

# Clair- Maltby

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## Finalized Technical Work Plan for Comprehensive Environmental Impact Study (CEIS)

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June 2017





**Clair-Maltby Secondary Plan and Master Environmental Servicing Plan  
(CMSP / MESP)  
Technical Work Plan Update For  
Comprehensive Environmental Impact Study (CEIS)  
City of Guelph**

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October 17, 2016 (Last Revised June 16, 2017)

Project Number: TPB168050

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## 1.0 INTRODUCTION

The City of Guelph is preparing the Clair-Maltby Secondary Plan Master Environmental Servicing Plan (CMSP / MESP) to establish a development plan for the last greenfield area of the City. The MESP is intended to satisfy and fulfill the requirements of the Environmental Assessment Act and the Planning Act. The Clair-Maltby Secondary Plan and MESP is in the process of being developed by the Macaulay Shiomi Howson Ltd. (MSH)-Amec Foster Wheeler (AFW) Team, and will be directly informed by the findings of the technical studies outlined in this Work Plan for the Comprehensive Environmental Impact Study (CEIS).

A Preliminary Work Plan for the CEIS was submitted to the City as part of the proposal for this project in March 2016. A revised Draft Work Plan was then prepared based on the Preliminary Work Plan components and revised based on the review of available background, results of initial site visits and monitoring undertaken over 2016, and discussions among the Consulting Team and City Project Team. The Draft Work Plan was then circulated to a broad range of stakeholders (described below) for review and input in October 2016. The City Project Team and Consulting Team met with these groups between November 2016 and February 2017 to update them on the status of the project and solicit feedback on the Draft Work Plan.

This Finalized Work Plan builds on the Preliminary and Draft Work Plan, including input from the respective stakeholders, and has been updated and revised in response to:

- ▶ Additional background information obtained and reviewed over the fall of 2016 and winter of 2017;
- ▶ Technical input from a wide range of stakeholders represented through the Technical Steering Committee (TSC)<sup>1</sup>, Technical Advisory Group (TAG)<sup>2</sup>, Ministry of Natural Resources and Forestry (MNRF), Environmental Advisory Committee (EAC) and River Systems Advisor Committee (RSAC)<sup>3</sup>;
- ▶ A boundary refinement to the Secondary Plan Area<sup>4</sup>;
- ▶ The types and / or extent of landowner access granted to date; and
- ▶ Dialogue with the City Project Team.

This Work Plan should be considered the 'Final' document guiding the work to be done in support of the Comprehensive Environmental Impact Study (CEIS) and Master Environmental Servicing Plan (MESP) for this study. Although there may be some additional minor refinements over late 2017 / early 2018 in response to comments and/or field conditions and/or changes in property access, these will be noted in the Monitoring Reports for those years.

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<sup>1</sup> The TSC for this project is comprised of key City staff from a cross-section of departments as well as representatives from the Grand River Conservation Authority (GRCA), Wellington County, and Township of Puslinch.

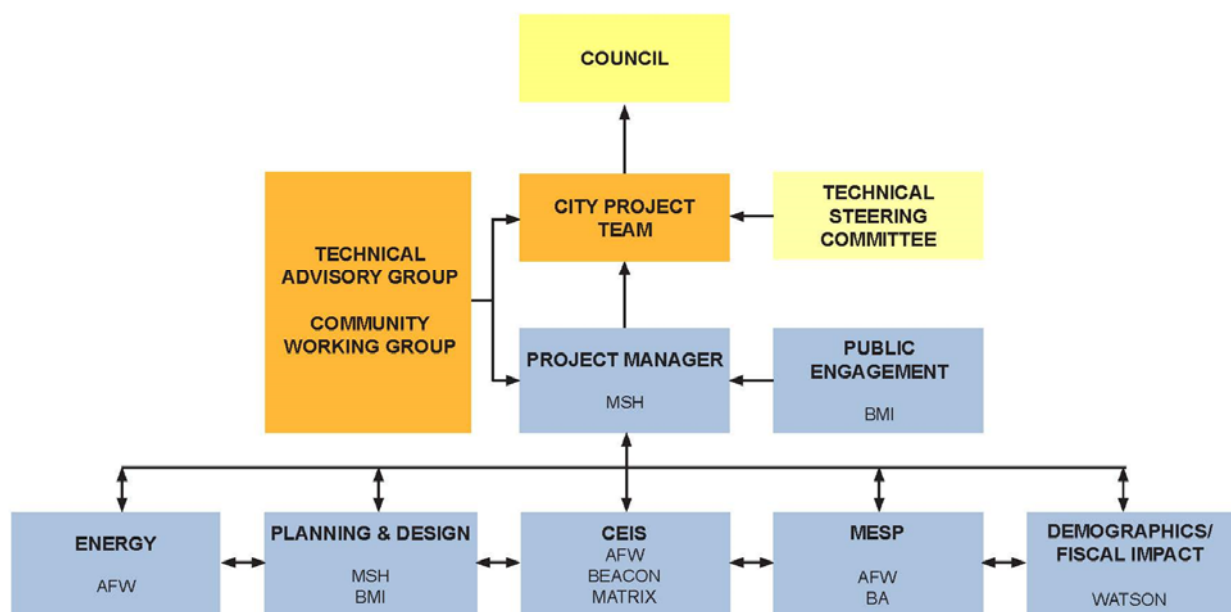
<sup>2</sup> The TAG for this project is comprised of 15 individuals with expertise in natural heritage, water resources / stormwater management, transportation, planning, and waste water servicing.

<sup>3</sup> EAC and RSAC are City advisory groups who review various aspects of various environmental projects and already have established memberships and Terms of Reference.

<sup>4</sup> Neumann's Ponds, which have been identified as Provincially Significant Wetlands and are within the property known as 132 Clair Road, have been added to the Secondary Plan Area.

As shown in the figure below, the Consulting Team for this project is being led and coordinated by Macaulay Shiomi Howson Ltd. (MSH) with support from Brook Mcllroy Inc. (BMI), Amec Foster Wheeler (AFW), Matrix Solutions Inc. (Matrix), Beacon Environmental Ltd. (Beacon), Darryl Cowell & Associates Inc (DCA), BA Group (BA), Watson and Associates Economists Ltd. (Watson), and Archaeological Services Inc. (ASI). AFW is leading and coordinating the CEIS and the storm, water and wastewater component of the MESP technical studies (BA is conducting the Mobility component of the MESP) with support from Matrix and Beacon for the CEIS.

CONSULTANT TEAM ORGANIZATION



## 2.0 PROJECT CONTEXT

### 2.1 Project Overview

In developing a technical understanding of the opportunities and constraints of the area as per the Terms of Reference (ref. City of Guelph 2015b), Task A, the CEIS, will form the basis for all the other studies including the Secondary Plan and the MESP. This process must integrate the requirements of the Planning Act and Environmental Assessment Act, and also include a comprehensive and inclusive consultation process. The individual components of the study have been elaborated on in the discussion of each Task which follows in Section 3.

The key tasks to be completed as part of this study consist of the following:

Task A. Comprehensive Environmental Impact Study (CEIS)

Task B. Water/Wastewater Servicing Study

- Task C. Stormwater Management
- Task D. Mobility Study
- Task E. Energy and Other Utilities
- Task F. Secondary Plan
- Task G. Fiscal Impact Assessment
- Task H. Community Engagement and Communications

As noted Task A, the CEIS, underpins all of the other studies in matters specific to the local area environment, while Task H, Community Engagement and Communications, will be running concurrently with all other tasks. The MESP will incorporate the results of Task B (Water/Wastewater Servicing Study), Task C (Stormwater Management Plan), and Task D (Mobility Study). The Secondary Plan (Task F) will reflect the results of Tasks A through D, and also input from Task E, Energy and Other Utilities Study, and Task G Fiscal Impact Assessment. Input received as part of Task H, Community Engagement and Communications, will be considered and incorporated as appropriate throughout the process, as comprehensive and sustained community engagement and communications will be central to this study.

The Team's approach to the individual components of the study is elaborated on in the discussion of each Task which follows in Section 3. The general approach to this study is based on the principles of integration which will need to be applied to various aspects of this study as follows:

- i. Integration with the City as a whole within the broader landscape context;
- ii. Integration of development within the area's unique natural/cultural heritage character;
- iii. Integration of a more intense development form within the City's evolving built form;
- iv. Integrating stormwater and environmental management;
- v. Ensuring the development of an integrated transportation system;
- vi. A holistic approach to energy efficiency and greenhouse gas reduction; and,
- vii. Integration of a sustainable financing plan.

The key to addressing the requirements in the Clair-Maltby Secondary Plan (CMSP) area is finding the right balance between protecting the environment, enhancing the economy, and fostering a healthy, sustainable, equitable and complete community in the context of Provincial and City policies. Achieving this balance in the context of CMSP where protection and integration of the Paris Moraine, and its associated functions, are required, will present some unique challenges and opportunities.

The goal of the CMSP is to effectively and sensitively integrate the urban development of the Clair-Maltby area with existing urban development in the City while respecting and protecting the existing Natural Heritage System (NHS) and cultural heritage resources. In planning for and accommodating the development of the Clair-Maltby area, the City will take a precautionary approach in establishing policies for development.

## 2.2 Natural Heritage Planning Context

Unlike some Secondary Plan areas, the Clair-Maltby Secondary Plan Area already has an identified and approved NHS. Given that this study will build on and refine the existing NHS, an overview of the development and components of this system is provided in this section.

The City of Guelph's NHS was first identified based on the technical information and guidance assembled through the City's Natural Heritage Strategy, which was undertaken in three phases between 2004 and 2009. The Natural Heritage Strategy included consideration of all available natural heritage data and mapping from existing sources supplemented with field surveys. These field surveys included vegetation assessments using the Ecological Land Classification (ELC) system, breeding amphibian surveys and breeding bird surveys, and incidental observations of other plants and wildlife with a focus on species considered significant at the federal, provincial and local scales<sup>5</sup>. Notably, a significant number of these surveys took place in the lands between Clair Road and Maltby Road as this was (and remains) the largest area of undeveloped land in the City, and was also an area for which natural heritage information from background sources was lacking, particularly outside the Provincially Significant Wetlands. The Strategy was also developed with input from consultations with a Technical Steering Committee, stakeholders and the public.

The NHS and technical guidance developed through the City's Natural Heritage Strategy was the basis for Official Plan Amendment 42 (OPA 42), which was focused on City-wide natural heritage policies and mapping, and was an update to the City's former Greenlands system. OPA 42 was approved by the OMB in June 2014 after all appeals were settled (with the exception of one site-specific case) and is now in effect. The settlement process provided an opportunity to clarify a number of the policies and refine the NHS mapping on some parcels.

The City's NHS, as defined in the Official Plan (Section 6A) is "a combination of natural heritage features and areas, including Significant Natural Areas and minimum buffers, Natural Areas, Ecological Linkages, Restoration Areas and Wildlife Crossings". The specific components of the NHS are divided into two categories – Significant Natural Areas and Natural Areas.

- ▶ Significant Natural Areas include: Significant Areas of Natural and Scientific Interest (ANSI), Significant Habitat for Provincially Endangered and Threatened Species, Significant Wetlands (including Provincially and Locally Significant Wetlands), Surface Water Features and Fish Habitat, Significant Woodlands, Significant Valleylands, Significant Landform, Significant Wildlife Habitat (including Ecological Linkages), Restoration Areas, and their buffers (where applicable). Significant Natural Areas, once confirmed as meeting the established criteria, must be protected as part of the NHS and

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<sup>5</sup> In the City of Guelph, "local" significance as it relates to species of plants and wildlife meant within the County of Wellington. As part of the Natural Heritage Strategy working lists of locally significant plants and wildlife species were developed (with many hours of volunteer support), as documented in Volume 2 of the Strategy.

only very limited development is permitted within them (e.g., trails under certain conditions, some types of storm water management).

- ▶ Natural Areas include: Other Wetlands, Cultural Woodlands, Habitat of Significant Species (that are not Provincially significant or Significant Wildlife Habitat), and their buffers (where applicable). Natural Areas, depending on which criteria they meet, may be protected within the NHS or may be developed in part or in whole as long as appropriate mitigative measures are implemented.

The NHS policies are intended to form the basis for a system that will be sustainable in an urban context and in the context of other stressors such as climate change, and are also intended to protect aspects of natural heritage that are unique to and/or valued within the City of Guelph. Policies that support this direction include:

- ▶ The identification and designation of Significant Natural Areas, including Ecological Linkages intended to support system connectivity;
- ▶ Criteria to identify portions of the Paris Moraine which are considered significant in Guelph;
- ▶ Opportunities to identify and designate Restoration Areas that will, among other things, help build system resilience and contribute to the City's tree canopy cover;
- ▶ Requirements for minimum buffer widths to some NHS features (e.g. Significant Wetlands, Significant Woodlands); and
- ▶ Urban forest policies to support tree protection and replacement outside the NHS, as well as management and stewardship of trees areas throughout the City.

The NHS in the Secondary Planning Area is set in a landscape dominated by hummocky topography with no features that would typically be described as watercourses. It does however have a number of wetlands and ponds that have formed in depressional areas where fine particles and organics have accumulated over time. The area is also characterized by both upland and lowland woodlands, plantations, thickets and meadows that exist among the agricultural lands, farm structures, and estate residences.

Watercourses often form the backbone of natural heritage systems in urban areas. In the Clair-Maltby Secondary Planning Area, areas of Significant Landform were used, in conjunction with Significant Woodlands and Significant Wetlands, to help identify terrestrial Ecological Linkages appropriate for this landscape through the Natural Heritage Strategy and OPA 42.

As part of the work for the Clair-Maltby MESP, additional natural heritage information will be reviewed and assessed with the objectives of: (a) refining the current NHS (and in particular with respect to Significant Wildlife Habitat and Ecological Linkages) and (b) having sufficient data to inform options related to land use planning, transportation networks (including trails), and servicing. Background information will focus on information collected since about 2005 when the bulk of the Natural Heritage Strategy field work was completed. Natural heritage field work for this study will focus on: verification and updating of available ELC mapping, reconciling and updating



wetland mapping, and wildlife assessments that will, to the extent possible with the access provided, provide more information about the range of species and wildlife habitats currently found within the Secondary Planning Area and their movements between different critical habitats (e.g. for breeding, overwintering).

The Secondary Planning Area supports a wide range of wetland types and sizes, including a number of relatively small ponds whose hydrology is not well understood. Work has already started (see the 2016 Monitoring Plan), and will continue over 2017 and 2018, to better characterize how these wetlands are being sustained, along with the seasonal variation in their water levels and quality. This is expected to help inform constraints and management strategies in a context of needing to integrate a range of land uses while protecting the functions of these wetlands.

Challenges and opportunities related to balancing protection of the NHS while accommodating urban development in the Secondary Planning Area will include identifying appropriate routes for new roads and trails, and approaches for integration of Significant Landform into the community that highlight the area's unique topography. Solutions to addressing these challenges through creative land use planning, design and policy will need to be considered.

### **3.0 METHODOLOGY**

This section outlines the detailed work plan for the CEIS and proposed approach to completing each component of the study described in the project Terms of Reference. The Draft Work Plan was based on the preliminary work plan submitted to the City as part of the proposal for this study, which was developed based on the Consulting Team's understanding of the requirements laid out in the original Terms of Reference (TOR) (City of Guelph 2015b), as well as consideration of comments received from various stakeholders through the TOR consultation (City of Guelph 2015a), and the Consulting Team's professional experience and knowledge of the area. This Finalized Work Plan has been updated based on:

- ▶ Background information reviewed since project initiation;
- ▶ Preliminary site visits and monitoring undertaken over the summer and fall of 2016;
- ▶ Technical input from a wide range of stakeholders (represented through the TSC and TAG developed for this study, MNRF, and established City advisory committees - EAC and RSAC);
- ▶ A boundary refinements to the Secondary Plan Area<sup>6</sup>;
- ▶ The types and / or extent of landowner access granted to date;
- ▶ Opportunities identified among the Consulting Team to better integrate data collection among the different disciplines and make it more robust; and
- ▶ Extensive dialogue with the City Project Team.

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<sup>6</sup> Neumann's Ponds, which have been identified as Provincially Significant Wetlands and are within the property known as 132 Clair Road, have been added to the Secondary Plan Area.

As noted in the Introduction, this Work Plan should be considered the 'Final' document guiding the work to be done in support of the CEIS and the MESP for the project. Although there may be some additional minor refinements over late 2017 / early 2018 in response to comments and/or field conditions and/or changes in property access, these will be noted in the Monitoring Reports for those years and discussed directly with the City Project Team.

## **TASK A: COMPREHENSIVE ENVIRONMENTAL IMPACT STUDY (CEIS)**

### **Study Understanding**

The CEIS forms one of the primary foundational studies to support the Secondary Plan. Environmental features and the management of surface water and groundwater, touches all aspects of land use change, including community and built form, transportation and servicing. As such, the CEIS is to accurately define the key features and functions within the Secondary Plan Area, and to establish their relationship to surrounding lands in the Primary and Secondary Study Areas (defined in Phase 1 below) in terms of landscape scale functionality.

Based upon this characterization, the potential for impacts due to proposed land use changes (including different options) can be assessed. Premised on the anticipated scope and nature of impact, appropriate management strategies, including mitigation (i.e., avoidance, minimization and compensation, including restoration), will be considered as part of a comprehensive evaluation.

The study areas include the headwaters for the Mill, Hanlon and Torrance subwatersheds, and is characterized by the generally well-drained and hummocky Paris Moraine topography which provides significant infiltration and storage functions and sustains aquatic habitat in downstream reaches. Therefore, establishing an understanding of surface water / groundwater interactions and their influence on the local Natural Heritage System (NHS), as well as the broader subwatershed systems, will constitute a core undertaking of the CEIS. The Work Plan which follows describes this fully integrated process.

### **Phase 1: Background**

#### **Defining the CEIS Study Areas**

As per the TOR, three (3) scales of study area (ref. Figure 1) are to be considered through the CEIS. They have been defined as follows:

- i. **The Secondary Plan Area (SPA):** representing the area that land use change will occur as per an approved Secondary Plan. The lands are south of Clair Road East, north of Maltby Road East, west of Victoria Road South, and approximately 1 km east of the Hanlon Expressway in the City of Guelph. In the fall of 2016 the Neumann Ponds, identified as Provincially Significant Wetlands within the existing NHS, were added to the SPA.

- ii. **The Primary Study Area (PSA):** is defined as the SPA plus a 500 m zone beyond this boundary, allowing for assessment of ecological features and animal movements to and from the SPA.
- iii. **The Secondary Study Area (SSA):** includes the PSA plus the receiving systems beyond the Clair Maltby SPA. This area considers the area's hydrology and hydrogeology, as well as natural heritage features and functions in the adjacent lands, to ensure that landscape scale connectivity is considered from both a terrestrial and aquatic perspective. The SSA boundary has been based on a number of factors including the area being modelled (determined by appropriate groundwater and surface water model boundaries, which inherently consider subwatershed boundaries of Mill Creek, Hanlon Creek, Torrance Creek, Irish Creek and Lower Speed River), and groundwater flow divides (i.e., preliminary predictions of where groundwater discharge may occur using outputs from the Tier 3 Model).

The limits of the SPA, PSA and the SSA have been confirmed with City staff and agency stakeholders.

## Phase 1: Background / Phase 2: Project

### Technical Work Plan and Field Studies

#### i. Site Access and Approaches to Addressing Data Gaps

Most of the land in the respective study areas is privately owned. The focus of landowner access efforts has been within the SPA and the PSA, where the more intensive field studies are taking place. Sampling locations in the broader SSA have been focused on watercourses from locations with public access.

In this process, the City has been responsible for primary contact with landowners, and for securing and tracking permissions, as well as following up with landowners regarding questions and concerns as required. This process was initiated in May 2016 with a landowners information session (held Thursday May 26, 2016) and a subsequent mailout of requests for permission for property access to each of the landowners in the Secondary Plan Area (see request form in Appendix A). To date, different types of access have been provided by a number of landowners, as shown in Figure 2.

The Consulting Team has been responsible for site access coordination support in terms of:

- ▶ Following up with selected landowners and/or their representatives to provide technical information where required (including meeting on site if requested by the landowner);
- ▶ Keeping track of the locations and types of access to the various properties;
- ▶ Undertaking the appropriate notification requests prior to actual site visits as required (e.g., notification via email or phone, coordination with the landowner or their representative); and

- ▶ Obtaining the necessary permits and / or clearances to perform intrusive sampling on the site, such as Road Occupancy Permits, or performing service locates (Ontario One Call), where required.

To date, the majority of access that has been provided has been for undertaking groundwater and surface water monitoring than for ecological monitoring. Although it would have been ideal to have full access across the SPA, the access provided, combined with relatively current sources of available background information and access from City-owned lands and rights-of-ways (i.e., roadside surveys), is considered adequate to collect the types and levels of information needed to inform the Secondary Plan.

The technical studies completed in support of the Secondary Plan are not expected to include all of the site-specific information required to make final planning decisions for specific development proposals on a given property. Following approval of the Secondary Plan, more detailed site-specific assessments (e.g., additional wells and/or mini-piezometers for groundwater monitoring, three-season vegetation surveys, Species-at-Risk screenings) will be required as part of local Environmental Impact Study (EIS) or Environmental Assessment (EA) studies. The City's Official Plan already includes general guidance for undertaking EIS. Specific requirements for site-specific EIS are typically developed through an EIS Terms of Reference which are vetted by the Environmental Advisory Committee (EAC) and must be approved by City staff. Project-specific EA requirements are also developed in consultation with one of the City's Environmental Planners.

Where data gaps are identified through the CEIS that cannot be filled due to site access issues, these will be addressed through the Secondary Plan by either taking a precautionary approach to land use planning and/or including requirements for filling these gaps through additional site-specific studies in the Secondary Plan policies.

## **ii. Field studies and analysis**

In order to supplement the available data from existing studies, reports and instrumentation, a range of field assessments are being conducted in accordance with this Finalized Technical Work Plan.

Field work commenced as of June 2016 in accordance with the Preliminary Work Plan focused on collection of groundwater and surface water monitoring data (see Figures 3 through 5). The field assessments and monitoring undertaken over the summer and fall of 2016 have informed the selection and refinement of monitoring locations, and constitute the first year of data collection of ground and surface water. Three (3) years of water-based monitoring data will be collected to support analyses (as requested by the GRCA, City of Guelph 2015a). The methods for the 2016 to 2018 hydrogeological and hydrologic assessments are described in conjunction with the proposed monitoring for 2017 and 2018 for natural heritage and landform provided in the following.

Notably, a greater level of effort has been allocated to understanding the water resources than the terrestrial natural heritage as there is already a NHS (as described in the foregoing) which needs to be refined, rather than identified.

► **Natural Heritage**

**a. Ecological Land Classification (ELC), Wetland Mapping and Headwater Drainage Feature Assessments (H DFA)**

• **Ecological Land Classification (ELC)**

Vegetation communities, identified using the ELC system (Lee *et al.*, 1998), were identified as part of the City's Natural Heritage Strategy in 2004 and 2005, and have been refined in some areas in 2008 (to verify plantation mapping) and between 2012 and 2014 as part of refinements from the OPA 42 settlements. This ELC base mapping will be used as the starting point for verifying and updating the vegetation classification in the SPA, including verification and refinement of wetland units.

Updates and refinements to the ELC polygons will be based on:

- Analysis of current (spring 2016) aerial photography using orthorectified photos in conjunction with wetland and contour mapping;
- Field verification (including data collection using ELC field sheets) where access has been provided (see Figure 2) in late spring / early summer and late summer / early fall; and
- Integration of current ELC based on site-specific field studies where available<sup>7</sup> from existing and approved studies completed over the past decade in the PSA (such as EIS or EIR) (as shown on Figure 6)..

Given the limited extent of access provided for vegetation assessments, the bulk of the ELC verification and refinement will be a desktop exercise whereby aerial photography is assessed in conjunction with other data sources and verified in the field where possible. Polygons will be refined in ArcGIS10™ and provided digitally to the City once complete.

As part of the ELC field surveys, there will be screening for the presence of any potential Significant Wildlife Habitats (SWH) (including seeps or springs) and / or plant species considered significant in the Province or County. However, given that these data are being collected to support a Secondary Plan (and not a site-specific application), feature boundaries will not be staked as part of this study, and three season vegetation surveys will not be undertaken. This work, where required, will be undertaken as part of site-specific EIS or EAs following approval of the Secondary Plan.

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<sup>7</sup> ELC layers have been requested from the various landowners and, where provided, will be incorporated as appropriate, excluding areas that have been developed or approved for development.

- **Wetland Mapping**

Under current Provincial, GRCA and City policies, development is not permitted within Provincially Significant Wetlands (PSWs), and a buffer of at least 30 m is required from confirmed PSW limits. There are a number of wetlands evaluated as PSWs in the PSA, as well as a number of unevaluated wetlands that are less than 2 ha in size. Although stand-alone wetlands smaller than 2 ha are generally not evaluated, such wetland units may be complexed<sup>8</sup> with one or more larger PSW areas if they meet certain criteria<sup>9</sup>. In addition, it was determined through the review of existing mapping that MNRF's wetland mapping does not align with the City's PSW mapping in a number of locations.

The City is seeking to ensure that the PSW mapping for the SPA is as accurate as possible to inform the Secondary Plan, however field verification and staking of all wetlands in the PSA is not feasible at this stage. Therefore, the TSC and selected members of the Consulting Team met with MNRF on January 11, 2017 to discuss, among other things, an appropriate approach to verifying and updating the wetland mapping in the SPA. At this meeting it was determined that:

- PSW mapping and complexing prior to 2013 had been done using the guidelines applicable at the time combined with the professional judgement of MNRF staff. Going forward, MNRF's decisions will be guided by the 2013 Ontario Wetland Evaluation System (OWES) Guidelines in conjunction with additional guidance provided from MNRF – Guelph District regarding wetland complexing. The Grand River Watershed Wetland Evaluation Protocol (GRCA *et al.*, 2005) includes some additional guidance that pertains to complexing of small wetlands as well as when open water bodies are not generally considered wetlands. It was agreed by GRCA and MNRF that this guidance would still be applicable. A document that synthesizes the guidance provided has been included in Appendix C.
- For this study, Beacon is to use the updated ELC base to refine and reconcile the existing PSW boundaries. It was recognized that these updates: (a) would be based primarily on desktop assessments supplemented by drive-by assessments and field assessments where access has been provided, and (b) may involve relatively minor reductions or expansions to PSW boundaries. These refined boundaries are to be provided to MNRF to update their mapping, recognizing that these boundaries will still be subject to field verification and staking as part of site-specific studies in the future.

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<sup>8</sup> "In a wetland complex, major functional discontinuities (such as uplands or open water lakes) may subdivide the area into a number of distinctive wetland units, but the entire wetland area is evaluated as a single unit". (MNRF 2013).

<sup>9</sup> The recommended approach and criteria for wetland complexing are provided on pages 39 and 40 of the OWES Manual (MNRF 2013). The criteria are quite broad and include (1) wetlands needing to be in the same watershed, except in headwater areas – as occur in the Clair-Maltby lands and (b) wetlands needing to be within 750 m of each other.

- It was agreed that Beacon is also to use the updated ELC base to confirm unevaluated wetlands and identify any additional wetland units not currently identified as PSW. With respect to the wetlands not currently identified as part of PSW complexes, it was agreed that these would be screened by Beacon and the City using the guidance provided by MNRF and GRCA in terms of whether they warrant consideration for complexing or not (see Appendix C). It was recognized that Beacon and the City may not have enough information to make an accurate assessment. In these cases, MNRF indicated that recommendations could be made based on desktop information using a transparent and systematic approach. Beacon and the City are to provide preliminary recommendations to MNRF regarding whether or not wetlands outside the existing PSW complexes should be considered for inclusion based on the guidance provided. MNRF will then review this information and make the final determination with the understanding that new or additional information can be brought forward at any time.
- Notably, even for wetlands confirmed as non-PSW, wetlands less than 0.5 ha still require assessment under GRCA's policies (specifically policy 8.4.4, GRCA 2008) and wetlands between 0.2 and 0.5 ha require assessment under the City's Natural Areas - Other Wetlands policies (City of Guelph 2014).

Options for unevaluated wetlands include: being complexed with one of the existing Provincially Significant Wetlands (PSW); qualifying as Locally Significant Wetlands (LSW); qualifying as Other Wetlands (as per OPA 42); or being too small and isolated to fit into any of these categories. Where access is provided, ELC will be confirmed or refined as appropriate, using the ELC system as the basis for wetland polygon boundaries.

- **Aquatic and Headwater Drainage Feature Assessments (H DFA)**

As noted above, there are no known perennial watercourses in the PSA, and it is a known headwaters area. Therefore it has been agreed that the aquatic habitat assessment work in the SPA and PSA will entail a scoped Headwater Drainage Feature Assessment (H DFA) undertaken in accordance with the most current H DFA Guidelines (CVC and TRCA 2014). The work will be scoped to include: (a) a desktop assessment identifying potential areas of intermittent or perennial flow based on ELC mapping, MNRF wetland mapping, topographic and landform mapping, confirmed amphibian breeding wetlands, and GRCA watercourse mapping; and (b) a "rapid" field assessment in late winter / early spring 2017 to screen for flow in any of these potential locations where there is access. Should flow be detected at any of these locations, follow-up site visits will be required. In 2018, potential and/or confirmed H DF locations will also be screened against areas where surface flows might be expected based on ground water modelling.

Although there are a number of watercourses in the broader SSA (e.g., Hanlon Creek and its tributaries, Mill Creek and its tributaries), conducting aquatic field assessments (e.g., benthic invertebrate surveys, fisheries surveys) in these watercourses is outside the scope of this study, which will rely on the available background records available from GRCA and MNR. Fisheries records from studies within the PSA will also be considered.

These assessments combined will help provide a more fulsome characterization of the aquatic features and areas in both the PSA and broader SSA.

#### **b. Botanical Surveys**

Botanical surveys will be undertaken in conjunction with ELC verification and refinement, and will focus on identification of Endangered and Threatened species, as well as any occurrences of other federally, provincially or locally significant species. Locations of Endangered and Threatened species, as well as concentrations of other significant species that may constitute Significant Wildlife Habitat (SWH) will be documented using GPS.

Given that this is a Secondary Plan exercise and that no site-specific development applications are being put forward as part of this study, it will not include species-specific assessments for SAR (e.g., Butternut) or permitting. Such activities, where applicable and required under the Endangered Species Act (2007), will need to be undertaken as part of site-specific study processes.

Botanical surveys will also include documentation of invasive species, and will make note of areas that may be heavily infested by invasive plants (such as Common Buckthorn or Garlic Mustard).

A significant species list will be generated for the PSA that includes current significance rankings at the global, federal, provincial, and local scales. Given the limited extent of access provided to-date, this list will be supplemented with significant species documented from approved EIS and EIR in the PSA (but generally outside the SPA), recognizing that the species assemblages in these lands are likely representative of those within the SPA. Beacon will ensure that the most current information is utilized.

#### **c. Natural Hazards Analysis**

As the PSA does not contain any valleylands, natural hazards in the context of the PSA are primarily related to steep slopes associated with the Paris Moraine, wetlands and certain forest types. The approach to wetland assessment is described in the foregoing, and hazards related to slopes will be identified in accordance with GRCA policies and in consultation with the Authority.

With respect to hazardous forest types, the PPS (2014) specifically states in Policy 3.1.8 that: "Development shall generally be directed to areas outside of lands that are



unsafe for development due to the presence of hazardous forest types for wildland fire.” MNRF has developed Draft guidance for identifying such forest types and how to address these new policies (MNRF 2014). However, the Draft guidance is more tailored to a central or northern Ontario context, and as of yet there are no known precedents as to how these policies could be applied in an urban context. MNRF is to keep the City apprised of any new developments or guidance in this area.

**d. Wildlife Habitat Assessments, including Linkages and Wildlife Crossings**

Given that an NHS has already been identified based largely on data collected over 2004 and 2005, as well as background data, one year (i.e., 2017) of wildlife surveys focused in the PSA is considered sufficient for a Secondary Plan scale assessment, to confirm and/or refine the current NHS and provide the necessary guidance for the other studies. The one exception is the wildlife crossing / movement surveys (primarily for amphibians and reptiles, but also for deer) which are recommended for both 2017 and 2018 to improve the robustness of data used to inform transportation (including trails) planning through the MESP and Secondary Plan process. In addition, up to 8 days have been allocated in 2018 for some follow-up field work for selected tasks or verification of specialized habitats where gaps are identified following 2017 field results review, or for areas where additional field study is considered warranted. During all surveys, field staff will be looking to confirm the presence of any provincially Endangered or Threatened species, as well as any other federally, provincially or locally significant species. Staff will also be looking for habitats that may qualify as any of the types of Significant Wildlife Habitat (SWH) that may occur in the PSA.

Specific field surveys for different groups of wildlife to be undertaken are described below with monitoring stations / transects illustrated on Figure 7. In all cases this data will supplement data collected from other background sources. A summary of the types of natural heritage surveys being undertaken is provided in Table 1.

<b>Table 1. Summary of Natural Heritage Surveys Being Undertaken</b>		
<b>Survey Type (Target Organisms)</b>	<b>Survey Protocol</b>	<b>Comments</b>
Vegetation Community Assessment	Ecological Land Classification (ELC) system for southern Ontario (Lee et al., 1998) undertaken between May and August 2017.	Building on / refining / verifying ELC mapping from the City's Official Plan. Largely desktop and supplemented with field data where access provided (ref. Figure 2).
Botanical Surveys	Visual surveys undertaken by an experienced Botanist between May and August 2017.	Building on existing species lists (see Figure 5) and limited to where access has been provided (ref. Figure 2).
Road Movement / Mortality Surveys	Visual surveys to be undertaken along seven established transects (see Figure 7) after rainfall in the evening after dusk or in the early morning. At least four separate visits between late March and June in 2017 and 2018. To include at least one survey in April to try and capture salamander movement.	Guided by existing data where movement has been recorded over the past decade, as well as potential movement areas based on existing suitable habitat on either side of the road.
Calling Amphibian Surveys	Calling surveys to be conducted according to the Marsh Monitoring Protocol (BSC 2009). One full round of surveys at 22 stations across the PSA during the window for (1) early, (2) mid- and (3) late calling amphibians between April and June of 2017.	Building on data from the Natural Heritage Strategy and other site-specific studies in the PSA (see Figure 6).
Basking Turtle Surveys	Visual observations of turtles at eight ponds in the PSA during sunny afternoons between April and June 2017. At least two rounds of surveys at all eight ponds.	
Winter Wildlife Surveys	Visual observations for species, scat and tracks after a fresh snowfall between January and March of 2017 and 2018. Total of two surveys along established transect routes (see Figure 7).	Second survey deferred to 2018 due to dearth of snow over the winter of 2017.

<b>Survey Type (Target Organisms)</b>	<b>Survey Protocol</b>	<b>Comments</b>
Incidental Wildlife Observations	Incidental observations as part of all other wildlife and botanical surveys in 2017 and 2018. To include looking under suitable cover objects for snakes in selected locations, and searches for chimney crayfish near wetlands and any noted seepage areas.	Consideration for species, specialized habitats or concentration of species that might be considered Significant Wildlife Habitat to be part of these, and other, wildlife surveys.

- **Amphibian Breeding (Frogs / Toads)**

The Beacon Team will undertake three evening breeding amphibian surveys between April and June of 2017 at 22 stations using the protocols provided in the Marsh Monitoring Program (MMP) (BSC, 2009a) to determine the diversity and abundance of frog and toad species within the SPA. Data from these surveys will be supplemented by background data from the City’s Natural Heritage Strategy (undertaken in 2004 and 2005) and findings from EIS and EIR completed since 2006. Surveys will be conducted after dusk at survey stations established adjacent to suitable habitat for calling breeding amphibians and where access has been provided or along the road right-of-way ROW) (as shown on Figures 2 and 7). Species and relative abundance of amphibians will be recorded at each station using a form based on the MMP protocols (see Appendix E).

- **Amphibian Movement (Salamanders)**

Beacon will undertake visual road surveys in the early spring (i.e., late March to May 2017 and 2018) during or immediately after a warm rain for migrating salamanders and frogs along seven defined transects within the PSA (see Figure 7). Transects have been identified in locations where there are prior and recent records of amphibian movement, or in locations where movement might be anticipated based on the presence of suitable habitat on either side of the road.

Surveys will be completed by walking/driving slowly along the transects and identifying the location, species and number of individuals that are attempting to cross the road or have crossed unsuccessfully using standardized forms (provided in Appendix D). In addition, incidental visual observations of movement will be conducted during other surveys of wetland and pond edges and other habitats, and additional searches for salamanders by overturning small to medium-sized natural cover objects (e.g., logs and rocks) in proximity of wetland features will also be completed where access has been provided.

- **Turtles**

Over the summer of 2016, Beacon conducted an evaluation of the ponds and wetlands within the PSA that could be viewed from the roadway ROW or where access has been provided to identify which features are likely to provide suitable overwintering and basking habitat for turtles. Eight (8) such ponds are considered suitable have been identified for turtle basking surveys (ref. Figure 7).

Two or three surveys will be conducted in the early spring to assess turtle habitat within these ponds. Surveys will be completed on sunny days when the air temperature is greater than 10°C and greater than the water temperature. During each survey, suitable basking areas within the selected wetlands/ponds will be surveyed by slowly traveling around the outer edge of the feature, pausing frequently to scan for turtles. The species, number and general location of turtles observed will be recorded and noted on field maps.

- **Snakes**

Surveys for snakes will consist of overturning natural cover objects (e.g., logs and rocks) and incidental observations within the PSA during other surveys that are completed within the active season for these species. Targeted surveys for snakes have not been included due to the intensive nature of the surveys required and their relatively low success rate, the somewhat broad scale of this study, and the expectation that such data would not change the outcome of the CEIS exercise.

- **Winter Wildlife**

To document site utilization by certain wildlife during the winter months, Beacon completed one survey during the winter of 2017 under snow cover (February 15, 2017) along five transects (see Figure 7). Although two surveys were originally scheduled for winter 2017, only one was possible due to the dearth of snow over much of February and March. Therefore an additional survey will be undertaken during the winter of 2018. These surveys will record evidence of mammal (with a particular focus on deer movement) and raptor use. This will be completed by walking transects in areas that are representative of the various habitats present within the PSA, and where access has been provided (shown on Figure 7).

- **Breeding Bird Surveys**

Beacon will undertake two rounds of breeding bird surveys in the PSA between May 24<sup>th</sup> and July 10<sup>th</sup> 2017 to confirm what species of birds are nesting in the area. A total of 15 point count survey stations within the PSA along ROWS and where access has been provided (ref. Figures 2 and 7). Point count survey stations have been established within/adjacent the various representative habitat types present within the PSA. Notably, no stations have been established along Gordon Street, as it is expected that there will be too much traffic along this stretch to yield useful results.

Surveys will be conducted using the protocols provided in the Ontario Breeding Bird Atlas (OBBA) Guide for Participants (Cadman *et al.*, 2007) at an appropriate time of day (i.e., between dawn and five hours after dawn) and under suitable weather conditions (i.e., no thick fog or precipitation; winds generally less than 20 km/h). Observations made will be recorded using a form based on the OBBA protocols (see Appendix F). Observations made between point count stations will also be recorded.

- **Incidental Wildlife**

Observations of wildlife in the PSA will be made incidentally as part of all other targeted field surveys. This includes observations of Terrestrial (or Chimney) Crayfish which can be detected around the margins of wet meadows and fields in spring. Observations of mammals will be made directly; no trapping is proposed.

- ▶ **Geology / Hydrogeology / Hydrology**

- a. **Landform**

Significant Landform has been identified as a component of the City's NHS through the Official Plan where it is defined with specific criteria and mapped in the Official Plan Schedules. The Significant Landform assessment being completed through the CEIS exercise is focused on understanding, refining and eventually (in a later phase) providing direction on how the adjacent land transition areas between Significant Landform and future development will work. This work is intended to support appropriate integration of Significant Landform in the SPA. No changes to the criteria used to identify Significant Landform in the City's Official Plan are being contemplated through this process. However, the City may consider new approaches, guidance and/or policies for integration of Significant Landform through the Secondary Planning process to assist with the refinement of the adjacent lands/ transition areas to support achievement of the objectives for Significant Landform, including the protection of the City's geologic and aesthetic uniqueness associated with portions of the Paris Moraine.

Technical studies for landform will include 3D modelling (to be completed by Matrix) based on the available 0.5 m topographic mapping to inform grading challenges related to the Paris Moraine, as well as a specific GIS analysis of topography. Key tasks will include:

- ▶ Developing a GIS algorithm to differentiate surface topography (i.e., hummockiness) within the 50 m adjacent lands area of the Significant Landform units, including a technical assessment of the nature of the adjacent lands – moraine intersection;
- ▶ Preparation of draft maps showing the adjacent lands topography and adjacent lands/moraine interface; and,
- ▶ Assessment of maps in the field and refinement as appropriate.

## **b. Surface Water Monitoring (Levels, Flows, Temperature and Quality)**

The GRCA in its review of the Draft TOR, recommended a minimum of three (3) years of continuous multi-level groundwater monitoring (City of Guelph 2015a). Concurrently, it was indicated by GRCA that stream baseflow measurements” should be collected to confirm linkages between the groundwater system and the tributaries of the upper Mill and Hanlon Creeks”.

While it is noted by GRCA that a spotflow program could be utilized, given the headwater conditions (i.e., small intermittent systems) and the need for a full seasonal understanding of the local flow regime, it was recommended and implemented (since 2010), that continuous water level monitors be installed in addition to spotflow measurements described under the groundwater program.

Figure 5 depicts the location for one (1) gauge to monitor the Mill Creek Subwatershed established near the south-east limit of the PSA (Station 14), and a further two (2) gauge locations (Stations 9A and 9B) that were installed in July of 2016 to monitor the discharge from the Hanlon Creek Subwatershed, draining to the north. However, no flows were detected in either of the Station 9 locations, hence an alternate location outside the PSA in Hanlon Creek Subwatershed (Station 15) was advanced in consultation with the City and GRCA and established in April 2017.

In the absence of a station with flow in the Hanlon Creek Subwatershed in 2016, one surface water level logger and quality station was developed in the southern extent of the large pond within Hall’s Pond Provincially Significant Wetland (Station 7) in July 2016, with surface water level and quality data collected over the summer and fall. This station will also remain in place going forward as part of a broader wetland monitoring program. Additional wetland level and quality monitoring stations have been established and will be sampled seasonally in 2017 (as described below). All of these stations will be sampled until the end of 2018.

The water level gauges include temperature sensors which provide a continuous scan of water temperature over the monitoring period. Although the gauges were not installed until July, 2016, in 2017 and 2018 they will be installed from post-freshet (i.e., late March or early April) to freeze-up (typically late November to early December). In order to convert water levels into flow rates, AFW will conduct velocity metering at each of the two (2) gauge stations (Stations 14 and 15, see Figure 5) to develop local rating curves. These rating curves will be adjusted annually and a comprehensive rating curve will be established on the basis of measurements during dry and wet periods.

The TOR also indicated a need for water quality sampling as part of the surface water monitoring effort. The Consulting Team concurs with the parameters suggested by GRCA in its review of the Draft TOR (see Table 2) (City of Guelph, 2015a) and has recommended that metals also be tested as well.

Grab samples are to be collected in dry and wet periods (1 each for each season) in the spring, summer and fall at each of the two (2) water flow gauge locations (Stations 14 and 15). Water quality sampling has already been undertaken at Station 7 (in the Hanlon Creek Subwatershed) and Station 14 (in the Mill Creek Subwatershed) over the summer and fall of 2016. An additional station with flows in the Hanlon Creek Subwatershed was established in April 2017. Over 2017 and 2018, both “dry” (i.e., after at least a 48 hour period with no rain) and “wet” (i.e., after a 48 hour period with at least 15 mm of rain) water quality samples from these two flow stations will be collected in spring, summer and fall for a total of six water quality samples from each station in each year. The water quality parameters being tested are presented in Table 2 below. Note that flow stations are not being tested for pesticides.

<b>Table 2. Water Quality Parameters Being Tested</b>		
<b>Water Quality Parameter</b>	<b>Mechanism of Analysis</b>	<b>Comments</b>
<ul style="list-style-type: none"> <li>▶ Total Suspended Solids (TSS)</li> <li>▶ Total Dissolved Solids (TDS)</li> <li>▶ Orthophosphate (P)</li> <li>▶ Total Phosphorus (TP)</li> <li>▶ Dissolved Sulphate (SO<sup>4</sup>)</li> <li>▶ Dissolved Chloride (Cl)</li> <li>▶ Total Kjeldahl Nitrogen (TKN)</li> <li>▶ Nitrite (NO<sup>2</sup>)</li> <li>▶ Nitrate (NO<sup>3</sup>)</li> <li>▶ Ammonia (NH<sup>3</sup>)</li> </ul>	To be analyzed from grab samples sent to a laboratory	Parameters suggested by GRCA in their comments on the Draft Clair-Maltby MESP Secondary Plan TOR (City of Guelph, 2015a).
<ul style="list-style-type: none"> <li>▶ water temperature</li> </ul>	To be measured continuously by the data logger and verified in situ three times over the season by field staff (with a water quality meter)	Parameter suggested by GRCA in their comments on the Draft Clair-Maltby MESP Secondary Plan TOR (City of Guelph, 2015a).
<ul style="list-style-type: none"> <li>▶ pH</li> <li>▶ conductivity, and</li> <li>▶ dissolved oxygen (DO)</li> </ul>	To be measured in situ by field staff (with a water quality meter)	Parameters suggested by GRCA in their comments on the Draft Clair-Maltby MESP Secondary Plan TOR (City of Guelph, 2015a).
<ul style="list-style-type: none"> <li>▶ Metals</li> <li>▶ Pesticides*</li> </ul>	To be analyzed from grab samples sent to a laboratory	Additional parameters suggested by the Consulting Team.

\* Due to the substantial expense of testing for pesticides, a more targeted approach to pesticide testing has been taken (i.e., single samples at six locations across the PSA in the fall of 2017, locations shown on Figure 5).

### **c. Wetland Water Level and Quality Monitoring**

The purpose of the wetland water level and quality monitoring is to (a) provide study-area wide baseline information of the pre-development condition of these features, and (b) help inform the understanding of surface and groundwater interactions in the PSA.

Sampling locations (ref. Figure 5) have been identified based on the desire to include samples:

- a. From a representative selection of wetlands located within the PSA, as well as falling within both the Hanlon and Mill Creek Subwatersheds;
- b. From wetlands expected to be protected for the long-term, therefore within confirmed Provincially Significant Wetlands (PSWs);
- c. From wetlands expected to have standing water in them all year round, even in dry years;
- d. From a representative selection of wetlands within different land use contexts (e.g., agricultural, natural, near roads); and
- e. In proximity to proposed groundwater stations to allow for integration and comparison of the surface water and groundwater data from the same wetlands.

Beacon will assess wetland water levels by installing continuous data loggers (Solinst brand, model 3001) at 12 locations within the PSA, and assess water quality by collecting some data *in situ* during sampling events (using a water quality meter) as well as collecting grab samples at these same locations for analysis in the lab. Parameters being tested are summarized in Table 2. Loggers will record water levels in each wetland at 15 minute intervals from April to October over 2017 and 2018. Data from these loggers will be downloaded once early in the season to confirm they are functioning and again in October when the loggers are collected before winter. Manual water depth measurements will be taken during the logger downloads for reference.

Beacon will collect water quality data three times a year (i.e., once in spring, summer and fall) over two years (i.e., 2017 and 2018) at all stations shown in Figure 5, except for 9a and 9b where no flowing or standing water was documented in 2016. Preliminary wetland level and quality data has been collected from Station 7 in 2016, as noted above.

Water quality parameters to be measured will be those listed in Table 2. Notably, the loggers are able to measure both water levels and temperature continuously. Sampling for metals has been added to provide additional baseline information that is expected to be of value in an urbanizing context, and also to allow for comparison with data collected as part of the groundwater sampling program (which is also sampling for metals).



Given the current land uses in the PSA – which include a golf course and agricultural lands – the Consulting Team has also recommended that pesticides be sampled for, but much less intensively. It has been agreed that one round of water quality samples at half of the 12 wetland water quality sampling locations be tested for pesticides once in the fall of 2017. Sampling for pesticides is relatively expensive, but having these data will contribute to a more comprehensive baseline assessment. Locations have been selected adjacent to land uses where pesticides would be expected (see Figure 5). Sample collection in the fall will also maximize the chances of detecting pesticides that have been used over the course of the season.

Matrix will complete a general bathymetric survey of the three (3) wetland/pond features within the PSA to better understand the hydroperiod, depths, and seasonal extent of these features. This will allow a better representation of the water budget in the integrated groundwater-surface water numerical modelling. The locations of the bathymetry surveys are illustrated on Figure 4. Two approaches will be used:

- i. Where pond depth is sufficient, a remote controlled boat equipped with a GPS, Sonar and mapping software capable of recording the depth to the pond bottom will be used.
- ii. Where pond depth is limited, a pressure transducer will be pulled across the bottom of the pond. By noting the time and position of the transducer along the guideline, the associated pressures will be converted to a water depth.

#### **d. Groundwater Monitoring**

The geology and hydrogeology of the Paris Moraine is highly complex and varies over short distances. The hummocky topography and relatively coarse-grained nature of the Paris Moraine presents a significant potential for groundwater recharge and pathways that feed both ecological features and water supply needs. Maintenance of the quantity and quality of this recharge is critical for both ecological features and the local municipal drinking water supply (e.g. Burke Well). Developing an understanding of the three dimensional and time-varying (e.g. seasonal) characteristics of the integrated surface water and groundwater flow system is critical in supporting the establishment of Community Structure plans for the SPA. The groundwater field program will support refinements to the existing hydrogeological characterization and establish baseline conditions within the SPA and PSA. In addition, it will contribute to a water balance evaluation of groundwater function, identify constraints and opportunities, and provide monitoring locations that will form part of the long-term monitoring network. The field work will be coordinated with the work being completed by the other disciplines in recognition of the inter-relationship between the hydrogeological and hydrologic systems, other users of water for anthropogenic needs, and the local ecosystem.

The Consulting Team has a solid understanding of the hydrogeology of the area based on work completed by Team members on the City's Tier Three Water Budget Study. This knowledge has been used to inform the proposed hydrogeological field program. Some key background with respect to the SSA that were used to inform the development of a field program include:

- ▶ Overburden thickness in the SPA and PSA ranges from approximately 15 to 50 m, with the greatest thicknesses associated with the height of the Paris Moraine. An upper aquifer is associated with the Wentworth Till and there is also a Contact Zone aquifer associated with the bedrock / overburden interface. The municipal supply aquifer is in the bedrock.
- ▶ Preliminary numerical model analysis that was completed using the groundwater model developed for the City's Tier Three study suggest that Hall's Pond is a perched system. The model also provides some insight on the recharge/discharge function of other wetlands, however there is insufficient available local data in the area to support these interpretations. Wetland functions need to be confirmed through the proposed detailed field studies and modeling.
- ▶ Preliminary flow analysis (forward particle tracking) using the Tier Three model suggests that the Paris Moraine is a key recharge source area for features in the SPA, PSA and SSA. Particle tracking can be used for quantifying source areas for water recharging the groundwater system and areas of groundwater discharge to streams. The analysis suggest that the PSA provides recharge to the Mill Creek Subwatershed, the Torrance Creek Subwatershed, the Speed River Wetland Subwatershed and the Hanlon Creek Subwatershed. Further, particle tracking extend toward the Provincially Significant Cranberry Oil Well Bog Wetland Complex and Irish Creek subwatershed, although these particles are at depth within the bedrock aquifer and are not necessarily connected to the surface. A proportion of the flow appears to be diverted by pumping at the Burke Well. This preliminary flow analysis will need to be refined through development of a refined conceptual model using new field data collected concurrent with the background review, including reports provided for sand and gravel pits in the area of the Cranberry Oil Well Bog Wetland Complex.

Based on this understanding, a hydrogeological field program was proposed at the onset of the project. Work on the field program is underway and consists of the following items:

- **Monitoring Wells**

The proposed plan for installing monitoring wells was developed primarily to understand the function of the upper aquifer(s) system, vertical gradients and groundwater flow directions. The Team originally proposed drilling up to 18 monitoring wells at nine (9) locations along three (3) transects across the moraine using dual rotary drilling with downhole geophysics; The middle borehole of each transect will be located in the lower topographical areas associated with the Hall's Pond and associated wetlands. The estimated drilling depths were based on estimated depth to bedrock and other hydrostratigraphic information available from the Guelph Tier 3 water budget model.

Dual rotary drilling was selected based on the anticipated difficult drilling conditions (e.g., very gravelly) in the Paris Moraine. The only downhole geophysical tool available for PVC-cased monitoring wells is a gamma ray log; and this tool is useful in distinguishing clay-rich soils from clay-poor soils. In general, the overburden consisted of coarse-grained sediment with little in the way of fine-grained material. For this reason, gamma logging was tested on three monitoring wells (1 transect) to assess its utility in helping characterize the subsurface. The results did not support completing downhole surveys in the other six monitoring wells.

The actual monitoring well locations were modified based on the preliminary understanding of gaining and losing stream reaches in the SSA, wetlands and ponds, access to land, identification of data-gaps, and maximizing areal distribution. As part of this review of available information, the Team was able to reduce the number of monitoring wells to 17 based on the availability of a previously drilled high-quality monitoring well at the 132 Clair Road property that may be available for monitoring as part of this project.

Borehole drilling and monitoring well installation was completed throughout July and August 2016. Eight of the nine locations were completed as well nests. The presence of existing wells at 132 Clair Road meant a well nest at the ninth location was unnecessary. This will provide valuable data regarding vertical gradients and the recharge potential in the SPA and PSA. Monitoring well locations are illustrated on Figure 4. Figure 4 also illustrates previously drilled boreholes and monitoring wells where data is available that will be used in this study.

All monitoring wells will be surveyed by Beacon staff. Dataloggers will be installed in all of the monitoring wells and programmed to automatically collect daily water levels over time. The dataloggers also collected water temperature data. The dataloggers will be downloaded once every 3 to 4 months and manual water level measurements will be obtained at that time to check against the electronic data.

At each monitoring well, one sampling round will be completed for general chemistry (basic anions, metals and nitrogen species) twice per year for three years. This sampling will be completed in the spring and fall of each year. In order to better understand the recharge function of the moraine with respect to the lower aquifer, four samples for isotopic analysis (e.g. tritium) will be collected at two of the well nests to provide an estimate of groundwater age.

- **Single Well Hydraulic Response Tests**

Hydraulic conductivity testing (e.g., slug testing) will be completed in all of the completed monitoring wells to evaluate the hydraulic conductivity of aquifer being tested. The data provided by this testing will be used to refine the parameterization of the numerical groundwater flow model.

- **Seeps and Springs**

During all field work, staff from all disciplines on the AFW Team will maintain a geo-referenced record of observations of seeps and springs. Searches for seeps and

springs will specifically be undertaken in conjunction with the ELC verification / refinement exercise and aquatic habitat assessments conducted in the SPA and PSA. These observations will be considered during the conceptual model development and calibration of the numerical groundwater flow model.

- **Spotflows**

Spot baseflow locations are presented in Figure 3 and were selected based on a review of existing information, modelling outputs (as described earlier), and a preliminary site reconnaissance. Spot baseflows are measured using the area-velocity method or other methods (such as direct volume measurement using graduated containers) at approximately 25 locations. Based on preliminary particle tracking results, the majority of these are located within the Mill Creek subwatershed south of the CMSP area, however, spotflow measurements are also being collected at key locations within the Hanlon Creek and Lower Speed River subwatersheds. No spotflow measurements are being collected in the Torrance Creek Subwatershed since any perennial features occur north of the Burke Well and were considered too far away from the SPA and PSA. Within the SPA, no spotflow stations were established since no perennially flowing features were observed. Measurements will be obtained under base-flow conditions seasonally over the project period (i.e., 3 monitoring events per year for 3 years). Data collected in the continuous loggers installed as part of the surface water study will also provide important information regarding the response of the streams to precipitation and the potential interaction with the groundwater system.

- **Closed Depression Investigation**

An investigation will be undertaken to assess the enhanced recharge capability of two representative closed depressions. The ability of closed depression's ability to enhance recharge to the groundwater regime is widely accepted but will be tested and quantified by collecting real-time data. At two representative locations to be selected in consultation with the study team and City staff, a surface water logger and a mini-piezometer equipped with a datalogger will be installed and monitored for the remainder of 2017. Each closed depression will be monitored manually three times. The goal of this study would be to determine if the closed depressions pond water after precipitation events. Using available climate data, Matrix will correlate different precipitation events with the corresponding hydraulic response in each hummock. This data will be used to help calibrate the MIKE SHE model.

- **Drive Point Piezometer Installation**

Drive point piezometers will be installed to provide information regarding the potential groundwater - surface water interactions in the areas of the wetlands and tributaries. Drive point piezometers will be installed at up to 20 locations, in addition to those installed in the closed depressions, as outlined above. Preliminary locations are shown on Figure 3. In the SPA and PSA, the piezometers will be installed around the wetland features and coordinated with the wetland surface water quantity and quality stations, as well as the flow stations, to the greatest extent possible (ref. Figure 5). Notably, permission to conduct wetland surface water monitoring at Stations 1 and 2 is still pending, as is access for any type of water monitoring at Station 10. In the PSA

and SSA, a number of piezometers will be installed along various tributaries to confirm gaining or losing conditions. The drive point piezometers will be located based on the results of the site reconnaissance, observations from other disciplines, and preliminary spot baseflow monitoring. Depending on the results of the reconnaissance survey, some locations may be nested (multi-level). Dataloggers will be installed in each of the drive point piezometers and the data downloaded once every three months. Manual water levels will be collected at this time.

- **Guelph Permeameter Testing**

Infiltration testing using the Guelph Permeameter testing method will be completed across the site adjacent to each monitoring well nest (i.e., nine locations) to gain an understanding of potential infiltration rates.

- e. **Rainfall Monitoring**

The City of Guelph and GRCA both have rainfall gauges within their jurisdiction; notwithstanding (ref. Figure 5), an additional rain gauge has been installed for the three (3) year monitoring period in the PSA. The rainfall gauge was installed (mid-July 2016) on the roof of the Guelph Home Building Supply, located at 500 Maltby Road East (ref. Figure 5). The rain gauge was installed concurrent with the streamflow monitoring (July 2016 to November 2018). Rainfall data have been and will continue to be downloaded on a monthly basis and documented in an annual data collection report with comparison to other available gauges from GRCA, City of Guelph, and others.

- f. **Integrated Surface Water and Groundwater Flow Model**

Surface water channels/streams are absent in the PSA as the hummocky topography directs the runoff to closed depressions that characterize this type of environment. Infiltration is spatially variable and influenced by topography and soil type. Drilling and water level monitoring indicates that, in many areas, the upper portion of the moraine deposits are unsaturated, which characterized by a large proportion of sand, gravel and cobbles. These observations suggest that proportion of water that is infiltrated and is not lost to evapotranspiration is conducted efficiently to the groundwater system.

A water budget will be developed to quantify the existing or future development partitioning of precipitation volumes into run-off, infiltration, evapotranspiration and groundwater recharge and discharge. Due to the hummocky topography and variability in climate and geology, surface water and groundwater processes need to be dynamically linked to represent the dependencies of the processes in a water budget. An integrated surface water – groundwater model provides the best approach to quantify the water budget volumes and the dynamics of the system. Further, the integrated model includes a representation of key physical features (e.g. vegetation, imperviousness, topography), which may be modified through development of the SPA. The integrated model will allow for a quantitative evaluation of potential impacts to the existing surface and groundwater functions and water budget as a result of development. The study team proposes to use MIKE SHE as the integrated numerical model for this study.

Based on the experience of AFW and Matrix in similar settings, it is considered appropriate for the water budget analysis / assessment to adopt the MIKE-SHE model. Previously, Matrix developed the Tier Three GAWSER and FEFLOW models to simulate the regional surface water and groundwater systems. However, the scale of the Tier Three models and the simplification of surface water processes require the development of a more local scale MIKE SHE integrated flow model to accomplish the objectives of the study, especially considering the hummocky nature of the PSA and its significance as a recharge feature. The MIKE SHE model will also consider the Greenway System within the SSA using a 50m by 50m grid, with the field monitoring program providing spot baseflow and surface flow measurements downstream of the Greenway system on Hanlon Creek Tributary 'E' for model calibration. Historical field monitoring data on the Greenway system will be reviewed and discussed with the City as to its usefulness, benefit to the groundwater and surface water assessments and potential assessment implications. A preliminary MIKE SHE model will be first developed to test the validity of the model boundaries before the model is updated with the findings of the field program and used in the water balance assessment. As part of the final model development, the conceptual model will be updated based on the results of the field program. Further testing of the conceptual model will be completed through calibration of the integrated model being developed for the project.

There is some uncertainty about the location of the groundwater divide between the Hanlon Creek and Mill Creek subwatersheds. There appears to be a reasonable amount of data to interpret the flow divide on a regional scale. However, if the numerical modelling identifies significant uncertainty with the groundwater flow divide that could affect the results of the impact analysis, some adjustments to the data collection may need to be required in 2018

In order to support the stormwater management planning for the Secondary Planning Area, a short-term instantaneous response is required for runoff, therefore it is also proposed to concurrently assemble a surface water model that can integrate its performance with that of the MIKE-SHE model. In order to remain consistent with the City's previous stormwater modelling, it is suggested that the PCSWMM model can be used in this regard. Integration of the PCSWMM and MIKE SHE hydrologic modeling will be conducted through comparison of peak flows and runoff volumes at key locations. MIKE SHE model and PCSWMM simulate common processes, including runoff, infiltration. However, each of the models developed for their specific purpose (stormwater vs. groundwater function/water budget). There are differences in spatial and temporal representation as well equations used to represent similar processes. However, the models are both calibrated to streamflow data and have common model input parameters, such as overland flow parameters. The common observation data and input parameters will be used and developed in a consistent manner

The PCSWMM model will be executed in both continuous and design event mode. The continuous data set will be developed in conjunction with data needs for the MIKE-SHE hydrologic model.

Figure 1 depicts an initial catchment geometry based on the base mapping available through MNR for the Secondary Planning Area. The PCSWMM model will be developed for the local drainage catchments within the SSA but not necessarily for the full SSA. Key flow nodes will be determined in proximity to the Secondary Planning Area that will be able to provide peak flows, flow durations and runoff volumes for existing land use conditions to ascertain the impact of the three (3) community land uses. The mapping will need to be further reviewed based upon other available information from the City and stakeholders (e.g. GRCA). Further refinements of catchment boundaries and/or extent of drainage catchments for the PCSWMM hydrologic modelling may be required to discretize the model based on local features and required points of interest.

► **Summary of Field Study Data and Mapping**

Given that the field data will be collected over three (3) consecutive years and the scope of study in any given year would vary, it is proposed that there will be an annual field study and mapping report (for 2016, 2017 and 2018 respectively) that provides a summary of data collected including a synthesis of its relevance to the study objectives. The intent of the reporting will be to initially underpin the understanding of area features, functions and form and in subsequent years, to provide a confirmation of this understanding.

**Meetings**

No.	With Whom	Subject	Number of Attending Staff			
			AFW	Beacon	Matrix	Cowell
1	City Project Team	Project Start-up (2)	1			
2	SPA Large Landowner's Consultants	Potential for data sharing and locations / types of existing groundwater monitoring wells	1	1	1	
3	SPA Landowners	Information Exchange	1	1	1	
4	City Project Team	Draft Work Plan Review (2)	1	1	1	
5	EAC / RSAC	Presentation of Draft Work Plan	1	1	1	
6	TAG #1	Work Plan Review and 2016 Field Work review	2	1	1	1
7	TAG / TSC	2017 Field Work review	2	2	1	
8	TAG / TSC	2018 Field Work review	2	1	1	
9	Stakeholders	PIC #1 Visions	1	1	1	
10	TAG #2	CEIS & SEM Work Plan Review	1			

## Phase 2: Project

### Conceptual Community Structure Analysis PSA and SSA Constraints and Opportunities

Phase 1 will provide a characterization of the natural heritage, surface and groundwater features, functions and form in the PSA and the SSA, with more focus and detail available for the PSA. This will subsequently support a preliminary constraints and opportunities analysis for the PSA. Due to the nature of this study, having a three (3) year monitoring period, it is proposed that the initial constraints and opportunities be established in the fall of year 2 (2017) and subsequently year 3 (2018) will be used to test and verify the assumptions established under year 2. Some of the key constraints and opportunities will include the following:

- ▶ Regulation limits
- ▶ Overland flow routes, etc.
- ▶ Natural Heritage System feature and area boundaries, including Linkages
- ▶ Discharge locations (including seeps and springs)
- ▶ Significant recharge zones
- ▶ Deficient conveyance infrastructure
- ▶ Natural hazards, including steep slopes
- ▶ Confirmed habitat for provincially Endangered and Threatened species

It is expected that this information will, as part of the Conceptual Community Structure Analysis, be fed into the overall study process including the Planning Charrette, in order to synthesize the understanding of the existing environment and how it informs future land use planning.

### Phase 1 and 2 Technical Analyses and Reporting

Based upon the input from Phase 1 Year 1 (2016-2017), an Existing Conditions report will be prepared which will focus on the NHS (including Significant Landform), surface water / groundwater interaction, and other key elements including the existing conditions budget for the PSA as developed within MIKE-SHE. Water budgets will also be established for representative natural heritage features within the PSA. Preliminary stormwater management targets for the PSA, based upon the existing land use conditions, will also be determined through numerical modelling in PCSWMM.

#### i. Existing Conditions

##### ▶ NHS Characterization

The refinements to the current NHS, as approved and mapped through OPA 42, will be identified and recommended based on the findings of the background review and field studies, as identified in the foregoing. It is anticipated that key refinements will relate to the status of unevaluated wetlands and SWH in the PSA, and potentially to identified wildlife crossings.

##### ▶ Identify / Evaluate Surface Water / Groundwater Features, Functions and Linkages

A 3-dimensional groundwater characterization will be presented in the form of hydrogeologic cross-sections, groundwater flow maps, recharge maps and groundwater



discharge maps. The AFW/Matrix Team will work together to characterize the connections between the groundwater and surface water dynamics, and the NHS, and identify and related constraints.

► **Surface Water / Groundwater Characterization**

In this phase of work, the preliminary MIKE SHE model will be updated with new field data and calibrated to existing conditions using available surface water and groundwater observational data over a number of years such that a range of climatic conditions is represented. The modelling results will be used to characterize:

- Surface-water and groundwater linkages to the NHS and municipal wells;
- Water budgets for the PSA, SSA and the NHS as a whole: including maps and plots of groundwater recharge and discharge, surface run-off directions, and evapotranspiration; and,
- Functional analysis of wetlands and groundwater features.

► **Significant Landform Review**

The landform assessments (described in the foregoing) will generate a final data layer/map showing the landform character and a classification across the PSA that is more refined than what has been used as the basis for the OPA 42 Significant Landform mapping. The intent of this work will be to develop a formal and transparent classification of adjacent lands and their intersection with the Significant Landform which will form the basis to prepare development criteria and prescriptions for integration of the Significant Landform across the PSA, and will also consider integration with immediately adjacent lands. The criteria used for defining Significant Landform in the City's Official Plan will not be revised through this process.

► **Identify Enhancement / Restoration Opportunities**

Ecological restoration and enhancement opportunities will be identified based on the refined NHS mapping developed as part of this study process, and in relation to opportunities in the landscape that present themselves with respect to the proposed land use planning. This will therefore be an iterative process. Opportunities to be considered will include enhancements within protected features and areas (e.g., meadow habitat creation in linkages, habitat restoration in buffers), naturalization and habitat creation associated with infrastructure such as stormwater management features, and enhancements in lands adjacent to the NHS.

► **Prepare Water Budget and Related Targets for the SPA and PSA and Representative NHS Features**

The purpose of this exercise is to establish generalized water budgets for the PSA and SSA as well as more detailed water budgets for representative NHS features (e.g., selected Significant Wetlands and Significant Woodlands) The detailed water budgets will provide a reference point for feature-based water balances required at the site-specific level (future studies).

Matrix will provide maps depicting the simulated hydroperiod (extent, depth, for wet and dry periods), catchment area, and water balance time-series plots (ET, surface water in/out, groundwater in/out, depth of ponded water and water table etc.) for Hall's Pond, Halligan's Pond, Neuman's Pond and the 1992 Gordon Woodlot. These features were chosen as they represent a range of physiographic environments across the study area; potentially include both groundwater and surface water dominated features; and, have monitoring data to calibrate the model representation of the feature. Maps of simulated depth of ponded water, depth to water table, and catchment area will be provided for the site depicting each wetland/woodland areas/complex as being predominately groundwater supported or surface water supported or both. These maps will be based on simulated conditions that are calibrated to available groundwater levels, ponded water extent, and flows.

▶ **Establish Stormwater Management Targets (Existing Conditions)**

The PCSWMM model, appropriately validated and calibrated against available rainfall and streamflow information and integrated with the MIKE-SHE modelling (drainage areas and appropriate parameterization, results -peak flows and runoff volumes), will be used to establish surface water targets for the planning of stormwater management under subsequent study phases.

▶ **Prepare Existing Characterization Report**

The foregoing information associated with the Phase 1 Characterization (following year 1: 2016-2017) will be documented in an Existing Characterization Report to be complemented and updated based upon additional field data collection through years two (2) [2017-2018] and three (3) [2018-2019]. The Phase 1 Characterization Report will document background information, relevant policies, guidelines and criteria and findings from each discipline and associated integrated results. Preliminary input into the Community Structure Analysis will be determined based on disciplines key findings (i.e. constraints and opportunities).

**ii. Evaluation of Preliminary Community Structure and MESP Alternatives**

Following the Characterization of the PSA and SSA after year 1 (2016-2017), and the Conceptual Community Structure analysis premised on constraints and opportunities, a series of Community Structure Alternatives for the CMSP area will be made available to the AFW Team and subsequently used to conduct an impact assessment to establish the scale and extent of impact along with a preliminary management hierarchy. Based upon the information in Addendum #1, it is understood that there will be three (3) Community Structure Alternatives to be evaluated concurrently. The information from the respective evaluations [three (3) distinct numerical analyses] will be used as input to ultimately establish a preferred Community Structure Alternative.

► **Impact Assessment**

• **Surface Water / Groundwater**

The MIKE SHE and PCSWMM models for existing land use conditions will be updated to reflect the three (3) Community Structure Alternatives. Key input to these concurrent and integrated analyses will be the assumed level of impervious coverages (both directly and indirectly connected) related to the various land uses under consideration. It will also be important at this stage to consider functional grading (reference Task C: Stormwater Management Plan) given the lack of perennial and/or intermittent flow drainage features and the SPA hummocky terrain and the need to preserve and protect various aspects of the landforms and internally draining features. This is likely to be a relatively complex undertaking however one that must be prepared to a reasonable scale in order to provide a solid understanding of potential impacts. The MIKE SHE modelling will provide a basis for establishing impacts to the water budget, as well as groundwater levels and recharge and discharge zones. Three (3) future Community Structure Alternatives will be simulated in the model using end-of-pipe stormwater management only, plus simulations that include varying levels of LID BMPs. In terms of the surface water model, it will provide an indication as to the potential for impacts to peak flows and runoff volumes (design event, annual volumes and discrete storm volumes). Discussion with the City and stakeholders will be required to determine if optional extreme storm events are to be considered as part of the analysis. In addition, a climate change (CC) assessment will be conducted. The City's IDF will be adjusted through the use of approved CC tools. These updated IDF relationships will be applied to the system as design storms to identify the influence on the proposed stormwater management system. The level of impacts will then be used to establish future management plans accordingly under each discipline.

Further, in order to assess the impacts to the Fiscal Plan, the high level costs related to stormwater infrastructure (end of pipe facilities, LID BMPs) will be estimated for the three (3) Community Structure Alternatives at this stage.

A sensitivity analysis will be conducted in this phase to evaluate the general sensitivity of features in the PSA and SSA to reductions in recharge. This will provide insight on the potential impacts of development and can be used in the development of Conceptual Community Structure (Preliminary Concept Plan) for the SPA.

• **Natural Heritage System (NHS)**

Impacts associated with the three Community Structure Alternatives will be identified for the NHS based on the refined NHS developed for this project, and in relation to what qualify as Significant Natural Areas and Natural Areas in OPA 42. While the primary focus will be on the anticipated impacts within the SPA, anticipated impacts to features and functions in the adjacent lands of the PSA will

also be considered in the Team’s analyses. Feature-specific impacts will be considered as well as impacts to the connectivity of the overall system.

- **Natural Hazards**

The Natural Hazards under the framework of GRCA’s regulations will be updated including limits of flooding, geotechnical setbacks, wetland limits, and associated setbacks. Special consideration will be given to the anticipated impacts to the Significant Landform in the PSA as a result of development, and to mechanisms to mitigate these impacts. This will include development of principles, criteria, and guidelines for development: within adjacent lands, and for linear and point infrastructure development on the Moraine with reference to specific Significant Landform policies in OPA 42.

- **Trail System**

Having a well-connected trail system that abuts or, in some cases, runs through portions of the NHS, is an important component of a liveable community that supports both active transportation and interaction with nature. The City of Guelph has, increasingly, promoted the presence of such trails as part of community planning. This project provides an excellent opportunity to ensure that such trails are planned for early on in the process, and integrated in a manner that appropriately balances environmental protection with community access and use. Trails will be considered as part of the impact assessment in the PSA so that options for avoiding and minimizing impacts to the NHS can be integrated into the Preferred Community Structure Alternative, along with recommendations for mitigation where appropriate. Mitigation measures to be considered will include the use of boardwalks over seasonally or permanently wet areas, and additional buffers to accommodate trails without compromising the buffer’s ecological functions.

- ▶ **Prepare Impact Assessment Report**

The impact assessment of the three (3) Community Structure Alternatives including associated recommendations for refinement, will be documented as part of the Impact Assessment Report. The information will be explicitly used to guide Stakeholder consultation and offer insights and direction with respect to a Preferred Community Structure Alternative. Notably, the Preferred Alternative may end up being a hybrid of preferred components from each of the alternatives.

## Meetings

No.	Type	Subject	Number of Attending Staff			
			AFW	Beacon	Matrix	Cowell
1	TAG / TSC	Existing Conditions (Constraints / opportunities)	2	1	1	1
2	CWG	Existing Conditions (Constraints / opportunities)	1	1		

No.	Type	Subject	Number of Attending Staff			
			AFW	Beacon	Matrix	Cowell
3	EAC	Existing Conditions (Constraints / opportunities)	1	1	1	
4	RSAC	Existing Conditions (Constraints / opportunities)	1	1	1	
5	PIC	Opportunities	2	1	1	
6	TAG / TSC	Impact Assessment	2	1	1	1
7	EAC	Impact Assessment	2	1	1	1
8	RSAC	Impact Assessment	2	1	1	1
9	PIC	Impact Assessment	2	1	1	

### Phase 3: MESP and Secondary Plan Input

The CEIS, as noted earlier is a fundamental undertaking to establish the Secondary Plan and associated MESP for the Secondary Plan Area. Following the Impact Assessment of the three (3) Community Structure Alternatives, ultimately leading to a Preferred Community Structure Plan, the third phase of the study will establish a formal Management Plan specific to the respective water-based and natural systems in the CMSP. While the focus of this component will be within the PSA, consideration will be made for the SSA as well, particularly as it relates to NHS/surface water/groundwater connections. The following provides an outline of the scope of work related to developing this Management Plan, as well as the Implementation / Monitoring Plan which will ultimately provide direction on how the City and its study partners will implement the recommendations and ultimately monitor the effectiveness of the management strategy.

### Management Plan

#### i. Surface Water (SWM)

Task C: Stormwater Management Plan will provide significant detailed guidance to this study component hence represents some overlap and integration. In brief, based upon the Preferred Community Structure Alternative, the PCSWMM hydrology model will be updated and the impacts confirmed and management practices determined accordingly, as prescribed through Task C; specifics will include stormwater management facility locations, application of Low Impact Development Best Management Practices (LID BMPs), and upgrades to various hydraulic features including culverts, and drainage features.

The stormwater management facility sizing criteria (infiltration, erosion, water quality and flood control for frequency events) will be provided in addition to the volumetric sizing of each facility. Discussion with the City and stakeholders on whether control beyond the 100 year storm event (e.g. Hurricane Hazel) will be required during Phase 2). Sizing criteria for flood control will be based on continuous modelling and frequency analysis. Sizing criteria for LID BMPs will also be provided. Functional grading for the Preferred Community Structure Alternative will facilitate determination of both major and minor system routes to stormwater infrastructure. Discussion with the City will be required on drainage outlets once a conceptual stormwater management approach has been agreed upon. For further details reference Task C.

## **ii. Groundwater (Matrix)**

Management strategies will be presented that will reflect the local and functional linkages of sensitive recharge and discharge areas and the potential quantity impacts on the municipal aquifer as well as groundwater quality degradation. Groundwater management strategies will also include technical input (quantitative and qualitative) into the following:

- Determination or refinement of hydrogeologically sensitive areas relating to both recharge and discharge;
- Determination of the potential sources and pathway of chloride, and inform on potential impacts to receptors. From this, BMPs with respect to salt management can be developed, with salt management approaches in other jurisdictions to be investigated (e.g. Region of Waterloo);
- Potential location and function of stormwater management facilities and other BMPs;
- Planning and policy recommendations for groundwater quantity and quality protection; and,
- A groundwater monitoring program.

## **iii. Natural Heritage System**

NHS management strategies associated with the Preferred Community Structure Alternative are expected to include a range of items including: habitat enhancement and restoration (as described in the foregoing), use of buffers as well as fencing, strategic location and design of trails, incorporation of LID measures, outreach and stewardship measures. Measures to help maintain connectivity between the SPA and PSA, such as tools to facilitate safe wildlife passage at key road crossings (e.g., installation of culverts) will also be considered. These may be implemented through Secondary Plan policies and/or refinements to existing guidelines and practices.

## **iv. Significant Landform**

Criteria and principles will be developed to help ensure appropriate integration of the protected Significant Landform areas within the SPA and immediately adjacent lands. The original criteria developed to define Significant Landform in the City's Official Plan will not be revised through this process. The focus will be on approaches and/or criteria and/or policies that support integration of areas of confirmed Significant Landform into the landscape of the SPA. These will include consideration of, and reference to: grading, landform visual character, sight lines, construction design conditions both in the adjacent lands area and for linear/site infrastructure on the moraine, road orientation, and restoration.

## **v. Urban Forest and Meadows**

In addition to protection of wooded areas within the NHS, recommendations will be made to sustain, enhance and expand tree cover, as well as open meadow habitats, outside the NHS. Although identification of specific plantable spaces will not be possible as part of this study (note that plantable spaces analyses are typically done on built out lands), the identification of potential plantable areas as well as potential meadow habitats in relation to the Preferred Community Structure Alternative is likely feasible. Beacon will also provide policy and

guideline recommendations intended to support urban forest canopy maintenance and expansion through the planning process.

**vi. Regulations Mapping / Natural Hazards**

The AFW Team will update the extent of the regulations mapping through an integrated land use and features mapping process, including the limits of flooding and wetlands, as well as potentially the identification of some areas of steep slopes associated with the moraine. Management strategies for protection and integration of these features into an urbanized landscape will be provided, as described above.

**Implementation and Monitoring Plan**

**i. Monitoring and Adaptive Management Strategy**

A fully integrated multi-year monitoring plan considering all relevant disciplines for the CMSP area will be developed. Discussions with the City and stakeholders as to the appropriate duration of the monitoring plan will be required during Phase 3.

Appropriate adaptive management strategies will also be tabled for consideration by the City and its partners, which will be made unique to the physical characteristics within the CMSP lands. The objective of the monitoring and adaptive management strategy will be to ensure that the plan and its recommendations succeed over time in meeting the study objectives with respect to appropriately managing the impacts from future land use change within CMSP.

**ii. Implementation Plan**

The City of Guelph will be charged with implementing the recommendations of the CEIS under the context of the MESP and the Secondary Plan. These documents, along with the other companion studies, in particular the Stormwater Management Plan, will provide guidance to the development community and the agencies within the PSA. As part of this task, it will important to clearly document criteria and implementation protocols including information on priorities, staging, funding and future study requirements.

**Meetings**

No.	Type	Subject	Number of Attending Staff			
			AFW	Beacon	Matrix	Cowell
1	TAG	Management Plan	2	1	1	1
2	TSC	Management Plan	2	2	1	1
3	CWG	Management Plan	1	1		
4	Project Team / TSC	Implementation Plan	2	1	1	
5	EAC	Management Plan	1	1	1	
6	RSAC	Management Plan	1	1	1	
7	PIC	Management Plan	2	1	1	
8	Project Team / TSC	Final Reporting	2	2	1	1
9	PIC	Final Reporting	2	1	1	

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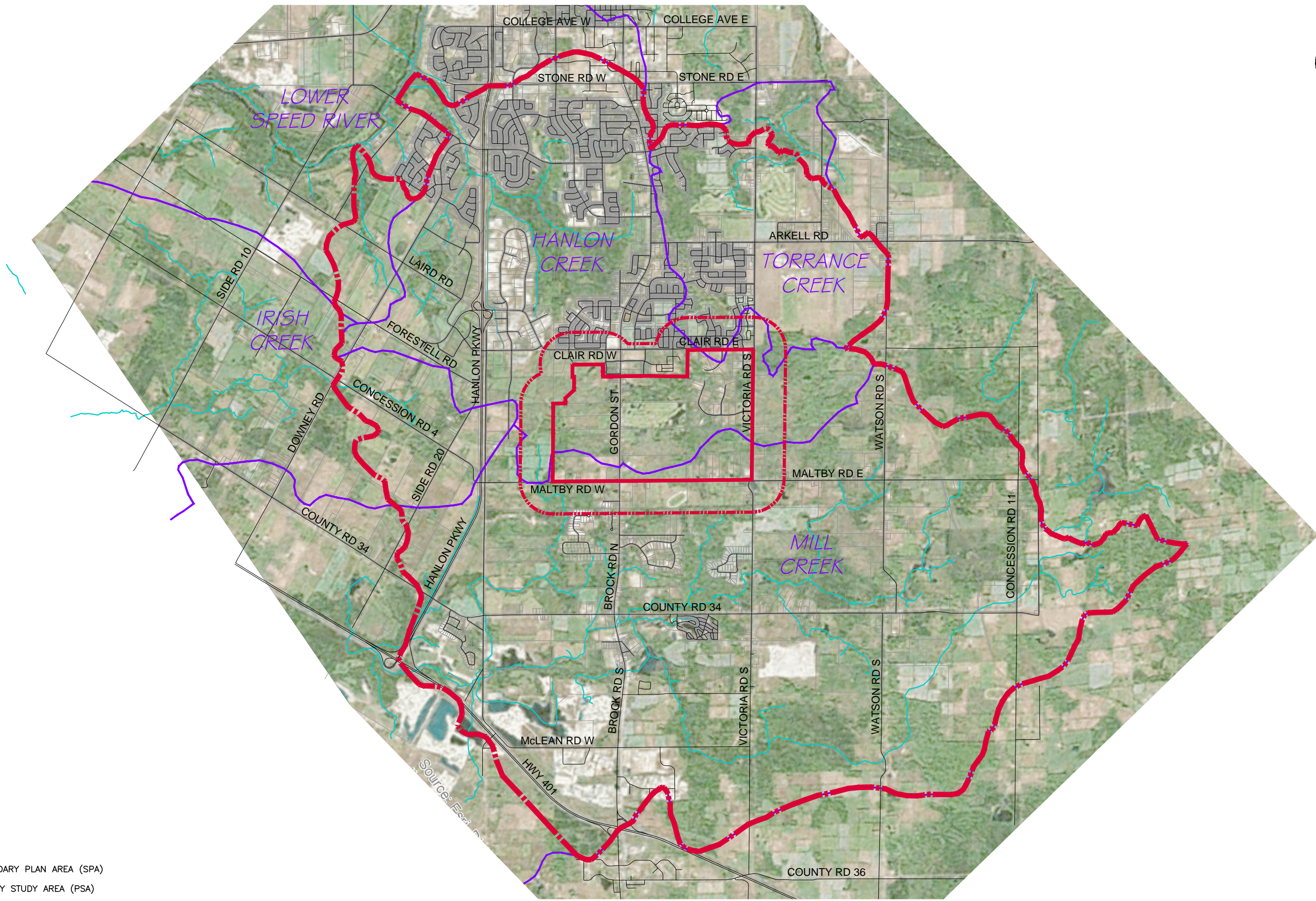
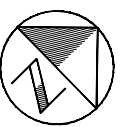
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**LEGEND**

	SECONDARY PLAN AREA (SPA)
	PRIMARY STUDY AREA (PSA)
	SECONDARY STUDY AREA (SSA)
	SUBWATERSHED BOUNDARY
	WATERCOURSE
	ROADWAY
	PROPERTY BOUNDARY

CLAIRE-MALTBY MASTER  
ENVIRONMENTAL SERVICING  
PLAN & SECONDARY PLAN  
CITY OF GUELPH

STUDY AREA PLAN



SCALE VALID ONLY FOR  
24"x36" VERSION

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# Access

## Figure 2

Clair-Maltby Master Environmental Servicing Plan (MESP) & Secondary Plan

### Legend

- Secondary Plan Area Boundary
  - Primary Study Area Boundary
  - Parcel Fabric
- Type of Access Granted**
- Deep groundwater monitoring (well)
  - Deep groundwater, shallow ground water (mini-piezometers), and surface water monitoring
  - Shallow groundwater and surface water monitoring
  - Deep and shallow groundwater, surface water, amphibian, bird and vegetation monitoring
  - Shallow groundwater, surface water and amphibian monitoring
  - Shallow groundwater, surface water, amphibian, bird and vegetation monitoring
  - Deep and shallow groundwater, surface water and amphibian monitoring

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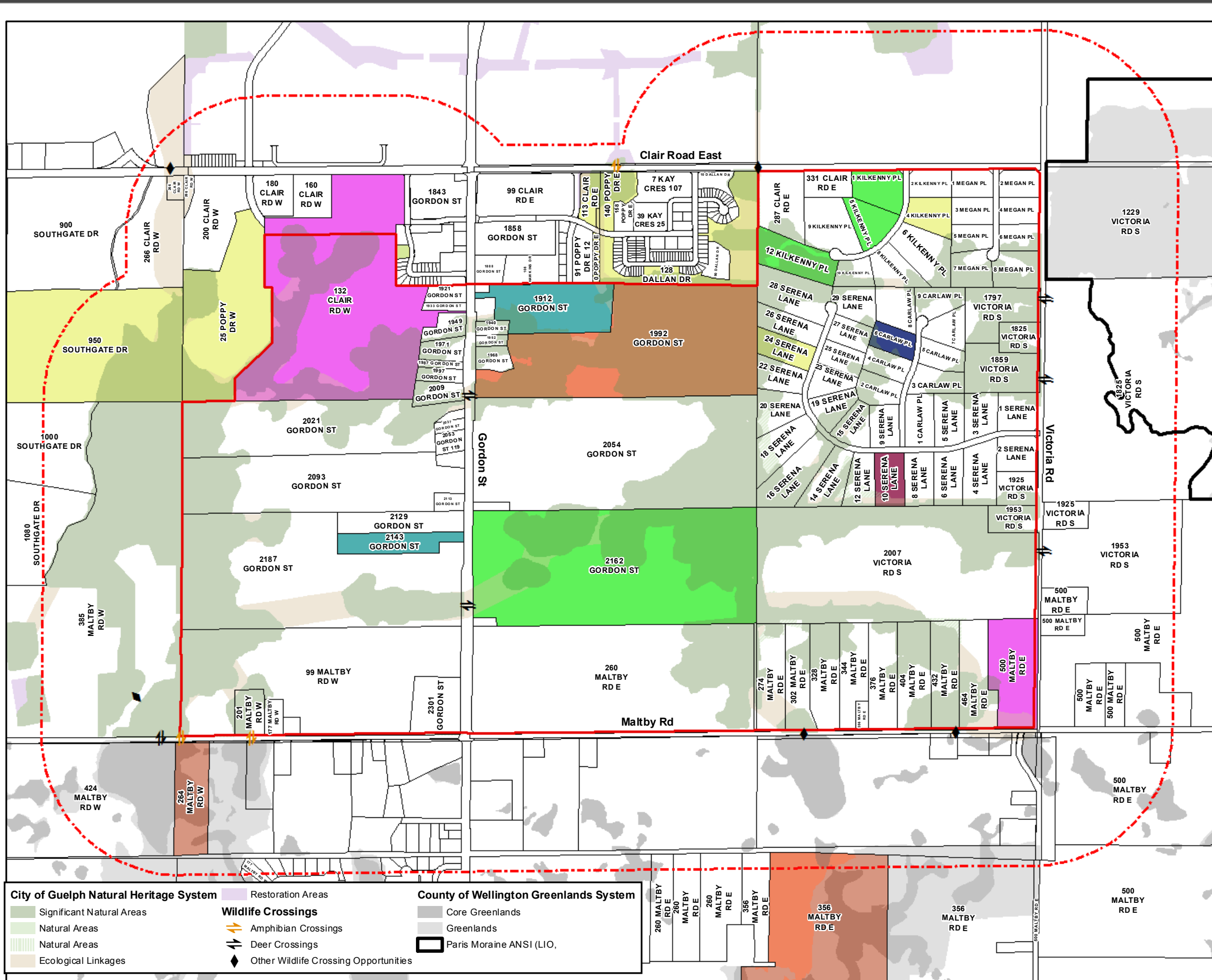
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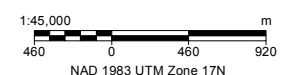


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| <p><b>City of Guelph Natural Heritage System</b></p> <ul style="list-style-type: none"> <li><span style="background-color: #90EE90; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Significant Natural Areas</li> <li><span style="background-color: #90EE90; border: 1px solid black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Natural Areas</li> <li><span style="background-color: #90EE90; border: 1px dashed black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Natural Areas</li> <li><span style="background-color: #FFD700; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Ecological Linkages</li> </ul> | <p><b>Restoration Areas</b></p> <ul style="list-style-type: none"> <li><span style="background-color: #FFB6C1; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Restoration Areas</li> </ul> <p><b>Wildlife Crossings</b></p> <ul style="list-style-type: none"> <li><span style="border-bottom: 1px dashed black; width: 15px; display: inline-block; margin-right: 5px;"></span> Amphibian Crossings</li> <li><span style="border-bottom: 1px solid black; width: 15px; display: inline-block; margin-right: 5px;"></span> Deer Crossings</li> <li><span style="border-bottom: 1px dotted black; width: 15px; display: inline-block; margin-right: 5px;"></span> Other Wildlife Crossing Opportunities</li> </ul> | <p><b>County of Wellington Greenlands System</b></p> <ul style="list-style-type: none"> <li><span style="background-color: #808080; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Core Greenlands</li> <li><span style="background-color: #A9A9A9; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Greenlands</li> <li><span style="border: 1px solid black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Paris Moraine ANSI (LIO)</li> </ul> |
|--|--|--|





- Primary Study Area Boundary
- Secondary Plan Area Boundary
- Water Body
- Watercourse
- Highway
- Road
- Mini Piezometer
- Spotflow Station
- Monitoring Well (Matrix)
- Monitoring Well (132 Clair Rd.)



Reference: Data provided by the City of Guelph and GeoBase® used under license. Imagery obtained from © 2013 Microsoft Corporation and its data suppliers.



City of Guelph  
Clair-Maltby Comprehensive Environmental Impact Study  
Year 1 Monitoring Report

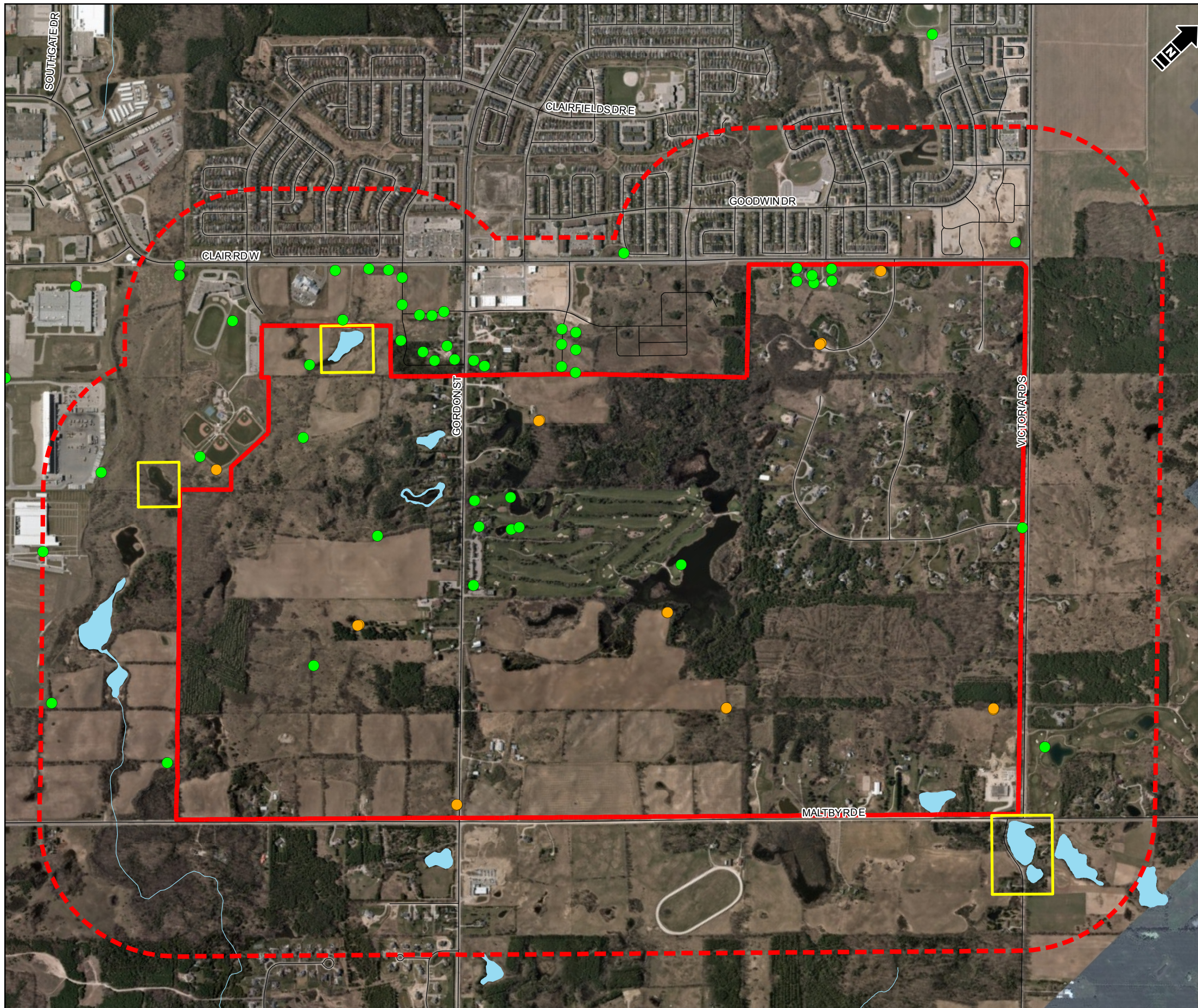
## Hydrogeological Monitoring Locations - Regional Extent

Date: 09 May 2017 Project: 23089 Technical: J. Melchin Reviewer: S. Davies Drawn: M. Urthel

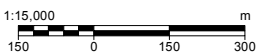
Disclaimer: The information contained herein may be compiled from numerous third party materials that are subject to periodic change without prior notification. While every effort has been made by Matrix Solutions Inc. to ensure the accuracy of the information presented at the time of publication, Matrix Solutions Inc. assumes no liability for any errors, omissions, or inaccuracies in the third party material.

Easting (m)

Northing (m)



- Primary Study Area Boundary
- Secondary Plan Area Boundary
- Bathymetry Location
- Water Body
- Watercourse
- Road
- Monitoring Well Nest
- Available Consultant Borehole/Monitoring Well



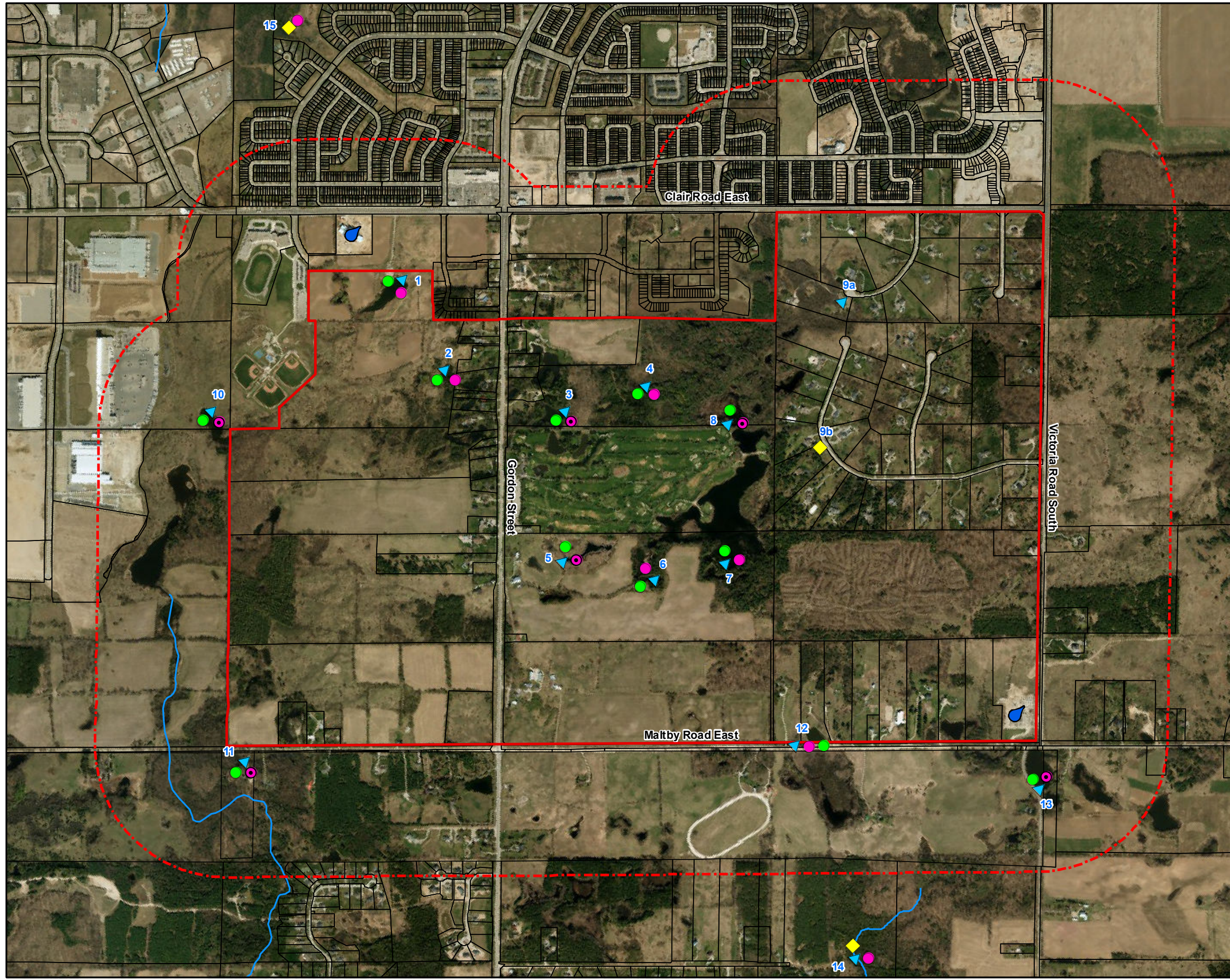
City of Guelph  
Clair-Maltby Master Environmental Servicing Plan (MESP) & Secondary Plan

### Hydrogeology Monitoring Locations - Local Extent

Date: 09 May 2017 Project: 23089 Technical: J. Melchin Reviewer: S. Davies Drawn: C. Curry

Disclaimer: The information contained herein may be compiled from numerous third party materials that are subject to periodic change without prior notification. While every effort has been made by Matrix Solutions Inc. to ensure the accuracy of the information presented at the time of publication, Matrix Solutions Inc. assumes no liability for any errors, omissions, or inaccuracies in the third party material.

I:\CityOfGuelph\23089\Figures and Tables\CH2016 Report\Technical\Work\plan\Local Extent.mxd



# Surface Water Monitoring Locations

## Figure 5

Clair-Maltby Master Environmental Servicing Plan (MESP) & Secondary Plan

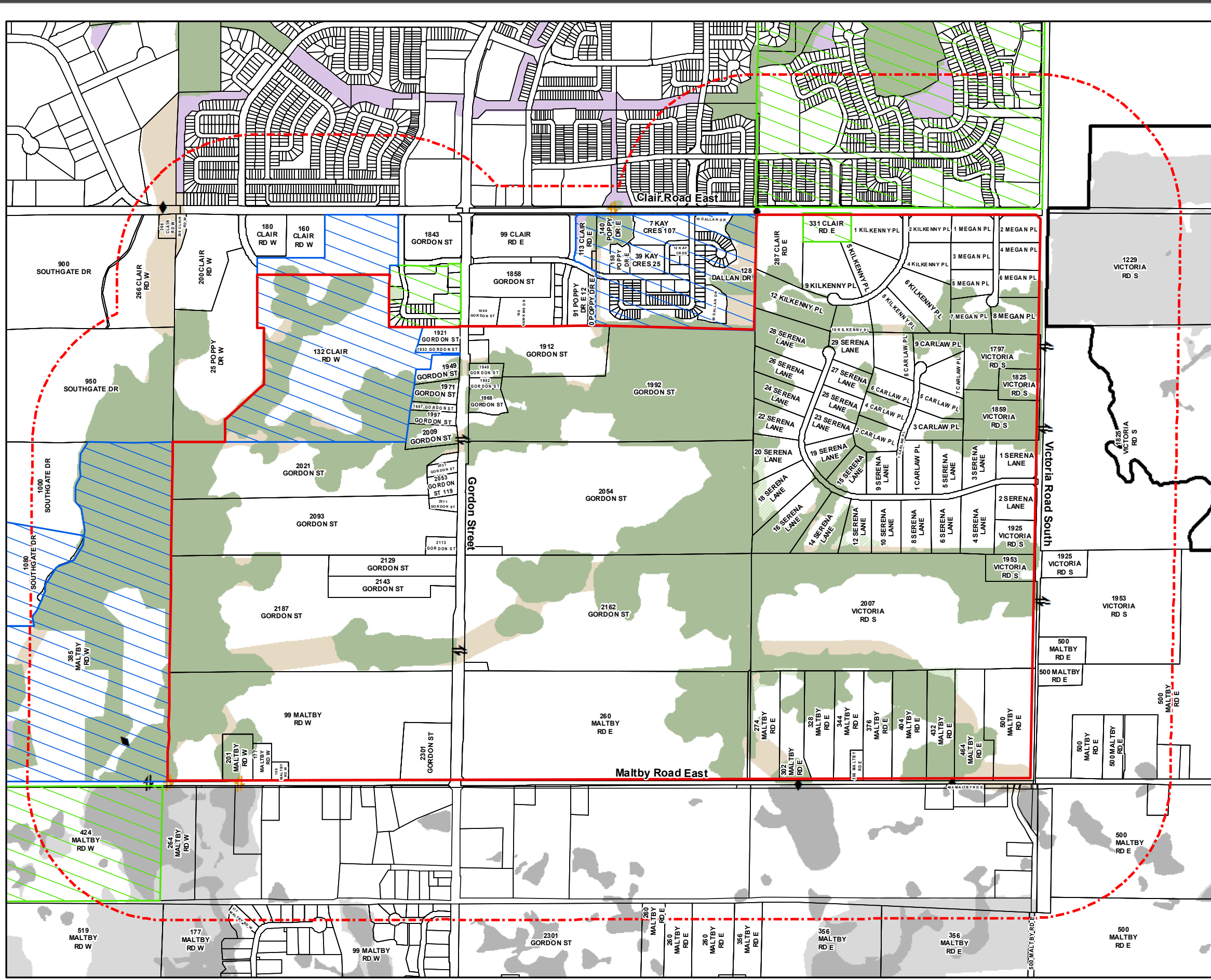
### Legend

- Secondary Plan Area Boundary
- Primary Study Area Boundary
- Watercourse
- CoG Parcel Fabric
- Surface Water Quality\*
- Surface Water Quality\* + Pesticides
- Surface Water Quantity
- ▲ Shallow Groundwater
- ◆ Surface Water Flow
- 💧 Rain Gauge

\* Water Quality Sampling Parameters include: TSS, TDS, PTP, SO<sup>4</sup>, Cl, TKN, NO<sup>2</sup>, NO<sup>3</sup>, NH<sup>3</sup>, Temp, pH, Conductivity, DO and Metals.

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First Base Solutions Web Mapping Service 2010	
UTM Zone 17 N, NAD 83	
<div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">0</span> <span style="margin-right: 10px;">155</span> <span style="margin-right: 10px;">310</span> <span style="margin-right: 10px;">620 Metres</span> </div>	1:15,200



# Available Natural Heritage Data

## Figure 6

Clair-Maltby Master Environmental Servicing Plan (MESp) & Secondary Plan

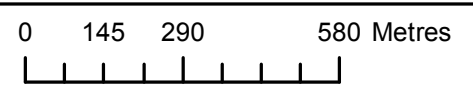
- Legend**
- Secondary Plan Area
  - Primary Study Area
  - Parcel Fabric
- Available Natural Heritage Data**
- Vegetation and Wildlife Data
  - Vegetation, Wildlife and Fisheries Data
- City of Guelph Natural Heritage System**
- Significant Natural
  - Natural
  - Natural Areas
  - Ecological Linkages
  - Restoration
- Wildlife Crossings**
- Amphibian Crossings
  - Deer Crossings
  - Other Wildlife Crossing Opportunities
- County of Wellington Greenlands System**
- Core Greenlands
  - Greenlands
  - Paris Moraine ANSI (LIO, 2016)

Note  
\* This map shows data available from site-specific studies undertaken within the Primary Study Area between 2005 and 2016.

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First Base Solutions  
Web Mapping Service 2010

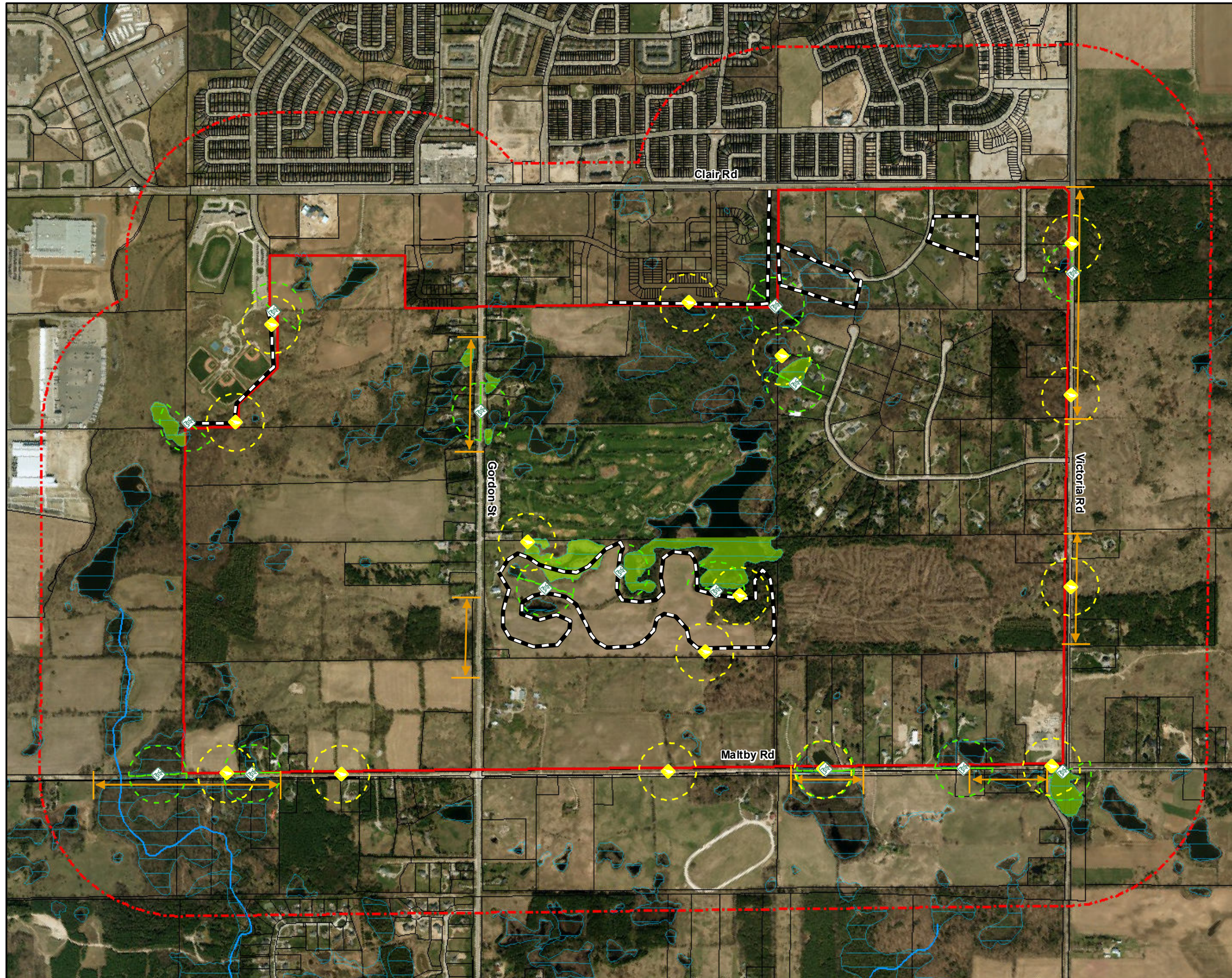
UTM Zone 17 N, NAD 83



1:14,000



Project 216002  
May, 2017



# Wildlife Monitoring Locations

## Figure 7

Clair-Maltby Master Environmental Servicing Plan (MESp) & Secondary Plan

### Legend

- Secondary Plan Area Boundary
- Primary Study Area Boundary
- Parcel Fabric
- Wetland (MNRF 2016)
- Watercourse
- Amphibian Monitoring Stations (22)
- Breeding Bird Stations (15)
- Basking Turtle Monitoring Stations (8)
- Winter Wildlife Transects (5)
- Wildlife Road Transects (7)

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First Base Solutions  
Web Mapping Service 2010

UTM Zone 17 N, NAD 83

0 145 290 580 Metres

1:14,000



Project 216002  
May, 2017





## **Appendix A**

### **Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby MESP**

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
<b>GRCA, November 10, 2016</b>		
<p>1. On page 7 - the text notes that 3-season vegetation surveys will not be undertaken. On page 8 – the text notes that butternut assessments will not be undertaken. It is the intent that these field surveys be required as part of future EIS or EA work at the subdivision/site scale? This study should identify those areas within the Secondary Plan Area where additional studies will be required, and what the minimum requirements for study components/field work will be.</p>	<p>1. Yes. More comprehensive vegetation surveys, including three-season surveys and Butternut assessments where required, will be required as part of more site-specific EIS or EA work.</p> <p>The City's Official Plan already includes general guidance for undertaking EIS. Specific requirements for site-specific EIS are typically developed through EIS Terms of Reference which are vetted through the Environmental Advisory Committee (EAC) and must be approved by City staff. Project-specific EA requirements are also developed in consultation with one of the City's Environmental Planners.</p>	<p>1. Yes</p>
<p>2. We agree that an approach should be adopted for determining the status of unevaluated wetlands and potentially refining the boundaries of evaluated wetland units. It is requested that the boundary of evaluated and unevaluated wetlands be refined where practicable.</p>	<p>2. Agreed. An approach has been developed in consultation with MNRF and GRCA and will be included in the Revised Work Plan. This approach includes refinement of PSW boundaries and consideration of smaller unevaluated wetlands.</p> <p>Conversions from ELC to OWES required for MNRF.</p>	<p>2. Yes</p>
<p>3. It may be informative to flag wetlands that are smaller than 0.5 ha and that would require further assessment in accordance with GRCA policy 8.4.4 and City of Guelph policies.</p>	<p>3. Agreed. See response to #2 above.</p>	<p>3. Yes</p>
<p>4. It is requested that wetland boundaries be determined using the combined technical guidance outlined in the ELC field manual and most current edition of the OWES manual, which has stressed the importance of soils, hydrology, and vegetation in such assessments.</p>	<p>4. Given that access is limited, it will not be possible to verify the soils, hydrology and vegetation of some of these wetlands. An alternate approach to refinement has been suggested (see response to #2 above) which will require confirmation of some site-specific details as part of site-specific studies.</p>	<p>4. Yes</p>
<p>5. We suggest that ELC data sheets, especially soils and vegetation sections, will need to be completed in order to substantiate and defend resultant ELC mapping and to identify candidate Significant Wildlife Habitat as identified in the MNRF's current Ecoregion Criteria Schedules. The botanical surveys need to yield more than an annotated checklist of species. Relative abundance of hydrophytic species in each strata is necessary when determining whether or not an area satisfies the vegetation rules outlined in the OWES manual and will also facilitate the delineation of wetland boundaries.</p>	<p>5. ELC data sheets for vegetation will be completed for the few properties where access has been provided. Soils will not be sampled. This will be clarified in the Revised Work Plan.</p> <p>Undertaking full OWES evaluations of all unevaluated wetlands in the Secondary Plan Area is outside the scope of this study, but will be required where appropriate through the EIS or EA process. Finalization and staking of wetland boundaries in the field will also be required as part of these studies after the Secondary Plan has been completed.</p>	<p>5. Yes</p>
<p>6. The MNRF and/or GRCA's wetland layers will provide a consistent level of coverage where property access is not granted. These areas should be identified on a map as part of the natural heritage system, but areas in need of further assessment at the site-specific development stage.</p>	<p>6. Agreed. These data layers will be considered in the review and refinement of PSW boundaries. See response #2.</p>	<p>6. Yes</p>
<p>7. It is noted that site-specific fisheries or benthic data collection will not be undertaken but that some aquatic assessment will be undertaken to provide a more fulsome characterization of the (habitat?) features and to supplement the information gathered through background review and consultations. Which field methods specifically (e.g. RGA, RSA, OSAP?) will be employed?</p>	<p>7. The Draft Work Plan (October 2016) proposed two days of scoped aquatic habitat assessments of creeks outside the Secondary Plan Area using OSAP. However, based on input from RSAC and the TAG, this effort will be shifted to undertaking a scoped assessment of Headwater Drainage Features (HDFs) within the Secondary Plan Area.</p> <p>Preliminary HDF screening to be completed in 2017. The findings of the preliminary screening will determine if more detailed assessment is warranted.</p>	<p>7. Yes</p>
<p>8. Page 12 - The number of surface water quality sampling events should be clarified (e.g., 6 samples per site, per year).</p>	<p>8. Noted.</p> <p>Change from staff gauges to level loggers plus enhanced quality assessments that include metals and pesticides.</p>	<p>8. Yes</p>
<p>9. Page 14 - How will the bathymetry survey be undertaken? (i.e. method)</p>	<p>9. Two approaches have been used:</p>	<p>9. Yes</p>

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
	i. Where pond depth was sufficient, a remote controlled boat was used that was equipped with a GPS, Sonar and mapping software capable of recording the depth to the pond bottom while the boat was driven in numerous transects across each pond. ii. Where pond depth was limited, a pressure transducer was pulled across the bottom of the pond. By noting the time and position of the transducer along the guideline, the associated pressures were converted to depth of pond water	
10. Page 16 - What time of year will the groundwater quality samples be collected?	10. Twice per year for three years in the spring and fall	10. Yes
11. Page 22-24 - The work plan notes that the impact assessment of the 3 community structure alternatives will be based on the initial characterisation work developed after the first year of monitoring (2016-2017). If subsequent monitoring (2017-2018) alters the understanding of the form or function of the natural systems, how will the impact assessment be updated in response?	11. Based on the Team's current understanding of the system in the proposed work plan, this is not anticipated; however, should a major modification to the base model or its calibration be necessary, it would be the Team's understanding that this would be out of scope. Minor modifications would be expected through more detailed site plan studies.	11. No
12. Page 23 - It is noted that the impacts associated with the 3 community structure alternatives on the Natural Heritage System will be focused on the Secondary Plan Area (SPA) and Primary Study Area (PSA). Potential impacts on natural heritage features in the Secondary Study Area (SSA) also need to be evaluated (per ecological corridors and the surface water/groundwater impact assessment).	12. The existing NHS has already been developed with consideration for connectivity with the surrounding County Greenlands system. Maintaining this connectivity will continue to be a consideration moving forward. Potential impacts to the SSA will be evaluated in the numerical model of ground and surface water.	12. Yes
13. Page 25 - Stormwater Management Plan - the stormwater management plan should assess the adequacy and legality of all outlets to receive drainage from a municipal stormwater system. This should include identifying the need for easements or a municipal drain process wherever surface outlets/routes are subject to increased rate, duration and/or volume of stormwater runoff.	13. The legality of outlets requires an alternate assessment not currently considered in the work plan. The need for easements and / or a Municipal Drain may require additional Team members. The intent of the plan would be to maintain existing stormwater peaks and volumes. To be addressed in the next phase(s) when a conceptual SWM approach has been identified.	13. Potentially
14. Page 13-14 - Available forward particle tracking information suggests a strong groundwater connection between lands within the Secondary Plan and the Provincially Significant Cranberry Oil Well Bog Wetland Complex and Irish Creek subwatershed located west of the subject lands. We suggest that this connection be investigated further in order to fully understand this connection and groundwater response and to assess potential impacts to this system.	14. Note particle tracking results actually are that particles exist at depth and do not discharge to surface in the area. This is supported by GRCA thermal regime mapping that indicate the surface water feature in the area is warmwater.  There are seven active pits in the vicinity of this wetland. Four hydrogeology reports have been obtained. These reports will be reviewed and relevant data will be incorporated into the conceptual and numerical models. Additional field work is not recommended at this time but may be required based on the review of these reports.	14. Yes
15. Page 16, 3rd paragraph (Monitoring Wells Section): The work plan discusses 8 nested well sites (2 wells per site; one deep, one shallow). What were the drill targets for the screened units versus what was actually found and is being monitored? Paragraph 5 of the same section includes a discussion on sampling for groundwater chemistry. The work plan should mention what time of year the sampling will take place, and also whether any field parameters will be collected (i.e. Field pH, dissolved oxygen, temperature).	15. The estimated well depths prior to drilling were based on data from the Guelph Tier 3 model. Estimated well depth vs. final well depth, mbgs: MW1s: 20.3 /13.4 MW1d: 26.7/21.2 MW2s: 15.9/8.2 MW2d: 24.2/20.4 MW3s: 23.9/23.2 MW3d: 36.1/34.1 MW4s: 27.9/20.9 MW4d: 38.6/28.3 MW5s: 11.1/16.8 MW5d: 25.3/24.1 MW6s: 24.8/22.9 MW6d: 38.7/36.6 MW7d: 42.1/34.6 MW8s: 19.6/7.6 MW8d: 35.2/19.2	15. Yes

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
	MW9s: 26.5/23.2 MW9d: 39.3/33.5  Groundwater sampling will occur twice per year for three years in the spring and fall. Field parameters will be collected at each sampling event and include: pH, EC, DO and temperature.	
16. Page 17: Drive Point Piezometer Installation - Reference is made to Appendix A, but this appendix is not included in the project folder.	16. Reference to 'Appendix A' should have been to 'Figure 3'.	16. Yes
17. Page 17: Guelph Permeameter Testing -It would be useful for the consultants to identify how many locations will be tested, and where.	17. Guelph Permeameter testing was conducted at nine locations, coinciding with areas adjacent to monitoring well nests.	17. Yes
18. The MIKE-SHE and PCSWMM models can both be used to quantify surface and groundwater targets if catchments are sufficiently well-discretized to provide output at appropriate points of interest.	18. The PCSWMM model is being used to establish surface water runoff for short term events including design storms while the MIKE SHE model will be used for longer term simulations of integrated surface and groundwater (i.e. seasonal / annual).	18. No
19. Given that a significant portion of the area is internally drained, development and SWM targets do need to ensure no adverse impacts to external lands. This therefore necessitates modelling of extreme events (the Regional Storm for the Grand River Watershed is the greater of the Hurricane Hazel storm or 100-year event). The worst case of continuous rainfall, 100-year and Hurricane Hazel design storms will then establish the greater volume and discharge targets. The foregoing may also be a concern to protect existing stakeholders within the study area.	19. This approach is inherent in the proposed work plan for surface water management.	19. No
20. Labelling of monitoring equipment in Figure 3 would be helpful.	20. Agreed	20. Yes
21. Page 27 -Implementation and Monitoring Plan - It is recognized that a "fully integrated, multiyear monitoring plan considering all relevant disciplines" will be developed and that "discussions with the City and stakeholders as to the appropriate duration of the monitoring plan will be required during Phase 3". We would also ask that the monitoring disciplines, parameters, frequency, and responsible parties also be identified.	21. Agreed; this is anticipated in the current scope of establishing a monitoring plan.	21. No
22. Page 28 - Literature Cited - Addition references (e.g. ELC protocol and wetland evaluation manual) could be added to the text and full citations included in Section 4.0.	22. Noted.	22. Yes
<b>RSAC, November 16, 2016</b>		
That the River Systems Advisory Committee support the Clair Maltby Master Environmental Servicing Plan and Secondary Plan Technical Work Plan Update with the following recommendations:		
i. That the scope of water quality work include a salt assessment to inform future development applications;	i. To be clarified that dissolved chloride (Cl) is being measured in the surface and ground water quality samples (Amec Foster Wheeler). As part of our proposal, Matrix stated that they will determine the potential sources and groundwater pathways of chloride and assess the potential impacts to receptors qualitatively. Within this context, BMPs related to salt management will be developed. Approaches in other jurisdictions could be investigated (e.g. Region of Waterloo)	i. Yes
ii. That the stormwater management strategies are innovative and consider ecological function;	ii. This is inherent in the proposed scope.	ii. No
iii. That the Significant Landform recommendations address the protection of adjacent lands that support the contextual elements of the earth science features;	iii. To be clarified that the Significant Landform assessment being undertaken as part of the CEIS is focussing on the "adjacent land" transition area between the SL and future development to inform appropriate integration through the Secondary Plan land uses and policies	iii. Yes

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
iv. That the natural heritage feature water balance include characterization of hydroperiods for selected wetlands and woodlands, and that this be considered with the development of stormwater management targets and strategies;	iv. General understanding of the hydroperiods for selected wetlands will be assessed with MIKESHE and coordinated with the stormwater management and surface water considerations.  Will provide maps depicting the simulated hydroperiod (extent, depth, for wet and dry periods), catchment area, and water balance time-series plots (ET, surface water in/out, groundwater in/out, depth of ponded water and water table etc.) for Hall's Pond, Halligan's Pond, Neuman's Pond and the 1992 Gordon Woodlot. These features were chosen as they represent a range of physiographic environments across the study area; potentially include both groundwater and surface water dominated features; and, have monitoring data to calibrate the model representation of the feature. For all wetland/woodland areas/complexes, we will provide maps of simulated, depth of ponded water, depth to water table, catchment area, and categorize each as being predominately groundwater supported or surface water supported or both.	iv. Yes
v. And THAT the City applies a precautionary approach to planning for development within the Clair Maltby area, recognizing that the area is located on the Paris Moraine, is a sensitive headwater area supporting Hanlon, Mill and Torrance Creeks and includes important natural heritage features and areas.	v. The goal of the CMSP is to effectively and sensitively integrate the urban development of these lands with existing urban development in the City while respecting and protecting the existing natural heritage system and cultural heritage resources. In planning for and accommodating the development of the Clair-Maltby area, the city will take a precautionary approach in establishing policies for development.	v. Yes
vi. And That a comprehensive surface water connectivity assessment be completed to assess seasonal aquatic habitat form and function.	vi. See response to GRCA Comment #7 above.	vi. Yes
vii. And That the study design consider the Hanlon Creek subwatershed study and locations of previous monitoring efforts and, where possible, incorporate the information from those studies to inform future potential subwatershed studies.	vii. All available data provided by the City and its partners is being considered including the Hanlon Creek Subwatershed Study.	vii. Yes
<b>EAC, November 16, 2016</b>		
That the Environmental Advisory Committee support the Clair Maltby Master Environmental Servicing Plan and Secondary Plan (CEIS component) Technical Work Plan Update with the following recommendations:		
i. That the City continue to pursue opportunities to shift field stations and study design to support the identification and refinement of ecological linkages for all taxa	i. Several amphibian and turtle monitoring stations have been shifted as discussed at EAC.	i. Yes
ii. That the scope of water quality work include a salt assessment to inform future development applications.	ii. To be clarified that dissolved chloride (Cl) is being measured in the surface and ground water quality samples. As part of the proposal, it stated that potential sources and groundwater pathways of chloride will be determined and the potential impacts to receptors qualitatively will be assessed. Within this context, BMPs related to salt management will be developed. Approaches in other jurisdictions could be investigated (e.g. Region of Waterloo)	ii. Yes
iii. That the stormwater management strategies are innovative and consider ecological function.	iii. This is inherent in the proposed scope.	iii. No
iv. That if the technical analysis/data collection phase of this study identify an outcome that will result in a SW management plan that is beyond the scope of the City's existing SWM policy, that the schedule/timeline of the project be adjusted to provide	iv. This comment will be addressed if this outcome occurs.	iv. Potentially

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
sufficient time for the City to develop an infiltration policy for SWM prior to the development of the Management Plan.		
v. That the natural heritage feature water balance include characterization of hydroperiods for selected wetlands and woodlands, and that this be considered with the development of stormwater management targets and strategies;	v. General understanding of the hydroperiods for selected wetlands will be assessed with MIKESHE and coordinated with the surface water modelling for SWM considerations. These will need to be revisited at the next stage of planning through site-scale studies.	v. No
vi. That the study design consider the Hanlon Creek subwatershed study and locations of previous monitoring efforts and, where possible, incorporate the information from those studies to inform future potential subwatershed studies.	vi. All available background information provided to the study team is being considered.	vi. No
vii. That the climate change scenarios be considered throughout the study including but not limited to extreme events, droughts, seasonal shift in precipitation pattern etc.	vii. Agreed, this is in the current work plan.	vii. No
viii. And THAT the City applies a precautionary approach to planning for development within the Clair Maltby area, recognizing that the area is located on the Paris Moraine, is a sensitive headwater area supporting Hanlon, Mill and Torrance Creeks and includes important natural heritage features and areas.	viii. The goal of the CMSP is to effectively and sensitively integrate the urban development of these lands with existing urban development in the City while respecting and protecting the existing natural heritage system and cultural heritage resources. In planning for and accommodating the development of the Clair-Maltby area, the city will take a precautionary approach in establishing policies for development.	viii. Yes
<b>Items discussed at EAC / RSAC Meeting but not included in the motion (November 16, 2016)</b>		
1. Collect winter temperature data (with spot flow measurements?)	1. Surface water temperature will be recorded at each spot baseflow station; however this will be conducted during the spring, summer, and fall when spot baseflows are measured. Spotflow data are not proposed during winter due to frozen conditions, or if not frozen, health and safety concerns. Therefore winter surface water temperature data will not be collected	1. Yes
2. Include data collection to inform mammal presence/absence	2. Observations of mammals will be made directly, and from tracks and scat, during the winter wildlife surveys, and incidental observations of mammals will also be made during all other surveys. No trapping is proposed.	2. No
3. Include detailed ELC data sheets	3. ELC data sheets will be completed for the few properties where access has been provided. This will be clarified in the Revised Work Plan.	3. Yes
4. Include a map that illustrates where existing NH data is available through background studies	4. New map to be included in Revised Work Plan.	4. Yes
<b>Environmental Planning, January 24, 2017</b>		
1. Include a methodology which incorporates the use of time-lapse cameras to monitor use of Maltby Road culverts	1. This is possible but will require additional budget that is not available at this time.	1. No
2. Add a road mortality station to Gordon Street in the vicinity of the wetlands (i.e., top of secondary plan area)	2. Ok.	2. Yes
3. Use the headwater drainage feature assessment guideline to assess HDFs/functions within the study area ( <a href="http://www.creditvalleyca.ca/wp-content/uploads/2014/02/HDFA-final.pdf">http://www.creditvalleyca.ca/wp-content/uploads/2014/02/HDFA-final.pdf</a> )	3. See response to GRCA comment #7	3. Yes
4. Indicate locations for aquatic habitat assessments	4. This task is to be replaced with preliminary HDF assessments within the SPA.	4. Yes
5. Coordination of and input to wetland mapping updates	5. Agreed. We anticipate City Environmental Planning staff to provide input to this process and be the liaison with MNRF.	5. Yes
6. Update the Workplan to reflect use of 2016 aerials	6. Noted.	6. Yes

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
7. Clarify which features will be representative features for the natural feature water budget and what the expected information output will include (i.e., hydroperiod?)	7. To be discussed with Team based on features of interest and limitations with the numerical model. This can be confirmed for the refined work plan.	7. Yes
8. Selection of features for water balance assessments	8. To be discussed with Team based on features of interest and limitations with the numerical model. This can be confirmed for the refined work plan.	8. Yes
9. Clarify how climate change will be integrated into the scenario analysis	9. Reference above.	9. No
10. Explore opportunities for innovative approaches to SWM	10. Contemporary stormwater management techniques will be assessed and considered.	10. No
11. How will SWM targets consider ecological function?	11. Quantity (peaks and volume) management will target no net impact; where this is not possible, a seasonal assessment can be evaluated in the context of sensitive receivers and species.	11. No
12. Identify mechanisms to integrate Significant Landform	12. To be clarified that the Significant Landform assessment being undertaken as part of the CEIS is focussing on the “adjacent land” transition area between the SL and future development to inform appropriate integration through the Secondary Plan land uses and policies.	12. Yes
13. Ensure Ecological Linkages are a primary consideration	13. Current work plan includes assessments of wildlife movement where access permits.	13. No
14. Refinements to monitoring (e.g., amphibian station on Gordon St & Clair Rd)	14. Several amphibian and turtle monitoring stations have been shifted as discussed at EAC. Road mortality station to be added on Gordon between wetlands.	14. Yes
<b>MNRF, January 11, 2017</b>		
1. Study should use updated ELC base to refine and reconcile the existing PSW boundaries, as well as confirm or identify any additional wetland units not currently identified as PSW.	1. Agreed. ELC updates to be based primarily on desktop assessments supplemented by drive-by assessments and field assessments where access has been provided.	1. Yes
2. Minor reductions or expansions to PSW boundaries identified through this process to be provided to MNRF to update their mapping, recognizing these boundaries will still be subject to field verification and staking as part of site-specific studies in the future.	2. Agreed.	2. Yes
3. With respect to the wetlands not currently identified as part of the PSW complexes (i.e., unevaluated wetlands), it was agreed that these would be screened using the guidance provided by MNRF and GRCA in terms of whether they warrant consideration for complexing or not. However, it was recognized that Beacon and the City may not have enough information to make an accurate assessment where access has not been provided. M. Thompson indicated that recommendations could be made based on desktop information (e.g., a wetland which strengthens a corridor link between larger wetlands or natural areas).	3. City and Consulting Team to develop a transparent approach for this based on guidance from MNRF and GRCA. Consulting Team, with input from City, is to undertake preliminary screening based on the agreed approach. MNRF is to review the information provided and make final determination.	3. Yes
<b>TAG Member (B.B.), February 1, 2017</b>		
1. With respect to the hydrology and hydrogeology tasks, the work plan is quite thorough and the phased approach to characterizing the study area is logical.	1. Acknowledged	1. N/A
2. The hummocky terrain is mentioned relative to its effects on groundwater recharge. The suggestion that closed depressions cause/create enhanced recharge to the groundwater regime remains, in my opinion, theoretical. I believe that the monitoring program should be enhanced by collecting real-time data in selected locations to validate this claim and to assist with calibrating the model(s). I welcome the opportunity to discuss this further with your consultant team.	2. Assuming access to representative hummocks over the PSA is given, Matrix proposes to complete a field program of instrumenting two representative hummocks each with a surface gauge and a mini-piezometer instrumented with a data logger. The recommended monitoring period would be the remainder of 2017. The goal of this study would be to determine if the hummocks pond water after precipitation events. Using available climate data, Matrix could correlate different precipitation events with the corresponding hydraulic response in each hummock. This data would subsequently be helpful in calibrating the MIKE SHE model.	2. Yes

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
3. There appear to be some gaps in locations of shallow and deep groundwater monitoring stations (e.g. southwest quadrant of the SPA and PSA). I am aware of existing groundwater monitors in this area and possibly others that I can share with your hydrogeology team. I have spoken with Steve Davies of Matrix regarding this possibility.	3. We have not provided all the information on the map in the work plan and have subsequently reviewed existing data with B.B.	3. No
4. I am concerned that there may be insufficient groundwater monitoring locations necessary to refine the Hanlon Creek-Mill Creek groundwater-shed divide. Again, I can review this with your hydrogeologists and determine if there are existing monitors, or possibly additional monitors, that could assist with this important aspect of the hydrogeological characterization.	4. The location of the Matrix MWs and available consultant wells within the PSA including the new monitors that have or will be installed in spring 2017 have been reviewed. It was agreed that there is a reasonable amount of data to interpret the flow divide on a regional scale. If, in the impact assessment, the modelling identifies significant uncertainty with the groundwater flow divide that could affect the results of the impact analysis, this may need to be revisited.	4. Yes
5. As part of the pre-development monitoring that was done in support of the Clairfields/Westminster Woods/Pine Ridge development sites, there was continuous flow monitoring conducted in an upper reach of Hanlon Creek (i.e. close to the northwest boundary of Clairfields). If this station remains, or could be rehabilitated, it may address the identified surface water flow monitoring gap. This station was used to calibrate a groundwater flow model of these development sites and beyond. I can provide more details to the consultant team.	5. Continuous flow monitoring data is welcomed.	5. Yes
<b>TAG Member (M.G.), February 6, 2017</b>		
1. It would be helpful to see a schedule of the Phase 1 characterization component, to see how the various tasks fit in with the proposed monitoring efforts and field seasons.	1. To be provided separately by City.	1. No
2. Can a copy of the City's Tier 3 Water Budget study be made available to TAG members?	2. Link to GRCA's website that houses the Tier 3 Water Budget Study. <a href="https://www.sourcewater.ca/en/source-protection-areas/Guelph-and-Guelph-Eramosa-Tier-3.aspx">https://www.sourcewater.ca/en/source-protection-areas/Guelph-and-Guelph-Eramosa-Tier-3.aspx</a>	2. No
3. I understand the water quantity/quality monitoring was based on the local hummocky moraine hydrogeology and therefore favors wetland hydrology/hydraulics. However, I am concerned that there is no mention of geomorphology. It is important to ensure that development will not negatively impact water quantity/quality under baseline conditions, but I think some consideration of the sediment supply needs to be factored into the assessment of receiving watercourses. I don't believe TSS alone can characterize this, but I think a few particle size distributions and substrate sampling analyses in selected watercourses coupled with a simple geomorphologic assessment might be warranted.	3. Area is generally devoid of high energy stream systems; it is likely that the preliminary headwater drainage feature assessment included in the updated work plan will address this point.	3. Yes
4. Lastly, for Phase 2, I was wondering how climate change scenarios might be addressed in this study.	4. See earlier response.	4. No
<b>TAG Member (P.J.), February 10, 2017 – Natural Heritage System</b>		
1. Consider characterizing the natural heritage system as 'green infrastructure' using the Province's asset management framework.	1. This adds a fiscal and infrastructure component to the work scope not currently considered (ref. Natural Capital)  The City is currently discussing opportunities to conduct a Natural Assets analysis. Although this may not be done directly as part of the Clair-Maltby Secondary Plan and MESP, this may be a recommendation from the Study that the City consider this going forward as part of its long range asset management planning.	1. No
2. Ron S mentioned the Natural Capital study he is working on in Oakville. As part of the characterization it would be useful to conduct an assessment of all relevant direct and indirect costs and benefits associated with the NHS or Green Infrastructure	2. See above.	2. No



**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
<p>3. This assessment would support evaluating different options in Phase 2. For example, which option provides the best service levels? Is it more cost effective to protect lands then to try and replicate their function through 'engineered assets' such as SWM ponds or LID? What are the life cycle costs associated with expanding a forested area vs a stormwater management pond designed to provide the same function? The Lake Simcoe Region Conservation Authority conducted a study in 2010 that examined the efficiency of almost 100 stormwater management ponds within the watershed. The study found that more than half of the ponds were not providing the required level of service (i.e. phosphorous reduction). Municipalities are struggling with keeping up the maintenance and operation of engineered facilities and it will only become worse as more infrastructure is brought on-line.</p>	<p>3. See above; Note that this can be quite complex.</p>	<p>3. No</p>
<b>TAG Member (P.J.), February 10, 2017 – Compensation</b>		
<p>1. Look at other areas of the city that were built with minimal stormwater controls and need to be retrofitted. Based on retrofit plans and the associated costs can you achieve the same benefits by protecting lands within the study area? How do the LCC compare between retrofitting an existing pond, building a new pond or retrofitting with LID features or protecting existing undeveloped lands within study area?</p>	<p>1. With respect to SWM approaches the MESP is to establish a SWM approach/hierarchy utilizing a treatment train or other methods. Opportunities to maintain or replicate ecosystem functions through SWM design will be considered through this process. Assessment of the broader community beyond the boundaries of Clair-Maltby is out of scope for this project.</p>	<p>1. No</p>
<p>2. The same could be considered for Well Head Protection Areas and compensation for (WHPA-Qs).</p>	<p>2. The Source Protection Committee has not yet developed water quantity policies with respect to WHPA Qs. Development of policies for Guelph as part of the Source Water Protection Plan for the Grand River Watershed will be developed concurrently to the Clair-Maltby project. City staff involved in the Water Quantity policy development are also part of the Steering Committee of this project and this will support alignment of these projects.</p>	<p>2. No</p>
<p>3. Are there flooding and erosion issues downstream of the study area that could be improved through restoration techniques within the study area?</p>	<p>3. This is being determined through this study.</p>	<p>3. No</p>
<b>TAG Member (P.J.), February 10, 2017 – Integrated Water Management / 'One Water Approach'</b>		
<p>1. How could the Secondary Plan be developed so that it supports the Water Opportunities Act?</p>	<p>1. As established through the City's Water Efficiency Strategy Guelph is committed to finding ways to reduce water use and enhance water conservation. The City has also raised concerns through other Provincial initiatives (including the review of the Growth Plan for the Greater Golden Horseshoe) recognising existing legislative barriers to community planning and infrastructure design that need to change in order to pursue a more holistic and sustainable approach with respect to water and infrastructure management. Opportunities to incorporate water efficiency and conservation through Clair Maltby can be considered, but will also need to be achievable and legislatively permissible. How to achieve this balance will need to be further examined as the project moves forward.</p>	<p>1. No</p>
<p>2. When characterizing the study area consider a 'one water' approach and take a holistic and integrated approach to water management. What sorts of linkages could be made between stormwater/wastewater/drinking water systems at the characterization phase? How could the area be developed so that we are keeping water local? Moving away from a centralized approach to servicing and more towards a decentralized approach. Could wastewater be treated through decentralized facilities and injected back into the ground rather than being piped long distances to a central system? Why are we pumping groundwater for potable/non-potable use, treating it and then sending it to the surface water system. How could we look at putting it back into the ground? This</p>	<p>2. See above</p>	<p>2. No</p>

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
could result in the need for less infrastructure to build and less infrastructure to operate/maintain/renew/rehabilitate/dispose of/etc.		
3. Municipalities are facing enormous infrastructure deficits and struggle with the on-going infrastructure operation and maintenance costs. Consider looking at an integrated stormwater/wastewater/water servicing plan that results in less infrastructure and lower life cycle costs to the city of Guelph. To do this successfully, are there things we need to understand at the characterization phase to make this work? Is there potential to reduce the energy footprint of water for the study area (water and sewage infrastructure is one of the largest energy costs for municipalities)?	3. See above	3. No
4. If a one water approach is taken for the study area this could mean deferred costs for the need to upgrade existing centralized systems and extend the useful life span of existing infrastructure.	4. See above	4. No
<b>TAG Member (A.C.), February 9, 2017</b>		
1. Page 26 iv. Significant Landform “Criteria and principles will be developed to help ensure appropriate integration of these protected Significant Landform areas within the Secondary Plan Area and immediately adjacent lands. These will include consideration of, and reference to; grading, <b>landform visual character</b> , sight lines, construction design conditions both in the adjacent lands area and for linear/site infrastructure on the moraine, road orientation, and restoration.” We were advised at the meeting that no new criteria would be introduced beyond what was approved as part of OPA No. 42. However, the visual character of landform was not part of OPA No. 42 and should be deleted from the work program.	1. The Significant Landform assessment being completed through the CEIS exercise is focused on understanding, refining and eventually (in a later phase) providing direction on how the adjacent land transition areas between Significant Landform and future development will work. This is intended to support appropriate integration of Significant Landform through the Secondary Plan for Clair Maltby. No changes to the criteria used to identify SL will be changed through this process. However, the City may consider new approaches, guidance and/or policies for integration of Significant Landform through the Secondary Planning process to assist with the refinement of the adjacent lands/ transition areas to support achievement of the objectives for Significant Landform, including the protection of the City’s geologic and aesthetic uniqueness (i.e. visual character).	1. No
<b>TAG Member (K.C.), February 13, 2017 - Points of Clarification</b>		
The following items were not clearly explained in the document.		
1. Context to the work completed in the area thus far and applicable policies (e.g. Natural Heritage) would be helpful in putting boundaries on the requirements of the work plan.	1. Context regarding the existing NHS and related policies already in place to be provided in the revised Work Plan.	1. Yes
2. What limitations to the understanding of the functions of terrestrial features and identification of species at risk, if any, are anticipated by having only one season of vegetation data collection? (page 8, paragraph 1).	2. Clarification to be provided related to the limitations of having a single season of vegetation data collection in the revised Work Plan.	2. Yes
3. In what season will the pond surveys be conducted? It is understood fisheries and benthic data collections is not warranted for these features. What is the scope of the characterization of these features? (page 8, paragraph 1).	3. Wetland surveys are to be conducted three times over the year – spring, summer and fall. Water levels and quality are to be measured. Clarification to be provided in the revised Work Plan.	3. Yes
4. Will invasive species be identified in the botanical surveys? (page 8, paragraph 2)	4. Abundant presence or significant patches of invasive species observed during ELC / botanical surveys are to be documented. Clarification to be provided in the revised Work Plan.	4. Yes
5. How many nights will be dedicated for amphibian monitoring, particularly salamander movement? Will salamander movement between features internal to the development boundary be surveyed? Have drift fence surveys been considered to assess salamander movement? Will egg mass surveys be completed in suitable habitats (ponds) within the development boundary? (page 9, paragraph 3)	5. Six evenings in 2017 will be dedicated to amphibian call surveys, and an additional four evenings / early mornings will be dedicated to road mortality surveys. Egg mass surveys will be completed in selected wetlands/ponds where access has been provided in conjunction with water quality monitoring in the early spring. Drift fence surveys will not be undertaken, and salamander movement between features within the SPA will not be assessed as part of this work.	5. Yes

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
6. Are migratory birds a concern in this area? (page 10, paragraph 4)	6. The SWH criterion for landbird migratory stopover areas for Ecoregion 6e are woodlands greater than 10 ha within 5 km of Lake Ontario. So although migratory birds certainly do pass through the Guelph area, it is not considered a significant area for such activity.	6. No
7. Have temperature (loggers) and visual inspection for groundwater indicators been considered to better understand the connection between surface and groundwater? (page 11, paragraph 3)	7. Yes, water levels and temperature within selected wetlands will be measured continuously with temperature loggers, and mini-piezometers have also been installed in those same locations to better understand the connection between surface and groundwater.	7. Yes
8. What was considered in determining the “major” wetlands/ponds within the PSA? This a characterization of the ecological values or size (surface area, depth) of the feature? (page 14, paragraph 4)	8. It will be clarified that the wetlands/ponds within the PSA were selected based on the desire to include samples: <ul style="list-style-type: none"> <li>a. from a representative selection of wetlands located within or immediately adjacent to the PSA, as well as falling within both the Hanlon and Mill Creek Subwatersheds;</li> <li>b. from wetlands expected to be protected for the long-term, therefore within confirmed Provincially Significant Wetlands (PSWs);</li> <li>c. from wetlands expected to have standing water in them all year round, even in dry years;</li> <li>d. from a representative selection of wetlands within different land use contexts (e.g., agricultural, natural, near roads); and</li> <li>e. in proximity to proposed groundwater stations to allow for integration and comparison of the surface water and groundwater data from the same wetlands.</li> </ul>	8. Yes
9. What <b>opportunities</b> should be considered in the conceptual community structure analysis? (page 20, paragraph 1)	9. Opportunities will consider various terms of contemporary stormwater management and Environmental Management including complementary land uses.	9. No
<b>TAG Member (K.C.), February 13, 2017 - Recommendations</b>		
1. A table showing the types of surveys being undertaken, locations/habitat types, time of year for data collection, methodology for assessment would clarify the proposed data to be collected and complement the Figure 2 showing access locations.	1. Summary table to be introduced in the Revised Work Plan	1. Yes
2. Consideration for the migratory birds convention act timing windows should be integrated into the construction phasing schedule as development proceeds. (page 10, paragraph 4)	2. This will not be a consideration for this study as there will be no development specifically proposed or approved as part of the Secondary Plan process. Notably, the City already practices and requires compliance with the MBCA on all development projects.	2. No
3. There is some repetition in the text between the surface water and groundwater field studies. At minimum the explanation of the surveys should be consolidated in one section and referred to in other sections as applicable. (page 11, paragraph 4)	3. An effort will be made to clarify and consolidate in the Revised Work Plan.	3. Yes
4. The Headwater Drainage Feature Assessment (TRCA) is a well-researched and tested guide for assessing headwater features and their functions. This document should be considered to assess headwater drainage features. (page 11, paragraph 4)	4. Agreed. See response to GRCA comment #7.	4. Yes
5. Credit Valley Conservation recently presented their methodology for determining low flows at the Natural Channel Conference (2016). This methodology used the area velocity logger in conjunction with a trail camera and staff gauge to verify the data collected using the logger. This methodology is recommended where flows are anticipated to be difficult to capture or where the hydrology may be unpredictable (e.g. diversion, wetlands) (page 11, paragraph 5; page 13, paragraph 2)	5. <i>Beacon – waiting for input from S Gorenc who is off this week</i>	5. No
6. The annual summary of field study data and mapping is a good opportunity to propose adjustments to surveys based on new information or new access to lands.	6. Agreed. Comment will be incorporated into the work plan.	6. Yes Can be reviewed each year
7. Constraints and opportunities identified in the Conceptual Community Structure Analysis should include significant wildlife habitat and significant woodlands. (page 20, paragraph 1)	7. Agreed, although these may be presented in terms of the overall NHS and not broken down by category.	7. No

**APPENDIX A: Matrix of Comments and Responses on the Draft Technical Work Plan for the Clair-Maltby CEIS**

Comment	Response	Work Plan to be Revised (yes/no)
8. The Conceptual Community Structure Analysis should include opportunities such as integration of green infrastructure and open spaces with the natural heritage system/features and restoration opportunities. The list provided focusses mostly on constraints. (page 20, paragraph 1)	8. Agreed	8. No
9. The natural heritage characterization should include appropriate mapping of the features and functions. Wildlife corridors should be identified. Page 21, paragraph 1)	9. Agreed	9. No
10. Identify enhancement/restoration opportunities should consider enhancement of wildlife corridors as well as habitat quality improvements to mitigate the effects of development to improve resiliency. Invasive species control should also be considered to mitigate the opportunities to spread once the site is disturbed. (page 22, paragraph 2)	10. Agreed	10. No
11. A discussion regarding opportunities and constraints for LID should be included in the surface water sections to compliment the discussion on stormwater management. It is suggested that LID and other green infrastructure be noted as opportunities to enhance the natural heritage system in the natural heritage section. (page 26, paragraph 3)	11. Agreed	11. No
12. The study should identify data gaps to be addressed in future studies where access is currently not granted.	12. Agreed	12. No
<b>Verbal Comments from TAG Meeting, February 7, 2017</b>		
1. Beneficial to have a 1 page outline on the comprehensive environmental impact study to show how it fits with the rest of the project/process [update the intro of the CEIS to include this?]	1. Agreed	1. Yes (change to document)
2. Discussion regarding historic Jefferson salamander populations south of Maltby Road and consultation with MNRF [include paragraph in CEIS to reference the MNRF email?]	2. The correspondence from MNRF regarding Jefferson Salamander can be provided on request.	2. Yes
3. Genetic testing for amphibians	3. We will contact Dr. Bogart about his willingness to undertake genetic sampling of any dead blue-spotted salamanders encountered during the course of our field studies. IF he is in agreement, we will provide him with these specimens.	3. Yes
4. Consultant team to review what version of contour mapping is being used [update the CEIS to indicate which version of contour mapping is being used?]	4. Matrix used the 2012, 0.5m contours provided by the City, which were converted into a 5 m DEM for the landform analysis. We can discuss whether a more refined resolution is required.	4. Yes
5. Should have a landscape architect on the study team to provide an aesthetic evaluation of significant landform	5. The visual character of the Paris Moraine, and in particular of the identified Significant Landform, in the Secondary Plan area will be one of several considerations in the analyses and recommendations made by D. Cowell on our team.	5. No
6. Discussion about natural capital and how to monetize it	6. See earlier comments.	6. No



## **Appendix B**

### **Property Access Information Session Notice**

May 10, 2016

**Clair-Maltby  
Master Environmental Servicing Plan (MESP)  
and Secondary Plan**

**Landowners Information Meeting – Property Access Permission**

An information session is being held for this project with landowners within the Clair-Maltby Secondary Plan area. Please attend to ask questions and provide comments in order to better understand the request for access to your property for this study.

**Thursday, May 26, 2016**

Settlers Room, Clair Road Emergency Services Centre, 160 Clair Rd W  
7-8:30 p.m. (presentation at 7:30 p.m.)

The City of Guelph is undertaking the Clair-Maltby MESP and Secondary Plan Study in order to comprehensively plan the last unplanned greenfield area of the City. The MESP and Secondary Plan is the process that Council has approved to appropriately address the complexity of planning for development of this area. The MESP offers an integrated approach that coordinates the requirements of both the Environmental Assessment Act and the Planning Act, and will provide the technical data to inform the Secondary Plan. The Secondary Plan will establish the appropriate range and mix of land use designations, and confirm transportation and servicing needs to help achieve the City's overall vision for a complete and healthy community.

As part of the Clair-Maltby MESP and Secondary Plan, it will be important to gather data related to groundwater, surface water, and natural heritage within the study area, as well as in some areas surrounding the study area. This data collection is being referred to as baseline monitoring. The overall intent is to gather enough information to inform planning, but not to supplant the more detailed site-specific studies that will be required at a later stage. Where possible, the consulting team will rely on data that has been and/or is being collected already. This will be supplemented, where permission is provided, with data collected by the Consulting Team.

The monitoring activities will have several different components and will be undertaken from approximately June 2016 to the end of 2019. Some of the monitoring will be continuous over this period, and some will be restricted to appropriate timing windows. The precise locations of the different monitoring components are still to be determined and will depend on where there are gaps in the available data, where the different biophysical conditions occur, and where property access is provided.

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We are writing to request your permission, as a property owner in the Clair-Maltby MESP and Secondary Plan area, to allow representatives from the following members of the City's Consultant Team for this study, to periodically access your property.

The City's consultants will be carrying identification and a permission letter from the City. Such access, particularly for natural heritage matters, may include site visits during early morning (e.g., for bird surveys) and/or evenings (e.g., for calling frogs), particularly in the spring. Other activities may include installation of gauges to monitor water levels in creeks and wetlands. There will also be a need to have monitoring wells on a few properties to determine the fluctuation of groundwater levels in the area. Once permissions have been received, and available information about ongoing monitoring has been provided, the Consulting Team will develop a work plan, in consultation with the City and agencies that confirms the monitoring locations for the various activities. This will be provided to those who have given permission for access.

**We request that you complete and sign the attached forms to indicate whether or not you will permit access to your property, and to advise of any conditions with respect to access.** Forms can be submitted at the Information Meeting or mailed to City Staff as per contact information provided below.

**If you have questions regarding how this may or may not impact you as a property owner, please attend the Information Meeting on May 26, 2016.** If you have questions prior to the meeting or if you are unable to attend the Information Meeting, please contact Stacey Laughlin or Arun Hindupur by emailing [clair-maltby@guelph.ca](mailto:clair-maltby@guelph.ca) or:

**Stacey Laughlin**, MCIP, RPP  
Senior Policy Planner  
519-822-1260 x 2327

**Arun Hindupur**, M.Sc., P. Eng.  
Infrastructure Planning Engineer  
519-822-1260 x 2282

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**Clair-Maltby  
Master Environmental Servicing Plan (MESP)  
and Secondary Plan**

**Property Access**

*To provide permission to access your lands, with or without conditions, please complete the following:*

We the undersigned owners of \_\_\_\_\_  
(address of property)

hereby confirm that members of the City of Guelph’s Consultant Team for the Clair-Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan from the firms of Amec Foster Wheeler, Beacon Environmental and Matrix Solutions may access the subject property.

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**OR**

*To deny permission to access your lands, with or without conditions, please complete the following:*

We the undersigned owners of \_\_\_\_\_  
(address of property)

hereby confirm that members of the City of Guelph’s Consultant Team for the Clair-Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan may not access the subject property at this time.

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

(continued on next page)

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**Clair-Maltby  
Master Environmental Servicing Plan (MESP)  
and Secondary Plan**

**Property Access Conditions** \_\_\_\_\_  
(address of property)

If you have provided permission for access but wish to add some conditions to this access, please provide information for a contact and complete the following pages:

Contact Person: \_\_\_\_\_

Email: \_\_\_\_\_

Telephone: \_\_\_\_\_

***Type of Notification Required***

The above undersigned hereby permit access with the following condition(s):

- As required without notification
- Following email notification\*
- Following email notification\* with landowner or representative in attendance
- Following telephone notification\*
- Following telephone notification\* with landowner or representative in attendance
- Subject to the following conditions not specified above

\_\_\_\_\_  
\_\_\_\_\_

\* Notification, if requested, will be provided at least 12 hours in advance of each site visit.

***Type of Monitoring Permitted***

The above undersigned hereby give permission to the following types of monitoring on their property:

- Surface water gauges (note these are installed by hand; no drilling is required)
- Mini-piezometers (note these are installed by hand; no drilling is required)
- Groundwater wells (note drilling is required)
- Amphibian surveys (in person visits three times between late March and late June in the evenings)

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- Bird surveys (in person visits two to three times between mid-May and early July in the early morning)
- Plant and vegetation community surveys (in person visits two or three times between mid-May and early September in the early morning during the day)

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## **Appendix C**

### **MNRF Guidance Related to Complexing Provincially Significant Wetlands**

## Appendix C: Wetland Mapping Guidance from MNRF and GRCA

*The following guidance has been compiled from a series of emails from Melinda Thompson, Management Biologist at the Ministry of Natural Resources and Forestry (MNRF) Guelph District and Anthony Zammit (Ecologist, GRCA) between January 11, 2017 and January 13, 2013 provided as follow-up to a technical meeting on January 11, 2017 where appropriate approaches for reviewing and updating wetland mapping in the Clair-Maltby Secondary Plan Area were identified.*

The focus of this guidance is on how to deal with unevaluated wetlands smaller than 2 ha, since, as stated in the *Ontario Wetland Evaluation System (OWES) Guidelines (2013)*:

“Note that wetland units less than 2 ha in size may be included as part of the [Provincially Significant Wetland] complex. Such tiny wetlands may be recognized when, in the opinion of the evaluator, the small wetland pocket may provide important ecological benefit. Some examples of such benefits would be: a grassy area used by spawning pike; an area containing a community or specimen of a rare or unusual plant species; a seepage area in which a regionally or provincially significant plant or animal species is found; or a wetland which strengthens a corridor link between larger wetlands or natural areas. The evaluator must attach to the Wetland Data Record a brief documentation of the reasons for inclusion of those areas less than 2 ha”.

The following are the general criteria used by MNRF to assess wetlands units under 2 ha in size for inclusion into a Provincially Significant Wetland complex. Wetlands under 2 ha can be included if they fulfil one or more of the following criteria (M. Thompson, MNRF, email correspondence dated January 11, 2017):

1. Occur in site districts where wetlands are very rare or rare (score of 60 or 80 points in the rarity within the landscape category - see Table 4, Section 4.1 in the OWES Manual). In these site districts, wetlands are so rare that small wetlands take on added importance and in some parts of the district may constitute the majority of wetlands.
2. Support wetland types not well represented elsewhere in a wetland complex, covering 10% or less of the total wetland area (i.e., open water wetlands in a wetland complex that largely supports deciduous swamps, a graminoid marsh wetland in a wetland complex that is largely cattail marsh, etc.). These less frequent wetland types will add to the biodiversity of the wetland complex and will support flora and fauna not in the more dominant wetland types in the wetland complex.
3. Sustain significant species/communities (i.e., rare or uncommon species/communities at the local, regional or provincial/national level based on species lists noted in the OWES Manual or approved by MNRF District office and Natural Heritage Information Centre (NHIC) lists for fauna, flora and communities; conservation priority bird species as defined by Bird Studies Canada; or species tracked by the NHIC).
4. Function as amphibian breeding areas.
5. Function as migratory waterfowl stopovers, summer feeding areas or waterfowl breeding areas.
6. Are headwater source areas or contribute base flows to watercourses.
7. Are hydrologically connected to larger wetlands.
8. Provide intervening wetland habitat between larger wetlands thereby acting as wildlife stepping stones.
9. Are part of a larger wetland divided by a road, driveway, trail, or utility corridor.
10. Are kettle wetlands, an uncommon wetland, restricted to moraines (i.e., most kettle wetlands are small and on some parts of a moraine constitute the majority of wetlands).
11. Occur along corridors.

## Appendix C: Wetland Mapping Guidance from MNRF and GRCA

Notably, in order to be subject to these criteria the feature must qualify as a “wetland” by MNRF and GRCA.

OWES defines wetlands as:

“Lands that are seasonally or permanently flooded by shallow water as well as lands where the water table is close to the surface; in either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic or water tolerant plants”. (MNRF 2013)

If a small waterbody is considered a “pond” rather than a “wetland” according to the joint agency guidance provided in Scenario 6 of the Grand River Watershed Wetland Evaluation Protocol (GRCA *et al.*, 2005) then it may not be subject to these complexing criteria.

Wetlands are defined by GRCA as land that:

- “is seasonally or permanently covered by shallow water or have a water table close or at the surface,
- directly contributes to the hydrological function of a watershed through connection with a surface watercourse,
- has hydric soils, the formation of which have been caused by the presence of abundant water, and
- has vegetation dominated by hydrophytic plants or water tolerant plants, the dominance of which has been favoured by the presence of abundant water

but does not include periodically soaked or wet land that is used for agricultural purposes and no longer exhibits wetland characteristics (Conservation Authorities Act, R.S.O. 1990, c. 27, s. 28, ss. 25)”.

Appendix 8 of the OWES Manual (2014) provides the following quantitative criteria to help assess water bodies:

- If water depth  $\leq 2$  m, then must have  $>10\%$  vegetation cover to be considered a wetland
- If water depth  $\geq 2$  m, then must have  $>25\%$  vegetation cover to be considered a wetland

In addition, Appendix B, Scenario 6 of the the Grand River Watershed Wetland Evaluation Protocol (GRCA *et al.*, 2005) states:

“The test to determine if open water bodies should be considered to be wetlands is the presence of wetland function. Open water areas that are presumed not to perform some wetland function should not be considered to be wetland. Open water bodies that do not contain wetland vegetation because of turbidity caused by intrusion of livestock or annual draw-down of waterbody by the landowner should not be considered to be wetlands. Similarly, storm water ponds, irrigation ponds and golf course ponds should not be included. Naturalized dug or dammed ponds may be considered to be wetlands. In making these decisions, MNR[F] typically does not differentiate between natural and man-made open water bodies”.



## **Appendix D**

### **Road Mortality / Movement Form**









## **Appendix E**

### **Amphibian Data Form**

# Amphibian Data Form



## Visit Information

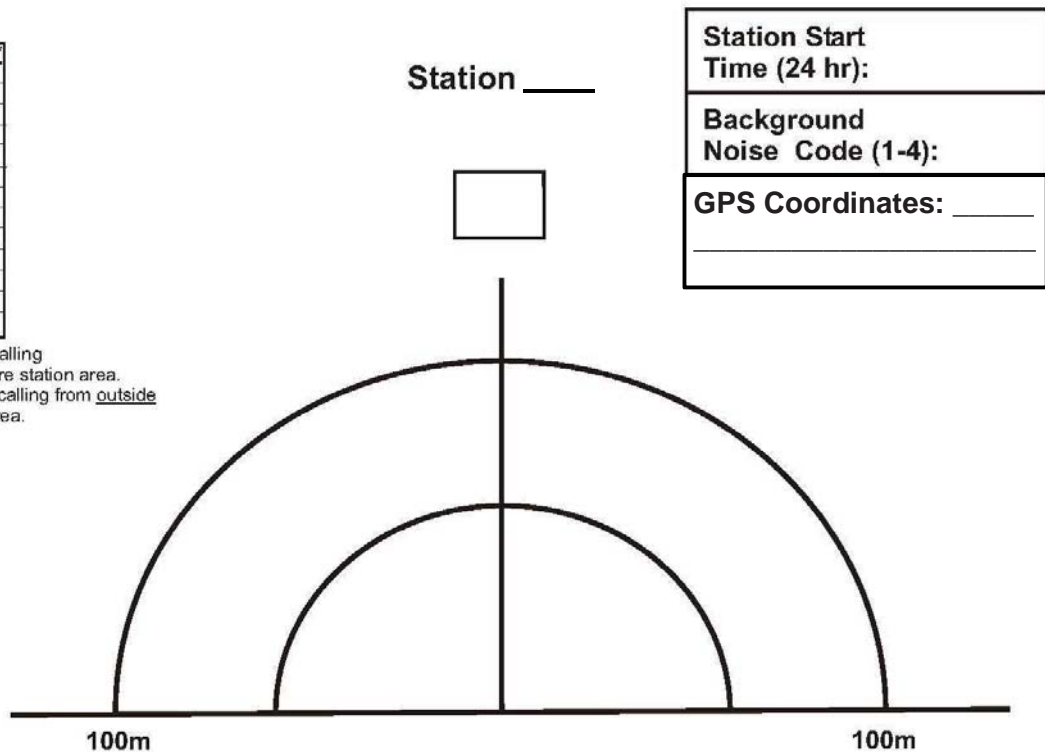
Project Name: _____	Project #: _____
Observer Name: _____	Visit #: _____
Date: _____	Cloud Cover (%): _____
Temperature (°C): _____	Beaufort Wind Scale (0-6): _____
Precipitation (check one): <input type="checkbox"/> None/Dry <input type="checkbox"/> Damp/Haze/Fog <input type="checkbox"/> Drizzle <input type="checkbox"/> Rain	

## Call Level Codes

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

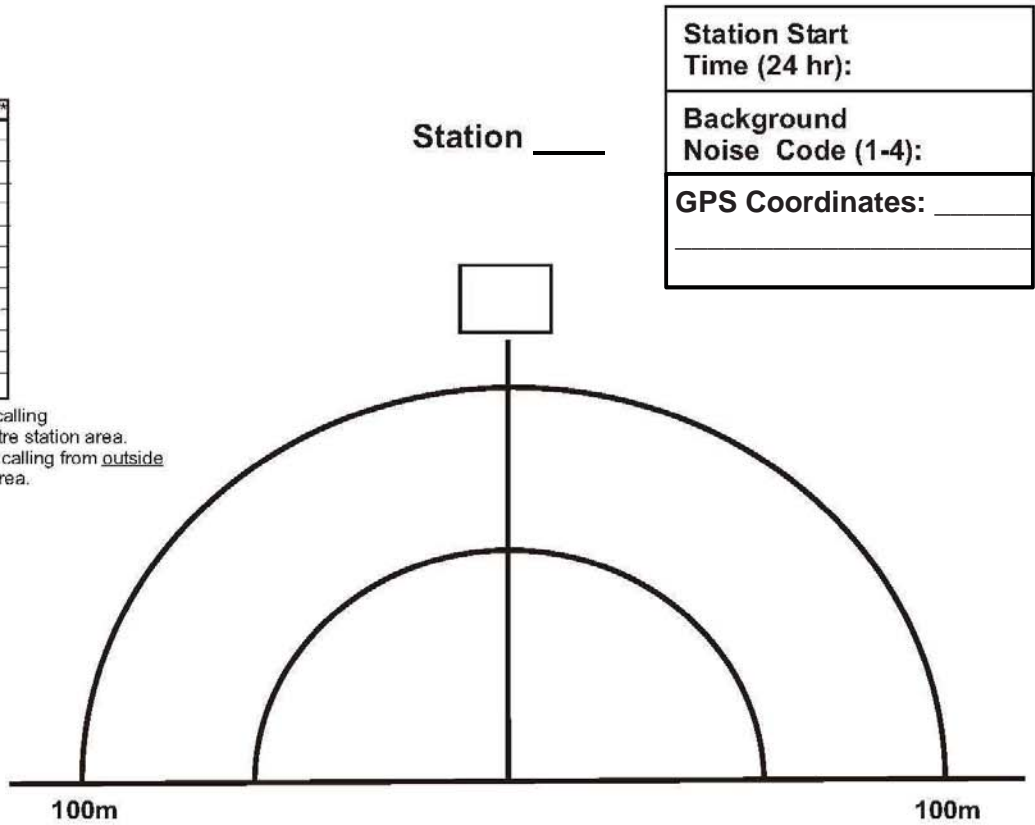
Species	In*	Out**
AMTO		
BCFR		
BULL		
CHFR		
CGTR		
FOTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

\* Check if species is calling from inside 100-metre station area.  
 \*\* Check if species is calling from outside 100-metre station area.



Species	In*	Out**
AMTO		
BCFR		
BULL		
CHFR		
CGTR		
FOTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

\* Check if species is calling from inside 100-metre station area.  
 \*\* Check if species is calling from outside 100-metre station area.



**Amphibian Species Codes**

Species	Code
American Toad	AMTO
Northern (Blanchard's) Cricket Frog	BCFR
Bullfrog	BULL
Chorus Frog	CHFR
Cope's (Diploid) Gray Treefrog	CGTR
Fowler's Toad	FOTO
Gray (Tetraploid) Treefrog	GRTR
Green Frog	GRFR
Mink Frog	MIFR
Northern Leopard Frog	NLFR
Pickerel Frog	PIFR
Spring Peeper	SPPE
Wood Frog	WOFR

**Background Noise Codes**

Index	Description
0	No appreciable effect (e.g., owl calling)
1	Slightly affecting sampling (e.g., distant traffic, dog barking, car passing)
2	Moderately affecting sampling (e.g., distant traffic, 2-5 cars passing)
3	Seriously affecting sampling (e.g., continuous traffic nearby, 6-10 cars passing)
4	Profoundly affecting sampling (e.g., continuous traffic passing, construction noise)

**24 Hour Time**

<u>12 Hour</u>	<u>24 Hour</u>	<u>12 Hour</u>	<u>24 Hour</u>
7:00 PM	1900	10:00 PM	2200
8:00 PM	2000	11:00 PM	2300
9:00 PM	2100	12:00 PM	2400

**Beaufort Wind Scale**

Number	Wind Speed		Indicators
	Km/h	Mph	
0	0-2	0-1	<b>Calm</b> , smoke rises vertically
1	3-5	2-3	<b>Light air movement</b> , smoke drifts
2	6-11	4-7	<b>Slight breeze</b> , wind felt on face
3	12-19	8-12	<b>Gentle breeze</b> , leaves and small twigs in constant motion
4*	20-30	13-18	<b>Moderate breeze</b> , small branches are moving, raises dust and loose paper

\* Winds over Beaufort 3 are unacceptable for amphibian surveys.



## **Appendix F**

### **Breeding Bird Station Data Form**

# Breeding Bird Station Mapping Card

Project #: \_\_\_\_\_ Project Name: \_\_\_\_\_ GPS Co-ord.: \_\_\_\_\_

Date: \_\_\_\_\_ Surveyor: \_\_\_\_\_

Time Started: \_\_\_\_\_ Time Ended: \_\_\_\_\_ Point Number: \_\_\_\_\_

Slope: Vertical

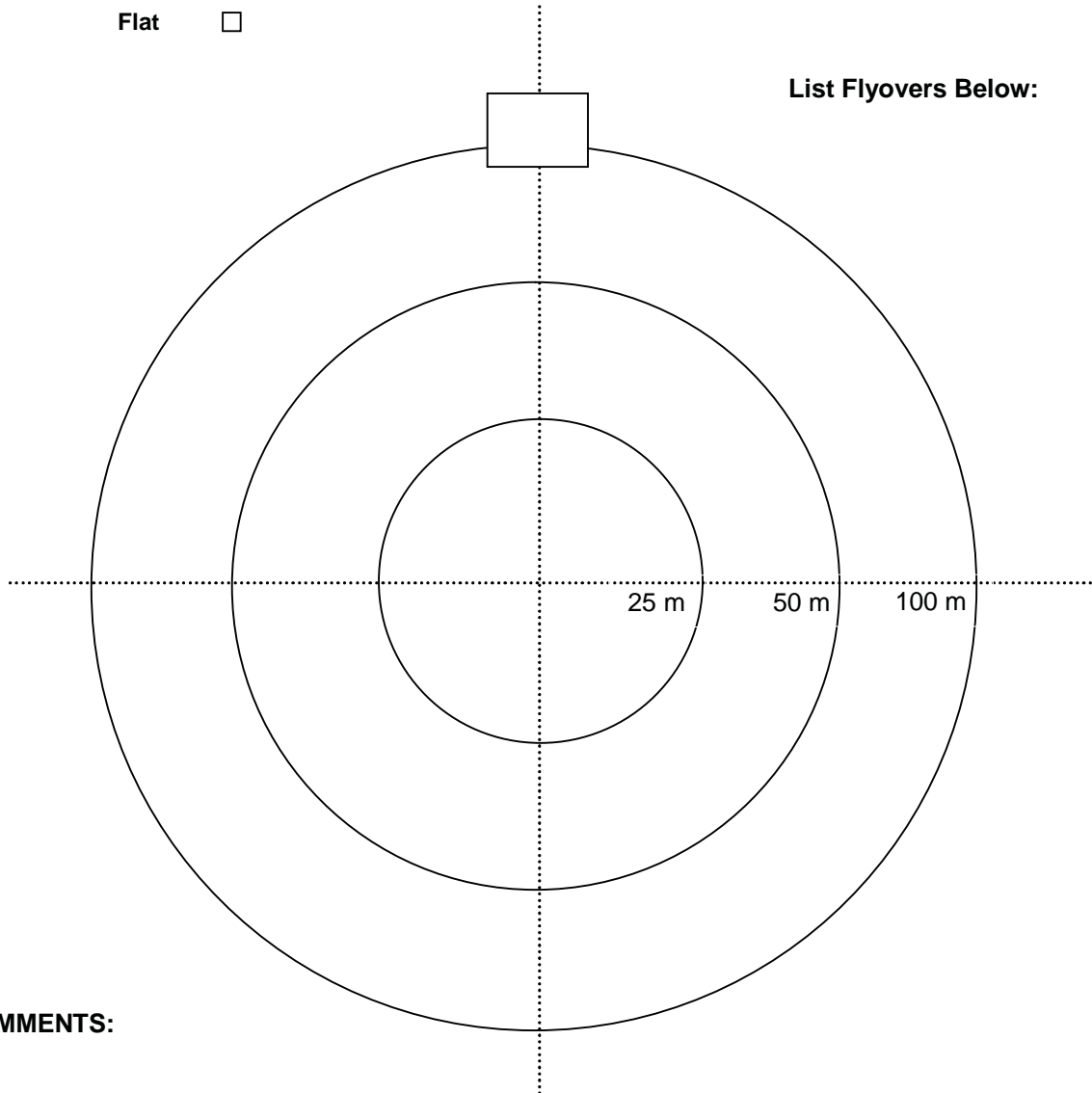
Steep

Gentle

Flat

Direction slope faces (Aspect) (ex. NE): \_\_\_\_\_

List Flyovers Below:



COMMENTS:

CLASSIFY HABITAT (within 100 m):

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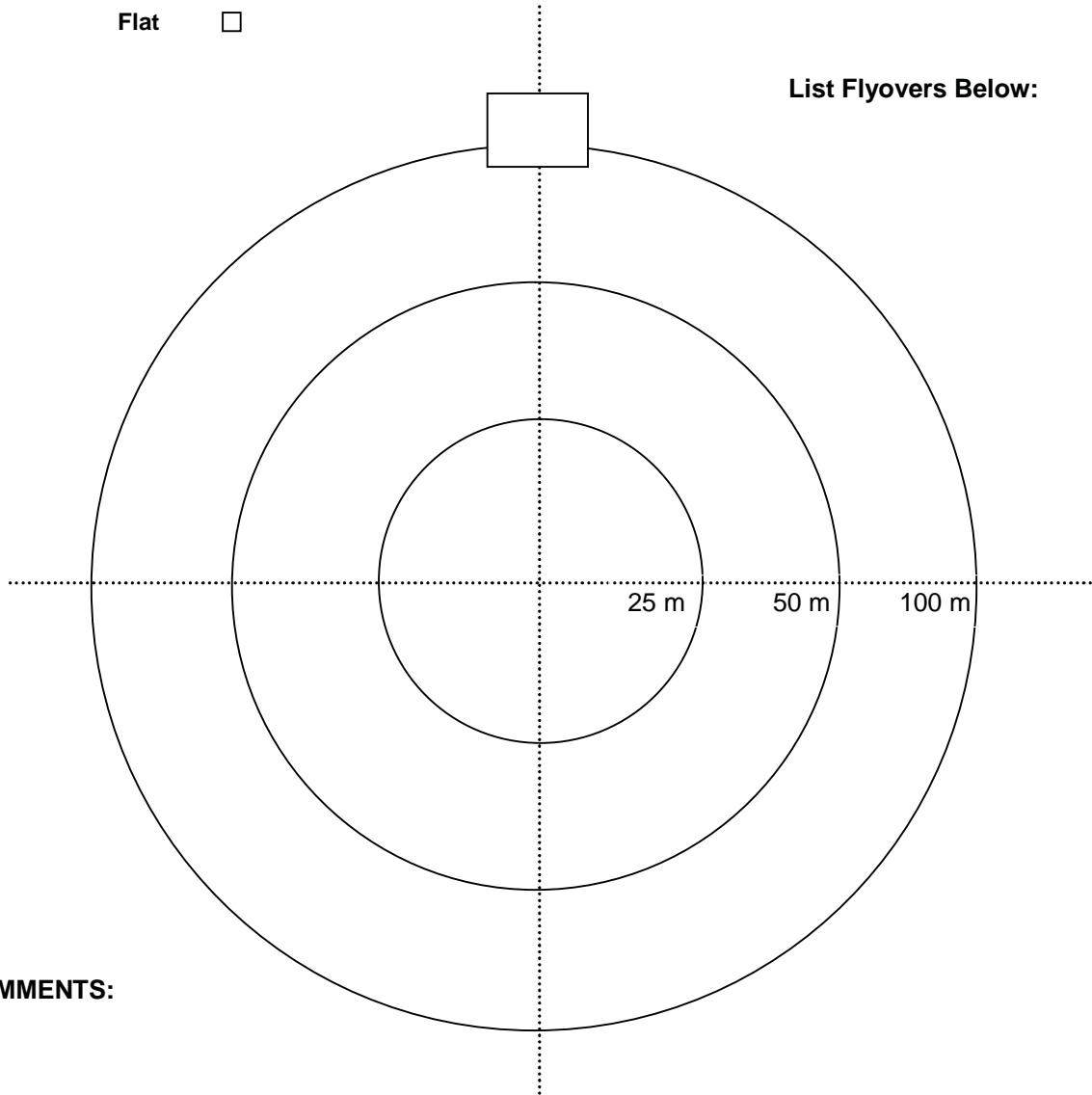
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# Breeding Bird Station Mapping Card

Project #: \_\_\_\_\_ Project Name: \_\_\_\_\_ GPS Co-ord.: \_\_\_\_\_  
 Date: \_\_\_\_\_ Surveyor: \_\_\_\_\_  
 Time Started: \_\_\_\_\_ Time Ended: \_\_\_\_\_ Point Number: \_\_\_\_\_

Slope: Vertical   
 Steep  Direction slope faces (Aspect) (ex. NE): \_\_\_\_\_  
 Gentle   
 Flat

List Flyovers Below:



COMMENTS:

CLASSIFY HABITAT (within 100 m):

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