372 seconds of shocking effort.

The majority of fish captured in 2021 belong to the Cyprinidae family (84%), followed by Gasterostidae (7%), Percidae (4%), and Catastomidae (4%). The remaining families represented less than 1% of the total catch effort (Ictaluridae, Umbridae, Centrachidae, Fundulidae, and Percopsidae). The Cyprinids represented the most diverse family with 12 species captured.

Of the species captured in spring of 2021, the most common was Fathead Minnow (N = 116, *Pimephales promelas*), followed by Creek Chub (N=71, *Semotilus atromaculatus*), Longnose Dace (N=68, *Rhinichthys cataractae*), Bluntnose Minnow (N=55, *Pimephales notatus*), Common Shiner (N=43, *Luxilus cornutus*), Brook Stickleback (N=31, *Culaea inconstans*), White Sucker (N=18, *Catostomus commersoni*), Northern Redbelly Dace (N=15, *Chrosomus eos*), Central Stoneroller (N=13, *Campostoma anomalium*), Johnny Darter (N=10, *Etheostoma nigrum*), Blacknose Dace (N=9, *Rhinichthys atratulus*), Iowa Darter (N=9, *Etheostoma exile*), Brassy Minnow (N=6, *Hybognathus hankinsoni*), Brown Bullhead (N=4, *Ameiurus nebulosus*), Central Mudminnow (N=3, *Umbra limi*), Finescale Dace (N=2, *Chrosomus neogaeus*), Sand Shiner (N=2, *Notropis stramineus*), Northern Pearl Dace, (N=1, *Margariscus nachtriebi*), Banded Killifish (N=1, *Fundulus diaphanous*), Trout-perch (N=1, *Percopsis omiscomaycus*), and Pumpkinseed (N=1, *Lepomis gibbosus*; Table 13). Catch per unit effort (CPUE) was approximately 8 fish/minute.

Four fish species previously undocumented in watercourses associated with the EOHWF were observed: Banded Killifish (captured at FD3), Sand Shiner (captured at MC1), Iowa Darter (captured at MC1, FD1, FD2, and T2), and Finescale Dace (captured at T2; Table 12).

Table 12 Fish captured in fished areas of the Study Areas, 2021

MNR Code	Common Name	Scientific Name	Moose Creek		Fraser Municipal Drain			Albert Fahey Award Drain		Upper Tayside Drain		Roxborough-Plantagenet Boundary Municipal Drain	Unnamed Surface Water Features
			MC1	MC2	FD1	FD2	FD3	AF1	AF2	T1	T2		Sod 1
141	Central Mudminnow	*Umbra limi*	1	-	-	-	-	-	-		2	-	-
163	White Sucker	*Catostomus commersoni*	4	9	2	1	-	-	-	1	1	-	-
182	Northern Redbelly Dace	*Chrosomus eos*	11	-	-	1	-	2	-	-	1	-	-
183	Finescale Dace	*Chrosomus neogaeus*	-	-	-	-	-	-	-	-	2	-	-
189	Brassy Minnow	*Hybognathus hankinsoni*	-	-	1	-	-	5	-	-	-	-	-
198	Common Shiner	*Luxilus cornutus*	7	30	4	2	-	-	-	-	-	-	-
200	Blacknose Dace	*Rhinichthys atratulus*	1	-	8	-	-	-	-	-	-	-	-
204	Sand Shiner	*Notropis stramineus*	2	-	-	-	-	-	-	-	-	-	-
208	Bluntnose Minnow	*Pimephales notatus*	3	5	19	25	-	-	-	-	3	-	-
209	Fathead Minnow	*Pimephales promelas*	4	-	1	-	-	48	60	1	-	-	-
211	Longnose Dace	*Rhinichthys cataractae*	16	-	41	10	1	-	-	-	-	-	-
212	Creek Chub	*Semotilus atromaculatus*	21	-	24	17	1	4	4	-	-	-	-
214	Northern Pearl Dace	*Margariscus nachtriebi*	-	-	-	-	-	-	-	-	1	-	-
216	Central Stoneroller	*Campostoma anomalium*	5	7	1	-	-	-	-	-	-	-	-
233	Brown Bullhead	*Ameiurus nebulosus*	-	-	-	-	-	-	-	4	-	-	-
261	Banded Killifish	*Fundulus diaphanous*	-	-	-	-	1	-	-	-	-	-	-
281	Brook Stickleback	*Culaea inconstans*	2	-	-	-	4	5	3	8	9	-	-
291	Trout-perch	*Percopsis omiscomaycus*	-	1	-	-	-	-	-	-	-	-	-
313	Pumpkinseed	*Lepomis gibbosus*	1	-	-	-	-	-	-	-	-	-	-
338	Iowa Darter	*Etheostoma exile*	2	-	5	1	-	-	-	-	1	-	-
341	Johnny Darter	*Etheostoma nigrum*	1	-	1	2	3	-	-	-	3	-	-
Total Number of Species			15	5	11	8	5	5	3	4	9	0	0

MNR Code	Common Name	Scientific Name	Moose Creek		Fraser Municipal Drain			Albert Fahey Award Drain		Upper Tayside Drain		Roxborough-Plantagenet Boundary Municipal Drain	Unnamed Surface Water Features
			MC1	MC2	FD1	FD2	FD3	AF1	AF2	T1	T2		Sod 1
Total Fish Catch			81	52	107	59	10	64	67	14	23	0	0
Total Effort (seconds)			377.9	532.6	459.4	319.4	408.7	325.4	297.6	438.2	385.5	372.1	

The physical attributes (aquatic habitat) of reaches electrofished in 2021 are summarized in Table 13. In general, land use surrounding the surveyed watercourses is heavily managed and non-natural and is dominated by active agriculture (i.e., sod production, mushroom farm, corn fields), peat extraction, and the EOWHF. All surveyed watercourses contain channel crossings (i.e., round culvert and/or open bottom culvert). Migratory obstructions observed during surveys include a perched culvert upstream of the sampling site at AF1 (Figure 19) along with dense vegetation at AF1 and at RPB1 that may prevent fish migration, particularly during low water levels. The banks of all surveyed watercourses appeared slightly unstable to moderately unstable, with undercut banks present at FD3.

Figure 19 Photo showing the perched culvert near the upstream end of the Albert Fahey Award Drain at electrofishing station AF1 taken on May 10, 2021

Table 13 Aquatic habitat characteristics of electrofished areas, 2021

Watercourse Name	Station	Surrounding Land Use	Channel Morphology						
			Channel Anatomy	Percentage of Station Area	Mean Wetted Depth (m)	Mean Wetted Width (m)	Mean Bankfull Width (m)	Mean Bankfull Depth(m)	Dominant Substrate
Moose Creek	MC1	Corn field + peat lands	run	20	0.4	4.0	8.7	2.8	Clay
			riffle	80	0.3	5.1	13.0	3.0	Cobble, gravel, sand
	MC2	Corn field	run	100	0.5	8.0	11.0	2.0	Gravel, silt, clay
Fraser Municipal Drain	FD1	EOWHF + sod field	run	100	0.2	3.0	3.8	1.2	Clay, silt
	FD2	EOWHF + sod field	run	100	0.1	2.0	4.0	1.1	Silt, clay, sand
	FD3	EOWHF + corn field	run	100	0.2	2.5	8.0	2.0	Silt, cobble
Albert Fahey Award Drain	AF1	EOWHF + peat lands	run	100	0.1	1.4	3.5	2.5	Muck, detritus
	AF2	EOWHF + peat lands	run	100	0.2	1.5	3.3	1.5	Clay, silt, muck
Upper Tayside Municipal Drain	T1	Corn field	run	100	0.2	3.4	7.5	0.8	Silt, muck, clay
	T2	Corn field + mushroom farm	run	100	0.2	2.7	7.0	2.5	Muck, silt
Roxborough-Plantagenet Boundary Municipal Drain	RPB1	Sod field + corn field	run	100	0.2	2.3	6.9	1.2	Muck, clay
Unnamed Surface Water Features	Sod 1	Sod field	run	100	< 0.01	0.6	3.5	0.4	Silt, clay

Channel substrates varied but were dominated by clay, silt, and muck (Table 13). FD3 and MC2 were the only two stations observed to have cobble substrates. Most stations were channelized and are presumed to contain water year-round (i.e., permanent watercourses), with the exception of AF1 and Sod 1, which are ephemeral reaches and dry shortly after the spring freshet. In terms of channel habitats, all stations except for MC1 were dominated by runs (areas with steady/smooth flow with little or no turbulence). MC1 included a run and a riffle (shallow areas where water runs fast and is agitated by rocks). Since MC1 had discernable riffle and run sequences, channel dimensions and water quality data were measured for both the riffle and the run sections (Table 13).

The majority of stations (FD2, FD3, T1, T2, RPB1, and Sod 1) had no vegetated stream cover. MC1, FD1, AF1, and AF2 had 1-30% stream cover and MC2 had the most stream cover with 30-60% vegetation cover throughout the survey station. For stations that contained in-stream vegetation, emergent species were the only vegetation type present, with an absence of submergent and floating aquatic plants. Of the emergent species, grasses were the most dominant, followed by Broadleaf Cattail and Common Reed. Most stations were devoid of fish habitat structures such as large woody debris, with the exception of surveyed reaches of Moose Creek and the Fraser Municipal Drain.

In situ water quality data for reaches electrofished in 2021 are summarized in Table 14. Cooler water temperatures at station RPB1 suggest the presence of groundwater at that location.

Table 14 Water quality of electrofished areas, 2021

Watercourse Name	Station	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Specific Conductance (µS/cm)
Moose Creek	MC1	run - 15.0 riffle -15.0	run - 8.3, riffle - 8.3	run - 9.1 riffle - 9.4	run - 522 riffle - 519
	MC2	14.8	8.4	9.2	549
Fraser Municipal Drain	FD1	16.5	8.0	8.8	476
	FD2	16.2	8.3	9.8	515
	FD3	16.6	7.7	6.1	514
Albert Fahey Award Drain	AF1	13.4	7.4	6.8	490
	AF2	9.5	7.4	6.8	354
Tayside-Legault Municipal Drain	T1	19.9	7.6	8.1	790
	T2	17.5	7.2	12.5	770
Roxborough-Plantagenet Boundary Municipal Drain	RPB1	12.7	7.3	3.8	1447
Unnamed Surface Water Features	Sod 1	-	-	-	-

4.0 DISCUSSION

4.1 Terrestrial & Wetland Habitats

This section discusses how species present or potentially present on or near the Future Development Lands may provide ecological values that could interact with future expansion of the EOWHF. Protected ecological values stem principally from two different considerations of species occurring or potentially occurring on the Future Development Lands. Firstly, SAR found to have the potential to occur on/near the Future Development Lands based on the findings in this report and other studies performed in the area have direct legal protections on both individuals and their habitats for those species listed as Threatened or Endangered under the ESA. Secondly, certain groupings of species (not necessarily SAR), or habitat areas that may support such groupings, may be identified and protected as Significant Wildlife Habitat. Areas of candidate Significant Wildlife Habitat are typically identified based on ELC habitat descriptions provided in the Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF, 2015a). Whether a candidate Significant Wildlife Habitat is considered a confirmed Significant Wildlife Habitat is typically based on observations of certain species within the candidate habitat (MNRF, 2015a). Note that even though Significant Wildlife Habitat is defined on a provincial level by MNRF, the protection of confirmed Significant Wildlife Habitat is a municipal matter.

4.1.1 Birds

4.1.1.1 At-risk Bird Species

Bank Swallow and Barn Swallow, both listed as Threatened under ESA and SARA, were observed in the Study Areas. Foraging habitat for both species is similar, consisting of broad open areas over fields, agricultural lands, or open water. Both species are generally tolerant of human presence and activity within the foraging areas, if the areas remain open allowing for unobstructed hunting of flying insects. The nesting habitat of the species differs, with Bank Swallows nesting in open, vertical banks or faces of sand or clay (e.g., steep river banks, fill piles, aggregate extraction pits), and Barn Swallows nesting on human made structures (e.g. buildings, bridges, or box culverts).

A Bank Swallow nesting colony was observed directly southwest of the Future Development Lands in the Off-Site Study Area. A Barn Swallow nest was observed on the GFL Environmental Inc. office building in the On-Site Study Area during the breeding season in 2019 but was later determined to be absent in the fall of 2020. A Barn Swallow nest was observed in the Off-Site Study Area in 2021 where Moose Creek crosses Concession Road 7. Both species are considered to feed over open areas of the project site. Bank Swallow and Barn Swallow currently receive protection for their Category 1, 2, and 3 habitats under the ESA (Table 15). Based on where the nests were located, and assuming that both species will return to these observed nesting sites, portions of Category 3 habitat for Bank Swallow fall on the Future Development Lands, whereas no protected habitat for Barn Swallow falls on the Future Development Lands (Figure 14). Category 3 habitat is considered to have the highest level of tolerance compared to Category 1 and 2 habitats.

Table 15 Summary of habitat categories protected under the ESA for Bank Swallow and Barn Swallow (MNRF, 2015c; MECP, 2019a)

Species	Category 1	Category 2	Category 3
Bank Swallow	The breeding colony (bank), including the congregation of burrows and the substrate between and around them.	The area within 50 m in front of the breeding colony bank face.	The area within 500 m of the outer edge of the breeding colony (foraging habitat).
Barn Swallow	The nest.	The area within 5 m of the nest.	The areas between 5 m and 200 m of the nest (foraging habitat).

For Bank Swallow, protected habitat (including the portion of Category 3 habitat that falls on the Future Development Lands) cannot be altered unless the project obtains permission from the MECP, potentially through an "overall benefit permit" (MECP, 2019b). However, changes that do not significantly alter the overall utility of a habitat may not require an overall benefit permit. For example, human activities that result in a minor land use change of a Category 3 habitat but still retain ecological function of the habitat (e.g., open foraging habitat supportive of insect presence) may not reduce the utility of the area as feeding habitat. The Category 3 habitat for Bank Swallow that falls on the Future Development Lands and the EOWHF is already highly disturbed and is not considered ideal foraging habitat. If no or only minor incursions of infrastructure are proposed for the Category 3 habitat, then it is unlikely an overall benefit permit would be required. However, MECP should still be consulted to determine appropriate mitigation/avoidance measures and whether an overall benefit permit would be required. Obtainment of an overall benefit permit may obligate the permittee to (1) create habitat for Bank Swallow, (2) make a financial contribution to Bank Swallow research, or (3) conduct other activities that are deemed to result in a net benefit to the species.

Bank Swallow nesting areas may spatially shift somewhat between breeding seasons as banks containing nests naturally degrade over time. It is therefore possible that the nesting bank in the Off-Site Study Area may no longer be suitable for nesting at the time of site preparation and development. However, Bank Swallows exhibit fidelity to breeding sites and may return to the same general area in subsequent breeding seasons (Garrison, 1999). Even if the bank is no longer suitable for nesting, Bank Swallows may still be present in the general area. Areas containing Bank Swallow nests cannot be intentionally altered to deter the species from nesting there in subsequent breeding seasons.

The Barn Swallow nest that was previously identified at the EOWHF was no longer present during an inspection conducted in fall 2020 following the inclusion of the Manderley Turf Products property into the footprint of the Future Development Lands. Regardless, it is evident that Barn Swallows occur in the Study Areas and suitable nesting and foraging habitat exists on and adjacent to the Future Development Lands. Barn Swallow, however, were reclassified from Threatened to Special Concern provincially in January 2022 (COSSARO, 2022) and federally in April 2021 (COSEWIC, 2021). That reclassification has implications for projects interacting with Barn Swallow habitat. As of January 2023, there will be no requirement under the *Endangered Species Act* to consult with MECP for interactions with Barn Swallow foraging habitat. With respect to the federal *Species at Risk Act,* it is likely but not certain that the Minister of the Environment will formally relist Barn Swallow as Special Concern on or before October 12, 2023. If the species remains Listed as Threatened, SARA protections would apply to Barn Swallow nests both within and outside the active nesting period (typically mid-May to late August; per naturecounts.ca). However, if the species is relisted as Special Concern, the *Migratory Birds Protection Act* would still provide protection to Barn Swallow nests

during the active nesting period. Environment and Climate Change Canada (ECCC) could be consulted for confirmation of protections prior to expansion.

4.1.1.2 Significant Wildlife Habitat for Birds

The Study Areas are part of a larger natural heritage feature that spans to the north as identified by MNRF at the landscape level (mapping not publicly available; GFL Environmental Inc. (Greg van Loenen) personal communication with MNRF (Kristen Wagner), 2020/06/29; KAL (Katherine Black) personal communication with MNRF (Joffre Côté), 2020/08/31). This natural heritage feature and therefore the Study Areas include a Migratory Bird Staging and Migration Stopover Area as it pertains to Snow Geese and Canada Geese for both spring and fall, as well as a Raptor Wintering Area for various species including Snowy Owls and Rough-legged Hawks.

Waterfowl Stopover and Staging Areas and Raptor Wintering Areas as mapped by MNRF are considered candidate Significant Wildlife Habitats (MNRF, 2015a). Confirmation of a candidate Significant Wildlife Habitat requires meeting criteria defined by MNRF (2015a), including confirming the presence of suitable ELC habitat codes and the abundance and/or groupings of associated species. Snow Geese were observed by KAL in large numbers (500+ individuals) on sod and annual row crop fields in the Study Areas (including on the Future Development Lands) over five days in the spring of 2019. However, the ELC criteria for significant Waterfowl Stopover and Staging Areas for Snow and Canada Geese only include aquatic habitats such as marshes, swamps, and shallow water aquatic systems such as ponds, lakes, bays, coastal inlets, and watercourses used during migration (ELC codes: MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, SWD1, SWD2, SWD3, SWD4, SWD5, SWD6, and SWD7).

The Study Areas contain swamps (including SWD6; there are no swamps directly on the Future Development Lands), but these are all densely treed and without open surface water, and observations of Snow Geese were not associated with these habitats. Canada Goose was observed on the Future Development Lands in low abundance. As such, the Study Areas do not contain significant Waterfowl Stopover and Staging Areas for Snow and Canada Geese based on MNRF's criteria (2015a). Similarly, even though several species of raptors have been observed at the existing EOWHF in the winter (e.g., NEA, 2018), the Study Areas do not contain a combination of forest (FOD, FOM, FOC) and upland (CUM, CUT, CUS, CUW) habitats greater than 20 ha to meet the habitat criteria for significant Raptor Wintering Areas (MNRF, 2015a). Specific studies for Snowy Owls and Rough-legged Hawks were not performed as these species are not listed as at-risk provincially or federally. Raptors are likely attracted to the existing EOWHF due to the presence of prey species such as gulls and small mammals that feed on the waste. No raptors (including Snowy Owls and Rough-legged Hawks) were observed by KAL on the Future Development Lands or the EOWHF.

Moose Creek Wetland in the Off-Site Study Area is confirmed Significant Wildlife Habitat for Special Concern Species, specifically Eastern Wood-pewee and Wood Thrush (KAL, 2021a). Habitat for these species does not exist on the Future Development Lands and habitat in the Off-Site Study Area would not be impacted by development of the Future Development Lands.

4.1.2 Bats and Other Mammals

4.1.2.1 Bat Presence and Habitat

A total of five bat species were observed via acoustic monitors installed at the interface of the northwestern edge of the Future Development Lands and the southeastern edge of the thicket swamp at the EOWHF property. The recordings captured in acoustic monitoring imply that bats were feeding and/or roosting within the vicinity of these areas (e.g., potentially foraging over the Future Development Lands and/or roosting nearby). Little Brown Myotis is the only listed at-risk bat species (Endangered under ESA and SARA) that was detected, and it was only recorded nine times during the seven-night monitoring period. If the monitors were installed for a ten-night period as per MNRF (2017a), the number of recordings of Little Brown Myotis would likely have been somewhat higher, but not considerably so. Since the main goal of the acoustic monitoring was to determine the presence of at-risk bats and not the number of their calls, this is not an issue. Hoary Bat, Silver-haired Bat, and Big Brown Bat were much more prominent compared to the presence of Little Brown Bat and Eastern Red Bat based on the number of recorded echolocations for these species. It is considered unlikely that other at-risk bats are present in the Study Areas.

AM-4 (the northern acoustic monitor) recorded more than 10 times the number of recordings from AM-3 (the southern acoustic monitor), suggesting better bat habitat exists near AM-4. AM-4 is located further away from landfill activities at the EOWHF than AM-3 (i.e., the surrounding area is less disturbed), and AM-4 is also closer to open-water ponds at the EOWHF that bats may feed over. These differences may explain why potentially better bat habitat and therefore greater bat abundance exists around AM-4.

4.1.2.1.1 At-risk Bat Species

As an Endangered SAR, Little Brown Myotis receives “general habitat protection” under the ESA (e.g., no defined habitat protection currently exists for Little Brown Myotis as it does for Bank Swallow and Barn Swallow). Generally, trees that Little Brown Myotis use for roosting cannot be cut down during the roosting season (April to September inclusive; MNRF, 2015d). Similarly, buildings that at-risk bats are confirmed to be roosting in cannot be altered during the roosting season. Therefore, KAL recommends that any alterations required to buildings on the Future Development Lands (i.e., those associated with Manderley Turf Products) be done outside of April to September in the absence of detailed bat monitoring for the buildings.

4.1.2.2 Significant Wildlife Habitat for Bats

The Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF, 2015a) define Bat Maternity Colonies (areas where females congregate to raise pups; a type of Significant Wildlife Habitat) as treed habitats with confirmed use by more than 10 Big Brown Bats and 5 adult female Silver-haired Bats. There were totals of 114 Big Brown Bat recordings and 263 Silver-haired Bat recordings over the seven-night monitoring period. The number of individuals cannot be discerned from the acoustic data, but based on the number of recordings, it is possible that maternity roosting colonies exist within the Study Areas. Tree cover on the Future Development Lands is limited to a hedgerow along the Fraser Municipal Drain and a sparse cluster of mainly Manitoba Maples in the southeastern corner of the Future Development Lands. As described previously, some of these trees are potentially suitable for bat roosting. However, Significant Wildlife Habitats for Bat Maternity Colonies occur in forested ecosites, such as those with FOD, FOM, SWD, or SWM ELC codes (MNRF, 2015a). None of these ELC communities occur on the Future Development Lands. As such, the Future Development Lands do not meet the criteria for Significant Wildlife Habitat for bats.

4.1.2.3 Candidate Significant Wildlife Habitat for White-tailed Deer

Moose Creek Wetland in the Off-Site Study Area may be a winter Deer Yarding Area and/or Deer Winter Congregation Area based on its habitat features, but winter surveys of the area to confirm use by deer were

not completed (KAL, 2021a). MNRF is responsible for managing and mapping deer yards and congregation areas and consultation with them is necessary for determining the significance of the habitat (MNRF, 2015a). Regardless, this habitat would not be impacted by development of the Future Development Lands.

4.1.3 Anurans

4.1.3.1 At-risk Frog Species

Western Chorus Frog was observed in the Fraser Municipal Drain along the western edge of the Future Development Lands and along the northern edge of the EOWHF. Western Chorus Frog is not listed under the ESA and so would not be protected under development unless the Federal Minister of the Environment and Climate Change warranted protection under SARA (under which Western Chorus Frog is listed as Threatened), which is unlikely.

4.1.3.2 Significant Wildlife Habitat for Amphibians

The number and degree of calling amphibian species were lower than the threshold that would classify the surface water features in the Study Areas as candidate Significant Wildlife Habitat for amphibians (MNRF, 2015a). No salamanders were observed in the Study Areas.

4.1.4 Turtles

4.1.4.1 Turtle Presence and Habitat

Two turtles were observed during turtle surveys: a Midland Painted Turtle and a Snapping Turtle. The Midland Painted Turtle was observed on the property containing the EOWHF while the Snapping Turtle was observed on the Future Development Lands. Midland Painted Turtle is not at risk under the ESA or SARA, and Snapping Turtle is listed as Special Concern under both federal and provincial Acts. Both species are Specially Protected Reptiles under the Ontario *Fish and Wildlife Conservation Act* which prohibits capturing, harassing, injuring, and killing of individuals but does not provide habitat protection. Midland Painted Turtle is tracked by the Natural Heritage Information Centre (MNRF, 2021) and is therefore a provincially significant species (MNRF, 2014). In general, surface water features associated with the Future Development Lands may provide suitability as travel corridors, foraging resources, and short-term refugia for Midland Painted Turtle and Snapping Turtle, but are highly unlikely to provide critical habitat such as nesting or overwintering.

There is negligible potential for Blanding's Turtle to occupy surface water features in the Study Areas for overwintering or for other critical activities (e.g., thermoregulation, reproduction, foraging, etc.); the habitat is not consistent with the species' habitat requirements. There is, as with other turtle species occurring in the region, potential that Blanding's Turtles may access the Future Development Lands via a travel corridor. However, the likelihood that the species will occur on the Future Development Lands is considered very low.

4.1.4.2 Significant Wildlife Habitat for Turtles

The Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF, 2015a) indicate that habitats containing a species listed as Special Concern under the ESA are Significant Wildlife Habitats. Consequently, the portion of the Roxborough-Plantagenet Boundary Municipal Drain on the northern edge of the Future Development Lands potentially classifies as a candidate Significant Wildlife Habitat due to the presence of a Snapping Turtle. However, this habitat is considered marginal and unlikely to provide critical habitat (i.e.,

nesting or overwintering habitat) for Snapping Turtle. This drain along with others in the Study Areas are more likely to provide a travel corridor to other (more optimal) habitats. This conclusion is supported by having observed Snapping Turtle on only one occasion during the five rounds of turtle surveys and other field visits. Whether or not the area in which Snapping Turtle was observed is protected as Significant Wildlife Habitat would be determined by the local municipality.

4.2 Aquatic Environment

4.2.1 Mussels

WSP Golder (2022) completed a field survey in the study area to confirm the presence/absence of species at risk species freshwater mussels. They documented shells or fragments of two species including the Cylindrical Papershell (*Anodontoides ferrusacianus*) and Giant Floater (*Pyganodon grandis*). Neither of these species is listed at Risk. The Cylindrical Papershell mussel uses Mottled Sculpin as its host for larval development (Clarke, 1981), suggesting that sculpin are present in the watershed. Both of those species had been historically found in the Moose Creek study area (per notes provided by South Nation Staff to WSP Golder , 2002). Creek Heelsplitter (*Lasmigona compressa*) and Pink Heelsplitter (*Potamlus alatus*) have also been historically observed in the Moose Creek study area (WSP Golder, 2022). None of the species identified by WSP Golder (2022) is listed “at Risk”.

4.2.2 Fish Communities

Surface water features on the Future Development Lands either go dry (Roxborough-Plantagenet Boundary Municipal Drain) or are very shallow by mid-summer (Fraser Municipal Drain and Upper Tayside Municipal Drain). Only the Fraser and Upper Tayside Municipal Drains provided habitat for fish communities in the summer. The stretches of the Fraser and Upper Tayside Municipal Drains on the Future Development Lands provide mostly cool-warm and warm waters for fish, respectively. Captured fish species are considered primarily to be warm- and cool-water species except for Northern Pearl Dace (captured at T2 in 2021), which also prefers coldwater streams (Holm et al., 2009).

The habitat preferences of fish species captured in fished areas in the Study Areas are summarized in Table 16. The species captured have some differing habitat requirements. Species such as Central Mudminnow are tolerant to turbidity, while others like Creek Chub and Brook Stickleback are not. Central Mudminnow and Brook Stickleback are tolerant to low dissolved oxygen. The species all generally have a high association with small substrates, including silt/clay, sand, and gravel. Species such as Central Mudminnow, Fathead Minnow, and Brook Stickleback have a high association with submergent and emergent aquatic vegetation. These species tend to occur in watercourses with degraded water quality (Stanfield and Kilgour, 2006). Fathead Minnow is known for its tolerance to chloride, boron, nitrate, and sulphate relative to other fish species and/or the established water quality guidelines (CCME, 2009; 2011; 2012; BCMOE, 2013).

The electrofishing surveys in the spring of 2019 and the summer of 2021 produced fish communities typical for the Moose Creek area. None of the species collected were outside a known range. No provincially and/or nationally listed (SAR) fish species were captured. In addition, no critical habitat for aquatic SAR (DFO, 2016) or sensitive spawning habitat was identified within the Study Areas (MNR, 2012). Considering this, minor alterations to fish habitat areas in the Study Areas (e.g., addition of culvert crossings) would require review

by SNC and DFO, but would likely be approved through the design and implementation of standard mitigation measures such as performing in-water works outside of the spawning period.

Table 16 Habitat preferences of fish species captured in fished areas of the Study Areas, 2019 and 2021

Family	Species	General	Spawning	Overwintering/Summer Refuge	Literature Cited
Catostomidae	White Sucker	Low substrate association for bedrock, boulder, cobble, and silt/clay, medium for rubble and high for gravel, sand; pools and runs. Turbidity tolerant. Deep water (1-3m), low velocity.	Riffle, rapid habitats, downstream of the base of beaver dams with rubble and gravel.	Broad temperature tolerance but prefers cool waters; year-round association for depths from 0 to 10+ m.	Lane *et al*., 1996a; Langhorne *et al*., 2001; Page and Burr, 2011; Richardson *et al*., 2001
Centrarchidae	Pumpkinseed	Lives in cool to warm waters of lakes and slow-moving streams with aquatic vegetation. Moderately tolerant of turbidity.	The male creates a shallow nest, 100-400 mm in diameter, on sand or gravel in shallow areas (<1m depth) with aquatic vegetation.	Usually found in quiet, slower moving streams, ponds, small lakes, and the weedy shallow bays of large lakes. Prefers clear water and areas of submerged vegetation or brush. Turbidity intolerant. Adults are found in slightly deeper water than juveniles (1-5 m) and are more associated with rocky or plant covered substrate. Resting areas are in the interstices of rocks or submerged logs.	Holm *et al*., 2009; Page and Burr, 2011; Scott and Crossman, 1973
Cyprinidae	Central Mudminnow	Slow-moving waters, soft bottoms, heavily vegetated areas. Turbidity tolerant.	High association with vegetation.	Burrow in silt substrates; tolerant of low dissolved oxygen. Tolerant of warm and cool waters.	Scott and Crossman, 1973
	Sand Shiner	Slow-moving, warm areas of streams with bottoms of sand and gravel, and in the shallow, sandy areas of lakes, including the Great Lakes.	Spawning takes place from late spring to mid-summer when the water temperature is above 21°C. Vegetation or sandy substrates are used during spawning events.	Medium velocity streams with a high association for sand and gravel substrate	Holm *et al*., 2009
	Northern Redbelly Dace	Broadcast spawner (can have 2 spawning periods) on masses of filamentous algae.	High association for spawning locations with pool habitat and algae cover.	Low substrate association for bedrock, boulder, cobble and silt/clay, medium for rubble and high for gravel, sand; Pools and runs. Turbidity tolerant. Deep water (1-3m), low velocity. Prefers cool waters.	Aadland and Kuitunen, 2006; Hall-Armstrong *et al*., 1996; Holm *et al*., 2009; Lane *et al*., 1996a,b; Langhorne *et al*., 2001; Page and Burr, 2011; Portt *et al*., 1999; Richardson *et al*., 2001; Scott and Crossman, 1973; Twomey *et al.,* 1984

Family	Species	General	Spawning	Overwintering/Summer Refuge	Literature Cited
	Common Shiner	Small-medium sized streams, with clear, cool water and moderate current.	High association with gravel (coarse) and moderate flowing water (head of riffle); spawning nests are excavated from gravel substrate, eggs are fertilized and adhere to gravel substrate.	High association with sand/gravel, medium association with vegetation. Prefers cool waters.	Lane *et al*., 1996a,b; Langhorne *et al*., 2001; Scott and Crossman, 1973
	Bluntnose Minnow	Generally tolerant of turbid environments.	Spring spawner in water temperatures of 8-20°C; nest builders on the underside of rocks or wood; high association with rubble and gravel substrate; medium association with submergent and emergent vegetation.	High association with pool and run habitats; gravel, sand and silt/clay substrate; depth 0-0.6 m. Prefers warm waters.	Lane *et al*., 1996a; Holm *et al*., 2009
	Fathead Minnow	High association for depth from 0-2 m; rubble, sand, and silt substrates; high association for overhead and in-situ cover. Tolerant of poor conditions (turbid, hot, poorly oxygenated water).	Spring spawner in water temperatures of 16-29°C; nest builders under rock or wood.	High association for gravel, sand, silt/clay; submergent/emergent vegetation, no cover and in-situ cover. Prefers warm waters.	Lane *et al*., 1996a,c; Holm *et al*., 2009; Langhorne *et al*., 2001; Page and Burr, 2011; Richardson *et al*., 2001; Scott and Crossman, 1973
	Longnose Dace	Riffle or rapid habitat.	Gravel for egg adhesion, low-moderate velocity and depths 0-0.2 m.	Preference for larger substrates, no vegetation or debris. Prefers cool waters.	Aadland and Kuitunen, 2006; Portt *et al*., 1999
	Creek Chub	Small streams with access between riffles to low velocity habitats and deep pools.	Gravel for nest building, turbidity intolerant.	Small, clear, cool streams with gravel substrate.	McMahon, 1982
Fundulidae	Banded Killifish	Prefers the warm surface waters of clear streams and the nearshores of lakes	Spawning occurs in quiet, heavily vegetated waters in spring and summer above 20°C.	Prefers slow-moving streams, calm areas of estuaries, and riparian areas of lakes. Typically remain in a small home range throughout its life. In lakes, they tend to overwinter in deep-water areas and move to shallow areas when the ice melts. In the summer prefer shallow water habitats with submerged aquatic vegetation.	Holm *et al*., 2009

Family	Species	General	Spawning	Overwintering/Summer Refuge	Literature Cited
Gasterosteidae	Brook Stickleback	High association for gravel, sand, and silt/clay; vegetative cover; pools and low velocity habitats. Turbidity intolerant.	Shallow water where they construct a nest of grass, green algae or reeds. Build nests among vegetation above substrate.	High association for depths 0-1.0 m. High association for gravel, sand and silt; pool and run habitats; heavy vegetation. Turbidity intolerant, but tolerant to low dissolved oxygen. Prefers cool waters.	Aadland and Kuitunen, 2006; Hall-Armstrong *et al.,* 1996; Lane et al., 1996a,b,c; Langhorne *et al.*, 2001; Richardson *et al.*, 2001
Ictaluridae	Brown Bullhead	Prefers the bottom of warm, shallow lakes and slow-moving streams. It prefers some form of cover, such as aquatic plants or fallen trees.	Spawns in late spring and early summer when temperatures are above 21°C. Spawning can occur in the shallows or lakes or in stream banks	High association with pools and sluggish runs over sand to mud substrate in creeks and rivers, ponds and lake embayment's. Preferred water temperature range is 25-31°C.	Holm *et al*., 2009
	Blacknose Dace	High association with small, shallow, cool streams with instream and riparian cover.	Shallow riffles where the male constructs a nest and defends a territory. Spawning occurs in spring when water temperatures are between 12-27°C.	Prefers riffles and runs of cool, small to medium sized streams with moderate to steep gradients and gravel substrate.	Holm *et al*., 2009
Leuciscidae	Brassy Minnow	Prefers cool, slow-moving streams and lakes, and is found over a wide range of bottom types, but there is a high association to silt, sand, and gravel.	Spring broadcast spawner in shallow areas depositing eggs near or on vegetation.	Inhabit small, slow flowing weedy creeks; cool, acidic, boggy streams; and shallow lakes. High association with gravel, sand and clay/silt substrate, vegetation, instream cover, pools, flats, backwater areas. Low association with fast flowing habitats.	Aadland and Kuitunen 2006; Hall-Armstrong *et al.,* 1996; Holm *et al*., 2009; Lane *et al.,* 1996a,b,c; Langhorne *et al*., 2001; Portt *et al*., 1999
	Central Stoneroller	Prefers the shallows of warmwater streams over bottoms of exposed bedrock or gravel and stones covered with its preferred food; encrusted algae.	Spawning occurs when water temperatures reach 14°C. Sand or gravel bottoms are preferred to create their nest.	High association with pool/ riffle/ run habitats of small to medium-sized streams with gravel, cobble, rubble and sand substrate	Holm *et al*., 2009
	Finescale Dace	Prefers the cool heavily vegetated, slow-moving, shallow waters of lakes and streams with bottoms of silt and detritus.	Broadcast spawners, often within masses of filamentous algae.	Cool, heavily vegetated, slow moving, shallow waters of lakes and streams with bottoms of silt and detritus; often associated with "tea" stained waters.	Lane *et al*., 1996a,b; Langhorne *et al*., 2001; Hall-Armstrong *et al*., 1996; Holm *et al*., 2009; Portt *et al*., 1999; Scott and Crossman, 1973

Family	Species	General	Spawning	Overwintering/Summer Refuge	Literature Cited
	Northern Pearl Dace	Prefers shallow, vegetated areas in cool and cold lakes and streams. High association with silt, sand, or gravel substrate, close to aquatic vegetation.	Spring spawners when the water temperature is between 13-18°C. Sand or gravel bottoms are preferred.	Same as general habitat	Holm *et al*., 2009
Percidae	Johnny Darter	Streams of all sizes; pool habitat; association with sand and gravel substrates.	Spring spawners in temperatures of around 10° C. Spawn on undersides of rocks.	Inhabits streams and rivers of all sizes where it is found in pools and other slack water habitats on sand and gravel substrates. Prefers warm waters.	Scott and Crossman, 1973; Ohio DNR, 2012
	Iowa Darter	Can be found in a wide variety of bottom habitats in the clear waters of lakes or streams.	Shallow waters near shores of lakes and streams on bottom organic debris, aquatic vegetation or fibrous root material; on sand or on organic material on sand when no undercut bank available.	Clear standing or slow-moving waters of ponds, lakes, or rivers at depths of <1.5 m.	Hall-Armstrong *et al*., 1996; Holm *et al*., 2009; Lane *et al.*, 1996a; Portt *et al*., 1999
Percopsidae	Trout-perch	Prefers the cool waters of lakes but may occasionally be found in streams. High association with sand and gravel substrate.	Spring spawners when the temperature reaches 10°C. Shallow, rocky streams or nearby waters of lakes.	Same as general habitat. If in lake environments typically inhabits the deeper parts of the lakes throughout the winter.	Holm *et al*., 2009

4.2.3 Northern Pike

Northern Pike spawning surveys and backpack electrofishing were intended to support the weight of evidence of the presence/absence of Northern Pike spawning in the drainage features. The conclusion that Northern Pike were not spawning in the drainage features adjacent to the proposed development lands is supported by the following:

1. Northern Pike have never been documented in the drainage features adjacent to the development lands.

   Table 8 summarized fish species that have been captured in watercourses in the Study Areas during previously completed studies; Northern Pike has not been captured since 1996. This species was captured in 1991 and 1996 in Moose Creek, but not elsewhere in the Off-Site Study Area or in the On-Site Study Area (NEA, 1998, 2018). Similarly, Table 10 showed that Northern Pike was not one of the species captured in the Fraser Municipal Drain or the Upper Tayside Municipal Drain in the summer of 2019. Further, Table 12 indicated that Northern Pike were not observed during

electrofishing surveys in the spring of 2021 within Moose Creek, the Fraser Municipal Drain, the Upper Tayside Municipal Drain, and the Albert Fahey Award Drain.

2. Most reaches of surveyed drainage features adjacent to the development lands did not provide highly suitable spawning habitat for Northern Pike due to a lack of flooded vegetation.

   Most surveyed drains lacked in-stream cover suitable for Northern Pike spawning (i.e., flooded grasses and sedges in shallow, sheltered areas). The Roxborough-Plantagenet Boundary Municipal Drain contained submerged vegetation throughout, and therefore may be suitable. However, the drain did not produce adult or young-of-year pike when electrofished, suggesting it was not used by pike for spawning.

   In general, land use surrounding the surveyed drains is heavily managed and non-natural and is dominated by active agriculture (i.e., sod production, mushroom farm, corn fields), peat extraction, and the EOWHF. Run-off and discharge associated with these land uses are expected to contribute to the relatively warm water temperatures of most drains in the Study Areas, combined with their shallow depths. All surveyed drains contained channel crossings (i.e., round culvert and/or open bottom culvert). Migratory obstructions observed during surveys included a perched culvert in the upstream reach of the Albert Fahey Award Drain along with dense vegetation within a short reach of this drain and within the Roxborough-Plantagenet Boundary Municipal Drain.

3. The timing of Northern Pike spawning surveys may not have directly corresponded to peak spawning activity as predicted by temperature models for the region in 2021 given the relatively early and warm spring conditions. However, surveys fell within the overall Northern Pike spawning and egg hatching period for the region. Since no evidence of spawning was observed (e.g., adults, eggs) and no young-of-year were captured during follow-up spring electrofishing, it is unlikely that the watercourses in the Study Areas provide spawning habitat for Northern Pike.

   KAL (2016) used a model developed by Mingelbier et al. (2008) to estimate the peak spawning period for Northern Pike in the Ottawa region. That model uses air temperatures and channel discharge rates to predict the peak spawning period. Based on the model, the period of maximum spawning for Northern Pike in the Ottawa region is estimated to have historically occurred between March 9 and April 20, while the maximum egg hatching period is predicted to have historically taken place between March 20 and May 1. After hatching, young-of-year Northern Pike remain and aggregate in the deepest areas of their nursery habitat (Cucherousset et al., 2009) and typically leave wetlands within a month of hatching (Nilsson et al., 2014). Given that spawning surveys took place on April 6, 8, 15, and 16, 2021, evidence of spawning (e.g., adults, eggs) would likely have been observed, if present. Further, follow-up electrofishing on May 10, 2021, would have likely detected young-of-year Northern Pike if present. The absence of young-of-year Northern Pike during spring electrofishing supports a conclusion that adult Northern Pike had not accessed the tributaries for spawning.

5.0 SUMMARY AND CONCLUSIONS

This report was prepared for GFL Environmental Inc. to document existing ecological environment conditions of the Study Areas. This Ecological Environment Existing Conditions Report is one component of the Environmental Assessment process and will be included with the final EOWHF Future Development Environmental Assessment.

An ELC assessment was performed in conjunction with a desktop review of available information to assess the potential for SAR to occur in the Study Areas. The information obtained from the ELC and desktop exercises was used to determine the studies required to document SAR that may occur in the Study Areas. Subsequently, detailed breeding bird surveys and bat acoustic monitoring were performed in 2019 and aural anuran surveys and turtle surveys were performed in 2020. These surveys were used to confirm the presence/absence of at-risk birds, bats, amphibians, and turtles and to assess the potential presence of Significant Wildlife Habitat and any other ecological features in the Study Areas that may interact with future development of the Future Development Lands.

The Future Development Lands and most of the surrounding area are largely of anthropogenic nature (i.e., landfill, agricultural, industrial) and are therefore not suitable habitat for most SAR known to occur or to potentially occur in the Study Areas. Three SAR protected under the ESA were observed during field surveys: Bank Swallow, Barn Swallow, and Little Brown Myotis. Category 3 habitat for Bank Swallow falls on the Future Development Lands and significant alterations to the ecological function of this habitat would require permission from MECP. Suitable nesting and foraging habitat for Barn Swallow exists on and adjacent to the Future Development Lands. The regulatory environment (provincial) for Barn Swallow will change on or before January 2023 such that interactions with foraging habitat will not require consultation with an agency. However, interactions with active nests of Barn Swallow will remain prohibited (like for other migratory birds) under the *Migratory Birds Convention Act*. Little Brown Myotis was detected along the western edge of the Future Development Lands; trees in this area may provide roosting habitat for the species, while the open sod fields may provide foraging habitat. Little Brown Myotis receives general habitat protection under the ESA so potential habitat areas would generally be protected with no defined limits of critical habitat at this point. If vegetation in this area needs to be cleared for the development of the Future Development Lands, it should be done outside of the bat roosting season. Similarly, buildings occupied by at-risk bats cannot be altered while bats are present, so if the Manderley Turf Products buildings on the Future Development Lands need to be altered (e.g., demolished), it is best to do so outside of the bat roosting season.

Western Chorus Frog was observed in the Fraser Municipal Drain on and adjacent to the Future Development Lands but does not receive protection under the ESA. This species is therefore of low concern for the project. Candidate Significant Wildlife Habitat for Snapping Turtle was identified within the Roxborough Plantagenet Boundary Municipal Drain north of the Future Development Lands, though whether this habitat is protected would be determined by the local municipality. No other candidate Significant Wildlife Habitats exist on the Future Development Lands.

The wooded area within Moose Creek Wetland in the Off-Site Study Area is known to contain habitat for Eastern Whip-poor-will (listed as Threatened under ESA and SARA) and qualifies as Significant Wildlife Habitat for White-tailed Deer (Deer Yarding and/or Deer Winter Congregating Areas), Eastern Wood-pewee, and

Wood Thrush (Significant Wildlife Habitat for Special Concern Species). These species and their habitats were not identified within the Future Development Lands or the existing EOWHF.

Fish communities within the Study Areas were assessed in the summer of 2019 and in the spring of 2021. The Roxborough Plantagenet Boundary Municipal Drain north of the Future Development Lands and the Albert Fahey Award Drain in the Off-Site Study Area go dry by mid-summer, while the Fraser Municipal Drain and the Upper Tayside Municipal Drain on the Future Development Lands contain shallow water and support fish communities in the summer. The stretches of the Fraser and Upper Tayside Municipal Drains on the Future Development Lands provide mostly cool-warm and warm waters for fish, respectively. Electrofishing surveys in the summer of 2019 and the spring of 2021 produced fish communities typical for the Moose Creek area. None of the species collected were outside a known range. No provincially and/or nationally listed (SAR) fish species were captured. In addition, no critical habitat for aquatic SAR or sensitive spawning habitat was identified within the Study Areas. Considering this, minor alterations to fish habitat areas in the Study Areas (e.g., addition of culvert crossings) would require review by SNC and DFO, but would likely be approved through the design and implementation of standard mitigation measures such as performing in-water works outside of the spawning period.

6.0 CLOSURE

This report was prepared for exclusive use by GFL Environmental Inc. and may be distributed only by GFL Environmental Inc. Questions relating to the data and interpretation can be addressed to the undersigned.

Respectfully submitted,

KILGOUR & ASSOCIATES LTD.

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7.0 LITERATURE CITED

Aadland, L., and A. Kuitunen. 2006. Habitat Suitability Criteria for Stream Fishes and Mussels of Minnesota. Technical manuscript. 107pp + appendices.

Bird Studies Canada, Ontario Field Ornithologists, Environment Canada, Ontario Nature, Ministry of Natural Resources, and Federation of Ontario Naturalists. 2001. Ontario Breeding Bird Atlas Guide for Participants. Available online at: https://www.birdsontario.org/download/atlas_feb03.pdf

Bird Studies Canada, United States Environmental Protection Agency, and Environment Canada. 2008. Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (Revised). Available online at: https://www.birdscanada.org/bird-science/marsh-monitoring-program/

Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature. 2009. Atlas of the Breeding Birds of Ontario 2001-2005. Eds. Cadman, M.D., Sutherland, D.A., Beck, G.G., Lepage, D., Couturier, A.R.

Bumble Bee Watch. 2021. Bumble Bee Sightings Map. Available online at: https://www.bumblebeewatch.org/app/#/bees/map?filters=%7B%22sightingstatus_id%22:%5B%5D,%22species_id%22:%5B%2237%22%5D,%22province_id%22:%5B%5D%7D

Cadman, M.D., P.F.J. Eagles, and F.M. Helleiner. 1987. Atlas of Breeding Birds of Ontario. University of Waterloo Press, Waterloo, Ontario.

Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier. 2007. 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, xxii + 706 pp.

California Academy of Sciences and National Geographic Society. 2021. iNaturalist. Available online at: https://www.inaturalist.org/

Canadian Council of Ministers of the Environment (CCME). 2012. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Nitrate. In: Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment, Winnipeg.

CanDetec Inc. 2021. Surface Water Assessment for Amendment of the Environmental Compliance Approval for the Leachate Treatment Facility at the GFL Eastern Ontario Waste Handling Facility Landfill, Moose Creek, Ontario – Revised Draft Report dated February 2021 submitted to GFL Environmental Inc.

Casselman, J.M. and Lewis, C.A. 1996. Habitat requirements of the northern pike (*Esox lucius*). *Canadian Journal of Fisheries and Aquatic Sciences*, 53(Suppl. 1):161-174.

Chu, C., N.E. Jones, A.R. Piggott, and J.M. Buttle. 2009. Evaluation of a simple method to classify the thermal characteristics of streams using a nomogram of daily maximum air and water temperatures. *North American Journal of Fisheries Management*, 29: 1605-1619.

Clarke, A.H. 1981. The Freshwater Mussels of Canada. National Museum of Natural Sciences/National Museums of Canada.

Committee on the status of Endangered Wildlife in Canada (COSEWIC). 2021. COSEWIC Assessment and Status Report on the Barn Swallow *Hirundo rustica* in Canada. [https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/barn-swallow-2021.html]

Committee on the Status of Species at Risk in Ontario (COSSARO). 2022. Annual Report, 2021. Committee on the Status of Species at Risk in Ontario (COSSARO). [http://cossaroagency.ca/wp-content/uploads/2022/05/COSSARO-2021-ANNUAL-REPORT_vF-1_26Jan2022.pdf].

Cucherousset, J., J.M. Paillisson, A. Cuzol, and J.M. Roussel. 2009. Spatial behavior of young-of-the-year northern pike (*Esox lucius* L.) in a temporarily flooded nursery area. *Ecology of Freshwater Fish*, 18: 314-322.

Cuddy, D.G. 1998. Vascular Plants of Eastern Ontario. Draft 2.2. Ontario Ministry of Natural Resources, Eastern Regional Office, Kemptville. Unpublished MS. 78 pp.

The Cornell Lab of Ornithology. 2021. eBird: An online database of bird distribution and abundance. Available online at: https://ebird.org/home

Environment and Climate Change Canada (ECCC). 2019. *Canadian Environmental Protection Act* 1999, Federal Environmental Quality Guidelines, Iron. Available online at: https://www.canada.ca/content/dam/eccc/documents/pdf/pded/feqg-iron/Federal-Environmental-Quality-Guidelines-Iron.pdf].

Environment and Climate Change Canada (ECCC). 2021. Range Map Extents – Species at Risk – Canada. Available online at: http://data.ec.gc.ca/data/species/protectrestore/range-map-extents-species-at-risk-canada/

Falk, B., L. Jakobsen, A. Surlykke, and C.F. Moss. 2014. Bats coordinate sonar and flight behavior as they forage in open and cluttered environments. *Journal of Experimental Biology*, 217: 4356-4364. DOI: 10.1242/jeb.114132

Fisheries and Oceans Canada ("DFO"). 2019. Aquatic Species at Risk Map. Available online at: https://www.dfompo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

Garrison, B.A. 1999. Bank Swallow (*Riparia riparia*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/414 doi: 10.2173/bna.414

Government of Canada. 2002. *Species at Risk Act*. Available online at: https://laws-lois.justice.gc.ca/eng/acts/s-15.3/

Government of Canada. 2019. Environment and Natural Resources: Historical Climate Data. Available online at: https://climate.weather.gc.ca/

Government of Canada. 2021. Species at Risk Public Registry. Available at: http://www.registrelep-sararegistry.gc.ca/sar/index/default_e.cfm

Government of Ontario. 1997. *Fish and Wildlife Conservation Act*. Available online at: https://www.ontario.ca/laws/statute/97f41

Government of Ontario. 2007. *Endangered Species Act*. Available online at: https://www.ontario.ca/laws/statute/07e06

Hall-Armstrong J., A.G. Harris, and R.F. Foster. 1996. Fish use of wetlands in Northwestern Ontario: a literature review and bibliography. Northwest Science and Technology, Ontario Ministry of Natural Resources, Thunder Bay, Ont. TR-90. 54 pp + appendices.

Holm, E., N.E. Mandrak, and M.E. Burridge. 2009. ROM field guide to freshwater fishes of Ontario. Royal Ontario Museum. ISBN 978-0-88854-459-9, 462 pp.

Humphrey, C., and Fotherby, H. 2019. Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Perimyotis subflavus*) in Ontario. Ontario Recovery Strategy Series. Prepared by the Ministry of the Environment, Conservation and Parks, Peterborough, Ontario. vii + 35 pp. + Appendix. Adoption of the Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), the Northern Myotis (*Myotis septentrionalis*), and the Tri-colored Bat (*Perimyotis subflavus*) in Canada (Environment and Climate Change Canada, 2018).

Humphrey, C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (*Myotis leibii*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 76 pp.

Jobin, B., J.-L. Desgranges, and C. Boutin. 1996. Population trends in selected species of farmland birds in relation to recent developments in agriculture in the St. Lawrence Valley. *Agriculture, Ecosystems and Environment*, 57:103–116.

Kilgour & Associates Ltd. 2016. Request for Review: Cranberry Creek Municipal Drain pump and dyke system reinstatement. Report submitted to Fisheries and Oceans Canada, dated March 10, 2016. iv + 27 pp. + appendices.

Kilgour & Associates Ltd. 2021a. Environmental Impact Study: Lands South of the Eastern Ontario Waste Handling Facility in Moose Creek. Report Version 2 dated February 19, 2021. iv + 72 pp. + appendices.

Kilgour & Associates Ltd. 2021b. Eastern Ontario Waste Handling Facility 2020 Biological Monitoring. Report Version 2 dated April 13, 2021. iv + 27 pp. + appendices.

Lane, J.A., C.B. Portt, and C.K. Minns. 1996a. Spawning habitat characteristics of Great Lakes fishes. Can. MS Rep. Fish. Aquat. Sci. 2368: 48p.

Lane, J.A., C.B. Portt, and C.K. Minns. 1996b. Nursery habitat characteristics of Great Lakes fishes. Can. MS Rep. Fish. Aquat. Sci. 2338: v+42p.

Lane, J.A., C.B. Portt and C.K. Minns. 1996c. Adult habitat characteristics of Great Lakes fishes. Can. MS Rep. Fish. Aquat. Sci. 2358: v+43p.

Langhorne, A.L., M. Neufeld, G. Hoar, V. Bourhis, D.A. Fernet, and C.K. Minns. 2001. Life history characteristics of freshwater fishes occurring in Manitoba, Saskatchewan, and Alberta, with major emphasis on lake habitat requirements. Can. MS Rpt. Fish. Aquat. Sci. 2579:xii+170p.

Lee, H.R., W. 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, North Bay.

McMahon, T. E. 1982. Habitat suitability index models: Creek chub. U.S.D.l. Fish and Wildlife Service. FWS/OBS-82/10.4 23 pp.

Mingelbier M, P Brodeur and J Morin. 2008. Spatially explicit model predicting the spawning habitat and early stage mortality of Northern pike (*Esox lucius*) in a large system: the St. Lawrence River between 1960 and 2000. *Hydrobiologia*, 601(1): 55-69.

Ministry of Environment, Conservation and Parks. 2019a. Barn Swallow General Habitat Description. Available online at: https://www.ontario.ca/page/barn-swallow-general-habitat-description

Ministry of Environment, Conservation and Parks. 2019b. Species at Risk Overall Benefit Permits. Available online at: https://www.ontario.ca/page/species-risk-overall-benefit-permits

Ministry of Environment, Conservation and Parks. 2019c. Alter a Structure (Habitat for Barn Swallow). Available online at: https://www.ontario.ca/page/alter-structure-habitat-barn-swallow

Ministry of Environment, Conservation and Parks. 2021a. Species at Risk in Ontario. Available online at: https://www.ontario.ca/page/species-risk-ontario

Ministry of Natural Resources and Forestry. 2014. Draft Survey Protocol for Eastern Whip-poor-will (*Caprimulgus vociferus*) in Ontario. MNRF Species at Risk Branch, Peterborough, Ontario. iii + 10 pp.

Ministry of Natural Resources and Forestry. 2015a. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. MNRF Regional Operations Division: Southern Region Resources Section, Peterborough, Ontario. 39 pp.

Ministry of Natural Resources and Forestry. 2015b. Survey Protocol for Blanding's Turtle (*Emydoidea blandingii*) in Ontario. MNRF, Species Conservation Policy Branch. Peterborough, Ontario. ii + 16 pp.

Ministry of Natural Resources and Forestry. 2015c. General Habitat Description for the Bank Swallow (*Riparia riparia*). 7 pp. Available online at: https://ossga.com/multimedia/0/bank_swallow_ghd_en.pdf

Ministry of Natural Resources and Forestry. 2015d. Technical Note: Species at Risk (SAR) Bats. MNRF Regional Operations Division. 37 pp.

Ministry of Natural Resources and Forestry. 2016. Survey Protocol for Ontario's Species at Risk Snakes. Ontario Ministry of Natural Resources and Forestry, Species Conservation Policy Branch. Peterborough, Ontario. ii + 17 pp.

Ministry of Natural Resources and Forestry. 2017a. Survey Protocol for Species at Risk Bats within Treed Habitats: Little Brown Myotis, Northern Myotis, and Tri-Coloured Bat. MNRF, Guelph District, Ontario. 13 pp.

Ministry of Natural Resources and Forestry. 2017b. Best Management Practices for Excluding Barn Swallows and Chimney Swifts from Buildings and Structures. Queen's Printer for Ontario, 2017. 22 pp.

Ministry of Natural Resources and Forestry. 2021a. Natural Heritage Information Centre. Make a Map: Natural Heritage Areas. Available online at: https://www.lioapplications.lrc.gov.on.ca/Natural_Heritage/index.html?viewer=Natural_Heritage.Natural_Heritage&locale=en-CA

Ministry of Natural Resources and Forestry. 2021b. Land Information Ontario Provincially Tracked Species Grid Detail. Available online at: https://geohub.lio.gov.on.ca/datasets/lio::provincially-tracked-species-grid-detail/about

Niblett Environmental Associates Inc. (NEA). 1998. Lafleche Environmental Inc., Eastern Ontario Waste Handling Facility (Phase I – Landfill). Lindsay, Ontario.

Niblett Environmental Associates Inc. (NEA). 2018. Ecological Environment Existing Conditions Report: Eastern Ontario Waste Handling Facility Landfill Expansion Environmental Assessment. Lindsay, Ontario. iv + 43 pp.

Nilsson, J., O. Engstedt, and P. Larsson. 2014. Wetlands for northern pike (*Esox lucius* L.) recruitment in the Baltic Sea. *Hydrobiologia*, 721: 145-154.

Ohio Department of Natural Resources (DNR). Division of Wildlife. 2012. Johnny Darter (*Etheostoma nigrum*) Overview. Available online at: http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/fish/johnny-darter

Ontario Nature. 2019. Herp Atlas. Available at: https://ontarionature.org/oraa/maps/

Page, L., and B. Burr. 2011. Peterson field guide to freshwater fishes of North America north of Mexico. Boston: Houghton Mifflin Harcourt.

Portt, C.B., Coker, G.A. and C.K. Minns. 1999. Riverine habitat characteristics of fishes of the Great Lakes watershed. Canadian Manuscript Report of Fisheries and Aquatic Sciences, No. 2481, vi + 62 pp.

Portt, C.B., Coker, G.A., Ming, D.L., and R.G. Randall. 2006. A review of fish sampling methods commonly used in Canadian freshwater habitats. Canadian Technical Report of Fisheries and Aquatic Sciences 2604. 58pp.

Renfrew, R.B., and A.M. Saavedra. 2007. Ecology and conservation of Bobolink in rice production regions of Bolivia. *Ornitologia Neotropical*, 18: 61-73.

Richardson, E.S., J.D. Resit and C.K. Minns. 2001. Life history characteristics of freshwater fishes occurring in the Northwest Territories and Nunavut, with major emphasis on lake habitat characteristics. Can. MS Rep. Fish. Aquat. Sci. 2569:vii+146p.

Sample, D.W. 1989. Grassland birds in southern Wisconsin: Habitat preference, population trends, and response to land use changes. M.S. thesis. University of Wisconsin, Madison, Wisconsin. 588 pp.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 184. University of Toronto Press.

Scott, W. B., and E.J. Crossman. 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. No. 184.

South Nation Conservation. Data sets from Ontario Stream Assessment Protocol, Moose Creek and Fraser Municipal Drain (SNC data shared with Niblett Environmental Associates; based on data shown in NEA (2018)).

Twomey, K., Williamson, K. L., & Nelson, P. C. (1984). Habitat suitability index models and instream flow suitability curves: white sucker. Western Energy and Land Use Team, Division of Biological Services, Research and Development, Fish and Wildlife Service, US Department of the Interior.

United Counties of Stormont, Dundas, and Glengarry. 2018. Official Plan. Available online at: https://www.sdgcounties.ca/sites/default/files/documents/SDG%20Official%20Plan%20-%20V.4.0%20Consolidated_0.pdf

WSP Golder. 2022. Derivation of Proposed Acute and Chronic Site-Specific Water Quality Objectives – Revision 2; Eastern Ontario Waste Handling Facility Near Moose Creek, Ontario (October 25, 2022).

Appendix A Vascular Plants Observed on the Future Development Lands, 2019

Scientific Name	Common Name	Global Rank	Provincial Rank	KAL Observations (2019)		
				FODM11	OAGM1 IAGM1	Sod Fields
Aceraceae						
Acer negundo L.	Manitoba Maple	G5	S5	x	x	
Acer rubrum L.	Red Maple	G5	S5	x		
Alismataceae						
Sagittaria latifolia Willd.	Arrowhead	G5	S5	x		
Amaranthaceae						
Amaranthus albus L.	White Pigweed	GNR	SNA	x		
Amaranthus retroflexus L.	Red-root Amaranth	G5	SNA			
Anacardiaceae						
Toxicodendron vernix (L.) *Kuntze*	Poison Sumac	G5	S4	x		
Apiaceae						
Berula erecta - (Huds.) Coville	Wild Parsnip	G4G5	-	x	x	
Apocynaceae						
Asclepias syriaca L.	Common Milkweed	G5	S5	x	x	x
Aquifoliaceae						
Ilex verticillata (L.) Gray	Winterberry	G5	S5	x		
Asteraceae						
Arctium lappa L.	Great Burdock	GNR	SNA	x	x	
Arctium minus Bernh.	Common Burdock	GNR	SNR	x	x	
Carduus acanthoides L.	Plumeless Thistle	GNR	SNA	x		
Cirsium arvense (L.) Scop.	Canada Thistle	G5	SNA	x	x	
Hieracium aurantiacum L.	Orange Hawkweed	GNR	SNA	x		
Lactuca hirsuta Muhl. ex Nutt.	Wild Lettuce	G5/T5	SNR	x	x	
Solidago canadensis L.	Canada Goldenrod	G5	S5	x	x	
Taraxacum officinale G.H. Weber ex Wiggers	Common Dandelion	G5	S5	x	x	x
Tussilago farfara L.	Colt's Foot	GNR	SNA	x	x	
Balsaminaceae						
Impatiens capensis - Meerb.	Jewelweed	G5	S5	x	x	x
Betulaceae						
Alnus incana (L.) Moench	Speckled Alder	G5	S5	x		
Betula papyrifera Marsh.	White Birch	G5	S5	x		
Boraginaceae						

Scientific Name	Common Name	Global Rank	Provincial Rank	KAL Observations (2019)		
				FODM11	OAGM1 IAGM1	Sod Fields
Echium vulgare L.	Common Viper's-bugloss	GNR	SNA	x		
Brassicaceae						
Alliaria petiolata (Bieb.) Cavara & Grande	Garlic Mustard	GNR	SNA	x		
Brassica rapa L.	Field Mustard	GNRTNR	SNA	x		
Capsella bursa-pastoris (L.) Medik.	Common Sheperd's Purse	GNR	SNA	x		
Thlaspi arvense L.	Field Penycress	GNR	SNA	x		
Caryophyllaceae						
Silene latifolia Poir.	White Campion	GNRTNR	SNA	x		
Cucurbitaceae						
Echinocystis lobata (Michx.) Torr. & Gray	Wild Cucumber	G5	S5	x		
Cupressaceae						
Thuja occidentalis L.	White Cedar	G5	S5	x		
Cyperaceae						
Carex	*Carex* sp.	-	-	x		
Dryopteridaceae						
Matteuccia struthiopteris (L.) Todaro	Ostrich Fern	G5	S5	x		
Onoclea sensibilis L.	Sensitive Fern	G5	S5	x		
Equisetaceae						
Equisetum arvense L.	Field Horsetail	G5	S5	x		
Fabaceae						
Glycine max (L.) Merr.	Soybean	GNR	SNA		x	
Trifolium pratense L.	Red Clover	GNR	SNA	x	x	
Trifolium repens L.	White Clover	GNR	SNA	x	x	
Vicia americana Muhl. ex Willd.	Purple Vetch	G5	S5	x	x	x
Lamiaceae						
Stachys byzantina K. Koch ex Scheele	Wooly Hedge-nettle	GNR	SNA	x		
Lemnaceae						
Lemna minor L.	Lesser Duckweed	G5	S5?			x
Lythraceae						
Lythrum salicaria L.	Purple Loosestrife	G5	SNA	x		
Oleaceae						
Fraxinus pennsylvanica Marsh.	Green Ash	G5	S4	x		

Scientific Name	Common Name	Global Rank	Provincial Rank	KAL Observations (2019)		
				FODM11	OAGM1 IAGM1	Sod Fields
Osmundaceae						
Osmunda regalis L.	Royal Fern	G5	S5	x		
Paniceae						
Echinochloa sp.	Barnyard Grass	-	-			x
Larix laricina (Du Roi) K. Koch	Tamarck	G5	S5	x		
Pinus sylvestris L.	Scots Pine	GNR	SNA	x		
Festuca rubra L.	Red Fescue	G5	S5	x	x	x
Hordeum jubatum L.	Foxtail Barley	G5	S5	x	x	x
Phalaris arundinacea L.	Reed Canary Grass	G5	S5	x	x	x
Poa pratensis L.	Kentucky Bluegrass	G5	S5			x
Poa sp.	*Poa* sp.	-	-	x		
Phragmites australis (Cav.) Trin. ex Steud.	Common Reed	G5	S4?			x
Bromus inermis Leyss.	Sweet Brome	G5T5	SNA	x	x	
Zea mays L.	Corn	GNR	SNA		x	
Polygonaceae						
Rumex altissimus Wood	Wood Tall Dock	G5	S5	x		
Rumex crispus L.	Curly Dock	GNR	SNA			
Pontederiaceae						
Pontederia cordata L.	Pickerelweed	G5	S5			x
Potamogetonaceae						
Potamogeton crispus L.	Curly Pondweed	G5	SNA			x
Ranunculaceae						
Anemone canadensis L.	Canada Anemone	G5	S5	x	x	
Thalictrum pubescens Pursh	Tall Meadowrue	G5	S5	x		
Rhamnaceae						
Frangula alnus P. Mill.	Glossy Buckthorn	GNR	SNA	x		
Rosaceae						
Fragaria virginiana Duchesne	Wild Strawberry	G5	S5	x		
Potentilla recta L.	Sulphur Cinquefoil	GNR	SNA	x		
Rubus occidentalis L.	Black Raspberry	G5	S5			
Rubus odoratus L.	Purple-flowering Raspberry	G5	S5	x	x	
Salicaceae						

Scientific Name	Common Name	Global Rank	Provincial Rank	KAL Observations (2019)		
				FODM11	OAGM1 IAGM1	Sod Fields
Populus balsamifera	Balsam Poplar	G5	S5	x		
Populus tremuloides	Trembling Aspen	G5	S5	x		
Salix sp.	Willow sp.	-	-	x	x	
Scrophulariaceae						
Verbascum sp.	Mullein					
Veronica officinalis L.	Common Speedwell	G5	SNA	x		
Typhaceae						
Typha latifolia L.	Broadleaf Cattail	G5	S5	x		
Urticaceae						
Urtica dioica L.	Stinging Nettle	G5	S5	x	x	
Vitaceae						
Parthenocissus quinquefolia (L.) Planch.	Virginia Creeper	G5	S4	x		

Note that none of the vegetation species on this list are considered regionally, provincially, or nationally significant based on Cuddy (1998). In addition, none are species that are tracked by the Natural Heritage Information Centre (MNRF, 2021a) or are provincially or federally listed species under the ESA or SARA, respectively.

Appendix B Results of Breeding Bird Surveys, 2019

Table B1: Bird species observed on the Future Development Lands, 2019

Scientific Name	Common Name	Global Rank	Provincial Rank	SARA Status	ESA Status	BBS2-1			BBS2-2			BBS2-3			BBS2-4			BBS2-5			BBS1-7		Incidental
						1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	
Empidonax alnorum	Alder Flycatcher	G5	S5B																				
Corvus brachyrhynchos	American Crow	G5	S5B							x					x	x		x					x
Spinus tristis	American Goldfinch	G5	S5B			x				x	x	x			x			x			x	x	x
Setophaga ruticilla	American Redstart	G5	S5B							x													
Turdus migratorius	American Robin	G5	S5B				x			x	x	x	x	x		x	x				x	x	x
Spizella arborea	American Tree Sparrow	G5	S4B							x	x			x									
Scolopax minor	American Woodcock	G5	S4B																				
Haliaeetus leucocephalus	Bald Eagle	G5	S2N, S4B	SC																			
Icterus galbula	Baltimore Oriole	G5	S4B								x												
Riparia riparia	Bank Swallow	G5	S4B	THR	THR																	x	x
Hirundo rustica	Barn Swallow	G5	S4B	THR	THR					x		x	x	x	x	x	x	x					x
Strix varia	Barred Owl	G5	S5																				
Megaceryle alcyon	Belted Kingfisher	G5	S4B																				
Mniotilta varia	Black-and-White Warbler	G5	S5B																				
Setophaga fusca	Blackburnian Warbler	G5	S5B																				
Poecile atricapillus	Black-capped Chickadee	G5	S5																				
Setophaga caerulescens	Black-throated Green Warbler	G5	S5B																				
Cyanocitta cristata	Blue Jay	G5	S5																				
Vermivora cyanoptera	Blue-winged Warbler	G5	S4B																				
Dolichonyx oryzivorus	Bobolink	G5	S4B	THR	THR																		
Toxostoma rufum	Brown Thrasher	G5	S4B																				
Molothrus ater	Brown-headed Cowbird	G5	S4B																				
Branta canadensis	Canada Goose	G5	S5								x												x
Cardellina canadensis	Canada Warbler	G5	S4B	THR	SC																		
Setophaga tigrina	Cape-may Warbler	G5	S5B																				
Thryothorus ludovicianus	Carolina Wren	G5	S4																				
Spizella pallida	Clay-coloured Sparrow	G5	S4B																				
Bombycilla cedrorum	Cedar Waxwing	G5	S5B																				
Setophaga pensylvanica	Chestnut-sided Warbler	G5	S5B																				
Chordeiles minor	Common Nighthawk	G5	S4B	SC	SC																		
Spizella passerina	Chipping Sparrow	G5	S5B							x							x						x
Quiscalus quiscula	Common Grackle	G5	S5B			x			x			x			x			x			x		x
Corvus corax	Common Raven	G5	S5																				
Geothlypis trichas	Common Yellowthroat	G5	S5B			x	x	x		x	x		x				x						x
Junco hyemalis	Dark-eyed Junco	G5	S5B																				
Picoides pubescens	Downy Woodpecker	G5	S5																				
Tyrannus tyrannus	Eastern Kingbird	G5	S4B													x							
Sayornis phoebe	Eastern Phoebe	G5	S5B							x	x												x
Sturnella magna	Eastern Meadowlark	G5	S4B	THR	THR																		
Pipilo erythrophthalmus	Eastern Towhee	G5	S4B																				
Caprimulgus vociferus	Eastern Whip-poor-whil	G5	S4B	THR	THR																		
Contopus virens	Eastern Wood-Pewee	G5	S4B	SC	SC																		
Sturnus vulgaris	European Starling	G5	SNA				x	x	x	x	x	x		x	x	x	x	x			x	x	x
Coccothraustes vespertinus	Evening Grosbeak	G5	S4B	SC	SC																		
Spizella pusilla	Field Sparrow	G5	S4B				x																
Regulus satrapa	Golden-crowned Kinglet	G5	S5B																				
Vermivora chrysoptera	Golden-winged Warbler	G4	S4B	THR	SC																		
Ammodramus savannarum	Grasshopper Sparrow	G5	S4B	SC	SC																		
Dumetella carolinensis	Gray Catbird	G5	S4B																				
Ardea herodias	Great Blue Heron	G5	S5	(BC population)																			
Myiarchus crinitus	Great Crested Flycatcher	G5	S4B																				
Leuconotopicus villosus	Hairy Woodpecker	G5	S5																				
Catharus guttatus	Hermit Thrush	G5	S5B																				

Table B1: Bird species observed on the Future Development Lands, 2019

Scientific Name	Common Name	Global Rank	Provincial Rank	SARA Status	ESA Status	BBS2-1			BBS2-2			BBS2-3			BBS2-4			BBS2-5			BBS1-7		Incidental
						1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	
Podiceps auritus	Horned Grebe	G5	S1B, S4N																				
Passer domesticus	House Sparrow	G5	SNA																				
Troglodytes aedon	House Wren	G5	S5B																				
Passerina cyanea	Indigo Bunting	G5	S4B					x															
Charadrius vociferus	Killdeer	G5	S5B, S5N			x	x					x	x	x									x
Ixobrychus exilis	Least Bittern	G4G5	S4B	THR	THR																		
Empidonax minimus	Least Flycatcher	G5	S4B																				
Tringa flavipes	Lesser Yellowlegs	G5	S4B, S4N																				
Setophaga magnolia	Magnolia Warbler	G5	S5B																				
Anas platyrhynchos	Mallard	G5	S5							x	x										x		x
Zenaida macroura	Mourning Dove	G5	S5									x				x	x	x				x	x
Leiothlypis ruficapilla	Nashville Warbler	G5	S5B																				
Cardinalis cardinalis	Northern Cardinal	G5	S5																				
Colaptes auratus	Northern Flicker	G5	S4B							x													
Circus hudsonius	Northern Harrier	G5	S4B								x												
Aegolius acadicus	Northern Saw-whet Owl	G5	S4																				
Parkesia noveboracensis	Northern Waterthrush	G5	S5B																				
Contopus cooperi	Olive-sided Flycatcher	G4	S4B	THR	SC																		
Pandion haliaetus	Osprey	G5	S5B																				
Seiurus aurocapilla	Ovenbird	G5	S4B																				
Falco peregrinus	Peregrine Falcon	G4	S3B	SC	SC																		
Podilymbus podiceps	Pied-billed Grebe	G5	S4B, S4N																				
Dryocopus pileatus	Pileated Woodpecker	G5	S5																				
Setophaga pinus	Pine Warbler	G5	S4B																				
Haemorhous purpureus	Purple Finch	G5	S4B																				
Sitta canadensis	Red-breasted Nuthatch	G5	S5																				
Vireo olivaceus	Red-eyed Vireo	G5	S5B																				
Melanerpes erythrocephalus	Red-headed Woodpecker	G5	S4B	THR	SC																		
Buteo jamaicensis	Red-tailed Hawk	G5	S5																				
Agelaius phoeniceus	Red-winged Blackbird	G5	S4			x	x	x	x		x	x	x		x	x	x	x			x		x
Larus delawarensis	Ring-billed Gull	G5	S5B, S4N						x	x									x				x
Columba livia	Rock Dove	G5	SNA														x				x		x
Pheucticus ludovicianus	Rose-breasted Grosbeak	G5	S4B																				
Archilochus colubris	Ruby-throated Hummingbird	G5	S5B																				
Bonasa umbellus	Ruffed Grouse	G5	S4																				
Euphagus carolinus	Rusty Blackbird	G4	S4B	SC	SC																		
Passerculus sandwichensis	Savannah Sparrow	G5	S4B			x		x	x	x	x	x		x		x	x	x	x				x
Piranga olivacea	Scarlet Tanager	G5	S4B																				
Asio flammeus	Short-eared Owl	G5	S2N,S4B	SC	SC																		
Anser caerulescens	Snow Goose	G5	S5B															x					
Melospiza melodia	Song Sparrow	G5	S5B				x	x	x		x	x	x	x		x	x	x			x		x
Actitis macularius	Spotted Sandpiper	G5	S5					x								x		x					
Melospiza georgiana	Swamp Sparrow	G5	S5B																				
Oreothlypis peregrina	Tennessee Warbler	G5	S5B																				
Tachycineta bicolor	Tree Swallow	G5	S4B			x			x			x						x					x
Cathartes aura	Turkey Vulture	G5	S5B																				
Catharus fuscescens	Veery	G5	S4B																				
Rallus limicola	Virginia Rail	G5	S5B																				
Vireo gilvus	Warbling Vireo	G5	S5B				x										x				x		
Sitta carolinensis	White-breasted Nuthatch	G5	S5																				
Zonotrichia albicollis	White-throated Sparrow	G5	S5B																				
Meleagris gallopavo	Wild Turkey	G5	S5						x														
Empidonax traillii	Willow Flycatcher	G5	S5B																				
Gallinago delicata	Wilson's Snipe	G5	S5B																				
Aix sponsa	Wood Duck	G5	S5																				

Table B1: Bird species observed on the Future Development Lands, 2019

Scientific Name	Common Name	Global Rank	Provincial Rank	SARA Status	ESA Status	BBS2-1			BBS2-2			BBS2-3			BBS2-4			BBS2-5			BBS1-7		Incidental
						1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	
Hylocichla mustelina	Wood Thrush	G5	S4B	THR	SC																		
Setophaga petechia	Yellow Warbler	G5	S5B						x	x	x												
Sphyrapicus varius	Yellow-breasted Sapsucker	G5	S5B																				
Setophaga coronata	Yellow-rumped Warbler	G5	S5B																				

Appendix C Results of Anuran Surveys, 2020

Scientific Name	Common Name	Global Rank	Provincial Rank	SARA Status	ESA Status	Herp Atlas (2019) latest reported sighting	Frog Survey Station and Round																														
							MMP-A.1			MMP-A.2			MMP-B			MMP-C			MMP-D			MMP-E			MMP-F			MMP-G			MMP-H			MMP-I		
							1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Bufo americanus	American Toad	G5	S5			2018		1	2		1	2	1	1			1			1			1						1	3		1	3	1	1	3
Rana catesbeiana	Bullfrog	G5	S4			2010																															
Hyla versicolor	Gray Treefrog	G5	S5			2018			2			2								1										3			3			3
Rana clamitans melanota	Green Frog	G5	S5			2018														1													1			
Lithobates septentrionalis	Mink Frog	G5	S5			2014																															
Rana pipiens	Northern Leopard Frog	G5	S5			2018																															
Lithobates palustris	Pickerel Frog	G5	S4			1987																															
Pseudarcris crucifer crucifer	Spring Peeper	G5	S5			2014		1			1			1		1	1		1				1						2			1			2	
Pseudarcris triseriata	Western Chorus Frog	G5	S4	THR		2010		1																					1								
Rana sylvatica	Wood Frog	G5	S5			2017							1															1						1		

Numbers indicated in columns above represent Call Code Levels as defined below.

Note that none of the frog species listed above are listed under ESA. Only one species (Western Chorus Frog) is listed under SARA and this species was observed.

Dates of evening frog surveys are as follows:

Round 1: April 25, 2020; Round 2: May 21, 2020; and Round 3: June 17, 2020

Call Code Levels	
Code 1	Not simultaneuous, individuals accurately counted.
Code 2	Some simultaneous, individuals reliably estimated.
Code 3	Full chorus, continuous and overlapping, individuals not reliably estimated.