APPENDIX A – Terms of Reference

Terms of Reference

Local Subwatershed Study Terms of Reference

Mayfield Tullamore Secondary Plan

Town of Caledon, Peel Region, Ontario

Submitted to:

Mayfield Tullamore Landowner Group Inc.
c/o Development Collective
Attn: Kim Beckman, MTLOG Group Manager

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Issues and Revisions Registry

Identification	Date	Description of Issued and/or Revision
First Submission	May 2024	
Second Submission	August 2024	Addresses agencies comments from the Town of Caledon, Region of Peel and Toronto and Region Conservation Authority.

Statement of Conditions

This Report / Study (the “Work”) has been prepared at the request of, and for the exclusive use of, the Owner / Client (Mayfield Tullamore Landowner Group), and its affiliates (the “Intended User”). No one other than the Intended User has the right to use and rely on the Work without first obtaining the written authorization of GEI Consultants Ltd. and SCS Consulting Group Ltd., and its Owner. GEI Consultants Ltd. and SCS Consulting Group Ltd. expressly exclude liability to any party except the Intended User for any use of, and/or reliance upon, the work.

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1. Introduction

GEI Consultants Ltd. (GEI) and SCS Consulting Group Ltd. (SCS), are working on behalf of the Mayfield Tullamore Landowner Group Inc. (MTLOG) in support of an official plan amendment to the Town of Caledon's Official Plan. The MTLOG lands are approximately 423 ha in size and generally located north of Mayfield Road, west of Torbram Road, south of Old School Road, and east of Dixie Road in the Town of Caledon, Ontario (**Figure 1, Appendix A**). As identified in the Mayfield Tullamore Secondary Plan Terms of Reference, Town of Caledon Official Plan (2024) and the Peel Region Settlement Area Boundary Expansion (SABE) Study, development of these lands requires a Local Subwatershed Study (SWS). The following document outlines the Terms of Reference (TOR) for the Local SWS, based on the Region of Peel TOR provided as Appendix F to the Scoped Subwatershed Study (Wood et al., 2022) and the Town of Caledon's SWS TOR(May 2024).

A first draft of this Terms of Reference was submitted to the Town of Caledon, Region of Peel and Toronto and Region Conservation Authority in May 2024. Comments from these agencies were received July, 2024.

1.1 Purpose

The Mayfield Tullamore Secondary Plan Area is located within Peel Region, in the Town of Caledon and is within the Peel Region's Settlement Area Boundary Expansion (SABE) Study Area, which outlines areas for future settlement and urban development. As outlined in the SABE Scoped Subwatershed Study (SABE SWS (Wood et. al., December 2021)), the purpose of a Local Subwatershed Study (SWS) is to assist in developing a sustainable development plan for the subject growth area in Caledon by ensuring protection and benefits to the natural and human environments through the further implementation of the direction, targets, criteria and guidance of the SABE SWS (Wood et. al., December 2021). As per the SABE SWS: "The Local Subwatershed Study will confirm, refine and implement a Natural Heritage System (NHS) and the water resource management approach that will protect, rehabilitate, and enhance the natural and water-based environments within the Secondary Plan Area, and the surrounding lands in the subwatershed."

The Future Caledon Draft OP (2024) outlines requirements for a Local SWS for the new community areas (Section 13.9.1) as part of the integrated planning process for Secondary Plan areas.

As such, a local Subwatershed Study (SWS) is required to support the future development of land owned by the MTLOG within the Humber River Watershed in alignment with Official Plan policies. The scope of the SWS will generally focus on characterization of the area, subwatershed impact analysis and mitigation strategies for future land use scenarios.

The SWS for the MTLOG lands will include field work programs and desktop assessments spanning the following main disciplines:

- Natural Heritage – Aquatic and Terrestrial Systems;
- Stream Morphology;

- Hydraulics and Hydrology;
- Hydrogeology;
- Geotechnical Assessment;
- Surface Water Quality; and
- Climate Change.

The SWS will also:

- Address the relevant natural features and functions identified in the Provincial Policy Statement (PPS; MMAH 2020), Region of Peel Official Plan, and Town of Caledon Official Plan;
- Provide the foundation for the layout of the Secondary Plan by defining and delineating elements such as the NHS, and the location of stormwater management facilities;
- Follow the direction and guidance of the Scoped Subwatershed Study (Wood et al., 2022) confirming targets and criteria based on site specific data obtained through the Secondary Plan level study;
- Define measures to protect and/or enhance the NHS;
- Address Climate Change to ensure the SWS adheres to various municipal climate change policies and targets; and
- Inform future work required as part of future planning stages

The Subwatershed Study will be separated into three phases, each with an associated report, these include:

- **Phase 1** Subwatershed Characterization and Integration;
- **Phase 2** Impact Assessment; and
- **Phase 3** Implementation and Management Strategies.

The SWS report will be submitted by phase, with the subsequent phase being prepared while the agencies are reviewing and preparing comments on the previous phase. This will allow adequate review time and opportunity to provide comment, while allowing the Study Team to proceed with the next phase ensuring that the overall Secondary Plan process timelines can be achieved.

1.2 Study Area – Caledon New Urban Area

The Mayfield Tullamore Secondary Plan encompasses approximately 423 hectares (1,045) acres in the Town of Caledon. These lands (herein referred to as the Study Area) are east of the Mayfield West Secondary Plan Area. They are generally bounded by Dixie Road to the west, Old School Road to the north, Torbram Road to the east, and Mayfield Road to the south. The majority of the lands are east of Bramalea Road; however, three participating parcels are located abutting the west side of Bramalea Road. The overall local Subwatershed Study Area includes the Secondary Plan Area boundaries; There are several secondary study components that have study areas that extend beyond the local Subwatershed Study Area; these include the following, shown on **Figure 1** (**Appendix A**):

1.2.1 Natural Heritage Study Area

The Natural Heritage Study Area (NHSA) will consist of the Secondary Plan area plus the 120 m adjacent lands, as shown on **Figure 1** (**Appendix A**). The 120 m adjacent lands allow for the assessment of potential negative impacts on significant features.

1.2.2 Stream Morphology Study Area

The geomorphic assessment will be undertaken for watercourses within the Secondary Plan area, as well as receiving watercourses for a distance of approximately 250 m downstream of the Study Area as shown on **Figure 1** (**Appendix A**). The assessment for the downstream reaches will be used to assess the impacts of the proposed development to these reaches, from a geomorphic perspective. Recognizing that these reaches flow on lands that are not participating in the current study, where appropriate, these geomorphic assessments will be completed within the road right--of--way, or through desktop-based methods.

1.2.3 Hydraulics and Hydrology Study Area

The Hydrologic Study Area (HSA) will encompass the Secondary Plan area, in addition to external drainage from lands upstream that flow through the Secondary Plan area. Existing peak flows at key flow nodes downstream of the MTLOG lands to Lake Ontario will be calculated and utilized to compare post development flows to pre-development flows for impact and mitigation assessment within the Secondary Plan (**Figure 2, Appendix A**).

1.2.4 Existing Land Use and Ownership

The Secondary Plan area is predominantly agricultural, with some residential dwellings, and a variety of candidate natural heritage features across the Study Area including woodlands and wetland in the central and southwestern portions of the Subject Lands; most of these associated with the Tributaries of the West Humber River that run in various directions across the Subject Lands. Many of these features are located within the Greenbelt Plan Area.

The participating landowners make up approximately 74% of the total Secondary Plan Area; participating properties are shown on **Figure 3** (**Appendix A**). The SWS will also include discussion related to non-participating lands. It is acknowledged that access to non-participating lands may be restricted, and site-specific information may not be made available for these lands. As such, items such as feature limit staking may not be able to occur at the SWS stage for these lands. The local SWS will provide high-level characterization for these non-participating lands based on aerial interpretation and secondary data sources. The SWS will also identify an outline of additional works/studies that may be necessary if/when these lands proceed to development. Efforts will be made to engage with non-participating landowners to obtain more detailed site conditions to support this local SWS.

In addition to addressing phasing in relation to Official Plan and Secondary Plan considerations, the SWS will also include discussion related to non-participating lands. It is acknowledged that access to non-participating lands may be restricted, and site-specific information may not be made available for these lands. As such, items such as feature limit stakings may not be able to occur at the SWS stage for these lands. The SWS will identify the non-participating landowners and provide an outline of additional works/studies that may be necessary if/when these lands proceed to development.

1.3 Policy Context

The SWS will support the overarching Secondary Plan for the Study Area. As such, it must conform with or be consistent with all applicable local and provincial land use planning policies. The SWS is not meant to replace or supersede existing policies, development standards, submission requirements, etc., as these are already covered by, but not limited to the following:

- Region of Peel Official Plan (2022 Consolidation);
- Region of Peel Settlement Area Boundary Expansion Technical Reports;
- Environmental Screening Report (2020);
- Scoped Subwatershed Study Part A, Part B and Part C (2022);
- Future Caledon Official Plan (2024);
- Town of Caledon Official Plan (consolidated 2024);
- Conservation Authorities Act, R.S.O 1990, c. C.27 (July 2023 Consolidation) and associated Ontario Regulation 41/24;
- Provincial Policy Statement (2022);
- Greenbelt Plan (2017);
- Growth Plan for the Greater Golden Horseshoe (2020);
- Nutrient Management Act. 2002, S.O. 2002, c. 4 (June 2021 Consolidation);
- Environmental Protection Act, R.S.O. 1990, C. E.19 (February 2024 Consolidation);
- Ontario Water Resources Act, R.S.O. 1990, C. O.40 (June 2021 Consolidation);
- Clean Water Act, S.O. 2006, C. 22 (February 2024 Consolidations);
- Endangered Species Act, 2007, S.O. 2007, c. 6 (February 2024 Consolidation);
- Fisheries Act, R.S.C., 1985, c. F-14 (amended March 2024); and
- Migratory Birds Act, S.C. 1994, c. 22 (amended December 2017).

For further clarity, the SWS will not be recommending new policies or development standards to address future development within the Study Area. The SWS will be measuring the potential future development against existing policies and standards and then identifying possible means to address the same. All future development within the Study Area will still remain subject to the *Planning Act* process, including but not limited to master planning, block planning, plans of subdivision and site plan application, etc.

1.4 Previous Studies, and Guidelines

Where relevant, other studies and guidelines will be used to provide input and guidance to the preparation of the SWS. One of the foundational references will be the Region of Peel Scoped Subwatershed Study (Wood et al., 2022). In addition, the following list includes some additional studies that will be referenced, but is not meant to be an exhaustive list:

- Ministry of Natural Resources: Natural Heritage Reference Manual: Second Edition (OMNR 2010);
- Humber River Watershed Plan (TRCA, 2008);
- Humber River Watershed Plan Implementation Guide (TRCA, 2008);

- Humber River State of the Watershed Reports (TRCA, 2008);
- Final Report Humber River Hydrology Update (TRCA, 2018);
- Humber River Watershed Characterization Report (TRCA, 2023);
- Listen to Your River: A Report Card on the Health of the Humber River Watershed (TRCA, 2007);
- Humber River Fisheries Management Plan (MNR and TRCA, 2005);
- TRCA Master Environmental and Servicing Plan Guideline (TRCA, 2015);
- Evaluation, Classification, and Management of Headwater Drainage Features Guidelines (CVC & TRCA, 2014);
- TRCA Guidelines for Review of SWM Pond Location with Respect to Groundwater Conditions;
- TRCA Stormwater Management Criteria Document (TRCA, 2012);
- Erosion and Sediment Control Guide for Urban Construction (TRCA, 2019);
- Crossings Guideline for Valley and Stream Corridors (TRCA, 2015);
- Channel Modification Design and Submission Requirements (TRCA, 2007);
- Technical Guidelines for Flood Hazard Mapping (TRCA and other Conservation Authorities, 2017);
- TRCA/CVC Low Impact Development Stormwater Management Planning and Design Guide (February 2024) https://wiki.sustainabletechnologies.ca/index.php?title=Main_Page&oldid=15953;
- Geotechnical Engineering Design and Submission Requirements (TRCA November 2017);
- Hydrogeological Assessment Submissions- Conservation Authority Guidelines to Support Development Applications (Conservation Ontario 2013);
- Wetland Water Balance Risk Evaluation (TRCA, 2017);
- Wetland Water Balance Monitoring Protocol (TRCA, 2016);
- Wetland Water Balance Modelling Guidance Document (TRCA, 2020);
- Technical Guide for River & Stream Systems: Erosion Hazard Limit (MNRF, 2002);
- Ministry of the Environment Water Well Records;
- Approved CTC Source Protection Plan (CTC Source Protection Committee, 2022); and
- Approved Assessment Report: Toronto and Region Source Protection Area (CTC Source Protection Committee, 2022).

Additional studies and resources will be reviewed and referenced as appropriate to support the SWS.

1.5 Technical Advisory Committee

To facilitate consultation, a Technical Advisory Committee (TAC) will be formed comprising of staff from the Region of Peel and the Town of Caledon. It may also include representation from the local Conservation Authority, various applicable Provincial representatives, landowner technical representatives, and the consulting team(s).

Monthly meetings with the TAC will be held to discuss technical matters, as needed.

Site visits will be organized to define and stake the limits of features where this exercise has not yet been completed or where limits need to be reconfirmed given the time that has passed since the completion of the prior staking.

For specific and specialized matters, “sub TACs”, involving the discipline-specific professionals, will be established where required. The TAC will advise and assist in directing the development of the Secondary Plan and its component studies throughout the study process. The TAC will assist in ensuring that the Secondary Plan evolves from the foundational basis of the Local Subwatershed Study to a Community Development Plan in a collaborative manner through the integration of the concurrent consultant studies.

1.6 General and Public Consultation

The SWS will include appropriate consultation within the context of the Planning Process including but not limited to public notification, agency notification, stakeholder consultation and Indigenous Engagement.

2. Phase 1 – Subwatershed Characterization and Integration

This analysis will inventory, characterize and assess natural hazards and natural heritage features and functions within the Study Area. The analysis will provide recommendations for the protection, conservation and management of natural hazards and natural heritage features within the Secondary Plan Area. Phase 1 should characterize the resources associated with each discipline and across disciplines to accomplish the following, as per the Town of Caledon's SWS TOR – Redline to the Peel Region Local Subwatershed Plan Terms of Reference (March, 2024):

- "establish the form, function and linkages of the environmental resources;
- confirm, refine and identify environmental constraints and opportunities related to terrestrial and aquatic habitat, features, and systems;
- establish surface water and groundwater constraints and opportunities associated with flooding, erosion, water quality, water budgets, including recharge and discharge areas through new numerical tools (models) suitably calibrated to local conditions; and
- Refine and implement criteria and constraints for management opportunities associated with the environmental features and systems".

The following items will be considered within **Phase 1**:

- Background Information Review: the goal of this exercise is to characterize and map preliminary constraints and opportunities for development across the Study Area based on desktop investigations and site reconnaissance, to be followed up by detailed fieldwork;
- Gap Analysis: the goal of this exercise is to use the background data from the background information review to identify background data gaps and propose methods to address these gaps; this should include suggestions for continued monitoring. A summary for each source used in the background review will be required; and
- Workplan Confirmation: Due to accelerated timelines, a large portion of the background review has been completed and subsequently has already influenced the local SWS work plan. The Phase 1 local SWS is anticipated to be delivered in tandem with a final TOR. As such, the workplan includes the scope of work that has been completed to date, as well as additional work that will be completed through subsequent phases of the local SWS that has been carried out is appended to this TOR. It is anticipated that a TAC meeting will be scheduled shortly after submission to allow for a technical review of the work plan.

The field work program is tailored specifically to address data gaps or otherwise outdated data as previously determined. The field program is inclusive of pre-development monitoring that not only characterizes the existing systems and features within the Study Area but will also contribute to establishing baseline conditions with the local Subwatershed Study Area for future post-development comparisons.

It is recognized that the municipal planning process and development of the Study Area occur over a protracted timeline, and therefore accommodations for the updating of existing conditions must be included in the SWS. For example, if a development parcel moves forward to Draft Plan in 2033, it may be necessary to re-evaluate changes in existing conditions such as natural hazards associated with valley lands or limits of vegetation and habitat boundaries. The SWS shall include a comprehensive discussion on the lifespan and relevance of baseline data in relation to impact assessment, specific to each discipline. The SWS shall propose a decision-making framework that helps to define when and why certain baseline conditions may need updating as part of future *Planning Act* applications.

The final deliverable for Phase 1 will be a Subwatershed Characterization and Integration Report. This report will include the following:

- Description of general characteristics of the local subwatershed and the Secondary Plan Area from each discipline's perspective and will include the following:
    - Climate, landform, geology, and soils;
    - Hydrogeology/groundwater quantity and quality;
    - Surface water quantity and quality;
    - Stream geomorphology;
    - Aquatic and Terrestrial ecosystems; and
    - Natural Environment Systems.
- Descriptions of the features, functions, constraints and opportunities within the Study Area; these will be mapped, and the preliminary Natural Heritage System from the SABE SWS (Wood et. al., December 2021) will be refined. This will include delineation of all key natural heritage and key hydrologic features, their status and significance with regards to policy requirements based on targeted field assessments.

The following are key activities that will be completed, by discipline:

2.1 Natural Heritage (Aquatic and Terrestrial Systems)

- A background review and gap analysis will be conducted to assess landscape conditions, as well as the aquatic and terrestrial environment; this will include species at risk screening using available databases;
- Update and/or confirm the fisheries and watercourse classifications in collaboration with the Stream Morphology Team;
- Identify general opportunities and constraints to development at a subwatershed scale level, through a summary of natural heritage characterizations completed (background review, gap analysis, field surveys);
- Refine the natural heritage and natural hazards limits reflecting the NHS objectives and other intentions of the Official Plan or Master Plans, in collaboration with the other disciplines, including:
    - Final staking of significant Natural Heritage System features in consultation with the Town and TRCA;
    - Coordinate with geotechnical investigation to determine long-term stable top of valley as required;
    - Identification of appropriate minimum Vegetative Protection Zones to be established based on feature sensitivity;

- Refinement of meander belt width delineation within proposed watercourse corridor (in areas where meander belt may impact limit of development;
- Update assessments of significance of natural heritage features (such as significant woodlands, significant wildlife habitat, etc.) in accordance with the Natural Heritage Reference Manual (MNR, 2010), the Official Plans of the Town and the Region, and other guidance documents as appropriate;
- Review and refine the SABE Scoped SWS's NHS enhancement and linkage opportunities based on the targets and goals in the Scoped SWS; and
- Update Species at Risk (SAR) assessment on a broad scale and for participating lands in consultation with MECP, as required.

To support the work above, the following detailed ecological field investigations will be undertaken in 2024 – these will provide baseline data and support characterization of the Study Area:

Terrestrial Field Investigations

- Winter Raptor Survey following Raptor Survey protocol adapted from the "British Columbia Ministry of Sustainable Resource Management Inventory Methods for Raptors" (2001);
- Bat Habitat Assessments and follow-up acoustic monitoring within wooded vegetation communities, following survey guidelines in "Bats and Bat Habitats: Guidelines for Wind Power Projects" (MNRF, 2011);
- Ecological Land Classification and three-season botanical inventories (spring, summer and fall) following ELC sampling protocol for Southern Ontario (Lee et al. 1998);
- Amphibian call count surveys (three rounds) using survey protocol based on the 'Marsh Monitoring Program' (Bird Studies Canada, 2014);
- Turtle basking surveys (three rounds) and turtle nesting suitability survey (one round) based on protocols established by "Survey Protocol for Blanding's Turtle (*Emydoidea blandingii*) in Ontario" (MNRF, 2015);
- Snake surveys (three rounds) based on the "Survey Protocol for Ontario's Species at Risk Snakes" (MNRF, 2016);
- Structure Screening Surveys (including visual assessment of potential to provide bat habitat, Barn Swallow nesting sites and snake hibernacula habitat suitability);
- Breeding bird surveys (two rounds) and grassland bird habitat assessment based on protocols from the Ontario Breeding Bird Atlas (2007); and
- Feature pre-staking (top of bank with geotechnical engineer, wetland and woodland dripline).

Third round breeding bird surveys have been identified as a provisional item if candidate habitat is identified and follow-up studies are deemed necessary.

Aquatic Field Investigations

- Headwater Drainage Feature Assessments (HDFA; three rounds) using protocol established in the "Evaluation, Classification and Management of Headwater Drainage Features Guidelines" (CVC & TRCA, 2014);

- Aquatic habitat assessment (one survey) following OSAP methodologies (2013); and
- Fish community sampling within all drainage features and ponds following OSAP methodologies (2013).

All incidental wildlife observations will be recorded during site investigations.

This scope of work will seek to characterize feature significance and sensitivity for all participating properties and identify the limits of Greenbelt KNHFs. It is assumed that there will be no alteration within 30 m of any of the Greenbelt's Key Natural Heritage or Key Hydrologic Features. Any proposed alterations within these features will require additional detailed investigations to be completed during the site-specific investigations (and to be addressed as part of subsequent Environmental Impact Studies).

2.2 Stream Morphology

- The fluvial geomorphological assessments in support of Local Subwatershed Studies will be aligned to meet or exceed the criteria outlined in Appendix B – Erosion and Geomorphology - of the TRCA Stormwater Management Criteria (2012). This work will be closely tied to the aquatic systems review;
- Stream morphology work will seek to identify and fill data gaps in context of geomorphic assessments for all watercourses and associated wetland features within the study area, including identification of headwater drainage features (HDFs) through to higher order streams/rivers;
- The following items will be completed to support the Background Review, Gap Analysis, and Existing Conditions Analysis:
    - Review of historic and recent aerial imagery, particularly with respect to deriving stream corridor dynamics such as meander belt, 100-year erosion risk, etc.;
    - Existing geomorphic mapping and analyses;
    - Conduct reach delineations where not previously completed;
    - Conduct rapid assessments where not previously completed;
    - Detailed geomorphic field assessments;
    - Meander belt width assessments for higher order streams within the study area; and
    - Results of the above reviews will support the Phase 1 delineation of a refined Natural Heritage System.

2.3 Hydraulics and Hydrology

- Existing storm drainage patterns and external drainage impacting the MTLOG lands will be identified to characterize the existing hydrologic setting;
- A summary of applicable stormwater management criteria for quantity, quality and erosion control will be provided including the Humber River unit rates for quantity control of 2 through 100 year storm events;
- The TRCA Humber River Watershed existing conditions hydrology model will be reviewed and verified based on existing land use and topography;

- The Regional storm event TRCA Humber River Watershed existing conditions hydrology model will be discretized for the purposes of establishing pre-development targets for stormwater management for the MTLOG lands. Regional storm event peak flows at key flow nodes downstream of the MTLOG lands will be confirmed at key locations down to Lake Ontario;
- Additional field investigations via survey and field inspection of existing culverts will be conducted to verify existing drainage patterns and the TRCA hydraulic models;
- The TRCA hydraulic models will be reviewed and verified for the tributaries of the Humber River located within the MTLOG lands. The floodlines for watercourses (defined bed and bank) will be delineated, as required. Any required modifications to the TRCA hydraulic model flows will be determined in accordance with the findings of the hydrologic assessment; and
- Existing Flood Vulnerable Areas (FVAs) downstream of the MTLOG lands that will potentially be impacted from future development in the MTLOG area will be identified.

2.4 Hydrogeology

- The hydrogeological background review will include available published data such as water well records in the area, as well as any available consulting or research reports, available geological or hydrostratigraphical conceptual models (available through or produced by source water protection studies or the Oak Ridges Moraine Groundwater Program) and mapping products (produced by the Geological Survey of Canada, Ontario Geological Survey, Ministry of the Environment, Conservation and Parks and/or Ministry of Natural Resources and Forestry, etc.);
- Additional field investigation will provide additional spatial and temporal insight on the groundwater system;
- The field program will include a combination, that will include, but is not limited to the collection of the following datasets to provide data on a more regional context and provide insight in establishing appropriate field investigations for more site-specific studies for site plan approval submissions:
    - Monitoring well installations with borehole logs (including monitoring well nests in select locations);
    - Drivepoint piezometers (including nested piezometers in select locations);
    - Long-term manual groundwater and surface level measurements (including hydraulic gradient calculations);
    - Groundwater and surface water chemistry;
    - Identification of the presence of seeps in and around watercourses and surface water features;
    - Hydraulic conductivity measurements; and
    - Spot baseflow measurements.
- This data will be used to help determine predevelopment infiltration, depth to groundwater throughout the year, groundwater flow direction/gradient, and the interaction with surface water features;
- Baseline data collection will support site and feature-based water balance analyses and support the assessment of LID feasibility;

- Depending on the outcome of the field investigation and the hydrogeological assessment, refinement of available hydrogeological understanding included in published studies may be possible and may include any or all the following:
    - Refine geologic interpretation and hydrostratigraphy including surficial geology and hydrogeologic parameters;
    - Refined understanding of the observed shallow groundwater conditions as they relate to response to seasonal changes in levels, flows and gradients, and responses to storm events (where possible);
    - Refine mapping and interpretations of groundwater discharge areas; and
    - Refinements to groundwater flow contributions to and from surface water features and wetlands.

2.5 Geotechnical

- Subsurface investigations will be conducted to determine the underlying soil and groundwater conditions, characterize the site geology, and to support the hydrogeological study;
- The scope also includes an erosion hazard assessment and slope stability study to determine the long-term stable top of slope (LTSTOS) position for confined valley systems on site. The site is within TCRA jurisdiction; therefore the slope stability study will follow TRCA guidelines within "The Living City Policies," dated November 28, 2014. The study will also follow provincial guidelines within "Technical Guide – River and Stream Systems: Erosion Hazard Limit," dated 2002, by Ministry of Natural Resources;
- Field investigations will include the following:
    - Obtain public and private utility locates;
    - Advance boreholes across the site on participating properties and collect soil samples using the Standard Penetration Test. Borehole depths are established to support typical development, with deeper boreholes in locations along the valley systems to support detailed slope stability analysis;
    - Monitoring wells and nested wells will be installed in strategic locations;
    - The boreholes with monitoring wells/nested wells will be instrumented with a 50 mm diameter PVC casing. All installations will be conducted in accordance with Ontario Regulation 903 for subsequent monitoring and testing purposes; and
    - Conduct geotechnical laboratory testing on selected soil samples to determine soil index properties.
- To support preliminary constraints and opportunities mapping, slope stability assessments will include:
    - A visual slope inspection of the valleylands on the participating properties. The MNR Slope Rating and Slope Inspection Forms will be filled out;
    - Cutting cross-sections through the slopes, watercourses and valleylands using the topographic plan or LiDAR DEM available for the site;
    - Conservative estimates for the toe erosion allowance and stable slope allowance will be used at this time to estimate the LTSTOS;
    - Assessment of the erosion access allowance and total development setbacks related to slope and erosion hazards;

- Review of any proposed grading strategy related to site servicing and stormwater management ponds; and
- Plan and profile views of the preliminary setback distances to assist with development constraint mapping.

2.6 Surface Water Quality

- Review of currently available background information to provide a preliminary understanding of the baseline water quality in the subwatershed;
- Existing datasets will be reviewed to understand the existing water quality status in the study area and to provide the baseline reference and identify any water quality concerns and constraints in the study area;
- Other published documents including, but not limited to, Conservation Authority's Source Water Protection documents will be reviewed for additional background information;
- The study will locate existing SWM facilities and the respective catchment areas, as the baseline reference for stormwater management in terms of water quantity and control;
- A surface water quality sampling program within the Study Area will be completed in order to characterize the surface water quality based on the contributing land use, soils, and stormwater quality management practices during both wet (storm) and dry (baseflow) periods;
- Surface water quality monitoring and stream gauging will be completed at the same locations in order to correlate the surface water quality with the study area hydrology;
- Six (6) surface water quality monitoring events will be completed between April and December 2024;
- Surface water quality samples will be collected at each station for one (1) wet and one (1) dry event for each season;
- Two (2) grab samples will be collected for each wet weather event; one grab sample will be collected during the onset of the storm and one grab sample will be collected during the recession of the storm. A "dry" weather event is considered to be an event completed where precipitation has not occurred within the previous 72 hours. A "wet" weather event is considered to be any precipitation event of 5 mm or more in a 24-hour time period;
- The grab samples for each wet weather and dry weather event will be analyzed for the following contaminants:
  - Oil and Grease;
  - Total Phosphorus;
  - Anions (Nitrate, Nitrite, Phosphate, Chloride);
  - Ammonia;
  - Total Kjeldahl Nitrogen (TKN);
  - Conductivity;
  - Total Solids (TS);
  - Total Suspended Solids (TSS);
  - Biochemical Oxygen Demand (BOD_5);
  - PH/alkalinity;

- Total Coliforms/Fecal Coliforms/E.Coli;
- PAH;
- Metals (Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, K, Se, Si, Ag, Na, Sr, Tl, Sn, Ti, W, U, V, Zn, Zr);
- Hardness as $CaCO_3$; and
- Turbidity.

- Field measurements of the following contaminants will be measured using a water quality probe during the sampling event:
  - Dissolved Oxygen;
  - PH;
  - Salinity; and
  - Temperature.

2.7 Climate Change

A Climate Scenario Analysis will be prepared that will assess relevant historic climate data versus future climate trend scenarios. Two climate scenarios will be used going forward, including the most recent climate change scenarios produced by the Intergovernmental Panel on Climate Change (IPCC) in their Sixth Assessment Report (AR6 2021), known as Shared Socioeconomic Pathways (SSPs). This data will support a more integrated assessment of climate risks associated with the SWS Study Area and will support **Phase 2** impact assessment and **Phase 3** monitoring, management, and implementation reports.

3. Phase 2 – Detailed Update to Existing Conditions and Impact Assessment

The objective of **Phase 2** is to provide a detailed characterization of the existing conditions, building off the outputs from **Phase 1**. The output from **Phase 2** will be an integrated and iterative impact assessment of all disciplines.

The **Phase 2** report will introduce the land use plan and will include a fulsome assessment of potential impacts on natural heritage and water resource features and functions as a result of proposed development. This report will also include an exploration of mitigation and management strategies for the proposed impacts.

Where appropriate, analytical tools will be used to predict changes to existing conditions and assess potential land use scenarios in relation to subwatershed-based targets based on background data or baseline monitoring data collected during Phase 1. These impact analyses will aim to identify preferred land use scenarios that meet the goals and targets identified within the SABE Scoped SWS and the Phase 1 Report.

Key objectives for the impact assessment phase are provided below.

3.1 Natural Heritage

- The report will include an integrated impact assessment of the proposed land use plan on the terrestrial and aquatic system within the Study Area and appropriate mitigation strategies to protect natural heritage features and functions;
- This includes, but is not limited to the following:
    - Review natural heritage features and sensitive areas for potential negative impacts as a result of the proposed land use plan;
    - Refinement of best management approaches for design, implementation and management of corridors, buffers, and restoration areas to avoid or mitigate impacts, including assessment of NHS/urban interface (i.e., fencing, directional lighting, interpretive signage, etc.);
    - Determine principles for buffer and natural infrastructure integration (e.g., low impact development);
    - Review potential linkage and enhancement opportunities as identified in the SABE Scoped SWS Preliminary NHS and refine these according to the targets, criteria, and goals of the SABE Scoped SWS;
    - Assess the potential impacts of direct aquatic habitat modifications (e.g., watercourse realignments, watercourses crossings) and impacts from changes to the hydrologic and hydrogeologic regimes;
    - Validation of fisheries mitigation and compensation for watercourses that are to be eliminated or realigned, in consultation with appropriate agencies;
    - Assess opportunities for enhancement of aquatic and riparian habitats;

- Assess impacts of the proposed land use plan on the overall Natural Heritage System as it related to thermal regime, species diversity, water quality and quantity and long-term protection;
- Provide preliminary mitigation and management recommendations to protect terrestrial and aquatic features and functions;
- Screening of retained features for Feature Based Water Balance Risk Assessment in consultation with other disciplines and explore candidate mitigation considerations (e.g. rooftop drainage, LIDs, etc.); and
- In consultation with other disciplines, demonstrate that proposed locations for wetland compensation will be supported by required hydrology.

3.2 Stream Morphology

- To support the impact assessment phase, erosion hazards and watercourse encroachments will be assessed in relation to the proposed land use plan;
- Conceptual strategies will be assessed from physically sustainable, fluvial/riparian, and a natural heritage/habitat perspective and will include:
  - Comprehensive list of current geomorphic regime status for all watercourses within the study area at the reach scale (i.e., 'in-regime', transitional, or adjusting, etc.);
  - Comprehensive list of current natural heritage values inherent to existing watercourses within study area at the reach scale using the Rapid Stream Assessment Technique (RSAT);
  - Opportunities and conceptual methods for bringing each reach identified as transitional or adjusting back to an 'in-regime' status;
  - Mitigation measures and opportunities for any potential impacts to thermal regime to ensure protection of habitat for Redside Dace;
  - Erosion threshold determination for watercourses identified to be sensitive to erosion;
  - Evaluate opportunities to bring each reach in line with the objectives for ecological sustainability;
  - Natural Channel Design identification and design objectives for future detailed design; and
  - Correlate above noted workplan elements with a climate change understanding and strategy that will depend upon the scenarios of interest. Both the physically sustainable fluvial/riparian perspective and the natural heritage/habitat perspective should be assessed from the 'no-regrets' scenario to the year 2100 scenario.

3.3 Hydraulics and Hydrology

- Discretize the TRCA Humber River Watershed future conditions hydrology model for the purposes of establishing post-development uncontrolled flows for the MTLOG lands;
- Update the TRCA future conditions hydrologic model for the 2 through 100 year and Regional storm events, to reflect proposed future land uses within the MTLOG lands in accordance with the land use;

- Report post development uncontrolled peak flows and compare to pre-development peak flows for the 2 through 100 year and Regional storm events at key nodes downstream of the MTLOG lands to Lake Ontario;
- Assess the implications of uncontrolled future flows in existing downstream flood vulnerable areas; and
- Confirm the need for the management of Regional storm event flows (in case the increase of flow causes unacceptable impacts to downstream culverts and flood vulnerable areas).

3.4 Hydrogeology

- The goal of the hydrogeological assessment is to establish a geological and hydrostratigraphical conceptual model for the study area and assess what would be impacted by development activities;
- The hydrogeological assessment data and conceptual model will be reviewed in the context of other disciplines and policy frameworks (such as the Source Water Protection Plan) to provide an impact assessment of areas that may be more sensitive to development, may be less developable due to significant constraints or may require additional mitigation to be feasible for the planned land uses. The impact assessment will address:
    - Seepage and discharge observations;
    - Fish habitat;
    - Phreatophytic observations;
    - Streambed composition;
    - Low flow analysis and water quality;
    - The impact assessment will also address the overall groundwater budget model along with the surface water components for both existing and future scenarios; the water budget for the study area will estimate precipitation, evapotranspiration, runoff and infiltration, and groundwater recharge and discharge;
    - Groundwater supported features; and
    - The baseline water balance assessment will be updated to reflect the proposed land use scenarios, and potential impacts to groundwater recharge will be assessed.

3.5 Geotechnical

- Based on the subsurface conditions and slope stability assessment, potential impacts will be assessed in relation to the proposed land use plan. Mitigation measures will be prepared to support future earthworks for the proposed development.

3.6 Surface Water Quality

- Based on the results of the quality analyses from **Phase 1**, an assessment of potential land use impacts on surface water quality, water quality improvement strategies, with particular attention to Redside Dace water quality requirements (DO, TSS, T) and mitigation strategies and BMPs for urban stormwater management will be addressed.

3.7 Climate Change

- Based on the Phase 1 review of the moderate emissions scenario (SSP2-4.5) and a very high emissions scenario (SSP5-8.5), Phase 2 of the local SWS will assess how climate change considerations and decision making can be incorporated to assist in creating a built form and system of infrastructure that mitigates the Town's contribution to climate change and enhances resiliency to its impacts; and
- Address measures that mitigate climate risk and enhance resiliency to changing climate conditions and extreme weather events, and bolster the safety and preparedness of communities, infrastructure and natural environment.

3.8 Servicing and Grading

To support the Phase 2 report, a Preliminary Grading and Servicing Memo will be prepared to demonstrate that the land use concept can be graded and serviced in accordance with the Town of Caledon, the Toronto and Region Conservation Authority (TRCA), Region of Peel, and the Ministry of Environment, Conservation and Parks (MECP) development criteria. The memo will include the following:

- Grading;
- Prepare a Preliminary Grading Plan showing centreline road grades based on the conceptual road alignments;
- Provide direction to more detailed grading analyses to be completed at the Draft Plan of Subdivision stage of the development process;
- Identify any areas where grading is required within the NHS for the implementation of infrastructure, trails or roads and assess potential impacts from grading on natural features and functions of the NHS;
- Storm Sewer Servicing;
- Prepare preliminary design and layout of internal trunk storm servicing system within the MTLOG Lands;
- Sanitary Sewer Servicing;
- Complete conceptual sanitary flow generation calculations based on the land use plan;
- Prepare preliminary design and layout of internal trunk sanitary servicing system within the MTLOG area;
- Provide confirmation of conformance of the plan to the Region's latest Water & Wastewater Master Plan;
- Confirm capacity of existing downstream sanitary infrastructure to facilitate any proposed interim and ultimate servicing strategies through consultation with Region staff;
- Identify potential impacts to the NHS from the proposed sanitary sewer servicing strategy;
- Water Supply and Distribution;
- Develop a conceptual fire and peak daily water demand associated with the land use plan;

- Identify the preliminary alignment and design of the internal trunk water supply system, and associated connection points to the external system;
- Provide confirmation of conformance of the plan to the Region's latest Water & Wastewater Master Plan;
- Identify potential impacts to the NHS from the proposed water supply and distribution strategy; and
- Hydrant testing/pressure monitoring to be conducted as required to support findings of the study.

4. Phase 3 – Implementation & Management Strategies

Based on the output from **Phase 2**, complimentary technical studies and stakeholder consultation, the objective of **Phase 3** is to:

- Provide input to the Secondary Plan and Preferred Land Use Scenario;
- Identify future study requirements as related to the development process and *Planning Act;*
- Discuss phasing considerations related to the *Planning Act* with respect to:
    - overall constraints and opportunities for implementation for stormwater management and hydrogeological (water balance) considerations;
    - grading and earth moving considerations by phase;
    - potential interim stormwater and servicing measures required (in tandem with MESP);
    - impacts of phasing on future study requirements;
    - Discuss construction best management practices;
    - Confirm rehabilitation, restoration, and enhancement projects to be incorporated into Draft Plans;
    - Provide guidance on the implementation and management of natural heritage system buffers, linkages, wildlife corridors and trails;
    - Guidance for decommissioning of Municipal Drains if required;
    - Provide guidance on a monitoring program that will allow for the tracking of impacts of the land use changes on the natural environment;
    - Provide guidance for the preparation of an Adaptive Management Plan to respond to results of the monitoring program; and
    - Provide guidance for any additional study requirements.

Where relevant, more specific objectives for this phase are below.

4.1 Natural Heritage

- Develop strategies and recommendations for restoration and enhancement of the NHS to improve ecological integrity, optimize biodiversity, and restore natural features;
- Provide guidance on the implementation and management of natural heritage system buffers, linkages, wildlife corridors and trails;
- Confirm rehabilitation, restoration, and enhancement projects to be incorporated into Draft Plans; develop preliminary ecological targets to guide subsequent planning phases for site-specific restoration and enhancement;
- Provide high-level recommendations for mitigation measures (LIDs, etc.), for retained and compensation wetlands, based on the feasibility assessment completed in Phase 2;
- Identify future development application requirements for detailed feature-based water balance assessments in consultation with other disciplines;

- Outline requirements, ecological, regulator, and policy-based, for any potential feature removal and compensation initiatives – feature removal and compensation will be assessed with support from the recommendations provided in the SABE Scoped SWS Part C report;
- Develop a preliminary implementation and management strategy to support the timing of restoration and enhancements through subsequent planning phases;
- Establish recommended monitoring program for aquatic and terrestrial environments; and
- Outline future study requirements for subsequent planning phases related to natural heritage.

4.2 Stream Morphology

- Coordinate amongst disciplines to identify strategies to meet natural heritage and fluvial sustainability goals;
- Provide restoration and optimization opportunities for headwater drainage features and streams/rivers including potential LID and Green Infrastructure opportunities to manage stormwater, protect water balance, maintain thermal regime, and support habitat creation; and
- Identify detailed design projects that would support the goals of the SWS and identify future studies and priorities for subsequent planning phases that will support stormwater management, natural heritage management, and climate change goals.

4.3 Hydraulics and Hydrology

- Develop a Stormwater Management (SWM) strategy, including LID measures and end of pipe SWM facilities that achieves the SWM criteria for quantity, quality, and erosion control, in addition to mitigating impacts to water balance. Natural heritage, groundwater and surface water impact assessments shall be considered when developing the SWM strategy;
- If warranted based on the hydrologic assessment, provide a recommended approach to the management of Regional storm flows;
- Verify the SWM strategy conformance with the criteria developed as part of the Phase 1 Study;
- Identify additional systems such as Clean Water Collector (CWC) systems, required to support LID measures as part of the overall water balance mitigation strategy and/or any feature specific water balance mitigation strategy, where required;
- Provide general design criteria for end-of-pipe SWM facilities that will work toward mitigating the impacts from the land use plan. The criteria will provide guidance at the next stage in the development process in support of Draft Plan of Subdivisions for sizing and grading of SWM facilities; and
- Provide an overview of timing, phasing and cost sharing requirements for end-of-pipe SWM facilities.

4.4 Hydrogeology

- Provide preliminary recommendations and measures to be considered during construction to mitigate impacts to local groundwater resources such as dewatering or to the water balance caused by decreases in infiltration and increases in runoff;
- Identify potential surface water infiltration opportunities based on soils information, depth to the water table, and aquifer vulnerability;
- Identify future development application requirements for feature based water balances in consultation with other disciplines;
- Establish a recommended monitoring program to support hydrogeological understanding of changes due to the preferred land use plan; and
- Provide details on future studies and considerations required for subsequent planning phases;

4.5 Geotechnical

- Provide details on future studies and monitoring considerations required for subsequent planning phases including boreholes and monitoring wells to support detailed design.

4.6 Surface Water Quality

- Provide details on future study requirements and additional field investigations to address detailed design items such as stormwater management.

4.7 Climate Change

- Provide guidance to address climate change considerations and demonstrate compliance with the Town of Caledon's Community Climate Change Action Plan and the Peel Region's Climate Change Master Plan.

4.8 Adaptive Management and Monitoring Plan

As per the Town of Caledon SWS TOR (May, 2024) an Adaptive Management and Monitoring Plan to assess and adapt to the subwatershed's response to the preferred land use changes.

This Plan will include a detailed monitoring plan, integrated amongst the disciplines, and adaptive responses to monitoring data results. As the MECP is advancing industry guidance for broad-based community monitoring plans to support the Consolidated Linear Infrastructure ECA process, this Adaptive Management and Monitoring Plan will look to align with this guidance when available.

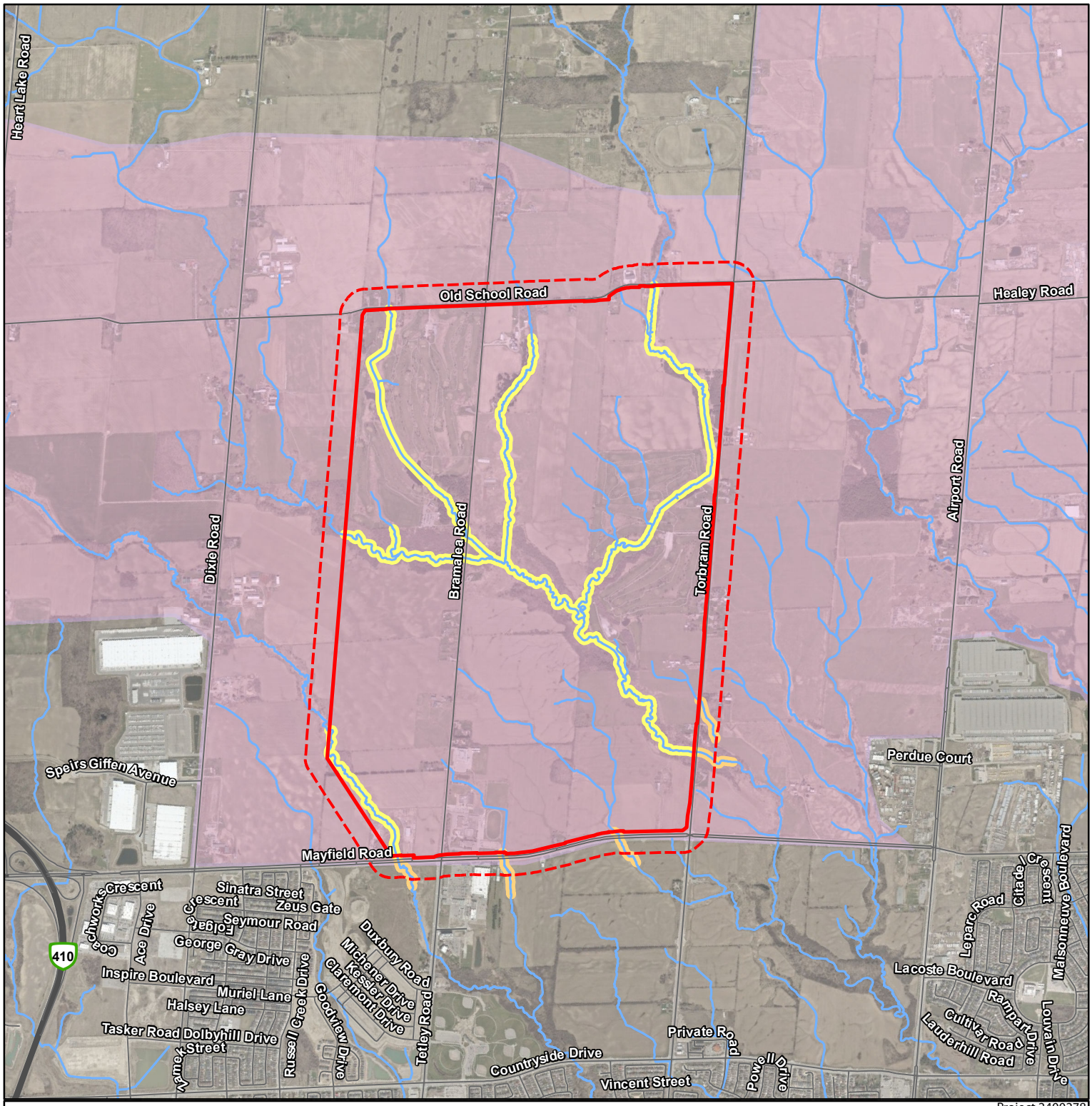
To better capture the goals and objectives for each discipline contributing to the SWS, further details have been included as appendices. The objectives and workplan requirements within these appendices are meant to be performed and addressed throughout the duration of the SWS and are not distinctly tied to a specific phase. The key workplan requirements are in support of Secondary Planning. Future Study Requirements are identified in support of either Draft Plan of Subdivision or Detailed Design.

Appendix A

Figure 1 – Mayfield Tullamore Local Subwatershed Study Area

Figure 2 – Hydraulic Study Area

Figure 3 – Participating Landowners



NOTES:
1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2024, © Toronto and Region Conservation Authority, 2024, © Region of Peel, 2024.
3. Orthoimagery © First Base Solutions, 2024. Imagery taken in 2022.

Legend
- Study Area
- Study Area + 120m
- Fluvial Geomorphology Study Area
- Additional Downstream Reaches to be Assessed
- Watercourse (TRCA, 2022)
- Approximate Settlement Area Boundary Expansion Focus Study Area (Peel, 2022)

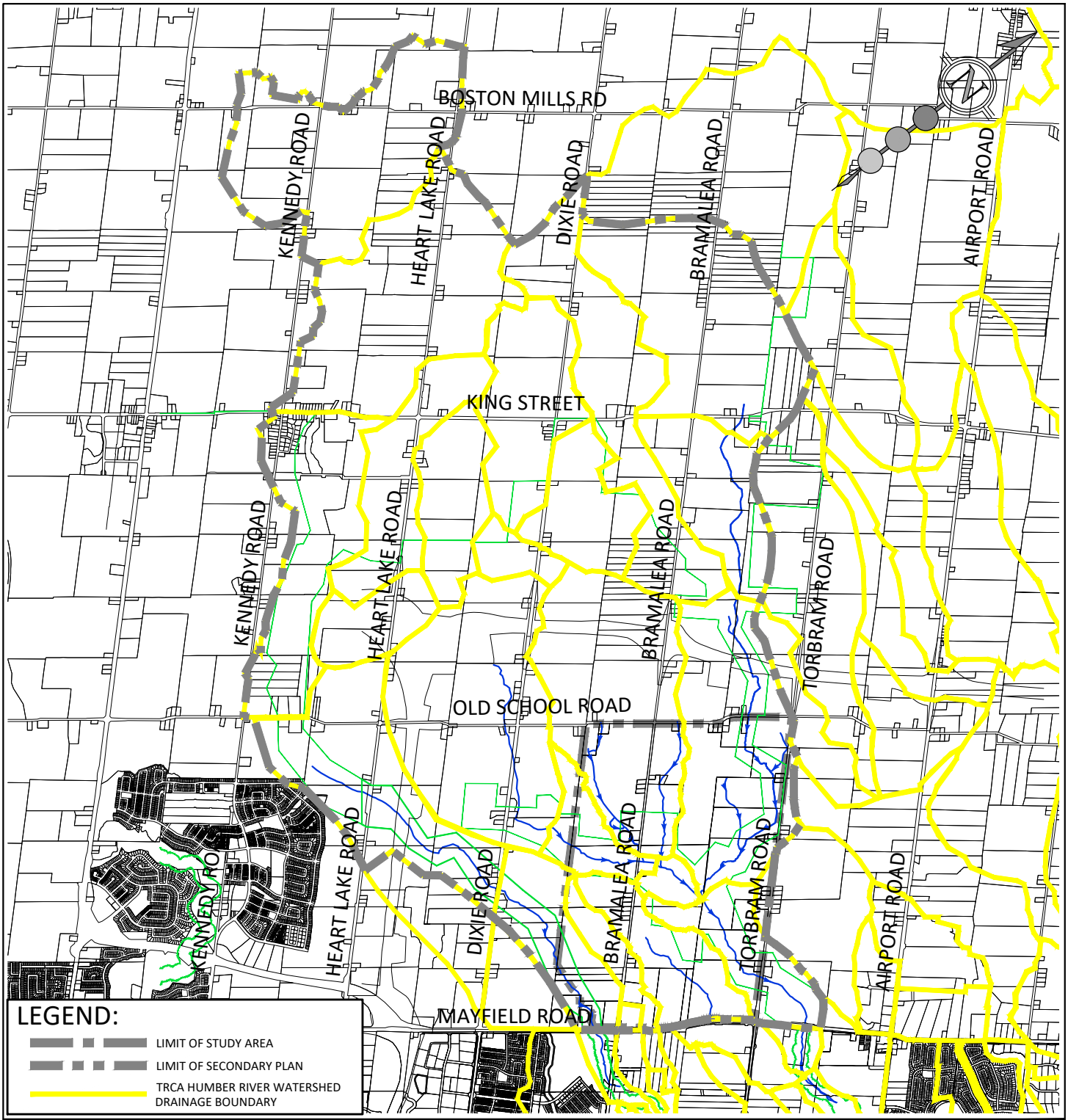
Project 2400278

Mayfield Tullamore Landowner Group
Terms of Reference

Figure 1
Subwatershed Study Area - Natural Heritage and Fluvial Geomorphology

0 400 m
1:30,000

GEI Consultants



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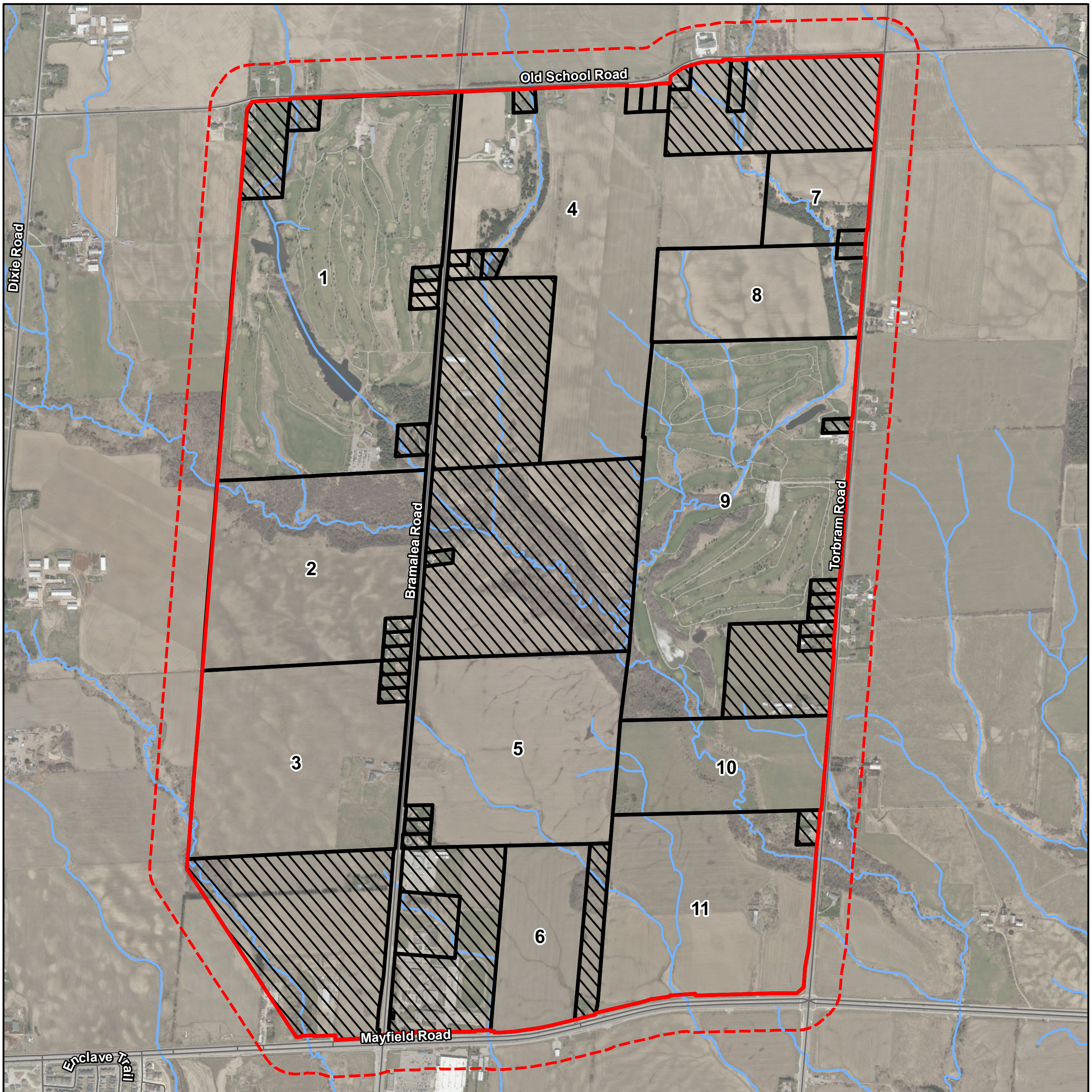
MAYFIELD TULLAMORE LOCAL SUBWATER STUDY

HYDRAULIC AND HYDROLOGIC STUDY AREA

DESIGNED BY: C.M.D.	CHECKED BY: N.D.M.	PROJECT No: 2699	FIGURE No: 2
SCALE: 1:50000	DATE: AUGUST 2024		

File: P:\2699 Mayfield Tullamore Landowner Group\Drawings\MESP\Fig\Report Figures\2699P-LOCT-X.2.dwg – Revised by <DDILAY> : Wed, Aug 28 2024 – 12:04pm



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3. Orthoimagery © First Base Solutions, 2024. Imagery taken in 2022.

Legend
- Study Area
- Study Area + 120m
- Watercourse (TRCA, 2022)
- Non-Participating Property
- Participating Property

Map #	Property Identifier	Ownership Entity
1	Banty's Roost Golf Course	ANATOLIA INVESTMENTS CORP.
2	Broccolini North	12442 BRAMALEA LIMITED PARTNERSHIP represented by its general partner 12442 BRAMALEA LIMITED PARTNERSHIP
3	Broccolini South	BRAMALEA ROAD LIMITED PARTNERSHIP represented by its general partner BRAMALEA ROAD ROAD BP INC. and BRAMALEA ROAD CONINVEST LIMITED PARTNERSHIP represented by its general partner BRAMALEA ROAD COINVEST GP INC.
4	TACC	TACC DEVELOPMENTS (ARMSTRONG) LTD.
5	DG-1	DG (CALEDON 1) INC.
6	Torchia	2052743 ONTARIO INC.
7	DG-2	SENTINEL (TORBRAM) HOLDINGS INC.
8	DG-3	SENTINEL (TORBRAM) HOLDINGS INC.
9	Mayfield Golf Course	MAYFIELD GOLF COURSE INC.
10	Rice	TULLAMORE INDUSTRIAL GP LIMITED
11	DG-4	MAYFIELD LANDING DEVELOPMENTS INC.

Project 2400278

Mayfield Tullamore Landowner Group
Terms of Reference

Figure 3
Participating Properties in Study Area

0 400 m
1:17,500

GEI Consultants

Appendix B

Discipline Specific Workplans

Appendix B

Discipline Specific Workplans

All work is to be completed in general conformance with the Town of Caledon SWS TOR – (May 2024), appended to this workplan (**Appendix A**).

Natural Heritage: Terrestrial and Aquatic Systems

Section 5.6.20.14.16 of the Peel Region OP requires that Secondary Plans:

"*make appropriate considerations for watershed boundaries and the protection, restoration and enhancement of a natural heritage system; and ensure protection of a natural heritage system and water resource system informed by subwatershed study recommendations and that integrates water and stormwater management objectives and requirements*"

The TOR acknowledges that a natural heritage system has generally been defined through previous studies and natural heritage system policies in support of the Region of Peel's Official Plan approval; inclusive of the SABE SWS (Wood et. al., December 2021).

The purpose of this assessment is to support the Official Plan policies above, review the preliminary natural heritage system proposed within the SABE Scoped SWS (Wood et. al. 2022) and confirm the opportunities and constraints, including natural feature and hazard limits, buffers, and setbacks associated within the Study Area. A Preliminary natural heritage system will be prepared, with some conservative assumptions on non-participating lands where candidate natural heritage features may be present. These assumptions will be based on aerial interpretation and will be required to be confirmed and refined if these non-participating parcels come forward.

For participating lands, the natural heritage refinements will be based on the background review and detailed field investigations undertaken during **Phase 1**; inclusive of aquatic and terrestrial systems. In addition, landscape-scale screening will be considered to provide recommended linkage opportunities to enhance ecological integrity, and promote habitat connectivity and wildlife movement.

Key Objectives

Objective 1: Determine the final limit of development adjacent to natural heritage system through: Confirmation of natural heritage and natural hazards limits, including field staking and survey in consultation with TRCA and the Town, and inclusion of buffer widths as appropriate.

Objective 2: Establish principles for works within buffers, including restoration and enhancement opportunities, in consultation with TRCA and the Town.

Objective 3: Integrate findings with hydrogeological and stormwater management assessments as input to the selection of appropriate LID measures for stormwater management and water balance mitigation.

Workplan Requirements

The following is a list of key activities to be completed:

- Identify the general opportunities and constraints to development at a subwatershed scale level, through a summary of natural heritage characterizations completed in support of secondary planning approval;
- Update and/or confirm the fisheries and watercourse classifications;
- Refine the natural heritage and natural hazards limits reflecting the NHS objectives and other intentions of the Master Plan, including:
    - Final staking of significant Natural Heritage System features in consultation with the Town and TRCA. Modifications to NHS boundaries to be minor to reflect differences in scale and level of detail from Secondary Plan in accordance with Official Plan or Official Plan Amendments (OPAs);
    - Conduct geotechnical investigation to determine long-term stable top of valley slope as required;
    - Review and recommend appropriate minimum feature buffers for natural heritage and hazard features;
    - Refinement of meander belt width delineation within proposed watercourse corridor (in areas where meander belt may impact limit of development;
    - Update assessments of significance of natural heritage features (such as significant woodlands, significant wildlife habitat, etc.) in accordance with the Natural Heritage Reference Manual (MNR, 2010), the Official Plans of the Town and the Region, and other guidance documents as appropriate; and
    - Update Species at Risk (SAR) assessment on a broad scale and for participating lands in consultation with MECP, as required.

To support the work above, the following ecological field investigations will be undertaken in 2024:

Terrestrial Field Investigations (**Figure 1, Appendix B**)

- Winter Raptor Survey following Raptor Survey protocol adapted from the “British Columbia Ministry of Sustainable Resource Management Inventory Methods for Raptors” (2001);
- Bat Habitat Assessments and follow-up acoustic monitoring within wooded vegetation communities, following survey guidelines in “Bats and Bat Habitats: Guidelines for Wind Power Projects” (MNRF, 2011), Species at Risk Bats Survey Note (MECP, 2022), and Maternity Roost Surveys (Forests/Woodlands) (MECP, 2022);
- Ecological Land Classification and three-season botanical inventories (spring (May, 2024), summer (July 2024) and fall (September 2024)) following ELC sampling protocol for Southern Ontario (Lee et al. 1998);
- Amphibian call count surveys (three rounds) using survey protocol based on the ‘Marsh Monitoring Program’ (Bird Studies Canada, 2014);
- Turtle basking surveys (three rounds) and turtle nesting suitability survey (one round) based on protocols established by “Survey Protocol for Blanding’s Turtle (*Emydoidea blandingii*) in Ontario” (MNRF, 2015);
- Snake surveys (three rounds) based on the “Survey Protocol for Ontario’s Species at Risk Snakes” (MNRF, 2016);

- Structure Screening Surveys (including visual assessment of potential to provide bat habitat, Barn Swallow nesting sites and snake hibernacula habitat suitability);
- Breeding bird surveys (two rounds) and grassland bird habitat assessment based on protocols from the Ontario Breeding Bird Atlas (2007); and
- Feature pre-staking (top of bank with geotechnical engineer, wetland and woodland dripline).

Third round breeding-bird surveys have been identified as a provisional item if candidate habitat is identified and follow-up studies are deemed necessary.

Detailed terrestrial station mapping is located in **Figure 1** (**Appendix B**).

Aquatic Field Investigations

- Headwater Drainage Feature Assessments (HDFA; three rounds) using protocol established in the "Evaluation, Classification and Management of Headwater Drainage Features Guidelines" (CVC & TRCA, 2014);
- Aquatic habitat assessment (one survey) following OSAP methodologies (2013); and
- Fish community sampling within all drainage features and ponds following OSAP methodologies; spring and summer sampling (2013).

Detailed aquatic station mapping is located in **Figure 2** (**Appendix B**).

Field Studies that have been completed to date have been compiled to confirm appropriate seasonal windows and timings were followed (**Table 1, Appendix C**). The following surveys are either underway or are to be completed summer/fall 2024:

- Spring and Fall Botany and ELC;
- Summer HDFA (round 3);
- Aquatic Habitat Assessment; and
- Summer fish community sampling.

One goal of this scope of work is to confirm the limits of the Greenbelt's Key Natural Heritage and Key Hydrologic Features; it is then assumed that there will be no alteration within 30 m of any of these features. Any potential alterations within these features will require additional detailed investigations to be completed during the site-specific investigations (and to be addressed as part of subsequent Environmental Impact Studies).

This scope of work will also include the following, in alignment with the SABE Scoped SWS goals and targets:

- Validation of fisheries mitigation and compensation for watercourses that are to be eliminated or realigned, in consultation with appropriate agencies;
- Refinement of best management approaches for design, implementation and management of corridors, buffers, and restoration areas to avoid or mitigate impacts, including assessment of NHS/urban interface (i.e. fencing, directional lighting, interpretive signage, etc.). Determine principles for buffer and infrastructure integration (i.e. low impact development);

- Identification of opportunities and constraints to meet Natural Heritage System objectives as they relate to non-participating lands (i.e. are there any non-participating lands that could provide strategic linkages in the Natural Heritage System or optimal location for mitigation or enhancement measures?);
- Evaluation of impacts, opportunities, constraints, and mitigation measures related to the Natural Heritage System from a climate change perspective; and
- Management and monitoring recommendations to ensure long-term sustainability of the NHS and other ecological features with the Study Area.

Ultimately, the SWS will include complete mapping of the Natural Heritage System boundary, including opportunities and constraints, consisting of but not limited to the following:

1. Physical top of bank (as staked with TRCA and the Town);
2. Long term slope stability limits, where applicable;
3. Erosion and flood hazard lands;
4. Locations of significant groundwater recharge areas and ecologically significant groundwater recharge areas;
5. Headwater drainage features requiring protection or conservation;
6. Watercourses;
7. Fish habitat;
8. Valleylands;
9. Woodlands (as staked by the Town);
10. Wetlands (as staked by the Town and TRCA);
11. Stream restoration and/or erosion site rehabilitation reaches;
12. Habitat of Endangered and Threatened Species;
13. Significant Wildlife Habitat;
14. Regional Greenlands System boundaries;
15. Greenbelt boundaries and its components including:
    a. Key natural heritage features;
    b. Key hydrologic features; and
    c. Key hydrologic areas.
16. Vegetation protection zones;
17. Natural heritage enhancement and compensation lands;
18. Stormwater management facilities; and
19. Linkage and Enhancements.

It should be noted that all of the features identified above through the SWS may not be incorporated into the Natural Heritage System. For example, nesting locations of Barn Swallow, a Special Concern species that commonly nests in manmade structures such as barns, are unlikely to be included within the NHS unless associated with other features identified above.

Future Study Requirements

The SWS will include a summary of future study requirements related to natural heritage assessments, which may include:

- Species at Risk Screening, if applicable, to evaluate/address changes related to Species at Risk (i.e. assess newly listed species, or confirm any new occurrences of Species at Risk, since SWS completion).
  Timing: Draft Plan of Subdivision

- Buffer Management Plan: address detailed design of storm outfalls, road crossings, linkages, detailed NHS restoration and enhancement opportunities.
  Timing: Detailed Design

- Climate change assessment: in relation to buffer management, which items are sensitive to the impacts of climate change? (i.e. road crossings, slope stability, extent of floodplain).
  Timing: Draft Plan/Detailed Design

- Monitoring program development:

  - Existing conditions baseline.
    Timing: Concurrent with SWS

  - Performance evaluation of the stormwater and environmental management system.
    Timing: Detailed Design

- Permitting requirements for lands within regulated areas (i.e. "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses", Tree Conservation By-laws/permits, DFO reviews/authorizations, MECP permits/authorizations under the Endangered Species Act, etc.).

  Timing: Draft Plan / Detailed Design

- SWS Addendum Report (for non-participating lands): Address SWS Terms of Reference for items not able to be completed during SWS preparation due to non-participating status of lands.

  Timing: Draft Plan

- Adaptive Management Plan (AMP)

Stream Morphology

The improvement of natural or human-made/-impacted watercourses has been dominated historically by the need to drain upland areas of watersheds quickly and efficiently, primarily in the context of water volume and discharge management. Recent advances in the understanding of watercourses as more interconnected and holistic topographic features within a natural landscape context have seen a change in the approach of watercourse management that includes values beyond physical volumetric parameters as driving mechanisms for management decisions. These values now include the re-instatement of the natural form and function for watercourses, driven by parameters such as watershed water balance restoration, and the enhancement/preservation/restoration of human impacted water features to embrace a wider array of ecological values such as sustainable channel corridors and the provision of higher quality habitat for riparian and aquatic species alike.

The remediation and restoration of human-impacted watercourses and associated wetland features within a subwatershed to derive more ecosystem focused positive outcomes and sustainability depends upon Natural Channel Design (NCD) elements that are expected from a thorough understanding of geomorphic criteria.

This component will be closely tied to the aquatic systems review.

Key Objectives

Objective 1: Confirm findings (in the context of the participating study lands) from the SWS Plan.

Objective 2: Identify and seek to fill data gaps in context of geomorphic assessments (as noted in Objective 1, above) for all watercourses and associated wetland features within the study area, including identification of headwater drainage features (HDFs) through to higher order streams/rivers.

Objective 3: Derive conceptual strategies to meet the overarching goals from a physically sustainable fluvial/riparian perspective. The strategies to meet the goals from this physical perspective will support hydrologic, hydraulic, and thermal regime sustainability (for cold water systems where required). Particular attention will be given to the role that sediment balance (net zero degradation/aggradation) and associated phosphorous mobilization is playing in the larger subwatershed contexts.

Objective 4: Derive conceptual strategies to meet overarching goals from a natural heritage/habitat perspective. The strategies to meet the goals from this ecological perspective will support the restoration and optimization of robust natural heritage values. Particular attention will be given to the interfacing of LID Strategies and Green Infrastructure (GI) in managing stormwater and protecting naturalized water balances as well as cold-water thermal regimes. Robust habitat creation strategies will also be explored, again focusing upon the creation or protection of cold-water riparian ecosystems.

Objective 5: Derive a comprehensive list of detailed design projects to meet the conceptual objectives noted above. The listing will seek to prioritize projects based upon ease of completion, cost and overall value for the realization of the conceptual objectives.

Objective 6: Correlate conceptual strategies and the resultant listing of detailed project priorities with all other SWS assessments, particularly stormwater management, natural heritage evaluation and climate change.

Workplan Requirements

- Data gap and existing conditions analysis:
    - Review of historic and recent aerial imagery, particularly with respect to deriving stream corridor dynamics such as meander belt, 100-year erosion risk, etc.;
    - Existing geomorphic mapping and analyses;
    - Conduct reach delineations where not previously completed;
    - Conduct rapid assessments where not previously completed;
    - Detailed geomorphic field assessments;
    - Meander belt width assessments for higher order streams within the study area; and
    - Erosion threshold determination.

- Conceptual strategies from physically sustainable, fluvial/riparian, and a natural heritage/habitat perspective:
    - Develop comprehensive list of current geomorphic regime status for all watercourses within the study area at the reach scale (i.e., 'in-regime', transitional, or adjusting, etc.);
    - Develop comprehensive list of current natural heritage values inherent to existing watercourses within study area at the reach scale using the Rapid Stream Assessment Technique (RSAT);
    - Opportunities and conceptual methods for bringing each reach identified as transitional or adjusting back to an 'in-regime' status;
    - Evaluate opportunities to bring each reach in line with the objectives for ecological sustainability; and
    - High-level cost estimates for the same.
- NCD identification and design objectives for future detailed design;
- Consideration of thermal regime for occupied and contributing redside dace habitat; and
- Correlate above noted workplan elements with a climate change understanding and strategy that will depend upon the scenarios of interest. Both the physically sustainable fluvial/riparian perspective and the natural heritage/habitat perspective should be assessed from the 'no-regrets' scenario to the year 2100 scenario.

Future Study Requirements

The SWS will include a summary of future study requirements related to fluvial geomorphic assessments, which may include:

- Detailed geomorphic field assessments/recommendations including:
    - Rapid and detailed Geomorphic Assessments for those reaches requiring such field investigations still (for permanently flowing channels);
    - Site specific reach refinements (RSAT);
    - Meander belt and 100-year erosion risk assessments;
    - Conceptual design of LIDS measures to confirm location and sizing; and
    - Refinement of SWMF outlet works and NCD correlation.

Timing: Draft Plan

- Natural Channel Design:
    - Refine NCD elements to maximize probability to meet objectives and to meet specific requirements related to cold-water system stability and the creation of rich and robust natural heritage features;
    - Dove-tailing detailed storm water management (SWM) studies with the geomorphic analyses and natural channel design aspects will be critical;
    - SWM analyses and designs should seek to assess the 1:100-year or Regional flood recurrence event ***and*** the bank forming (aka bankfull) flood event, best approximated by the 1:2-year recurrence flood event; and
    - Hydraulic parameters must include the width, depth, and mean velocity for these recurring flood flows.

Timing: Detailed Design

Hydrology and Hydraulics

The purpose of the hydrologic and hydraulics work is to establish the existing and proposed storm drainage patterns internal and external to the Secondary Plan area lands and characterize the hydrologic setting. The focus of the work will be on understanding the existing and proposed flows to significant features within the Secondary Plan area, identifying and confirming stormwater management design criteria, and determining the extents of floodplain development constraints on the developable area. The work will also identify any potential impacts on flood vulnerable areas downstream due to the future development.

Key Objectives

Objective 1: Establish existing and proposed storm drainage boundaries.
Objective 2: Refine available hydrology and hydraulics models.
Objective 3: Confirm stormwater management criteria via background information review and results of hydrologic study.
Objective 4: Identify a stormwater management strategy including LID measures and end of pipe SWM facilities that achieves the SWM criteria.

Workplan Requirements

The hydrology analysis will include examining or assessing the following:

- Identifying existing storm drainage patterns and external drainage impacting the Secondary Plan to characterize the existing hydrologic setting;
- Identifying and preparing a summary of applicable stormwater management criteria for quantity, quality and erosion control including the Humber River unit rates for quantity control of 2 through 100 year storm events;
- Reviewing and verifying the TRCA Humber River Watershed existing conditions hydrology model based on existing land use and topography;
- The Regional storm event TRCA Humber River Watershed existing conditions hydrology model will be discretized for the purposes of establishing pre-development targets for stormwater management for the Secondary Plan area. Regional storm event peak flows at key flow nodes downstream of the study area will be confirmed at key locations down to Lake Ontario;
- Discretize the TRCA Humber River Watershed future conditions hydrology model for the purposes of establishing post-development uncontrolled flows for the MTLOG lands;
- Update the TRCA future conditions hydrologic model for the 2 through 100 year and Regional storm events, to reflect proposed future land uses within the MTLOG land in accordance with the land use;
- Report post development uncontrolled peak flows and compare to pre-development peak flows for the 2 through 100 year and Regional storm events at key nodes downstream of the MTLOG lands to Lake Ontario;
- Assess the implications of uncontrolled future flows in existing downstream flood vulnerable areas;
- Confirm the need for the management of Regional storm event flows (in case the increase of flow causes unacceptable impacts to downstream culverts and flood vulnerable areas);

- Develop a Stormwater Management strategy, including LID measures and end of pipe SWM facilities that achieves the SWM criteria for quantity, quality, and erosion control, in addition to mitigating impacts to water balance. Natural heritage, groundwater and surface water impact assessments shall be considered when developing the SWM strategy;
- If warranted based on the hydrologic assessment, provide a recommended approach to the management of regional storm flows;
- Verify the SWM strategy conformance with the criteria developed as part of the Phase 1 Study;
- Identify additional systems such as Clean Water Collector (CWC) systems, required to support LID measures as part of the overall water balance mitigation strategy and/or any feature specific water balance mitigation strategy, where required;
- Provide general design criteria for end-of-pipe SWM facilities that will work toward mitigating the impacts from the land use plan. The criteria will provide guidance at the next stage in the development process in support of Draft Plan of Subdivisions for sizing and grading of SWM facilities; and
- Provide an overview of timing, phasing and cost sharing requirements for end-of-pipe SWM facilities.

The hydraulic analysis will include examining or assessing the following:

- Additional field investigations via survey and field inspection of existing culverts to verify existing drainage patterns and the TRCA hydraulic models;
- The TRCA hydraulic models will be reviewed and verified for the tributaries of the Humber River located within the Secondary Plan. The floodlines for watercourses (defined bed and bank) will be delineated, as required. Any required modifications to the TRCA hydraulic model flows will be determined in accordance with the findings of the hydrologic assessment; and
- Existing Flood Vulnerable Areas (FVAs) downstream of the study area that will potentially be impacted from future development of the Secondary Plan will be identified.

Future Study Requirements

The SWS will include a summary of future study requirements related to hydrologic and hydraulic assessments. As the development approvals proceed through the Tertiary Plan and Draft Plan of Subdivision processes, the proposed servicing and stormwater management design will be refined including preliminary design and recommendations of stormwater management facilities and infiltration measures. Updates to the hydrologic modelling are anticipated based on refined local road networks, grading, servicing, and land use characteristics. Updates to the hydraulic models may be required if grading is proposed within the existing floodplain.

Hydrogeological Assessment

The purpose of the hydrogeological assessment is to review the regional hydrogeological setting of the Secondary Plan area lands, and characterize the local soil, groundwater and surface water flow conditions. The focus of the work will be on understanding the key hydrogeological functions and groundwater interactions with natural features to provide input to the design and engineering of proposed development areas such that important aquifers and natural features will be supported.

Key Objectives

The goal of the hydrogeological assessment is to establish a geological and hydrostratigraphical conceptual model for the study area. This investigation is more focused on the shallower environment, which is what would be impacted by development activities and what is typically interacting with the surrounding ecosystems. The deeper aquifer system is not intended to be studied in depth as part of this investigation as it is intended to be largely unaltered by development activities, specifically construction and dewatering activities.

This will include examining or assessing the following:

- Establish the study area stratigraphy and identify the aquifer(s) that may be present and their extents (hydrostratigraphy);
- Evaluate key characteristics of these bedrock and overburden systems, including hydraulic conductivity, hydraulic gradients (upward or downward), and groundwater chemistry;
- Evaluate the interactions between the groundwater and surface water systems and how these interactions impact the surrounding ecological environment;
- Identify areas where further investigation may be required to quantify or evaluate the hydraulic characteristics and/or confirm/establish conditions in complex environments or connections between the groundwater system and the surrounding environment;
- Identify areas within the study area where dewatering and/or depressurization may be required to facilitate development and construction or where a high groundwater table may be present; and
- Identify areas where future development may not be possible or where future development may have significant impacts to the groundwater regime or impacts its connection to the surface water, ecological, or other systems.

Workplan Requirements

The scope of work required to complete the hydrogeological assessment includes reviewing available published data and conducting a field investigation to confirm or establish in-situ conditions via in-situ testing and assessment.

Available data includes the review of water well records in the area, as well as any available consulting or research reports, available geological or hydrostratigraphical conceptual models (available through or produced by source water protection studies or the Oak Ridges Moraine Groundwater Program) and mapping products (produced by the Geological Survey of Canada, Ontario Geological Survey, Ministry of the Environment, Conservation and Parks and/or Ministry of Natural Resources and Forestry, etc.).

Additional field investigation will provide additional spatial and temporal insight on the groundwater system. In order to accomplish this, the field program will include a combination, that will include, but is not limited to the collection of the following datasets to provide data on a more regional context and provide insight in establishing appropriate field investigations for more site-specific studies for site plan approval submissions:

- Monitoring well installations with borehole logs (including monitoring well nests in select locations);
- Drivepoint piezometers (including nested piezometers in select locations);

- Long-term manual groundwater and surface level measurements (including hydraulic gradient calculations);
- Groundwater and surface water chemistry;
- Identification of the presence of seeps in and around watercourses and surface water features;
- Hydraulic conductivity measurements; and
- Spot baseflow measurements.

Monitoring locations are shown in **Figure 3** (**Appendix B**).

Depending on the outcome of the field investigation and the hydrogeological assessment, refinement of available hydrogeological understanding included in published studies may be possible and may include any or all the following:

- Refinegeologicinterpretation and hydrostratigraphy including surficial geology and hydrogeologic parameters;
- Refined understanding of the observed shallow groundwater conditions as they relate to response to seasonal changes in levels, flows and gradients, and responses to storm events (where possible);
- Refine mapping and interpretations of groundwater discharge areas;
- Refinements to groundwater flow contributions to and from surface water features and wetlands; and
- Feature-based water balance risk assessments.

The hydrogeological assessment data will be reviewed in the context of the following to provide a more comprehensive assessment of areas that may be more sensitive to potential impacts from development as well as areas that may not be ideal for development due to significant constraints or may require addition mitigation to be feasible and acceptable for the planned land uses.

These additional observations and technical assessments would be obtained from the hydrologic, terrestrial, aquatic and fluvial geomorphologic characterizations and would include, for example:

- Observations of seepage and discharge;
- Fish habitat;
- Phreatophytic observations;
- Streambed composition; and
- Low flow analysis and water quality.

In turn the groundwater characterization may also be used to provide technical input to aid in the characterization and data gap analysis for these same related and connected component disciplines.

Field observations for groundwater discharge will be coordinated at the field program's outset and all disciplines will be directed to collect appropriate observations during the completion of their other field tasks, as appropriate.

Future Study Requirements

The SWS will include a summary of future study requirements related to hydrogeological assessments. Additional investigations may be recommended for many reasons, including inconsistent data or unexpected results that may require confirmation or further delineation, or the results indicate a more complex environment than anticipated.

Some additional investigation recommendations may be included that can be completed in future work when more detailed site studies are being completed for site plan or zoning approvals. Additional tasks that may be required for immediate assessment or as recommendations to be included in future detailed site plan studies, may include any or all of the following:

- Additional drilling investigations, including additional monitoring points;
- Extended groundwater and surface level monitoring;
- Feature Based Water Balance Risk Assessments;
- Additional monitoring wells (maybe additional monitoring nests);
- Additional drivepoints and/or staff gauges (maybe additional monitoring nests);
- Seepage meter installation and monitoring;
- Additional streamflow or baseflow assessments; and
- Additional groundwater and/or surface water sampling.

Surface Water Quality

The purpose of the surface water quality work is to review the available existing surface water quality data of the Secondary Plan lands and characterize the surface water quality within the study area, including seasonal trends and effects due to precipitation events. The study will assess potential land use impacts on surface water quality, mitigation strategies and BMPs for urban stormwater management and identify management, implementation and monitoring of the surface water quantity and quality.

Key Objectives

The goal of the surface water quality study is to establish the baseline surface water quality within the study area and identify water quality concerns and/or restraints. This study will focus on water quality monitoring at the far upstream and downstream reaches of each watercourse in the study area to allow for robust characterization of baseline conditions and comparison to future conditions during and following development.

Workplan Requirements

The scope of work required to complete the surface water quality study includes a review of currently available background information to provide a preliminary understanding of the baseline water quality in the subwatershed. The existing datasets will be reviewed to understand the existing water quality status in the study area. The existing water quality status will then be assessed to provide the baseline reference and identify any water quality concerns and constraints in the study area. Other published documents including, but not limited to, Conservation Authority's Source Water Protection documents will be reviewed for additional background information. The study will also locate existing SWM facilities and the respective catchment areas, as the baseline reference for stormwater management in terms of water quantity and control.

A surface water quality sampling program within the study area will be completed in order to characterize the surface water quality based on the contributing land use, soils, and stormwater quality management practices during both wet (storm) and dry (baseflow) periods. Surface water quality monitoring and stream gauging will be completed at the same locations in order to correlate the surface water quality with the study area hydrology. Six (6) surface water quality monitoring events will be completed between April and December 2024. Surface water quality samples will be collected at each station for one (1) wet and one (1) dry event for each season. Spring is

considered to encompass April and May, summer is considered to encompass June through August, and fall is considered to encompass September through December. Two (2) grab samples will be collected for each wet weather event; one grab sample will be collected during the onset of the storm and one grab sample will be collected during the recession of the storm. A “dry” weather event is considered to be an event completed where precipitation has not occurred within the previous 72 hours. A “wet” weather event is considered to be any precipitation event of 5 mm or more in a 24-hour time period.

The grab samples for each wet weather and dry weather event will be analyzed for the following contaminants:

- Oil and Grease;
- Total Phosphorus;
- Anions (Nitrate, Nitrite, Phosphate, Chloride);
- Ammonia;
- Total Kjeldahl Nitrogen (TKN);
- Conductivity;
- Total Solids (TS);
- Total Suspended Solids (TSS);
- Biochemical Oxygen Demand (BOD5);
- PH/alkalinity;
- Total Coliforms/Fecal Coliforms/E.Coli;
- PAH;
- Metals (Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, K, Se, Si, Ag, Na, Sr, Tl, Sn, Ti, W, U, V, Zn, Zr);
- Hardness as CaCO3; and
- Turbidity.

Field measurements of the following contaminants will be measured using a water quality probe during the sampling event:

- Dissolved Oxygen;
- PH;
- Salinity; and
- Temperature.

A surface water quality section in the SWS report will be prepared summarizing the location of the water quality sampling stations and results of the quality analyses and provide an assessment of the surface water quantity and quality. The report will provide an assessment of potential land use impacts on surface water quality, mitigation strategies and BMPs for urban stormwater management. The report will also identify management, implementation and monitoring of the surface water quantity and quality.

Future Study Requirements

The SWS will include a summary of future study requirements related to surface water quality. Additional investigations may be recommended for many reasons, including inconsistent data or unexpected results that may require confirmation or further delineation, or the results indicate a more complex environment than anticipated. As the proposed stormwater management plan for the study area evolves, additional studies may also be necessary to adequately characterize baseline conditions close to proposed stormwater management facilities.

Some additional investigation recommendations may be included that can be completed in future work when more detailed site studies are being completed for site plan or zoning approvals. Additional tasks that may be required for immediate assessment or as recommendations to be included in future detailed site plan studies, may include any or all of the following:

- Additional water quality sampling events;
- Additional water quality sampling locations;
- Change in frequency and schedule of water quality sampling events;
- Additional streamflow or baseflow assessment; and
- Additional groundwater and/or surface water sampling.

Geotechnical Assessment

The purpose of the geotechnical assessment is to complete a subsurface investigation to determine the underlying soil and groundwater conditions, characterize the site geology, and to support the hydrogeological study. The scope also includes an erosion hazard assessment and slope stability study to determine the long-term stable top of slope (LTSTOS) position for confined valley systems on site. The site is within TCRA jurisdiction; therefore the slope stability study will follow TRCA guidelines within *"The Living City Policies,"* dated November 28, 2014. The study will also follow provincial guidelines within *"Technical Guide – River and Stream Systems: Erosion Hazard Limit,"* dated 2002, by Ministry of Natural Resources.

Key Objectives

Objective 1: Complete a subsurface investigation including borehole drilling, monitoring well installations, and geotechnical laboratory testing.

Objective 2: Characterize the subsurface soil and groundwater conditions encountered below the site.

Objective 3: Complete an erosion hazard assessment and slope stability study to determine the LTSTOS position for the confined valley systems within the site limits.

Workplan Requirements

Geotechnical Field Work Investigation and Reporting

The field investigation to be completed is generally summarized below:

- Obtain public and private utility locates;
- Advance boreholes across the site on participating properties and collect soil samples using the Standard Penetration Test. Borehole depths are established to support typical development, with deeper boreholes in locations along the valley systems to support detailed slope stability analysis;
- Monitoring wells and nested wells will be installed in strategic locations;
- The boreholes with monitoring wells/nested wells will be instrumented with a 50 mm diameter PVC casing. All installations will be conducted in accordance with Ontario Regulation 903 for subsequent monitoring and testing purposes; and
- Conduct geotechnical laboratory testing on selected soil samples to determine soil index properties.

Borehole locations are depicted in Figure 4 (**Appendix B**).

A geotechnical section will be prepared and included in the SWS report which will include background site information, work methodology, etc.; a site location plan showing the site in relation to relevant landmarks in the area; a borehole location plan showing the locations of the boreholes advanced on site; and borehole logs which will provide an illustrative view of the subsurface conditions encountered. The subsurface conditions encountered in the boreholes will be summarized in the report.

Slope Stability Assessment

To assist with preliminary constraints mapping, GEI will conduct a preliminary slope stability assessment for the confined valley systems on the participating properties. The scope will generally include:

- A visual slope inspection of the valleylands on the participating properties;
- Cutting cross-sections through the slopes, watercourses and valleylands using the topographic plan available for the site;
- Conservative estimates for the toe erosion allowance and stable slope allowance will be used at this time to estimate the LTSTOS;
- Assessment of the erosion access allowance and total development setbacks related to slope and erosion hazards;
- Review of proposed grading strategy related to site servicing and stormwater management ponds;
- Plan and profile views of the preliminary setback distances to assist with development constraint mapping; and
- A report summarizing the slope inspections, methodology and results.

Due to timing, this work will be completed to a preliminary level prior to the subsurface investigation, to support the overall site constraints mapping. More detailed slope stability analysis can be completed once the subsurface investigation is completed and detailed topographic information is available for the confined valley systems.

Future Study Requirements

Additional boreholes and monitoring wells would need to be advanced at the site as the design progresses to draft plan and into detailed design. The depths and locations of future boreholes and monitoring wells would need to cater to the proposed development concept. The future geotechnical reports should provide additional recommendations for earthworks,, foundation design, earth pressures,, excavations requirements, etc. as needed to support the proposed development.

Timing: Draft Plan, Detailed Design

Climate Change

When this TOR was prepared, the Caledon Green Development Standards (Sustainability Solutions Group, July 2023) was still in draft. When the standards are finalized, the Local SWS may be updated to accommodate requirements identified by the Town. In general, climate change will be considered as it is related to each of the aforementioned disciplines including potential impacts on the Natural heritage system and water resource system and will address how the proposed development concepts and proposed management will impact climate change considerations. Climate change considerations will also demonstrate alignment with Peel Region's Climate Change Master Plan (2019).

APPENDIX A

Detailed SWS Terms of Reference, May 2024

Terms of Reference

Local Subwatershed Studies

May 2024

Contents

1.0 INTRODUCTION

The Growth Plan for the Greater Golden Horseshoe (2019), along with other guiding documents, promotes integrated land use planning processes which consider multiple factors when planning for communities and neighbourhoods. These factors include the natural and physical environment, infrastructure needs, transportation, and socio-economic considerations. A cornerstone to contemporary planning, as recognized by the Growth Plan (2017), is the need for multi-disciplinary subwatershed studies which comprehensively establish a baseline characterization of the environmental conditions and natural systems and resources in a subject study area planned for growth developed based on a subwatershed unit, and from this establish an integrated management plan for the natural and water-based systems.

For each Secondary Plan within the New Urban Area (Settlement Area Boundary Expansion), a Local Subwatershed Study (Local SWS) must be completed to develop a sustainable development plan that protects and enhances the natural and human environments through the implementation of the direction, targets, criteria and guidance of the Settlement Area Boundary Expansion Scoped Subwatershed Study (Wood et. al., January 2022). The Local Subwatershed Study is intended to confirm, refine and implement a natural heritage and water resource systems management approach and will will protect, rehabilitate, and enhance the natural and water-based environments within the subject Secondary Plan Areas, and the surrounding lands in the respective subwatershed.

It is the Town's requirement that for any developer-led Secondary Plan, a Local Subwatershed Study must be completed. This document provides a framework to guide applicants on the Town's minimum requirements for a Local Subwatershed Study. For every Local Subwatershed Study completed, the Town requires the applicant to develop a Terms of Reference for their Local Subwatershed Study that outlines how they will fulfill the Local Subwatershed Study requirements. The Terms of Reference will need to be approved by the Town prior to initiation of the study.

1.1 Purpose

The lands being proposed for development through a Secondary Plan are generally referred to as the Primary Study Area (PSA) while those lands beyond the PSA within the subwatershed limits are referred to as the Secondary Study Area (SSA). Local SWS work in the PSA is typically more detailed and supported by field investigations, whereas the work in the SSA is generally less detailed and primarily supported by desktop information and limited field work, largely of a confirmatory nature. The broader watershed/subwatersheds may have existing downstream constraints beyond the identified Secondary Plan study area and, to the appropriate extent, these constraints either environmental or public safety will have to be considered in establishing the management strategies in the subject Secondary Plan area based on the overall study objectives and ultimate targets. Where there are watershed wide management strategies established through approved watershed studies, the established strategy is to be considered a minimum requirement.

The Local Subwatershed Studies will need to:

- Identify the location, extent, present status, significance, and sensitivity of the existing natural environment;
- Identify environmentally sensitive areas and natural hazards, including constraints and opportunities;
- Confirm or refine the natural environment system(s) (i.e., natural heritage system and water resource system) to protect, rehabilitate, and enhance the water quality/quantity,

ecological form, function and the interactions and interdependences between the system within the Secondary Plan Area and local environs;

- Identify lands where development may be considered, and determine how existing and future land uses can be developed to be compatible with the natural environment system(s);
- Undertake an iterative Impact Assessment based on an initial Preliminary Preferred Land Use Plan for the Secondary Plan area (This inherently will require establishing an initial land use concept which will need to be tested and assessed), followed by a second refined land use concept developed through the feedback from the initial testing, including input from other technical studies and feedback from stakeholders;
- Provide direction on best management practices (BMPs) to manage impacts from the urbanization proposed through the Secondary Plan (from an environmental and water management perspective), and, where there are established BMPs for infrastructure, these are to be considered a minimum requirement;
- Provide direction on future study requirements (i.e., Environmental Implementation Study or equivalent), infrastructure needs (i.e., Master Environmental Servicing Report (MESR) - planning and implementing servicing and transportation infrastructure from an environmental and water management perspective);
- Establish an implementation and management strategy and requirements for environmental systems monitoring;
- Support the Class Environmental Assessment processes being undertaken as part of the infrastructure planning for the Secondary Plan area, specific to constraints and opportunities associated with the natural and water-based systems.

As noted above, the extent and form of study varies based on the discipline and the areas of interest, with more intensive field investigations in the Secondary Plan area and less intensive desk-top forms of study in the lands beyond the Secondary Plan area to provide an overall subwatershed context. This systems-based assessment is required to examine the role of water (both surface and ground) in sustaining area resources, including creeks, wetlands, and other water-based features, including headwater drainage features. This baseline characterization is built on a period of field data collection and monitoring (minimum 2-years preferred 3-years), which then serves as the basis from which to examine and assess potential impacts due to planned urbanization. The impact assessment process includes a vetting of land use concept plans through an integrated and comprehensive planning exercise, that includes consideration of the findings and requirements of other infrastructure studies such as Master Servicing (Water/wastewater) and Transportation Plans, which need to be concurrently advanced for consideration through a consultative process involving local (Caledon) and the Regional municipality (Peel), other provincial agencies, landowners, Indigenous Nations and Peoples, and the public. This public consultation is vital to ensure that the varied interests of all stakeholders are appropriately considered in the study. Once appropriately vetted, management and monitoring recommendations to implement the recommendations of the Local Subwatershed Study and related municipal Master Plans are required to be translated into policy and strategies for community development as part of the Secondary Plan which will be enacted through an Official Plan Amendment (OPA).

1.2 Study Area

In alignment with Future Caledon Official Plan, a Local Subwatershed Study is required for each secondary plan area or new development in the New Community Areas and New Employment areas. The limits of the study area of the Local Subwatershed Study will:

- Consider Policy 21.3.3 and Figure F3 of Future Caledon Official Plan
- Ensure that the study will:
    - Characterize the location, extent, sensitivity and significant of the water resource system, and Natural Environment System form and functions, within and across the secondary plan area or development area; and,
    - evaluate the factors and influences that are important to the sustainability of the water resources system, and Natural Environment System form and functions, to the satisfaction of the Town; and,
- be determined in consultation with the Town, the Region and the Conservation Authority/Authorities; and,
- be approved by the Town.

1.2 The Secondary Planning Process

This Section is meant to assist in the understanding of the context of the Local Subwatershed Study (Local SWS) in relation to the Town's Secondary Planning Process. The relationship between the Secondary Planning process and the integrated Local Subwatershed Study and Infrastructure Planning Processes is presented in Figure 1.

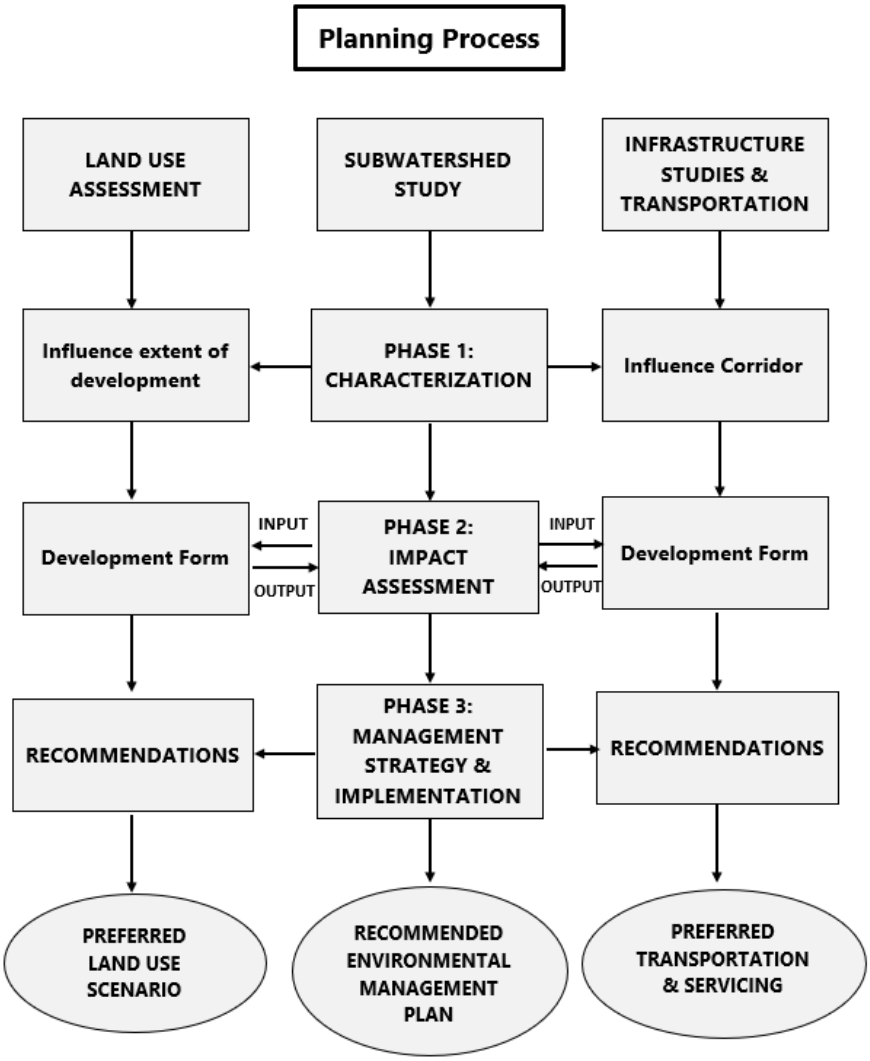


Figure 1: Integrated Land Use, Subwatershed, and Infrastructure Study Process

The Secondary Plan, with the accompanying studies, supports the development of a community development plan (with accompanying development policies). The Secondary Plan, and the related studies (i.e., Local Subwatershed Study, Transportation Master Plan, Water and Wastewater Master Plans, Agricultural Impact Study, and Fiscal Impact/Asset Management Study and others), are part of a comprehensive and coordinated planning process that will be required to meet the approvals necessary under the Planning Act and the Environmental Assessment (EA) Act.

The Local SWS will provide the environmental base and context for the natural and water-based systems to support the infrastructure planning for the Secondary Plan Area. Combining the Planning Act and Municipal Class EA process permits the Municipality and Region to plan the Secondary Plan area and its required infrastructure collaboratively in a holistic manner, whereby the Local SWS will provide important resource and management guidance to the Environmental Assessments for roads, water and wastewater servicing.

The concurrent infrastructure related studies, as part of the Secondary Plan, are intended to follow the Municipal Class EA Master Planning Process (typically adopting Approach #2). The level of investigation, consultation, and documentation will need to be sufficient to address Phases 1 and 2 of the Class EA process

to fulfill the requirements for Schedule A, A+ and B projects and thereby establish in the documentation the basis for specific future investigations if Schedule C projects are identified.

To facilitate consultation, a Technical Advisory Committee (TAC) will be formed comprising of staff from the Municipality, the Region, Conservation Authority, various applicable Provincial representatives, landowner technical representatives, and the consulting team(s). For specific and specialized matters, "sub TACs", involving discipline-specific professionals, will be established. The TAC will advise and help direct the development of the Secondary Plan and its component studies throughout the study process. The TAC will assist in ensuring that the Secondary Plan evolves from the foundational basis of the Local Subwatershed Study to a Community Development Plan in a collaborative manner through the integration of the outputs and recommendations from the concurrent studies.

Overall, the Secondary Plan will identify the community structure for the subject portion of the Settlement Area Boundary Expansion (SABE) lands to ensure appropriate integration and consideration for development opportunities within the community. The Secondary Plan will include land use categories, a road/transit/cycling/trail and municipal servicing network, a natural heritage system and open space/major community facility requirements. The objective is to ensure that the new community neighbourhoods and employment areas in the current SABE lands are developed sustainably in the optimal location, meeting the objectives and requirements of the Growth Plan (2017), as implemented through the Regional Official Plan and the Municipal Official Plan.

As noted above, the environmental base for the Secondary Plan (i.e., the natural heritage system and the water resource system) will be defined by the Local Subwatershed Study. The natural heritage system and water resource system established through the Province and Regional Official Plan, refined through the Municipal Official Plan, will be further refined or confirmed through the Local Subwatershed Study in support of the Secondary Plan.

A fundamental objective of the Secondary Plan is to ensure the Municipality develops as a sustainable community. To achieve sustainability, the community will be developed based on the vision to be a sustainable, healthy, connected and complete community.

2.0 GENERAL SUMMARY OF THE SUBWATERSHED STUDY PROCESS

2.1 Local Subwatershed Studies – Scope and Approach

The Secondary Plan Scope and related Studies will guide the development of the Secondary Plan area through a consultative, collaborative, and coordinated process to establish a sustainable, healthy, connected and complete community.

The Local Subwatershed Studies for the various Secondary Plan Areas in Caledon will need to describe the location, extent, sensitivity and significance of natural features and functions within the identified study area and evaluate the factors and influences that are important to their sustainability. The respective studies will establish goals and objectives for terrestrial and aquatic systems (i.e., natural heritage) and water resource systems in accordance with the Provincial Policy Statement, the Region's Official Plan, Future Caledon Official Plan, and the applicable Watershed Plans and Subwatershed Studies, including the Settlement Area Boundary Expansion Scoped Subwatershed Study (Wood et. al., January 2022). Using existing desktop information and available studies, as well as reconnaissance-level and detailed field work, the respective studies will document existing conditions, assess potential impacts of existing and future development and recommend management strategies to manage and mitigate the predicted impacts of urbanization, including comprehensive stormwater management strategies to protect, enhance and restore

hydrologic functions. In conjunction with the concurrent development of Secondary Plans, including Transportation and Servicing Master Plans (water and wastewater), the Local Subwatershed Studies will reflect and refine the Scoped SWS Natural Heritage System and Water Resource System in the Secondary Plan area and identify strategies to protect, enhance and restore ecological functions and promote compatible activities.

In addition, the Local Subwatershed Study will be required to include monitoring pre-development (minimum 2 years preferred 3 years, additional years may also depend on climatic conditions to characterize existing features and systems and establish baseline conditions. The initiation of monitoring prior to development is necessary to properly characterize the study area and further to conduct a thorough impact assessment at a detailed level for the local SWS and Secondary Plan. The post-development monitoring program, implemented following completion of the Local Subwatershed Study, is also required to provide appropriate recommendations for potential adaptive environmental management incorporating the findings from the environmental monitoring program in Town-led or Conservation Authority-led initiatives, such as broader scale planning strategies and secondary planning recognizing that development and secondary planning will be staged and phased with opportunities to adjust requirements in subsequent planning stages. In this regard, the Local Subwatershed Study is required to provide guidance for developing and implementing a monitoring program post-development, as well as to provide direction regarding the timing and duration associated with each monitoring component, the party responsible for the various monitoring components, and funding, timing and implementation strategy.

The Local Subwatershed Studies will be conducted in three (3) phases, discussed in further detail below and presented in the Figure 2. The formulation and TAC acceptance of the Technical Work Plan is a core component of the process for Local Subwatershed Studies. The Technical Work Plan needs to be developed under a separate process, prior to initiating the Local Subwatershed Study and site monitoring. The Technical Work Plan needs to include details on the scope of field work and monitoring along with preliminary mapping to characterize the study area and provide the basis for required modelling for the subwatershed area. **The Local Subwatershed Study process requires that the Technical Work Plan be finalized and approved by the municipality, with consultation with relevant Conservation Authority and Region prior to initiating field surveys to support the Characterization phase (Phase 1) and prior to proceeding into the Impact Assessments (Phase 2).**

An overview of each phase of the Local SWS process is provided below, with further details provided in the subsequent section.

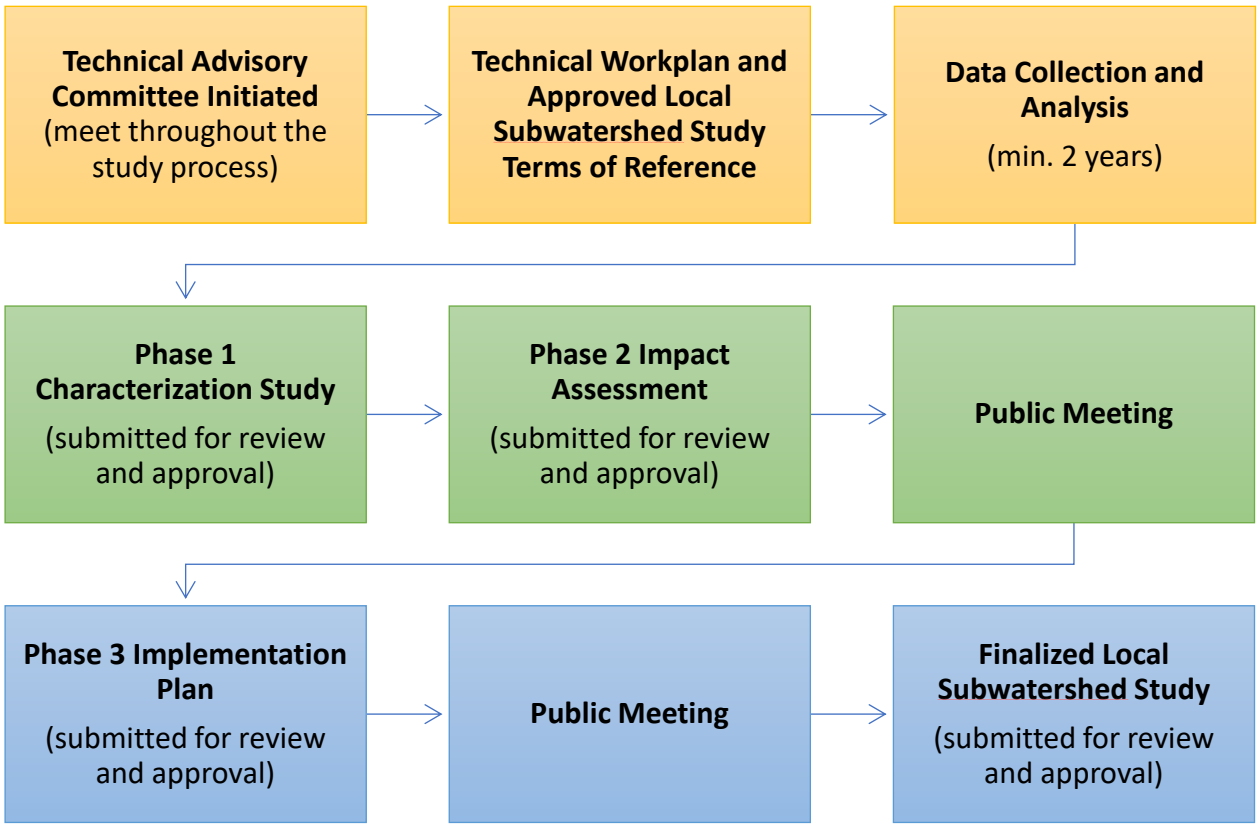


Figure 2: Local Subwatershed Study Process

Technical Workplan and Approved Terms of Reference

Developer-led Local Subwatershed Studies should commence with a proposed Terms of Reference to be submitted to the Town and approved by the Town and agency partners before initaiton of the work. The proposed Terms of Reference should undertake, at minimum, the work outlined in this document and include a detailed explanation of how the work will be completed. The Local Subwatershed Study Terms of Reference will need to be accompanied by a data gap analysis and development a technical workplan that outlines the methodology (i.e. how, what and where) for collection of all of the data and the analysis of that data, including the models that will be used and how they will be calibrated and validated. The Local Subwatershed Study will need to include a Technical Advisory Committee, comprised of representatives from Caledon, Peel, CAs, landowner groups and various Provincial agencies, that meets regularly throughout the study process.

Phase 1: Characterization and Integration

Phase 1 of the Local SWS will need to fully consider the data and information in the Scoped Subwatershed Study to characterize the resources associated with each subwatershed organized by study discipline (i.e., hydrology/hydraulics, groundwater, water quality, stream morphology, aquatic, and terrestrial ecology). Background and supplemental field data are to be assessed by each discipline, and then across disciplines, to:

- establish the form, function and linkages of the environmental resources,
- confirm, refine and identify environmental constraints and opportunities related to terrestrial and aquatic habitat, features, and systems using the targets and objectives set out in the Scoped Subwatershed Study

- establish surface water and groundwater constraints and opportunities associated with flooding, erosion, water quality, water budgets, including recharge and discharge areas through new numerical tools (models) suitably calibrated to local conditions,
- Refine and implement criteria and constraints for management opportunities associated with the environmental features and systems.

Goals, objectives and targets developed through the Scoped Subwatershed Study and Future Caledon should form the basis of the goals, objectives and targets for the Local Subwatershed Study. As part of Phase 1, the Local Subwatershed Study will need to finalize the goals, objectives and targets to be area specific, carrying through, as indicated above, the goals, objectives and targets of the Scoped Subwatershed Study and including additional ones should there need to be for the specific area in consultation with the Technical Advisory Committee (TAC)..

The Phase 1 characterization will need to include a minimum of two-years of pre-development monitoring, with three-years being preferred to characterize existing systems and features, as well as to inform establishing baseline conditions for comparison with predictions associated with post-development conditions. Should the two years of minimum data be undertaken during abnormal climatic conditions, a third year will be required.

Phase 2: Subwatershed Impact Assessment

Phase 2 of the Local SWS identifies future stressors, describes (past, present) and predicts (future) impacts, and assesses these impacts against the preliminary goals, objectives, and targets developed as part of Phase 1. Future land use scenario(s) are evaluated based on input from the Secondary Plan Land Use Team. For various disciplines (i.e., groundwater, hydrology, hydraulics and water quality) analytical tools are required to be used to predict changes to existing conditions in relation to subwatershed-based targets associated with the development of the Secondary Plan area. Information and analyses from previous background studies (i.e., Watershed Plan, Regional Scoped Subwatershed Study, Hydrologic Investigations, Tier 3 Groundwater Studies, etc.) will be used to assist modelling future land use scenarios. For others (i.e., terrestrial and aquatic ecology) predictions will inherently be semi-quantitative, qualitative or conceptual, integrated with predictions from other subwatershed disciplines (i.e., hydrogeology, hydrology, hydraulics and water quality) and experience elsewhere including knowledge of habitat/biota interactions.

As noted earlier, the Subwatershed Impact Assessment process is expected to be an iterative process whereby an initial land use concept will be evaluated/tested against the preliminary targets, and the feedback from this initial test may then inform the establishment of a refined land use concept.

Phase 3: Management Strategies, Implementation, and Monitoring Plan

Phase 3 of the Local SWS will use the findings of Phase 2: Subwatershed Impact Assessment to refine and finalize the evaluation of various land use scenarios and recommend a set of preferred management strategies, addressing the preferred land use designations and form, established through broader planning input to achieve the identified goals and objectives, and to establish the recommended strategies. An Implementation Plan will be prepared to offer guidance on locations and types of SWM facilities including Low Impact Development (LID) practices, staging/phasing, future study requirements, monitoring, Environmental Assessment requirements, and general economics.

Phase 3 also involves the development of a long-term monitoring initiative that is to evaluate the effectiveness of the proposed management strategies post-development by assessing whether the assumptions made at the Local SWS scale are appropriate and predictions made are sufficiently accurate. The feedback from this post-development monitoring will then be used through a process of adaptive management to determine if parts of the Local Subwatershed Study strategies and/or recommendations

should be modified as part of future development applications. While the execution of the post-development monitoring plan is not included within the scope of work for the Local Subwatershed Studies, the Local Subwatershed Studies are nevertheless to provide framework-level direction regarding the components, methods, duration, and key locations for the execution of the monitoring program, as part of future work. In addition, the subject monitoring approach and plan should will fulfill the CLI-ECA monitoring requirements. Further details on area specifics would need to be considered as part of future neighbourhood scale studies.

Public Meetings

At minimum, two public meetings should be held to share the findings of the study with residents and to gain their feedback. The meetings should be held as part of the Phase 2 Impact Assessment work and following the Phase 3 work.

The following provides further information on the technical work that needs to be completed as part of each phase of the Local Subwatershed Study.

2.2 Background Information Review/Gap Analysis/Work Plan Confirmation

Background Information Review:

During Phase 1, the Study Area will need to be characterized and preliminary mapping of constraints and opportunities will need to be developed. Information shall be obtained through three (3) levels of investigation, including (i) review of desk-top secondary sources (compiling information from existing documents); (ii) reconnaissance-level fieldwork; and (iii) detailed field work (Minimum 2 years, 3 years preferred).

Existing desk-top information relevant to the Local Subwatershed Study Area will need to be reviewed. Appendix A has a comprehensive database and summary of the area studies relevant to these study areas and should be established as the starting point.

Gap Analysis:

Background data used to prepare the Local Subwatershed Study, will need to be documented listing its source and format (e.g., municipal report/agency website/personal communication). For map data, the map scale shall be specified. The list of source materials shall follow a generally accepted bibliographic format. The purpose of documenting the background data is to facilitate a "gap analysis" and identify possible preferred methods by which to appropriately address the information gaps in Phase 1, as required.

A summary of each document from which information was used to prepare the Local Subwatershed Study characterization will need to be prepared. For each source, a brief review shall be produced, summarizing the source's content, and describing its relevance to the Local Subwatershed Study.

Technical Work Plan Confirmation:

Once all of the background data have been collected, the need and requirements for obtaining additional information shall be determined, and a proposed program for collecting additional data shall be outlined to the TAC. This process allows for collaborative consultation on the Technical Work Plan. It will be important to receive final sign-off from the TAC prior to advancing the updated/refined work plan.

2.2 Phase 1 – Subwatershed Characterization and Integration

2.2.1 Hydrology and Hydraulics

Background information on the study area is to be collected from all available sources. Maps of the study area will be provided by the Town, Region, and Conservation Authority. For each subwatershed and associated outlet, the physical features (e.g., subwatershed boundary, physiography, topography, soils, major watercourses, drainage swales, and wetland features) within the Secondary Plan Area shall be established. Any specific areas of interest shall be defined, identifying important implications on development potential, environmental features, and / or watercourse system function.

Hydrology:

The Hydrologic Modelling should apply a hybrid approach whereby:

- the hydrologic modelling of the Local Subwatershed shall apply the approved hydrologic modelling from the Conservation Authorities for Regulatory Flood Hazard assessments, and
- new local detailed continuous hydrologic modelling will need to be prepared for assessment of frequency flows, water balance and erosion.

The detailed continuous hydrologic model shall be selected for use in the Local SWS; the model(s) will need to be developed and calibrated for the subwatershed's existing condition. The local hydrologic model shall be a continuous, deterministic, hydrologic model, approved by TAC**,** with a strong physical representation of surface runoff, baseflows, and surface and groundwater interaction. It will be necessary to justify the applicability and sufficiency of the proposed numerical model(s). The modelling should ensure that the hydrologic and hydraulic features are appropriately represented for each subwatershed/catchment within the study area. The development of the model(s) will need to be in accordance with applicable standards to support future Municipal or Conservation Authority use of the model, and model results.

It is recommended as part of the review of background data, that the locations for streamflow gauges and rain gauges be identified. Field data for model calibration and validation should be collected between April and November inclusive. Once calibrated and validated the model is to be executed in both event (synthetic design storms) and continuous mode (using frequency analyses) to generate peak flows for a range of return period storms including 2, 5, 10, 25, 50, 100, 350 year and Regional Storm.

The results from the surface water modelling should be used to corroborate the water budget developed as part of the Hydrogeologic assessment (ref. Section 2.2.3).

The hydrologic modelling is to establish the baseline hydrology for the subwatershed system. As noted, it is required that the model(s) will be calibrated andvalidated based upon both historical rainfall and flow monitoring data, as well as new hydro-meteorological data collected as part of this study. The exercise should meet Provincial standards to provide a comprehensive understanding of the existing hydrologic conditions of the study area. The model shall be calibrated andvalidated to provide comparable flows at the subwatershed outlets to those determined in any previous watershed or drainage studies for the given watercourses, and any differences need to be rationalized. The model input parameters shall be compared to previous studies and modified to represent more detailed subwatershed modelling and shall be completed to the satisfaction of the TAC. The extent of area modelled should be sufficient to generate results at key/important downstream locations/confluence points and locations of interest (i.e. Special Policy Areas, Flood Vulnerable Areas, Flood Vulnerable Roads etc.) to confirm that the development of the Secondary Plan Area will not have any adverse impacts on the peak flow rates and runoff volumes specific to the objectives of managing the impacts due to adverse flooding and erosion.

The Erosion potential assessment of receiving and downstream watercourses shall be carried out using continuous simulation of watercourse flows over a suitable period of time, to evaluate the duration of critical discharge exceedance, cumulative erosion index (Ontario Ministry of Environment, 2003), cumulative effective work (per TRCA SWM Criteria, 2012), and other methodologies proposed by the study team stream morphologist (e.g. cumulative effective discharge, number of exceedances), to determine erosion thresholds (discharge, velocity and shear stress) established by the study stream morphologist and the associated guidance on the appropriate methodology.

Hydraulics:

The Local SWS will involve a field inventory of creeks, road crossings (culverts and bridges), stormwater facilities, etc. The current drainage systems and outlets shall be characterized as to potential drainage constraints and opportunities. The intent of the hydraulic modelling is to define area flood hazards and system constraints.

For established and regulated watercourses located in the study area, hydraulic analyses shall be conducted. Flood lines shall be established for the Regulatory Event (i.e., based on the flows associated with the greater of the Regional Storm event or 100 Year Storm) for existing conditions. For the creeks that have floodplain delineation, as identified in previous studies, the flood lines shall be updated to reflect the current limits of the flood hazard, for land use planning purposes, but not as a formal flood plain map. The floodplain delineation should be based on hydraulic modelling, using the latest Hydrologic Engineering Center's River Analysis System (HEC-RAS) model from the U.S. Army Corps of Engineers, to generate the associated flood lines based on the peak flows established through the hydrologic analysis conducted for the Local SWS. As noted, this component of the Local SWS, while preparing preliminary floodlines for land use planning purposes, is not intended to be a formal floodline mapping study.

2.2.2 Hydrogeology

The goal of the Local SWS with respect to hydrogeology is to establish a geological conceptual model for the study area, determining the key characteristics of the bedrock and overburden systems, in addition to their functions in terms of controlling groundwater movement, availability, and quality in the subwatershed study area. An integral component of the hydrogeologic study is to assess the interactions between the groundwater system and the surface water system, and to determine the overall role or function of these interactions in an ecosystem context. It is also important to establish an understanding of the effects of future development on the local groundwater resource to assist in the need and implementation of measures to address overall water balance. This Local Subwatershed Study will build upon the understanding derived through the SABE Scoped Subwatershed Study. The incorporation of additional field monitoring using new data and refined modelling tools will provide additional spatial and temporal insights on the groundwater system. The refined analysis will be needed to achieve the primary objectives and extend the understanding of the following key matters:

- Presence of potentially significant local recharge areas, linked with local discharge,
- Shallow depth to groundwater,
- Locations of strong upward gradient,
- Groundwater/surface water interaction,
- Dewatering needs,
- Seepage areas and
- Existing tile drainage.

In order to accomplish the above, additional data made available over the course of the local study will need to be reviewed prior to finalizing the groundwater field program, as part of the Technical Work Plan. The groundwater field program, which is to be prepared by a qualified hydrogeologist, is expected to be

tailored to the characteristics and resources in the subject Subwatershed area and include but not be limited to the following: :

- Monitoring well installations with borehole logs,
- Drivepoint piezometers,
- Manual and continuous water level measurements,
- Groundwater and surface water chemistry,
- Hydraulic conductivity measurements and
- Spot baseflow measurements.

Depending upon the needs of the local study area, the refinement of the conceptual groundwater model provided in the Scoped Subwatershed Study may include the following:

- Refine geologic interpretation and hydrostratigraphy including surficial geology and hydrogeologic parameters.
- Refined understanding of observed shallow groundwater conditions as they relate to response to storm events, upward gradient and potential impacts on infrastructure.
- Refine mapping and interpretations groundwater discharge areas (subwatershed scale and reach scale).
- Refinements to understanding of groundwater flow including contributions to and from areas outside the subwatershed(s).

The baseline groundwater conceptual model and more detailed numerical groundwater model and analysis should incorporate observations and technical assessment from the hydrologic, terrestrial, aquatic and fluvial geomorphologic characterizations; these would include for example:

- Observations of seepage and discharge,
- Fish habitat,
- Phreatophytic observations,
- Streambed composition, and
- Low flow analysis and water quality.

In turn, the groundwater characterization should provide technical input to aid in confirming or guiding the characterization of the other component disciplines associated with the Local SWS.

Field observations for groundwater discharge must be coordinated at the outset of the field program. In order to efficiently use the field resources, observations from all disciplines should be captured, as it is expected that more field reconnaissance is carried out by terrestrial, aquatic and fluvial geomorphology in the course of their work.

The SABE Scoped Subwatershed Study provided an existing conditions water balance for the Focus Study Area utilizing the water balance parameters estimated from an Oak Ridges Moraine Groundwater Program model. This water balance methodology should be considered for the Local Subwatershed Study to provide a refined baseline water balance for comparative purposes in the Phase 2 Impact Assessment. This water balance, should be compared to the numerically-derived hydrological model water balance results described above.

2.2.3 Stream Morphology

Several objectives concerning aquatic habitat are intended to protect the morphological and fluvial character of the study area streams, with the intent (where feasible and required) to restore sinuosity, maintain physical habitat attributes (e.g., pools, riffles etc.), diversity and fluvial processes (e.g., bed load

transport, energy reduction through sinuosity, etc.), and to prevent increases in erosion and deposition through the maintenance of the hydrological regime.

The fluvial geomorphological assessments in support of Local Subwatershed Studies should meet or exceed the criteria outlined in Appendix B – Erosion and Geomorphology - of the TRCA Stormwater Management Criteria (2012).

Available data for the subwatershed and other existing sources, are to be reviewed to confirm the need for updating the existing information. Surface water feature types (watercourses and headwater drainage features) should be defined and identified appropriately as a reach delineation is performed. Reach delineations and feature types are to be confirmed and/or updated based on refined mapping and field investigations. A baseline morphologic assessment, according to stream characterization and flood /erosion considerations, is required including a detailed inventory of stream morphology observations. Through field-based observations of channel processes and stability, sensitive and/or representative sites are to be selected to complete detailed field surveys for an erosion threshold analysis at the systems scale.

An erosion potential analysis is to be conducted, based on the erosion data collected to understand the erosion processes and to identify areas which are prone to erosion, or where existing structures may be at risk. This will be completed though desktop and field analyses. The erosion potential analysis is also to determine the threshold flows for erosion at strategic points in the subwatershed for input to the hydrologic assessment to support the development of stormwater management guidance. Assessments will identify those sites most sensitive to erosion, with reasonable details covering the entire study area.

An erosion hazard delineation will be completed for each watercourse reach. The valley setting will determine whether a meander belt (unconfined systems), or a long-term stable top of slope (confined systems) is delineated. These assessments and application of setbacks will conform to Provincial Policy and applicable Conservation Authority Regulations.

In addition, the Study Team's Stream Morphologist, along with others on the Study Team including aquatic and terrestrial ecologists and surface and groundwater specialists, are to conduct an assessment of watercourse constraints (high, medium, or low constraints) to confirm or refine the results from the SABE, while also completing an assessment of the headwater drainage features (HDFs) in accordance with the application methodology presented in *Evaluation, Classification and Management of Headwater Drainage Features Guidelines (*TRCA/CVC 2014). The assessment will need to involve multi-seasonal field work (minimum two years) and an integrated interpretation of the data to establish current classification and future management (Phase 3). Any site-specific modifiers to the protocol will need to be vetted through the study's Technical Advisory Committee, prior to finalizing and proposing management recommendations. The classification and management of HDFs provides for detailed, field verified assessments to maintain overall system function and contributions, that previously may have been estimated through the application of legacy drainage density targets.

2.2.4 Aquatic Environment

The available background information on fish habitat in the study area, including information on permanence of flow and thermal regime, fish communities, fish species present, aquatic species at risk present, and benthic invertebrate communities should be acquired and used to characterize the aquatic environment. Some aspects of aquatic habitat, such as channel form and stability, headwater drainage feature classification, and riparian vegetation will be addressed by, or in conjunction with, other disciplines (e.g,, fluvial geomorphology, terrestrial ecology). Data gaps should be identified, if present. If data gaps exist that will limit the effectiveness of the subsequent phases of the Local SWS, field programs should be conducted to address these gaps. In some cases, data gaps may be addressed through baseline monitoring.

Baseline monitoring sites should be established and monitoring initiated. Baseline monitoring sites should be representative of larger reaches based on key parameters such as the fish community and thermal regime and on expected susceptibility to development impacts. Baseline monitoring methods should follow established protocols (e.g., Ontario Stream Assessment Protocol, Ontario Benthic Biomonitoring Protocol) and conform with the monitoring methodologies employed by TRCA and CVC, if possible, to maximize the utility of the data.

2.2.5 Terrestrial Environment

Landscape Scale Screening

To better understand the ecological context of the proposed development area, as part of the overall subwatershed, the Local Subwatershed Studies will need to review and build upon the direction and guidance in the Regional Scoped SWS. The purpose of this review will be to generate information on the ecological context of the Study Area, consider its position and role in the overall Natural Heritage System of the Scoped SWS and potential connectivity of the Study Area within the broader landscape. This Landscape Scale Screening supports identification of terrestrial and wetland habitat connectivity, potential wildlife movements, and the ecological context of the Secondary Plan Area, in relation to the surrounding environs to help understand, confirm and, where appropriate recommend additional linkages between the ecological systems and enhancement opportunities within the Secondary Plan area and with lands beyond their boundaries on the landscape. This screening will rely on existing desktop information sources.

Building on the approaches used in the SABE Scoped SWS, a variety of metrics should be used to quantify existing landscape-scale conditions and functions. Given the broader scale of interest for the Landscape Scale Screening, the objective should be to characterize patches of natural cover that occur within the subwatershed and the area surrounding the Secondary Plan Area being studied. Metrics should include, but are not limited to, those that quantify:

- The occurrence and diversity of vegetation community types within and across patches
- The size and shape characteristics of vegetation and habitat patches
- Landscape composition (i.e., matrix influences) influence on features and/or natural area patches
- Connectivity of patches (i.e., physical and functional connectivity)
- The occurrence and coverage of features and/or habitats that have policy implications (e.g. habitat for Species at Risk, species that are provincially rare, Significant Wildlife Habitat, etc.)

Detailed Assessment of Terrestrial Resources

A detailed assessment of terrestrial resources in the subwatershed shall be undertaken. The Natural Area Inventory information from the Conservation Authority and the Town of Caledon, should be consulted prior to the initiation of field work. The data collected shall be used to ensure that future land-use planning and proposed development is consistent with Section 2.1 of the Provincial Policy Statement, Region of Peel's Official Plan, and Future Caledon Official Plan

Depending on the vegetation community, Ecological Land Classification (ELC) results and habitats determined to be present in the study area, it may be appropriate to undertake targeted surveys for certain taxa or species, rather than rely solely on incidental observation. The Significant Wildlife Habitat Eco-Region 6E Criteria Schedules (MNR, 2015) should be used in conjunction with the Significant Wildlife Habitat Technical Guide (MNR, 2000) when assessing Significant Wildlife Habitat (SWH); this analysis should incorporate advancements in SWH analysis that are provided by stakeholders and agencies (e.g., watershed-scale SWH mapping).

Detailed field assessment of the subwatershed's terrestrial resources shall be provided to characterize the terrestrial environment and establish a baseline terrestrial environment for the Secondary Plan Area,

including the proximity to, and the degree of linkage with other habitats. When assessing species, status should include federal, provincial and local rankings. In addition, maps that identify natural heritage features and the results of the terrestrial investigations shall be provided. Features are to be assessed against criteria and direction outlined in the Scoped Subwatershed Study (Part A) to inform implementation of management guidelines for features and other components of the NHS (Parts B and C of the Scoped Subwatershed Study). Specific consideration shall be given to the location and relationship of features and areas within the NHS (e.g., occurring within the Province's NHS, linkage, proximity to Key Features, etc.). Opportunities for enhancement of the terrestrial environment shall build on those identified in the Scoped Subwatershed study, including confirmation of enhancement areas, objectives and targets.

Table 1: Terrestrial Environment Inventory Requirements

Biophysical Inventory	**Inventory Requirements**
Vegetation Community Identification	Use Ecological Land Classification to classify vegetation communities according to Lee et al. (1998).
Botanical Inventory	3 season survey (spring, summer and fall) to identify species.
Native / Invasive Flora Survey	Determine the percentage of Native and Invasive Species in surveyed vegetation communities.
Woodland Evaluations	Inventory within woodland areas should be sufficient to evaluate the significance of woodland features based on relevant criteria and policy definitions. Woodland boundaries should be field verified with responsible authorities where feasible.
Evaluation of Unclassified Wetlands	Document species records and wetland community types consistent with methods used in the Ontario Wetland Evaluation System (OWES).
Breeding Bird Surveys	2 surveys at least 10 days apart; the first between May 24th and June 16th and the second between June 17th and July 10th using 10-minute point counts and area searches. Breeding evidence by species should be recorded according to the Ontario Breeding Bird Atlas protocol.
Reptile Surveys	Use active searching or other commonly accepted. MNRF protocols/methods (April- July and Sept.-Oct.)
Amphibian Breeding Surveys	3 surveys between April and June corresponding to specific nighttime temperatures of >5°C, >10°C and >17°C, according to the Marsh Monitoring Protocol. Salamander surveys are required using active searching and should be completed in spring in appropriate ponds to determine the presence of salamander breeding areas.
Incidental Wildlife Observations	Incidental sightings of all wildlife (mammals, birds, butterflies, dragonflies, damselflies, amphibians, and reptiles) should be recorded during site investigations

Biophysical Inventory	Inventory Requirements
Species at Risk Screening	Screening should include results from all available sources, i.e. Natural Heritage Information Centre, wildlife atlases, MNRF Municipal List and Conservation Authority database.
Significant Wildlife Habitat Screening and Assessment	This assessment will include identifying candidate and confirmed Significant Wildlife Habitat and will utilize the MNR's *Significant Wildlife Habitat Technical Guide 2000)* and associated Criteria Schedules (MNRF 2015).

2.2.6 Surface Water Quality

Currently available background information shall be used to provide a preliminary understanding of the baseline water quality in the Secondary Plan Area and subwatershed. The existing datasets shall be reviewed to understand the existing water quality status to provide the baseline reference and identify any water quality concerns and constraints in the study area. Other potential studies, such as the Conservation Authority's Source Water Protection work will have some relevant data to contribute to this understanding. The study will also complete an inventory of existing SWM facilities within the subwatershed and the respective catchment areas, as the baseline reference for stormwater management in terms of water quantity/ quality control.

Local water quality monitoring data will need to be collected to support characterizing the area's surface water quality based upon the contributing land use, soils, and existing stormwater quality management practices during both wet (storm) and dry (baseflow) periods. Surface water quality monitoring at the same locations as the streamflow gauging is preferred in order to correlate the surface water quality with the study area hydrology. For all permanently flowing streams continuous monitoring of temperature, dissolved oxygen and turbidity is required between April and December for a minimum of two years. Surface water quality monitoring needs to be conducted between the months of April and December. Water quality grab sampling should be completed at each station for three (3) dry weather events and three (3) wet weather events, capturing at least one (1) wet and one (1) dry event for each season. Two (2) grab samples would be obtained for each wet weather event, with the objective of characterizing the surface water chemistry during the onset of the storm with the first sample and characterizing the surface water chemistry during the recession of the storm with the second sample. Grab sampling has been recommended over the use of automated samplers as prior experience with the use of automated samplers has demonstrated logistical issues related to the pre-determination of the sampling duration and interval, functional issues related to the "triggering" of the sampler and siting on a flat surface, as well as other issues related to protection against vandalism.

The grab samples for each wet weather and dry weather event may need to be analyzed for the following contaminants:

- Oil and Grease
- Total Phosphorus
- Anions (Nitrate, Nitrite, Phosphate, Chloride)
- Ammonia
- Total Kjeldahl Nitrogen (TKN)
- Conductivity
- Total Solids (TS)

- Total Suspended Solids (TSS)
- BOD_5
- Dissolved Oxygen
- pH/alkalinity
- Salinity
- Total Coliforms/Fecal Coliforms/E. Coli
- PAH
- Metals (Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, K, Se, Si, Ag, Na, Sr, Tl, Sn, Ti, W, U, V, Zn, Zr)
- Hardness as $CaCO_3$
- Turbidity

2.2.7 Phase 1 Report – Subwatershed Characterization and Integration

At the completion of Phase 1, the general characteristics of the study area subwatershed will have been identified and a clear understanding of the constraints and opportunities will have been developed. Constraints and opportunities mapping shall be developed, and a preliminary Natural Heritage System and Water Resource System should be identified, building upon that identified in the Region's Scoped SWS. The Phase 1 Report will establish the general characteristics of the subwatershed and the Secondary Plan Area, which will be the starting point from which the proposed land uses are to be developed. Of importance, the Phase 1 Characterization report should identify/delineate all key natural heritage and key hydrologic features and assess their status and significance tied to policy requirements, as a key deliverable and component of the constraint mapping.

The Phase 1 Report shall include:

- Summary of background literature and data reviewed;
- Subwatershed study area characterization including:
    - Climate, landform, geology, and soils
    - Hydrogeology/groundwater quantity and quality
    - Surface water quantity and quality
    - Stream geomorphology
    - Aquatic and Terrestrial ecosystems
    - Natural Environment Systems
- Integrated assessment of above identified features and functions to evaluate their significance
- Summary of the subwatershed study area major issues, concerns and constraints.

The constraint-based framework that is developed should be consistent and inclusive of all relevant federal, provincial, municipal, and CA policies and clearly identify areas that are protected from development and those that provide opportunities for development.

Note: It is expected that a Draft Table of Contents will be submitted for review and comment well in advance of the Draft Report submission.

2.3 Phase 2 – Subwatershed Impact Assessment

Based on the outcomes of Phase 1, including the review of background information sources and supplementary field work, Phase 2 will require an iterative assessment of the potential impacts of proposed

future land use changes on the natural environment and water-based system within the study area. The findings from the Phase 1 Characterization Study, completed by the various disciplines, along with the outcomes of the initial servicing and transportation needs, will be considered in an integrated manner in developing the preliminary preferred land use concept. A screening of the preliminary land use concepts is to be undertaken to determine a preliminary preferred concept(s) for the impact assessment in Phase 2.

The Phase 2 Impact Assessment will be completed concurrently to the other component studies such as the Transportation Master Plan, and Water/Wastewater Master Servicing Plan, which will also assess the impacts and requirements of the preliminary preferred land use concept.

The intent of Phase 2 is to assess the impacts of the preliminary preferred land use concept and inform the preliminary establishment of initial management strategies which:

- protect the critical elements and systems of the subwatershed and local drainage system;
- prevent environmental degradation;
- provide adequate flexibility for integration with adjacent development and redevelopment areas where present;
- assist in the establishment of open space linkages;
- address opportunities and constraints to development;
- provide a strategy to manage legacy impacts from existing land uses;
- Establish details on preliminary locations and areas for stormwater management (LID BMPs and end-of-pipe facilities);
- identify restoration and enhancement opportunities to meet system targets; and
- ensure that the land use plan meets the goals, objectives and targets of the Local Subwatershed Study.

In Phase 2, a detailed analysis shall be completed to assess the impacts of future land use changes in the Secondary Plan Area. Various options and practices for mitigating these impacts shall be reviewed and management strategies to create net benefit shall be advanced. As noted, the assessment of future land use changes is premised on an iterative approach whereby the feedback from the initial land use assessment shall be provided to the TAC and the Land Use Planning Team. The impact assessment shall also consider the impacts of climate change to the Natural Heritage System and Water Resources System, and the manner in which the proposed development and management plan may exacerbate or mitigate these impacts. In this regard, the impacts resulting from the proposed development and climate change are intended to be assessed in an integrated manner, rather than evaluating the impacts separately.

As part of the Humber River Watershed Study currently being undertaken the Toronto and Region Conservation Authority an assessment of the impacts of climate change has been undertaken by applying a quantitatively or qualitatively tiered approach assessing the impact of two climate scenarios. The two climate scenarios include a moderate emissions scenario (SSP2-4.5) and a very high emissions scenario (SSP5-8.5), which translate to approximately 2.7°C and 4.4°C of global warming by the end of the century, respectively (IPCC, 20211). Further information can be provided by the Town as part of inititing the Local

[1] IPCC, 2021: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp. doi:10.1017/9781009157896.

Subwatershed Study process. It is the intent of the Local Subwatershed Study to apply a similar methodology. For the Local Subwatershed Studies being undertaken within the Humber River Watershed this will include downscaling TRCAs approach to the applicable study area. In this case, the work done by TRCA can provide supporting information. For the areas of SABE outside of the Humber River Watershed, the same approach should be taken but can not be supported by a similar broader scale analysis. Should the applicant prefer to devise a different approach this should be provided in the Technical Workplan and approved by the TAC. Please note that both CVC and TRCA have undertaken considerable climate change impact assessment work over the last decade which may provide valuable insights and considerations including TRCA's Vulnerability Assessment for Natural Systems in Peel Region.

The information from the Local SWS at this stage, will be considered along with the information from the concurrent transportation and servicing assessments to refine the preliminary preferred land use concept option(s) to eventually develop a preferred Secondary Plan land use.

The next iteration of impact assessment will be expected to be more scoped and focused on the specific changes to the land use and proposed environmental impact management strategies. Hence the scope outlined in the following sections will need to be conducted iteratively, whereby the initial assessment will inherently be more complex and detailed than the subsequent assessments. It is expected that the majority of the impacts and associated management and land use changes will have been captured as part of the initial iteration.

2.3.1 Hydrologic and Hydraulic Analysis

Hydrology:

A hydrologic analysis shall be conducted for the initial future development land use concept to determine post-development flows, hydrographs and water balance (integrated with the groundwater assessment).

The existing conditions hydrologic model(s) shall be modified to reflect post-development conditions and executed both continuously (using flow frequency analysis) and in event mode (using design storms) to generate peak flows for all events ranging from 2, 5, 10, 25, 50, 100 and 350 year, and the Regional Storm. As in the hydrologic analysis for existing conditions, the model results shall be reviewed by the TAC. The modelling will be used to determine the potential impacts of planned development on surface water, groundwater and water budgets. The Phase 2 Impact assessment hydrologic analysis will need to:

- Delineate discrete drainage areas based on potential future development;
- Calculate post-development flows for all event storms and the Regional Storm at predetermined locations, as per the discretized drainage area plan and model schematic diagram for the study area. The post-development flows shall be compared to existing flows for all storm events at the hydrologic nodes of interest. If the Conservation Authority has an approved hydrologic model which establishes unit release rates for development, then the results of the local modelling as part of this local study are to be validated against the existing guidance from local Conservation Authorities;
- Conduct the water budget assessment at the nodes of interest coordinated with the Groundwater modelling (see below).
- Identify constraints related to imperviousness and intensity of development. Assess the requirement and/or performance of proposed stormwater management facilities including the potential approach for Regulatory flow impact management per the details outlined in the Regional Scoped SWS;
- Assess the future discharge impacts (both flows (peak and volume) and erosion potential) on the local systems and the broader creek systems based upon the methods completed as part of the

Phase 1 hydrologic assessment (critical discharge, cumulative erosion index, and cumulative effective work), in coordination with the Study Team Stream Morphologist;

- Complete a climate change assessment consisting of evaluating the hydrologic impacts for projected design storms (i.e., 2080s IDF projections applying an RCP of 8.5 (Climate Trends and Future Projections in the Region of Peel, February 2016, TRCA et al.) and four (4) local historic storms, and the formative timeseries for four (4) formative storm events which occurred in other jurisdictions, as well as applying the Humber River Watershed climate change impact assessment methodology.
- Any preliminary stormwater management strategies, required to match the post-development flows to existing conditions, shall be identified.

The future development impact assessment should evaluate the impacts on both runoff volumes and peak flow rates, without and with mitigation. SWM practices will be required to be sized to a preliminary level of detail as related to managing the flows for 2 to 100 year event. Furthermore, impacts to Regulatory flows (Hurricane Hazel) will need to be assessed including consideration for Regional Storm management facilities. Guidance from the Scoped SWS, and a review of downstream FVAs and FVRs will need to be considered as part of this task. The hydrologic impact assessment should be integrated with the ecological component impact assessments and could include environmental flows analysis (eg. Indicators of Hydrologic Alteration).

Hydraulics:

The existing hydraulic conditions shall be reviewed in the context of the proposed development, with the land use changes, runoff increases and/or channel modifications. For those watercourses which may receive additional flow or perhaps require no controls, the study shall assess the impacts of the proposed development on watercourse water levels, flow velocities and water surface profiles for all storm events. Any potential erosion based upon critical erosion parameters (i.e., critical flow, critical shear, critical velocity) and/or flood risk concerns due to the proposed development shall be identified and compared to those identified under Phase 1, in consultation with stream morphologists. Again, for any watercourses where the flow regime would change, current flood line information shall be updated for post-development scenarios. The model results shall be reviewed and approved by the TAC.

The updated future land use flood lines (where changes are considered) are to be presented on the maps, with Regulatory Event flood line locations and cross sections identified with flood elevations. The level of service for hydraulic structures within the study area and the resulting overtopping depths, caused by the Regulatory Event, shall be assessed and documented on existing roads at all crossing structures. The floodplain maps should confirm the post-development flood levels are consistent with the current condition. Any changes in the flood inundation magnitude must be listed in inventory, with explanations of such changes.

For those watercourses which are anticipated to be altered (realigned and reconfigured) as part of the watercourse management plan, full hydraulic modelling is not required however the geometry (cross-section and longitudinal slope) needs to be checked using approved methods, and documented accordingly.

2.3.2 Hydrogeology

The hydrogeologic impact analysis shall examine the potential impact of future development land use changes on the groundwater systems, as well as the impacts of climate change. An impact analysis is to be completed to evaluate the sensitivity of the groundwater flow system to changes in land use resulting from a potential reduction in recharge. Impacts are expected to include a decrease in the water table elevation,

changes to stream flow (e.g., baseflow/groundwater discharge) and the potential degradation of groundwater quality. The hydrogeological component of the subwatershed investigation shall:

- Ensure the groundwater sensitive areas are recognized and protected from future urbanization and disturbances;
- Within the water balance assessment, update the overall groundwater budget model along with the surface water components for both existing and future scenarios; the water budget for the study area shall estimate precipitation, evapo-transpiration, runoff and infiltration, in addition to the groundwater recharge and discharge; and
- Consider any relevant needs within the Source Water Protection Plan.

The baseline water balance assessment described in Phase 1, should be updated to reflect changes in the various parameters related to development scenarios and climate change to consider potential impacts particularly to changes in groundwater recharge. As presented in Phase 1, the hydrological model is also to be used to carry out a water balance, and a comparison and differences rationalized. Integration with the hydrologic modelling and consistency of the various input parameters is required. It is understood the hydrologic and groundwater analysis may have some differences in their physical representation. These potential limitations should be reflected in the overall impact assessment.

The groundwater impact assessment should be integrated with the ecological component impact assessments, as it relates to the groundwater function for discharge or water table depth.

2.3.3 Stream Morphology and Erosion Analysis

Erosion hazards as mapped and confirmed through Phase 1 will need to be evaluated against the proposed land use plan to ensure that area watercourses which are proposed to be protected in-place are protected from encroachment by development, but also to ensure that risk to property and infrastructure is minimized. Where realignments are proposed, and provided there is sufficient rationale, realignment alternatives should be evaluated through an integrated process with other members of the Study Team to maintain flood conveyance, habitat requirements, and linkages. Any realignment will require that appropriate erosion hazards and setbacks are delineated and mapped.

The continuous erosion analysis (see hydrologic assessment above) for the existing conditions shall be updated with the future development scenarios for each of the critical parameters as described in Section 2.2.2 (critical discharge, cumulative erosion index, and cumulative effective work). Erosion potential for the study area shall be estimated by applying erosion thresholds to the existing channel / bank conditions using the post-development flows. This analysis is to be completed for the same cross sections that were assessed as part of the detailed geomorphological assessment. Appropriate mitigation measures shall be recommended for sections showing a significant increase in erosion potential. Erosion thresholds shall be used to establish discharge rates for stormwater management systems for the proposed development to ensure there is no increase in downstream erosion, by applying the methodology per the approved Technical Work Plan. This process will involve determination of the impacts without mitigation and then defining the necessary levels of control in an iterative manner to ensure downstream systems are appropriately protected.

Based on the results presented in Phase 1, identify which watercourses and headwater drainage features (HDFs) in the proposed development area are stable and have sufficient conveyance capacity, and which watercourses and headwater drainage features need restoration or alteration through the application of natural channel design principles. Stream morphology shall be assessed downstream of future development areas, with a focus on existing and potential erosion concerns. The extent to which downstream areas need to be assessed will be based on a sensitivity review by the Stream Morphologist

and the Hydrologist. Existing and future development impacts shall be evaluated with the development strategy indicated to limit the potential for negative impacts, while accommodating opportunities to restore and improve the existing watercourses or HDF condition. This approach will need to consider watercourse constraints (high or medium constraint, as per the SABE Scoped SWS) and HDF management classifications (protection, conservation, mitigation, no management) which determine the recommendations for those features which remain on the landscape (protected in-place or realigned) versus those (HDFs) which can be removed subject to appropriate management practices.

For areas of new development, the size of the channel block necessary to allow natural channel design to occur shall be determined. The sizing will include the erosion hazard, hydraulic criteria, fisheries setbacks and Natural Heritage System planning, and all buffers and setbacks. The natural channel design information on which the preliminary assessments are made, shall be documented for use at the next stages of planning (i.e., neighbourhood scale and/or tertiary plan). The natural channel design strategy must clearly define that all channel blocks can convey flows associated with the Regulatory event. As noted, the size determination should be made based on stream morphology, in addition to the considerations of aquatic and terrestrial features and setbacks. The determination of which watercourses and HDFs are to be maintained and considered for relocation or removal, needs approval of the TAC. The Conservation Authority and MNRF and others will ultimately need to be consulted for any recommended channel works.

2.3.4 Aquatic Environment

Assess the potential impacts of future land uses and climate change on the aquatic habitats through direct modifications (e.g., watercourse realignments, watercourses crossings) and impacts arising from changes to the hydrologic and hydrogeologic regimes and disruption to riparian vegetation. Opportunities for aquatic habitat enhancement by direct modification (e.g., eliminating barriers to fish migration) or enhancement of riparian buffers should also be considered. The effects of the anticipated changes to aquatic habitat on aquatic biota will need to be assessed.

Consideration is to be given to the presence and role of aquatic features and functions as part of the Natural Heritage System. This is to include, at a minimum, thermal regime, species diversity, water quality and quantity, and their long-term protection within the NHS to inform the assessment of impacts at the system scale.

2.3.5 Terrestrial Environment

The Study Team is to investigate potential land use impacts and climate change on terrestrial features, their associated functions and their role within the NHS based on the integrated system analysis completed in Phase 1. Appropriate mitigation strategies, including establishing appropriate buffers/setbacks, will be identified to protect the natural heritage features and functions from disturbance. In addition, linkages and enhancement areas identified through the Scoped SWS will need to be confirmed or refined according to the Scoped Subwatershed Study, and consideration for additional linkages (e.g., site scale linkages) is to be assessed. The function and conceptual location of linkages and enhancements shall be confirmed and defined through this phase. Linkages are important in reducing the potential for adverse impacts of habitat fragmentation on natural areas. The management strategies shall be documented to:

- Demonstrate protection of features retained as components of the NHS;
- Demonstrate efficacy of mitigation measures to protect features from impacts associated with proposed development.
- Clearly identify linkages and enhancements necessary to maintain system connectivity (and thus functions).
- Demonstrate how system targets are met.

Where a continuous ELC-defined vegetation community extends beyond the subject areas, the assessment shall generally address the entire community, including portions beyond the study area boundaries.

Additionally, the impact assessment should consider the degree to which any changes in the recommendations of the Scoped SWS could have potential for negative impacts. For example, this may include assessing changes to/removal of proposed linkages and/or enhancement areas, Alterations and impacts are to be considered at both the site-scale and system-scale.

In addition to management strategies that address land use impacts, consideration should also be given to impacts or opportunities associated with the active transportation network (particularly NHS/WRS crossings) and trail networks.

2.3.6 Surface Water Quality

The Study Team shall investigate potential land use impacts (i.e., increased imperviousness, land use type changes, etc.) and develop strategies to maintain or enhance in-stream water quality. Actions to address existing point and non-point sources of pollution potentially resulting in degraded water quality shall be developed. Within the New Urban Area and New Employment Area includes occupied and contributing Redside Dace habitat. To ensure sufficient thermal mitigation the impact assessment will need to consider the resulting thermal impact of the changing land uses.

Best Management Practices (BMPs) for urban stormwater management shall be recommended for all new developments to address stormwater quality. The proposed BMPs shall be in accordance with the requirements of the MECP and the Municipality including the Provincial guidance which focuses on a treatment train approach using LID BMPs.

2.3.7 Phase 2 Report – Impact Assessment

At the completion of the Phase 2 Impact Assessment the results of the iterative land use assessments will need to be prepared (i.e., one for each iteration) outlining the findings of the Impact Assessment. The Report shall be submitted to document the results of the impact assessment and the preliminary evaluation of the stormwater management options and recommended subwatershed management strategies, as they relate to the proposed development. The water (surface/ground) modelling input and output files shall be appended to this report. In addition, constraints and opportunities present in the study area, in terms of urban expansion, environment impacts and protection, shall be clearly documented with GIS maps for the associated locations.

Note: It is expected that a Draft Table of Contents will be submitted for review and comment well in advance of the Draft Report submission.

2.4 Phase 3 – Management, Implementation and Monitoring Plan

Phase 3 shall identify and set the framework for implementation and monitoring of the preferred subwatershed's management strategy building from the results of the iterative land use impact assessments, as part of Phase 2. Management recommendations are required to address the objectives identified in the Settlement Area Boundary Expansion Scoped Subwatershed Study, as well as the goals, objectives and targets from the parent watershed plan for the respective Secondary Plan Areas. A Management, Implementation, and Monitoring Plan shall be developed, which sets out the requirements for phasing, operation of facilities, and monitoring to ensure that the future development(s) are in compliance with the recommendations associated with the approved Local Subwatershed Study and Secondary Plan Policies. The direction provided in the Settlement Area Boundary Expansion Scoped Subwatershed Study - Part C: Implementation Plan (Wood et. al., January 2022) shall be used as the foundation for developing the monitoring plan to further refine, develop and identify management recommendations and requirements established through the detailed subwatershed studies. The Phase 3

work will be completed when a preferred land use plan has been determined based upon the findings and recommendations from Phase 1 and 2 of the detailed Subwatershed Study, considering the natural heritage system and water resource system direction and guidance, as well as the companion studies for transportation and servicing. The findings of this study will provide implementation recommendations and a technical framework for future infrastructure works and support the future development proposals in accordance with the approved Secondary Plan.

The stormwater management strategy will need to outline the siting for various components of the overall stormwater management plan, including key locations for facilities and general guidance for selecting green infrastructure and LID practices to manage the impacts to the Natural Heritage System and Water Resources System. The scope for additional studies will also need to be identified that are to be completed in support of future Tertiary Plans, Draft Plans of Subdivisions or Condominium, and Site Plans as required, to meet the objectives and targets of the Local Subwatershed Study. The Local Subwatershed Study is to identify preliminary locations for logical development blocks based on contiguous drainage sheds for consideration as part of future neighbourhood plans and/or tertiary plans. The scope for additional studies should include requirements to complete hydrologic and/or hydraulic modelling to verify the stormwater management criteria established in the higher-level studies based upon more detailed information, and revise/refine the criteria as required.

Management strategies are required that will consider and preserve the local and functional linkages of sensitive groundwater recharge and discharge areas, the potential groundwater quantity impacts on the private wells and groundwater quality degradation. Groundwater management strategies should include technical input (quantitative and qualitative) into the determination or refinement of hydrogeologically sensitive areas relating to both recharge and discharge, issues related to shallow water table or strong upward gradients, potential location and function of Stormwater Management facilities and other BMPs, as well as planning and policy recommendations for groundwater quantity and quality protection.

Watercourse management recommendations will be made at the reach scale and based on an integrated characterization of feature constraints, with site-specific opportunities presented as appropriate. Similarly, headwater drainage feature management recommendations will be based on the outcome of the Local Subwatershed Study, through the application of the TRCA/CVC (2014) guidelines with reach-scale recommendations. Deviations from the recommendations of the HDF guidelines will require that site modifiers are identified to justify changes in the management recommendation. Management recommendations and opportunities are to be developed in consultation with the Study's TAC, with agreement prior to study conclusion.

Managing features of the NHS will build on the proposed strategy outlined in the Scoped Subwatershed Study following the recommended Net Gain Mitigation Hierarchy approach. Specific management strategies and implementation recommendations should be prescribed for features/areas based on - avoidance (i.e., protect in-situ), minimize and mitigate, linkage, enhance, replicate, and compensate. The framework outlined in the Scoped SWS provides a detailed overview of the various management approaches. Avoidance is required and/or recommended for key features (e.g., protected by policy) and/or supporting features included in the NHS. Minimization of impacts and mitigation strategies should identify the required set of integrated approaches that reduce the degree of disturbance and impacts on natural features resulting from the proposed land use changes. Linkage recommendations should include specific design and implementation requirements to support connectivity at multiple scales (landscape, local, and site-scale). Enhancement recommendations should identify improvements to biological composition and function of areas in the context of the local landscape (e.g., habitat diversity / availability) or within the

system (e.g., under-represented habitats). Replication and/or compensation management strategies should be identified, as a last resort, for features that cannot be protected in-situ, but require inclusion in the NHS; sufficient guidance should be presented such that the success of the proposed replication and/or compensation can be assured based on appropriate site selection, restoration protocols, financing, and long-term ownership/management responsibility

Phase 3 shall outline the agencies/organizations that are responsible for carrying out the various recommendations and specify when in the development process the various recommendations need to be initiated. Phase 3 shall include:

- Timing and Phasing recommendations for the construction of any required facilities with respect to the future development; these recommendations will inherently need to consider the influence of other infrastructure as well;
- Asset Management Strategies such as:
    - A Phasing and Funding strategy for the construction and maintenance of the facilities;
    - Recommendations for future studies;
- An Adaptive Management and Monitoring Plan to monitor the subwatershed's response to land use change and suggest adaptive responses where impacts are being observed; the monitoring program will need to ensure compliance with the Local Subwatershed Study, and a strategy for corrective actions which may be necessary based on results of the monitoring program; it is notable that MECP is advancing industry guidance for broad-based community monitoring plans to support the Consolidated Linear Infrastructure ECA process; this guidance is expected in 2024 at which point the Municipality will have 2 years to prepare a plan for MECP review and approval; the Local SWS monitoring program should take this into consideration and align with its requirements accordingly;
- Assist Secondary Plan Team with developing policies for consideration in the Secondary Plan;
- Criteria and time frame for the review/update of the Local Subwatershed Plan;

The Management, Implementation, and Monitoring Plan shall also recommend the phasing of development, and provide guidance to address climate change considerations, particularly demonstrating compliance with the Town of Caledon's Community Climate Change Action Plan and the Peel Region's Climate Change Master Plan. This will permit changes to recommend mitigation measures and management strategies for future phases of the development, in the case where results of monitoring from the initial phases suggest that changes are warranted.

Note: It is expected that a Draft Table of Contents will be submitted for review and comment well in advance of the Draft Report submission.

Consultation and Engagement:

Fulsome consultation and engagement are the cornerstone to a successful land use study process. It is important to integrate and coordinate the consultation and engagement associated with the Secondary Plan and companion studies with the Local Subwatershed Study. The reason for this is to ensure that the public understands the relationship of environmental and water-based studies to the community planning associated with the Secondary Plan.

As noted, a TAC should be formed and at minimum three (3) meetings of the TAC will be required roughly aligned with each phase of the Subwatershed Study. A minimum of two (2) Public Information Centers (PICs) should be held and canagain aligned with those points of contact for the Secondary Plan.

Indigenous Peoples and Nations engagement is similarly important to consider throughout the land use planning process, hence it is again recommended that the local SWS work to align communications with Indigenous People and Nations in accordance with the protocols of the Province and the Town of Caledon, fully coordinated with the land use planning provisions.

Appendix A – Available Data and Data Sources

Table 1: Peel SABE Secondary Plan Area Screening (Water Resources and Natural Heritage System)

Proposed Secondary Plan Area	1. Are there any Secondary Plan boundaries that cross multiple watershed and subwatershed boundaries?	2. Given different sizes of Secondary Plan boundaries, are there any concerns, from a subcatchment/drainage perspective?	3. Any large contiguous natural heritage areas divided by Secondary Plan boundaries?	4. Are there important dependencies on contiguous Secondary Plan units that would need to be considered?	5. General Recommendations/Considerations of grouping Secondary Plan areas for detailed SWSs
A1	Two watershed and four subwatersheds. Overlap with Credit River includes Glen Williams to Norval, Huttonville, and Fletchers.	Subcatchments do not overlap with other Secondary Plan areas	No. Divisions are generally broken by the GTA West roadway.	Water resources are generally not dependent on other SPAs. However, being within two Conservation Authority jurisdictions and within the headwaters of four subwatersheds will result in some complexities related to downstream impacts. Natural Heritage System implications will largely relate to understanding cross watershed connectivity, and ensuring systems planning for linkages and enhancements within the Etobicoke Creek subwatershed are consistent with SPA B.	Consolidate SPAs A, B, C, and D (west and south) for west side SWS.
B1	Entirely within Etobicoke Creek.	Subcatchments overlap with Secondary Plan Area C.	Complex overlap with natural heritage and water resource system. Divides various Etobicoke Creek valley corridors. Northwest area splits two HDF corridors. Resulting in 10 +/- segregated tableland areas.	Water resources are contiguous with those in SPA A and C, as well SPA B has shared Subcatchments with the west section of SPA C. Natural Heritage System implications are complex with various linkage and enhancement considerations that will require systems coordination with SPA A and C.	Consolidate SPAs A, B, C, and D (west and south) for west side SWS.
B2, C3	Predominantly Etobicoke Creek: east section overlaps into West Humber River.	Subcatchments in west section overlap with SPA B, subcatchments in east section overlap with SPA D.	Generally supportable. Overlaps with four Etobicoke Creek valley corridors.	Water resources are generally not dependent on other SPAs. However, the west section of SPA C drains into SPA B, and the east section drains to SPA D (west). Natural Heritage System implications are complex with various linkage and enhancement considerations that will require systems planning with SPA B and D (west).	Consolidate SPAs A, B, C, and D (west and south) for west side SWS.
C2, C1, D1, E1	Overlaps Etobicoke Creek and West Humber River, and very small section of Spring Creek.	Subcatchments overlap with SPA C. East unit subcatchments overlap with SPA E.	West community area unit is most problematic, overlapping with a complex series of valley corridors. East section of west unit also crosses from Etobicoke Creek to West Humber River.	Water resources for SPA D (west) are contiguous with those in the east section of SPA C, and have overlapping subcatchments with the southeast section of SPA C. The northeast and southeast units are generally not dependent on other SPAs; however, the northeast unit does have overlapping subcatchments with SPA E. Natural Heritage System implications are complex for SPA D (west) with linkage and enhancement considerations with SPA B and SPA C. The northeast and southeast units are less complex.	Consolidate SPAs A, B, C, and D (west and south) for west side SWS. Consolidate SPAs D (east), E, F, and G for west central SWS.
D2, E2, E3, E4, E5	Entirely within West Humber River	West area subcatchments overlap with SPA D.	Secondary Plan area is divided by major valley; major features/corridors maintained.	Water resources for SPA E are generally not contiguous with other those in other SPAs. However, subcatchments within the west section of SPA E overlap with SPA D (northeast unit). Natural Heritage System linkage and enhancements are generally contained with the SPA. There are however important interfaces with major valley corridors that are shared with SPA F.	Consolidate E1, E2, E3, E4, D2, F1, F2, G1, and G2 G for west central SWS.
F1, F2	Entirely within West Humber River	East area subcatchments overlap with SPA G.	Major valley corridor splits Secondary Plan area.	Water resources in SPA F are generally not contiguous with other SPAs. There are however subcatchment overlaps with SPA E and SPA G. As well, drainage from much of the east section of SPA F flows into SPA G. Natural Heritage System linkage and enhancements are moderately complex. The west section of SPA F interfaces with the major valley corridor shared with SPA E; as well, localized linkages and enhancements along small watercourse systems are shared with SPA G.	Consolidate SPAs E1, E2, E3, E4, D2, F1, F2, G1, and G2 for west central SWS.
G1, G2	Entirely within West Humber	West area subcatchments overlap with SPA F2.	Significant headwater features	Water resources in west section of SPA G are contiguous and share subcatchments with SPA F2. The east section of SPA G is not contiguous with other SPAs.	Consolidate SPAs E1, E2, E3, E4, D2, F1, F2, G1, and G2 as part of west central SWS.

Proposed Secondary Plan Area	1. Are there any Secondary Plan boundaries that cross multiple watershed and subwatershed boundaries?	2. Given different sizes of Secondary Plan boundaries, are there any concerns, from a subcatchment/drainage perspective?	3. Any large contiguous natural heritage areas divided by Secondary Plan boundaries?	4. Are there important dependencies on contiguous Secondary Plan units that would need to be considered?	5. General Recommendations/Considerations of grouping Secondary Plan areas for detailed SWSs
				Natural Heritage System linkages and enhancements in the west section of SPA G are shared with SPA F. As well, on the east boundary interfaces with a major valley system shared with SPA H.	
H1	Entirely within West Humber River	North area subcatchments overlap with SPA H2 & H3.	No issues	Water resources in SPA H are contiguous with a complex network of watercourses and headwater drainage features in SPA I (which in turn is contiguous with water resources in SPA J). Natural Heritage System linkage and enhancements are contiguous with those proposed for SPA I. As well, the west boundary interfaces with a major valley system shared with SPA G.	Consolidate SPAs H2, H3, and H4 as part of east central SWS.
H2, H3	Entirely within West Humber River	North area subcatchments overlap with SPA H4. South area subcatchments overlap with SPA H1.	No major issues. Some HDF/valley corridors divided along boundary with SPA J.	Water resources in SPA H2 and H3 are contiguous with SPAs H1 and H4. Natural Heritage System linkage and enhancements are shared between SPAs J and H.	Consolidate SPAs H1, H2, H3 and H4 as part of east central SWS.
H4, Part of H3 (northest of King and Emil Kolb)	Overlaps West Humber and Main Humber Rivers	South area subcatchments overlap with SPA in the south section of H3 (south of King).	Some HDF/valley corridors divided along boundary with SPA H3. North boundary bisects supporting features.	Water resources in SPA J are not dependent on other SPAs, but are contiguous with SPA I, including shared subcatchment boundaries.	Consolidate SPAs H, I, and J as part of east central SWS.
I1, I2	Entirely within Main Humber River	Subcatchements do not overlap with other Secondary Plan areas	North edge of west unit bisects key/supporting feature. East unit bisects a variety of supporting features.	Water resources and Natural Heritage System linkage and enhancements are not contiguous with or directly linked to those in other SPAs.	SPA I1 and I2 can stand alone as a separate SWS.

Table 2: Subwatershed System Summary of Available Data

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEMS	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
1	Credit River Systems	Partial A	**Streamflow Gauge:** *Station ID: EM7* • Data Type: flow and water level • Collection method: N/A • Period of record: 2012-2019 • Time step: 15 mins • Ownership: CVC *Station ID: EM8* • Data Type: flow and water level • Collection method: N/A • Period of record: 2012-2019 • Time step: 15 mins • Ownership: CVC *Station ID: Huttonville Creek at Lionhead Gold Course* • Data Type: water level and air temperature • Collection method: N/A • Period of record: 2013-2019 • Time step: 15 mins • Ownership: CVC	**Floodplain Mapping:** • Engineered flood lines beyond the SPA boundaries (west and downstream). **Hydraulic Model:** *Huttonville Creek* • Hydraulic Model: HEC-RAS • Year Completed: 2011 • Source: AMEC *Fletcher's Creek* • Hydraulic Model: HEC-RAS • Year Completed: 2011 • Source: AMEC	• Oak Ridges Moraine Groundwater Monitoring Program (ORMGP). • Provincial Water Well Information System. • Provincial Permit to Take Water Database. • Provincial Groundwater Monitoring Database. • Ontario Geological Survey Mapping.	**Watercourses:** • CVC rivers and streams • Scoped SWS for SABE (2021) – New mapping or geoprocessed base data – Region, updated to reflect 2018 air photo and based on LiDAR; Watercourse constraint rankings (high, medium, low constraint); Potential headwater drainage features delineated. **Erosion Hazard Mapping:** • TRCA (2019) meander belt width. • Scoped SWS for SABE (2021) - Meander belt widths updated accordingly.	**Existing Data** • Ecological Land Classification (TRCA and CVC) • GIS layers for each Conservation Authority jurisdiction that includes identification of vegetation community types • Various features layers (wetlands, woodlands, watercourses, ponds/lakes) • Flora/Fauna records (TRCA and CVC monitoring; NHIC, open source data) • Significant Wildlife Habitat (CVC – various types) • Climate Change Vulnerability data (TRCA - various types) **Scoped SWS Data**	**Thermal regime by stream segment:** • Identifies segments as warm, cool, or coldwater. • Available from Land Information Ontario (LIO). **Fish sampling data** • Includes sampling date, method, and species captured. • Available from Land Information Ontario (LIO). **Locations of Redside Dace (*Clinostomus elongatus*) occupied stream reaches and potential contributing habitat** • Occupied reaches present downstream.

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEMS	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
			Station ID: Fletcher's Creek at Highway 7 • Data Type: water level • Collection method: N/A • Period of record: 2010-2019 • Time step: 15 mins • Ownership: CVC **Water Quality Station:** *Station ID: 06007600302* • Monitoring condition: unknown • Period of record: 1965-2016 • Ownership/provider: MECP *Station ID: EM7* • Monitoring condition: Wet and Dry weather condition • Period of record: 2013 May to October, 2015 June to August • Ownership/provider: CVC *Station ID: EM8* • Monitoring condition: Wet and Dry weather condition • Period of record: 2013 June to October, 2015 June to August • Ownership/provider: CVC *Station ID: 501070008 (Huttonville Creek at Lionhead Golf and Country Club)* • Monitoring condition: Unknown • Period of record: 2014 August to November, 2016 January to November, 2018 January to November • Ownership/provider: CVC **Hydrologic Models:** • Hydrologic Model: HSP-F • Type of Assessment: continuous simulation • Year Completed: 2011 • Source: Northwest Brampton Subwatershed Study, AMEC			**Erosion Threshold Sites** • North West Brampton Urban Development Area - Huttonville and Fletcher's Creeks Subwatershed Study (2010)– Existing erosion threshold site SW-4 downstream of FSA. • Scoped SWS for SABE (2021) - Proposed erosion threshold site within FSA **Orthoimagery/LiDAR** • Digital Air Photos of Southern Ontario (Hunter Corporation 1954) – are publicly available through University of Toronto • 2018 Orthophoto (Region) – Coverage of City of Brampton	• Landscape sensitivity L-rank (Woodlands, Wetlands, Meadows) • Landscape Connectivity • Vegetation community L-rank • Locally rare/sensitive species occurrence • Species of Conservation Concern/Species at Risk • Significant Wildlife Habitat • Valley crossing sensitivity • Natural Heritage System Components (Woodlands, Wetlands, Meadows, Valleylands, Watercourses, Savannah, Redside Dace) • Preliminary NHS • Preliminary NHS Linkages • Preliminary NHS Enhancements	
	Etobicoke Creek	Partial A1, B1, B2, C2 and C3	**Precipitation Gauge**: *Station ID: Sue Grange Farms (HY061)* • Data Type: precipitation (rain/snow) • Period of Record: 1981-2019 • Time Step: N/A	**Floodplain Mapping:** • Estimated floodplain. • Flood line from engineered flood study in south of watershed • Limited engineered floodplains, found in	• Oak Ridges Moraine Groundwater Monitoring Program (ORMGP). • Provincial Water Well Information System.	**Watercourses:** • TRCA watercourses, waterbodies, drainage, wetlands • Scoped SWS for SABE (2021) – New mapping or	**Existing Data** • Ecological Land Classification (TRCA and CVC) • GIS layers for each Conservation Authority jurisdiction that includes	**Thermal regime by stream segment:** • Identifies segments as warm, cool, or coldwater. • Available from Land Information Ontario (LIO).

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEMS	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
			• Ownership: TRCA **Streamflow Gauge:** *Station ID: Etobicoke at 410 (HY101)* • Data Type: water level • Collection method: sensors • Period of record: 2017-2020 • Time step: N/A • Ownership: TRCA *Station ID: Etobicoke Creek at Brampton (02HC017)* • Data Type: flow and water level • Collection method: continuous recorder from 2003-2020 • Period of record: 1957-2020 (active) • Time step: 5 mins • Ownership: Environment Canada *Station ID: Etobicoke at Brampton* • Data Type: water level • Collection method: sensors • Period of record: 2007-2020 • Time step: N/A • Ownership: TRCA **Water Quality Station:** *Station ID: Mayfield-EC1* • Monitoring condition: unknown • Period of record: 2016-Jan to 2018-March • Ownership/provider: TRCA *Station ID: Mayfield-EC3* • Monitoring condition: unknown • Period of record: 2016-Jan to 2018-March • Ownership/provider: TRCA *Station ID: Mayfield-EC4* • Monitoring condition: unknown • Period of record: 2016-Jan to 2018-March • Ownership/provider: TRCA *Station ID: Mayfield RWMP* • Monitoring condition: unknown	southern and eastern region of watershed. **Hydraulic Model:** *Etobicoke Creek* • Hydraulic Model: HEC-RAS • Year Completed: 2016 • Source: Aquafor Beech Limited *Downtown Brampton SPA* • Hydraulic Model: HEC-RAS • Year Completed: 2014 • Source: Amec Foster Wheeler **Hydraulic Structures:** *Etobicoke Creek – 26.795* • HEC-RAS Coding: Bridge • Structure Type: Open bridge *Etobicoke Creek – 26.735* • HEC-RAS Coding: Multiple opening • Structure Type: Open bridge	• Provincial Permit to Take Water Database. • Provincial Groundwater Monitoring Database. • Ontario Geological Survey Mapping.	geoprocessed base data – Region, updated to reflect 2018 air photo and based on LiDAR; Watercourse constraint rankings (high, medium, low constraint); Potential headwater drainage features delineated. **Erosion Hazard Mapping:** • TRCA (2019) meander belt width and crest of slope mapping • Scoped SWS for SABE (2021) - Meander belt widths and erosion hazard limits updated accordingly. **Erosion Threshold Sites** • Mayfield West, Phase 2 Secondary Plan Comprehensive Environmental Impact Study and Management Plan, Part A (2014) - Existing erosion threshold sites within FSA • Scoped SWS for SABE (2021) - Proposed erosion threshold site within FSA **Orthoimagery/LiDAR** • Digital Air Photos of Southern Ontario (Hunter Corporation 1954) – are publicly available through University of Toronto • 2018 Orthophoto (Region) – Coverage of Town of Caledon • LiDAR (1m) and LiDAR derived contours (1m) **Regulation Limits** • TRCA 2019 Regulation Limits **Erosion Monitoring Locations**	identification of vegetation community types • Various features layers (wetlands, woodlands, watercourses, ponds/lakes) • Flora/Fauna records (TRCA and CVC monitoring; NHIC, open source data) • Significant Wildlife Habitat (CVC – various types) • Climate Change Vulnerability data (TRCA - various types) **Scoped SWS Data** • Landscape sensitivity L-rank (Woodlands, Wetlands, Meadows) • Landscape Connectivity • Vegetation community L-rank • Locally rare/sensitive species occurrence • Species of Conservation Concern/Species at Risk • Significant Wildlife Habitat • Valley crossing sensitivity • Natural Heritage System Components (Woodlands, Wetlands, Meadows, Valleylands, Watercourses, Savannah, Redside Dace) • Preliminary NHS • Preliminary NHS Linkages • Preliminary NHS Enhancements	**Fish sampling data** • Includes sampling date, method, and species captured. • Available from Land Information Ontario (LIO). **TRCA fish community monitoring data for Etobicoke Creek watershed:** • Includes sampling location, date, and number and total weight of fish captured, by species. • Provided to SABE team as Excel file by CVC – current to 2019. **TRCA benthic invertebrate monitoring data for Etobicoke Creek watershed.** • Includes sampling location, date, habitat type, and number of individuals in the sample, by family. • Provided to SABE team as Excel file by CVC – current to 2018.

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEMS	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
			• Period of record: 2015-Jan to 2018-March • Ownership/provider: TRCA *Station ID: Mayfield-EC6* • Monitoring condition: unknown • Period of record: 2016-Jan to 2018-March • Ownership/provider: TRCA **Hydrologic Models:** • Hydrologic Model: Visual OTTHYMO Version 2.4 • Type of Assessment: Synthetic design storms • Year Completed: 2013 • Source: Etobicoke Creek Hydrology Update, MM Group Ltd			• TRCA - site locations, last year inspected, watercourse info, site status (active/inactive) and comments on site conditions/observations (details and completion of notes varies); downstream of FSA. **Stream Power Mapping** • Scoped SWS for SABE (2021) - LiDAR based		
2	West Humber (West)	D1, D2, E1, E2, E3, E4, E5, F1, F2, G1, G2	**Precipitation Gauge**: *Station ID: Toronto Pearson Airport (6152695)* • Data Type: precipitation (rain/snow), temperature (max/min), windspeed • Period of Record: 1953-2020 (active) • Time Step: hourly, daily, monthly • Ownership: Environment Canada *Station ID: Laidlaw Bus Depot/Tullamore (HY041)* • Data Type: precipitation (rain/snow) • Period of Record: 2013-2020 • Time Step: N/A • Ownership: TRCA **Streamflow Gauge:** *Station ID: Humber at Goreway* • Data Type: flow and water level • Collection method: sensors • Period of record: 2012-2020 • Time step: N/A • Ownership: TRCA *Station ID: West Humber at Hwy 7 (02HC031)* • Data Type: flow and water level	**Hydraulic Models:** *West Humber* • Hydraulic Model: HEC-RAS • Year Completed: 2017 • Source: Cole Engineering Ltd **Hydraulic Structures:** West Humber – 1380.675 • HEC-RAS Coding: Culvert • Structure Type: CSP Arch West Humber – 1355.061 • HEC-RAS Coding: Culvert • Structure Type: CSP Arch West Humber – 1353.874 • HEC-RAS Coding: Culvert • Structure Type: CSP Arch West Humber – 1304.84 • HEC-RAS Coding: Culvert • Structure Type: CSP Arch West Humber Crk – 679.4845 • HEC-RAS Coding: Bridge • Structure Type: Open Bridge with Pier **Floodplain Mapping:** • Estimated floodplain.	• Oak Ridges Moraine Groundwater Monitoring Program (ORMGP). • Provincial Water Well Information System. • Provincial Permit to Take Water Database. • Provincial Groundwater Monitoring Database. • Ontario Geological Survey Mapping.	**Watercourses:** • TRCA watercourses, waterbodies, drainage, wetlands • Scoped SWS for SABE (2021) – New mapping or geoprocessed base data – Region, updated to reflect 2018 air photo and based on LiDAR; Watercourse constraint rankings (high, medium, low constraint); Potential headwater drainage features delineated. **Erosion Hazard Mapping:** • TRCA (2019) meander belt width and crest of slope mapping • Scoped SWS for SABE (2021) - Meander belt widths and erosion hazard limits updated accordingly. **Erosion Threshold Sites** • Mayfield West, Phase 2 Secondary Plan Comprehensive	**Existing Data** • Ecological Land Classification (TRCA and CVC) • GIS layers for each Conservation Authority jurisdiction that includes identification of vegetation community types • Various features layers (wetlands, woodlands, watercourses, ponds/lakes) • Flora/Fauna records (TRCA and CVC monitoring; NHIC, open source data) • Significant Wildlife Habitat (CVC – various types) • Climate Change Vulnerability data (TRCA - various types) **Scoped SWS Data** • Landscape sensitivity L-rank (Woodlands, Wetlands, Meadows) • Landscape Connectivity • Vegetation community L-rank • Locally rare/sensitive species occurrence	**Thermal regime by stream segment:** • Identifies segments as warm, cool, or coldwater. • Available from Land Information Ontario (LIO). **Fish sampling data:** • Includes sampling date, method, and species captured. • Available from Land Information Ontario (LIO). **TRCA fish community monitoring data for Humber River watershed:** • Includes sampling location, date, and number and total weight of fish captured, by species. • Provided to SABE team as Excel file by CVC – current to 2019. **TRCA benthic invertebrate monitoring data for Humber River watershed.** • Includes sampling location, date, habitat type, and number of individuals in the sample, by family. • Provided to SABE team as Excel file by CVC – current to 2018. **Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat** • Occupied reaches provided in SABE report confirmed at the

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEMS	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
			• Collection method: sensors • Period of record: 2007-2020 • Time step: N/A • Ownership: TRCA *Station ID: West Humber at Hwy 7* • Data Type: flow and water level • Collection method: continuous recorder from 2002-2020 • Period of record: 1965-2020 (active) • Time step: 5 mins (real time) • Ownership: Environment Canada **<u>Water Quality Station:</u>** *Station ID: 06008310302* • Monitoring condition: unknown • Period of record: 2002-2016 Ownership/provider: MECP	• Presence of engineered floodplains in southern region of watershed		Environmental Impact Study and Management Plan, Part A (2014) - Existing erosion threshold sites within FSA • Scoped SWS for SABE (2021) - Proposed erosion threshold sites within and downstream of FSA **<u>Orthoimagery/LiDAR</u>** • Digital Air Photos of Southern Ontario (Hunter Corporation 1954) – are publicly available through University of Toronto • 2018 Orthophoto (Region) – Coverage of Town of Caledon • LiDAR (1m) and LiDAR derived contours (1m) **<u>Regulation Limits</u>** • TRCA 2019 Regulation Limits **<u>Erosion Monitoring Locations</u>** • TRCA - site locations, last year inspected, watercourse info, site status (active/inactive) and comments on site conditions/observations (details and completion of notes varies); downstream of FSA. **<u>Stream Power Mapping</u>** • Scoped SWS for SABE (2021) - LiDAR based	• Species of Conservation Concern/Species at Risk • Significant Wildlife Habitat • Valley crossing sensitivity • Natural Heritage System Components (Woodlands, Wetlands, Meadows, Valleylands, Watercourses, Savannah, Redside Dace) • Preliminary NHS • Preliminary NHS Linkages • Preliminary NHS Enhancements	time by MOECP (current as of February 2021). • Potential contributing habitat in SABE report identified through desktop exercise.
3	West Humber (East)	H1, H2, H3, H4	**<u>Streamflow Gauge:</u>** *Station ID: Claireville Dan* • Data Type: water level • Collection method: sensors • Period of record: 2007-2020 • Time step: N/A • Ownership: TRCA	**<u>Floodplain Mapping:</u>** • Estimated floodplain. • Presence of engineered floodplains in southern region of watershed.	• Oak Ridges Moraine Groundwater Monitoring Program (ORMGP). • Provincial Water Well Information System. • Provincial Permit to Take Water Database.	**<u>Watercourses:</u>** • TRCA watercourses, waterbodies, drainage, wetlands • Scoped SWS for SABE (2021) – New mapping or geoprocessed base data – Region, updated to reflect	**<u>Existing Data</u>** • Ecological Land Classification (TRCA and CVC) • GIS layers for each Conservation Authority jurisdiction that includes identification of vegetation community types	**<u>Thermal regime by stream segment:</u>** • Identifies segments as warm, cool, or coldwater. • Available from Land Information Ontario (LIO). **<u>Fish sampling data:</u>** • Includes sampling date, method, and species captured. • Available from Land Information Ontario (LIO).

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEMS	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
					• Provincial Groundwater Monitoring Database. • Ontario Geological Survey Mapping.	2018 air photo and based on LiDAR; Watercourse constraint rankings (high, medium, low constraint); Potential headwater drainage features delineated. **Erosion Hazard Mapping:** • TRCA (2019) meander belt width and crest of slope mapping • Scoped SWS for SABE (2021) - Meander belt widths and erosion hazard limits updated accordingly. **Erosion Threshold Sites** • Mayfield West, Phase 2 Secondary Plan Comprehensive Environmental Impact Study and Management Plan, Part A (2014) - Existing erosion threshold sites within FSA • Scoped SWS for SABE (2021) - Proposed erosion threshold sites within FSA **Orthoimagery/LiDAR** • Digital Air Photos of Southern Ontario (Hunter Corporation 1954) – are publicly available through University of Toronto • 2018 Orthophoto (Region) – Coverage of Town of Caledon • LiDAR (1m) and LiDAR derived contours (1m) **Regulation Limits** • TRCA 2019 Regulation Limits **Erosion Monitoring Locations** • TRCA - site locations, last year inspected, watercourse info, site status (active/inactive)	• Various features layers (wetlands, woodlands, watercourses, ponds/lakes) • Flora/Fauna records (TRCA and CVC monitoring; NHIC, open source data) • Significant Wildlife Habitat (CVC – various types) • Climate Change Vulnerability data (TRCA - various types) **Scoped SWS Data** • Landscape sensitivity L-rank (Woodlands, Wetlands, Meadows) • Landscape Connectivity • Vegetation community L-rank • Locally rare/sensitive species occurrence • Species of Conservation Concern/Species at Risk • Significant Wildlife Habitat • Valley crossing sensitivity • Natural Heritage System Components (Woodlands, Wetlands, Meadows, Valleylands, Watercourses, Savannah, Redside Dace) • Preliminary NHS • Preliminary NHS Linkages • Preliminary NHS Enhancements	**TRCA fish community monitoring data for Humber River watershed:** • Includes sampling location, date, and number and total weight of fish captured, by species. • Provided to SABE team as Excel file by CVC – current to 2019. **TRCA benthic invertebrate monitoring data for Humber River watershed.** • Includes sampling location, date, habitat type, and number of individuals in the sample, by family. • Provided to SABE team as Excel file by CVC – current to 2018. **Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat** • Occupied reaches provided in SABE report confirmed at the time by MOECP (current as of February 2021). • Potential contributing habitat in SABE report identified through desktop exercise

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEMS	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
						and comments on site conditions/observations (details and completion of notes varies); downstream of FSA. **Stream Power Mapping** • Scoped SWS for SABE (2021) - LiDAR based		
4	Main Humber	I1, I2	**Streamflow Gauge:** *Station ID: Bolton McFall Dam (HY006)* • Data Type: flow and water level • Collection method: sensors • Period of record: 2007-2020 • Time step: N/A • Ownership: TRCA *Station ID: Cold Creek near Bolton (02HC023)* • Data Type: flow and water level • Collection method: continuous recorder from 2004-2020 • Period of record: 1962-2020 (active) • Time step: 5 mins (real time) • Ownership: Environment Canada **Hydrologic Models:** • Hydrologic Model: Visual OTTHYMO Version 4 • Type of Assessment: Synthetic design storms • Year Completed: 2015 • Source: Humber Hydrology Update Report, Civica	**Floodplain Mapping:** • Estimated floodplain. • Presence of engineered floodplains in southern region of watershed **Hydraulic Models:** *Bolton SPA* • Hydraulic Model: HEC-RAS • Year Completed: N/A • Source: N/A *Upper Main Humber* • Hydraulic Model: HEC-RAS • Year Completed: 2018 • Source: N/A *Lower Main Humber* • Hydraulic Model: HEC-RAS • Year Completed: 2017 • Source: Wood **Hydraulic Structures:** Lower Humber – 148.4585 • HEC-RAS Coding: Bridge • Structure Type: Open Bridge with Pier Lower Humber – 75.84924 • HEC-RAS Coding: Bridge • Structure Type: Open Bridge with Pier Lower Humber – 4264.165 • HEC-RAS Coding: Bridge • Structure Type: Open Span Bridge with Pier Lower Humber – 4201.13 • HEC-RAS Coding: Bridge	• Oak Ridges Moraine Groundwater Monitoring Program (ORMGP). • Provincial Water Well Information System. • Provincial Permit to Take Water Database. • Provincial Groundwater Monitoring Database. • Ontario Geological Survey Mapping.	**Watercourses:** • TRCA watercourses, waterbodies, drainage, wetlands • Scoped SWS for SABE (2021) – New mapping or geoprocessed base data – Region, updated to reflect 2018 air photo and based on LiDAR; Watercourse constraint rankings (high, medium, low constraint); Potential headwater drainage features delineated. **Erosion Hazard Mapping:** • TRCA (2019) meander belt width and crest of slope mapping • Scoped SWS for SABE (2021) - Meander belt widths and erosion hazard limits updated accordingly. **Erosion Threshold Sites** • Mayfield West, Phase 2 Secondary Plan Comprehensive Environmental Impact Study and Management Plan, Part A (2014) - Existing erosion threshold sites within FSA	**Existing Data** • Ecological Land Classification (TRCA and CVC) • GIS layers for each Conservation Authority jurisdiction that includes identification of vegetation community types • Various features layers (wetlands, woodlands, watercourses, ponds/lakes) • Flora/Fauna records (TRCA and CVC monitoring; NHIC, open source data) • Significant Wildlife Habitat (CVC – various types) • Climate Change Vulnerability data (TRCA - various types) **Scoped SWS Data** • Landscape sensitivity L-rank (Woodlands, Wetlands, Meadows) • Landscape Connectivity • Vegetation community L-rank • Locally rare/sensitive species occurrence • Species of Conservation Concern/Species at Risk • Significant Wildlife Habitat • Valley crossing sensitivity • Natural Heritage System Components (Woodlands,	**Thermal regime by stream segment:** • Identifies segments as warm, cool, or coldwater. • Available from Land Information Ontario (LIO). **Fish sampling data:** • Includes sampling date, method, and species captured. • Available from Land Information Ontario (LIO). **TRCA fish community monitoring data for Humber River watershed:** • Includes sampling location, date, and number and total weight of fish captured, by species. • Provided to SABE team as Excel file by CVC – current to 2019. **TRCA benthic invertebrate monitoring data for Humber River watershed.** • Includes sampling location, date, habitat type, and number of individuals in the sample, by family. • Provided to SABE team as Excel file by CVC – current to 2018. **Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat** • Occupied reaches provided in SABE report confirmed at the time by MOECP (current as of February 2021). • Potential contributing habitat in SABE report identified through desktop exercise

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEMS	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
				• Structure Type: Open Span Bridge with Pier Lower Humber – 4098.95 • HEC-RAS Coding: Bridge • Structure Type: Open Span Bridge with Pier		• Scoped SWS for SABE (2021) - Proposed erosion threshold sites within FSA **<u>Orthoimagery/LiDAR</u>** • Digital Air Photos of Southern Ontario (Hunter Corporation 1954) – are publicly available through University of Toronto • 2018 Orthophoto (Region) – Coverage of Town of Caledon • LiDAR (1m) and LiDAR derived contours (1m) **<u>Regulation Limits</u>** • TRCA 2019 Regulation Limits **<u>Erosion Monitoring Locations</u>** • TRCA - site locations, last year inspected, watercourse info, site status (active/inactive) and comments on site conditions/observations (details and completion of notes varies); within and downstream of FSA. **<u>Stream Power Mapping</u>** • Scoped SWS for SABE (2021) - LiDAR based	Wetlands, Meadows, Valleylands, Watercourses, Savannah, Redside Dace) • Preliminary NHS • Preliminary NHS Linkages • Preliminary NHS Enhancements	

Table 3: Secondary Plan Area Summary of Available Data

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
1	• No existing monitoring stations within SPA.	• Estimated floodplain throughout SPA.	• See Table 4	• See Table 4; one potential erosion threshold site.	• See Table 4	• Thermal regime by stream segment • Fish sampling data • Redside Dace (*Clinostomus elongatus*) occupied stream reaches present downstream in Fletchers Creek watershed.

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
	• No existing monitoring stations within SPA.	• Estimated floodplain throughout SPA.	• See Table 4	• See Table 4; no potential erosion threshold sites.	• See Table 4	• Thermal regime by stream segment • Fish sampling data • TRCA fish community monitoring data • TRCA benthic invertebrate monitoring data
	• No existing monitoring stations within SPA.	• Estimated floodplain throughout SPA.	• See Table 4	• See Table 4; no potential erosion threshold sites.	• See Table 4	• Thermal regime by stream segment • Fish sampling data
	• One (1) water quality monitoring location.	• Estimated floodplain throughout SPA.	• See Table 4	• See Table 4; no potential erosion threshold sites.	• See Table 4	• Thermal regime by stream segment • Fish sampling data • TRCA fish community monitoring data • TRCA benthic invertebrate monitoring data
2	• No existing monitoring stations within SPA.	• Engineered and Estimated floodplain along the edges of the SPA.	• See Table 4	• See Table 4; no potential erosion threshold sites.	• See Table 4	• Thermal regime by stream segment • Fish sampling data • Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat • TRCA fish community monitoring data • TRCA benthic invertebrate monitoring data
	• No existing monitoring stations within SPA.	• Engineered flood lines in the northeast side and estimated floodplain in the west of SPA.	• See Table 4	• See Table 4; 5 potential erosion threshold sites downstream of SPA.	• See Table 4.1	• Thermal regime by stream segment • Fish sampling data • Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat • TRCA benthic invertebrate monitoring data
	• No existing monitoring stations within SPA.	• Engineered flood lines in the center of SPA and estimated floodplain on the east and west of area.	• See Table 4	• See Table 4; one potential erosion threshold site within SPA and one downstream.	• See Table 4.1	• Thermal regime by stream segment • Fish sampling data • Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat
	• No existing monitoring stations within SPA.	• Limited engineered flood lines in the east of the SPA and estimated floodplain.	• See Table 4	• See Table 4; one potential erosion threshold site within SPA and two downstream.	• See Table 4	• Thermal regime by stream segment • Fish sampling data • Locations of Redside Dace (Clinostomus elongatus)

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
						occupied stream reaches and potential contributing habitat
3	• No existing monitoring stations within SPA.	• Engineered flood lines in the center of SPA.	• See Table 4	• See Table 4; one potential erosion threshold site downstream of SPA.	• See Table 4 •	• Thermal regime by stream segment • Fish sampling data • Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat
	• No existing monitoring stations within SPA.	• Estimated floodplain in the north side of SPA.	• See Table 4	• See Table 4; three potential erosion threshold sites downstream of SPA.	• See Table 4 •	• Thermal regime by stream segment • Fish sampling data • Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat
	• No existing monitoring stations within SPA.	• Estimated floodplain in the west of SPA.	• See Table 4	• See Table 4; no potential erosion threshold sites.	• See Table 4 •	• Thermal regime by stream segment • Fish sampling data • Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat
4	• No existing monitoring stations within SPA.	• Estimated floodplain in north of SPA.	• See Table 4	• See Table 4; five potential erosion threshold sites downstream of SPA.	• See Table 4 •	• Thermal regime by stream segment • Fish sampling data • Locations of Redside Dace (Clinostomus elongatus) occupied stream reaches and potential contributing habitat • TRCA fish community monitoring data • TRCA benthic invertebrate monitoring data

Table 4: Subwatershed Systems - Future Data Requirements

SUBWATERSHED GROUPING	SUBWATERSHED SYSTEM	SECONDARY PLAN AREAS	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
1	Credit River Systems	Partial A1	• No additional monitoring stations required.	• No Credit River System Floodplains within SPA A.	• Monitoring well installations with borehole logs. • Drivepoint piezometers. • Manual and continuous water level measurements. • Groundwater and surface water chemistry. • Hydraulic conductivity measurements. • Spot baseflow measurements. • Seeps and springs observations.	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds • Confirm thresholds for MEC-R1, MEC-R2, MEC-R3, MEC-R8, MEC-R4(2), SW-4, and EM-10	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Site-specific determination of location and extent of Redside Dace contributing habitat.
	Etobicoke Creek	Partial A1, B1, B2, B3, C1, C2, and C3	**Precipitation Gauge**: • Two (2) Rainfall Gauges **Streamflow Gauge:** • Six (6) Stream Flow Gauges **Water Quality Station:** • Four (4) Water Quality Stations	**Hydraulic Structure Inventory:** • **Estimated Floodplain** = Twenty-one (21) hydraulic structures requiring topographic survey • **Engineered Floodplain** = Four (4) hydraulic structure requiring field verification	• Monitoring well installations with borehole logs. • Drivepoint piezometers. • Manual and continuous water level measurements. • Groundwater and surface water chemistry. • Hydraulic conductivity measurements. • Spot baseflow measurements. • Seeps and springs observations.	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined)

2	West Humber (West)	D1, D2, E1, E2, E3, E4, E5, F1, F2, G1, and G2	**Precipitation Gauge**: • Three (3) Rainfall Gauges **Streamflow Gauge:** • Thirteen (13) Stream Flow Gauges **Water Quality Station:** • Seven (7) Water Quality Stations	**Hydraulic Structure Inventory:** • **Estimated Floodplain =** Sixteen (16) hydraulic structures requiring topographic survey • **Engineered Floodplain** = Fourteen (14) hydraulic structure requiring field verification	• Monitoring well installations with borehole logs. • Drivepoint piezometers. • Manual and continuous water level measurements. • Groundwater and surface water chemistry. • Hydraulic conductivity measurements. • Spot baseflow measurements. • Seeps and springs observations	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.
3	West Humber (East)	H1, H2, H3, H4	**Precipitation Gauge**: • One (1) Rainfall Gauge **Streamflow Gauge:** • Five (5) Stream Flow Gauges **Water Quality Station:** • Two (2) Water Quality Stations	**Hydraulic Structure Inventory:** • **Estimated Floodplain =** Seven (7) hydraulic structures requiring topographic survey • **Engineered Floodplain** = Seven (7) hydraulic structure requiring field verification	• Monitoring well installations with borehole logs. • Drivepoint piezometers. • Manual and continuous water level measurements. • Groundwater and surface water chemistry. • Hydraulic conductivity measurements. • Spot baseflow measurements. • Seeps and springs observations.	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.
4	Main Humber	I1 and I2	**Precipitation Gauge**: • One (1) Rainfall Gauge **Streamflow Gauge:**	**Hydraulic Structure Inventory:** • **Estimated Floodplain =** Four (4) hydraulic	• Monitoring well installations with borehole logs. • Drivepoint piezometers.	• Updated watercourse mapping based on recent orthophoto	• Incorporate any new available background data	• Fish community information where sufficient information is not available (to be determined).

			• One (1) Stream Flow Gauge	structures requiring topographic survey • **Engineered Floodplain** = Two (2) hydraulic structure requiring field verification	• Manual and continuous water level measurements. • Groundwater and surface water chemistry. • Hydraulic conductivity measurements. • Spot baseflow measurements. • Seeps and springs observations.	• Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.

Table 5: Secondary Plan Area Future Data Requirements

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
1	**Precipitation Gauge**: • One (1) Rainfall Gauge **Streamflow Gauge:** • One (1) Stream Flow Gauge **Water Quality Station:** • One (1) Water Quality Station	• **Estimated Floodplain** = Four (4) structures requiring detailed topographic survey.	• See Table 4	• See Table 4 • Confirm erosion thresholds for sites MEC-R1, MEC-R2, MEC-R3, MEC-R4(2), SW-4, and EM-10	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat (Credit River watershed only).
	Streamflow Gauge: • Three (3) Stream Flow Gauges **Water Quality Station:** • Three (3) Water Quality Stations	• **Estimated Floodplain** = Ten (10) structures requiring detailed topographic survey.	• See Table 4	• See Table 4 • Confirm erosion thresholds for sites MEC-R1, MEC-R2, MEC-R3, MEC-R4(2), SW-4, and EM-10	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined)
	Precipitation Gauge: • One (1) Rainfall Gauge (South) **Other Streamflow / Water Quality:**	• **Estimated Floodplain** = Five (5) structures requiring detailed topographic survey.	• See Table 4	• See Table 4 • Confirm erosion thresholds for sites MEC-R1, and MEC-R8	• Incorporate any new available background data	• Fish community information where sufficient information is not available (to be determined).

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
	• Gauges / Stations installed downstream in SPA B & D.	• **Engineered Floodplain =** Four (4) structures requiring field verification.			• Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined.
	Precipitation Gauge: • One (1) Rainfall Gauge (North) **Streamflow Gauge:** • Two (2) Stream Flow Gauges **Other Streamflow / Water Quality:** • Additional Gauges / Stations installed downstream in SPA B.	• **Estimated Floodplain =** Three (3) structures requiring field verification.	• See Table 4	• See Table 4 • Confirm erosion thresholds for sites MEC-R1, and MEC-R8	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined).
2	**Streamflow Gauge:** • One (1) Stream Flow Gauge **Water Quality Station:** • One (1) Water Quality Station	• **Engineered Floodplain =** Two (2) structures requiring field verification.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined)

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
				• Detailed surveys for erosion thresholds	• Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Site-specific determination of location and extent of Redside Dace contributing habitat.
	Precipitation Gauge: • One (1) Rainfall Gauge **Streamflow Gauge:** • Six (6) Stream Flow Gauges **Water Quality Station:** • Four (4) Water Quality Stations	• **Estimated Floodplain** = Five (5) structures requiring detailed topographic survey. • **Engineered Floodplain =** Nine (9) structures requiring field verification.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.
	Precipitation Gauge: • One (1) Rainfall Gauge **Streamflow Gauge:** • Six (6) Stream Flow Gauges **Water Quality Station:** • Three (3) Water Quality Stations	• **Estimated Floodplain** = Five (5) structures requiring detailed topographic survey. • **Engineered Floodplain =** Five (5) structures requiring field verification.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds .	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
					potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	
	Precipitation Gauge: • One (1) Rainfall Gauge **Streamflow Gauge:** • Four (4) Stream Flow Gauges **Water Quality Station:** • One (1) Water Quality Stations	• **Estimated Floodplain** = Six (6) structures requiring detailed topographic survey. • **Engineered Floodplain =** Two (2) structures requiring field verification.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.
3	**Streamflow Gauge:** • One (1) Stream Flow Gauge **Water Quality Station:** • One (1) Water Quality Station	• **Engineered Floodplain =** Two (2) structures requiring field verification.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
					assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	
	Streamflow Gauge: • One (1) Stream Flow Gauge	• **Engineered Floodplain =** Two (2) structures requiring field verification.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.
	Precipitation Gauge: • One (1) Rainfall Gauge **Streamflow Gauge:** • One (1) Stream Flow Gauge **Water Quality Station:** • One (1) Water Quality Station	• **Estimated Floodplain** = Four (4) structures requiring detailed topographic survey.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.

SUBWATERSHED GROUPING	HYDROLOGY	HYDRAULICS	HYDROGEOLOGY	STREAM MORPHOLOGY	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY
	Streamflow Gauge: • One (1) Stream Flow Gauge	• **Estimated Floodplain** = Five (5) structures requiring detailed topographic survey. • **Engineered Floodplain =** Two (2) structures requiring field verification.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.
4	**Precipitation Gauge**: • One (1) Rainfall Gauge **Streamflow Gauge:** • One (1) Stream Flow Gauge	• **Estimated Floodplain** = Four (4) structures requiring detailed topographic survey. • **Engineered Floodplain =** Two (2) structures requiring field verification.	• See Table 4	• Updated watercourse mapping based on recent orthophoto • Rapid Geomorphic Assessment • Seasonally Based Headwater Drainage Features Assessments • Confirm reach delineation, feature types, and erosion hazards • Detailed surveys for erosion thresholds	• Incorporate any new available background data • Ecological Land Classification – desktop analysis and field verification for all vegetated features • Botanical inventories – three season inventories for all vegetated features • Wildlife Inventories – scoped based on features type and potential for Significant Wildlife Habitat • Validate Connectivity model – where appropriate, rapid assessment of linkage potential in high connectivity areas • Feature boundary delineation – where appropriate, field validated feature boundaries	• Fish community information where sufficient information is not available (to be determined). • Fish and benthic invertebrate monitoring stations where existing monitoring network is inadequate (to be determined) • Site-specific determination of location and extent of Redside Dace contributing habitat.

*Refers to Study Area depicted in Figure 4.

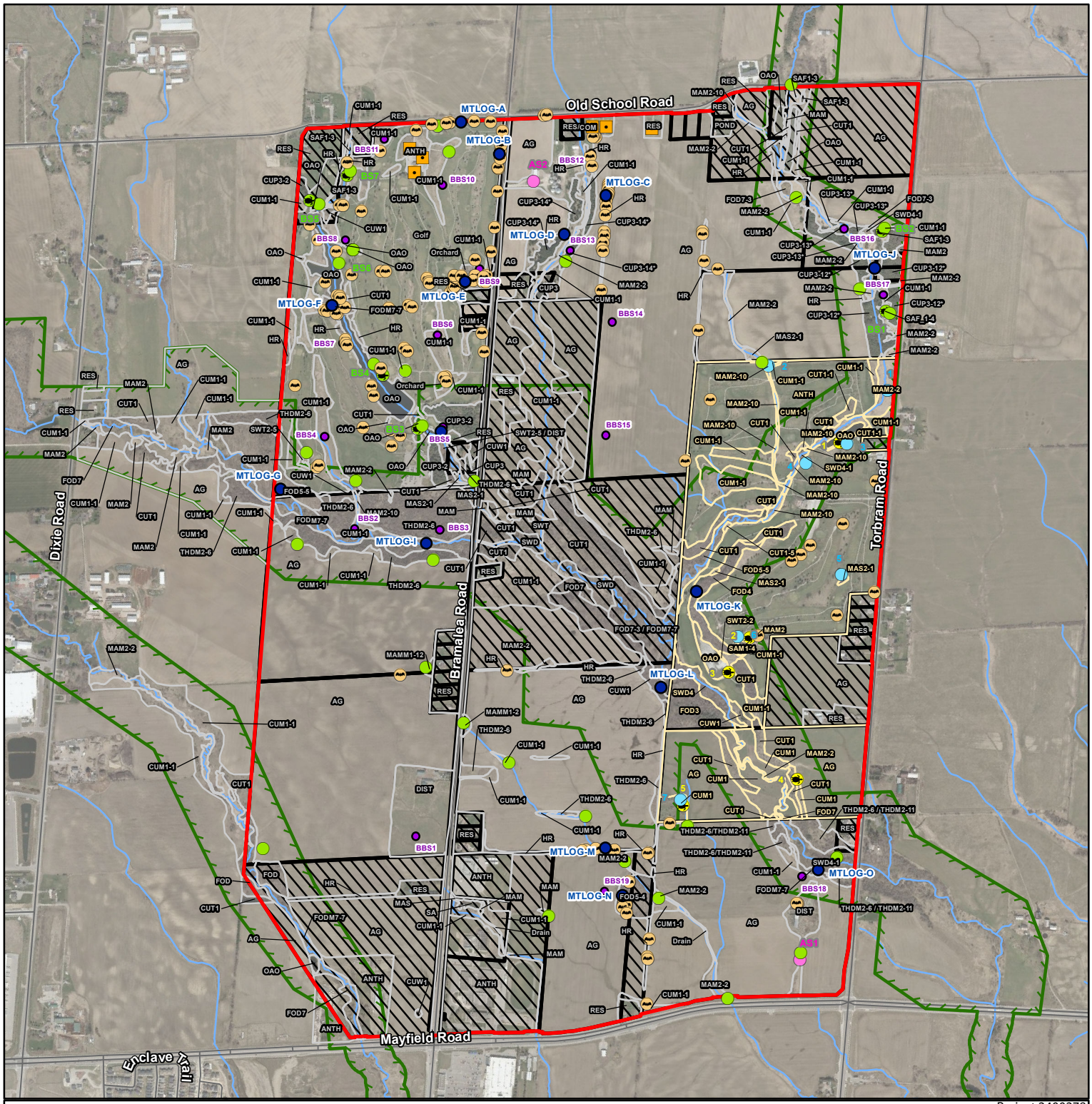
APPENDIX B

Figures

Figure 1 – Terrestrial Survey Stations

Figure 2 – Aquatic Survey Stations

Figure 3 – Monitoring Locations



Project 2400278

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Legend

- Study Area
- Watercourse
- Greenbelt Plan Area
- Non-Participating Property
- Participating Property
- Breeding Bird Stations (GEI 2024)
- Turtle Basking Surveys (Beacon 2023)
- Snake Visual Encounter Surveys (GEI 2024)
- Turtle Basking Surveys* (GEI 2024)
- Amphibian Call Count Stations (GEI 2024)
- Amphibian Call Count Stations (Beacon 2023)
- Bat Exit Structure (GEI 2024)
- Bat Acoustic Stations (GEI 2024)
- Ecological Land Classification (GEI 2024)
- Ecological Land Classification (Beacon 2022,2023)

- All participating properties were reviewed for potential suitability for winter raptors. There are no specific stations for this survey type; rather, the entire property was surveyed to review for suitability

- Breeding bird surveys completed by Beacon Environmental (2022,2023) used a roving technique instead of point count locations.

*General turtle nesting suitability assessments were completed throughout the Study Area

Mayfield Tullamore Landowner Group
Local Subwatershed Study Work Plan

Figure 1
Terrestrial Survey Stations

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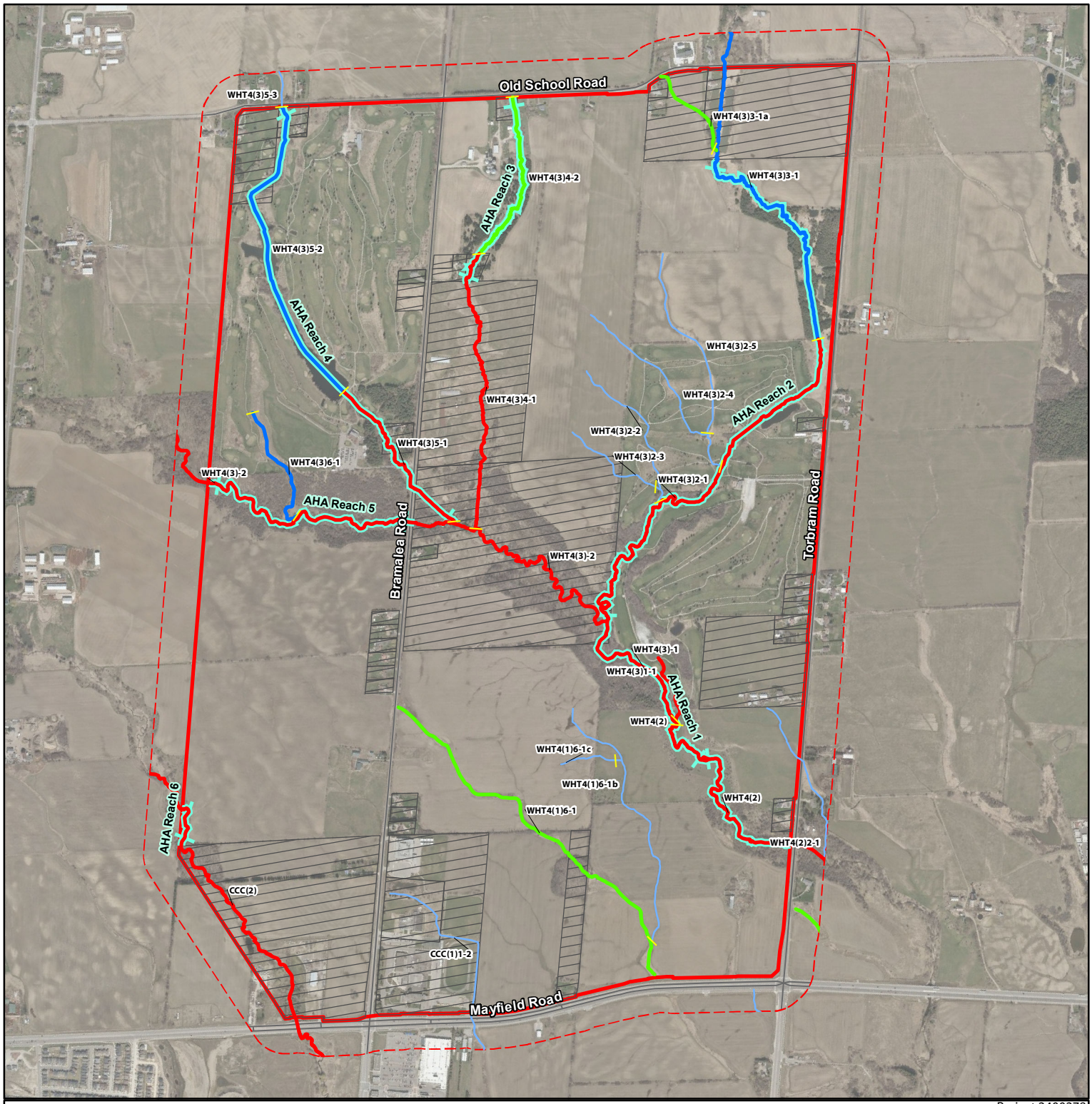
GEI Consultants



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Legend

- Study Area
- Study Area + 120m
- Non-Participating Property

Stream Constraints (Peel SABE 2020)

- High
- Medium
- Low
- Watercourse
- Reach Breaks
- Aquatic Habitat Assessment and Summer Fish Community Sampling

*Spring Fish Community Sampling was completed for all HDFs within participating properties

Mayfield Tullamore Landowner Group
Local Subwatershed Work Study Plan

Figure 2
Aquatic Survey Stations

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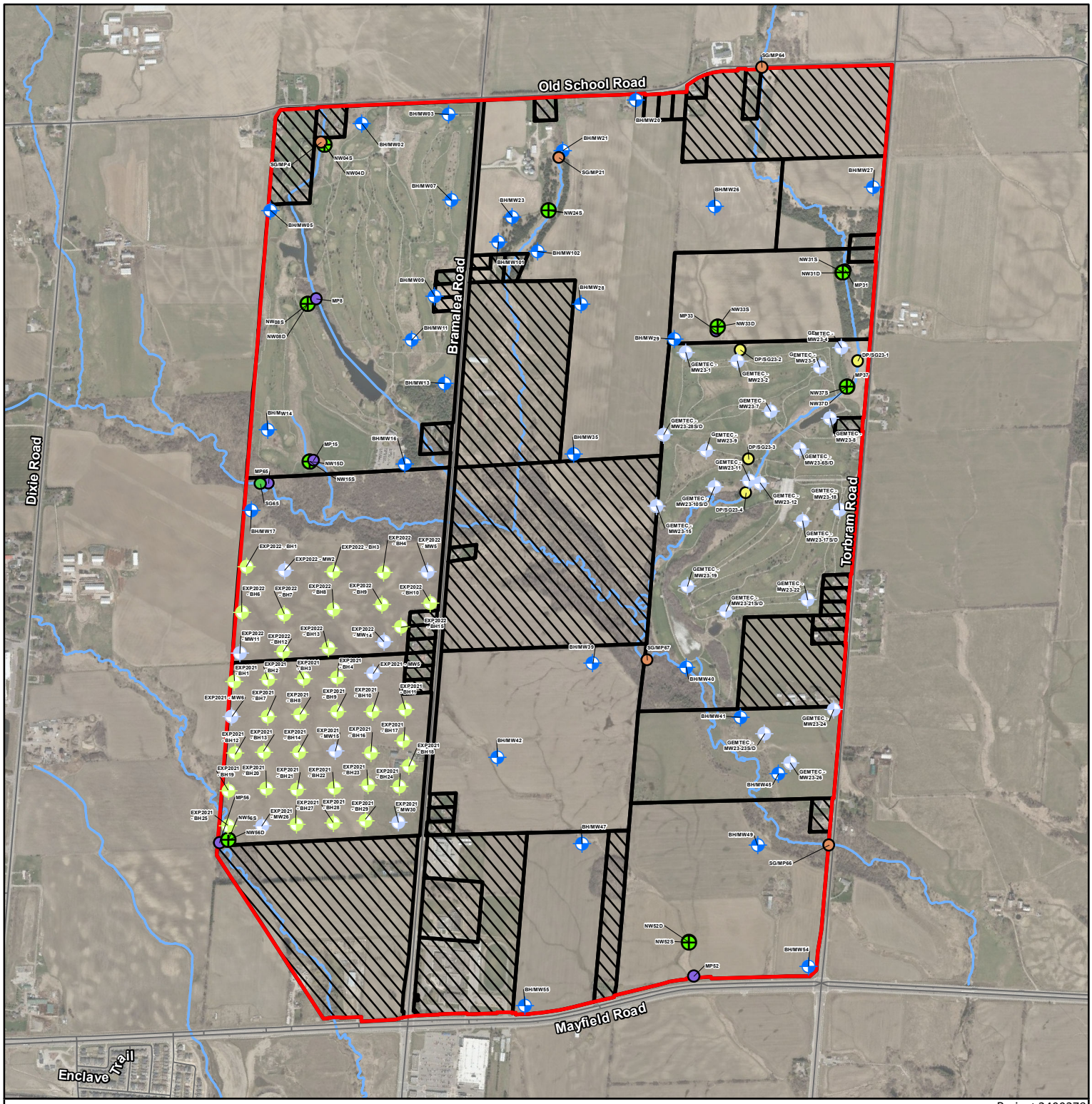
GEI Consultants



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Legend

- Study Area
- Non-Participating Property
- Participating Property
- Borehole/Monitoring Well (GEI 2024)
- Nested Well (GEI 2024)
- Monitoring Well (EXP 2021, 2022 & GEMTEC 2023)
- Borehole (EXP 2021, 2022)
- Mini Piezometer (GEI 2024)
- Staff Gauge (GEI 2024)
- Staff Gauge/Mini Piezometer (GEI 2024)
- Drive Point/Staff Gauge (GEMTEC 2023)

Mayfield Tullamore Landowner Group
Local Subwatershed Study Work Plan

Figure 3 A Hydrogeological and Geotechnical Monitoring Locations

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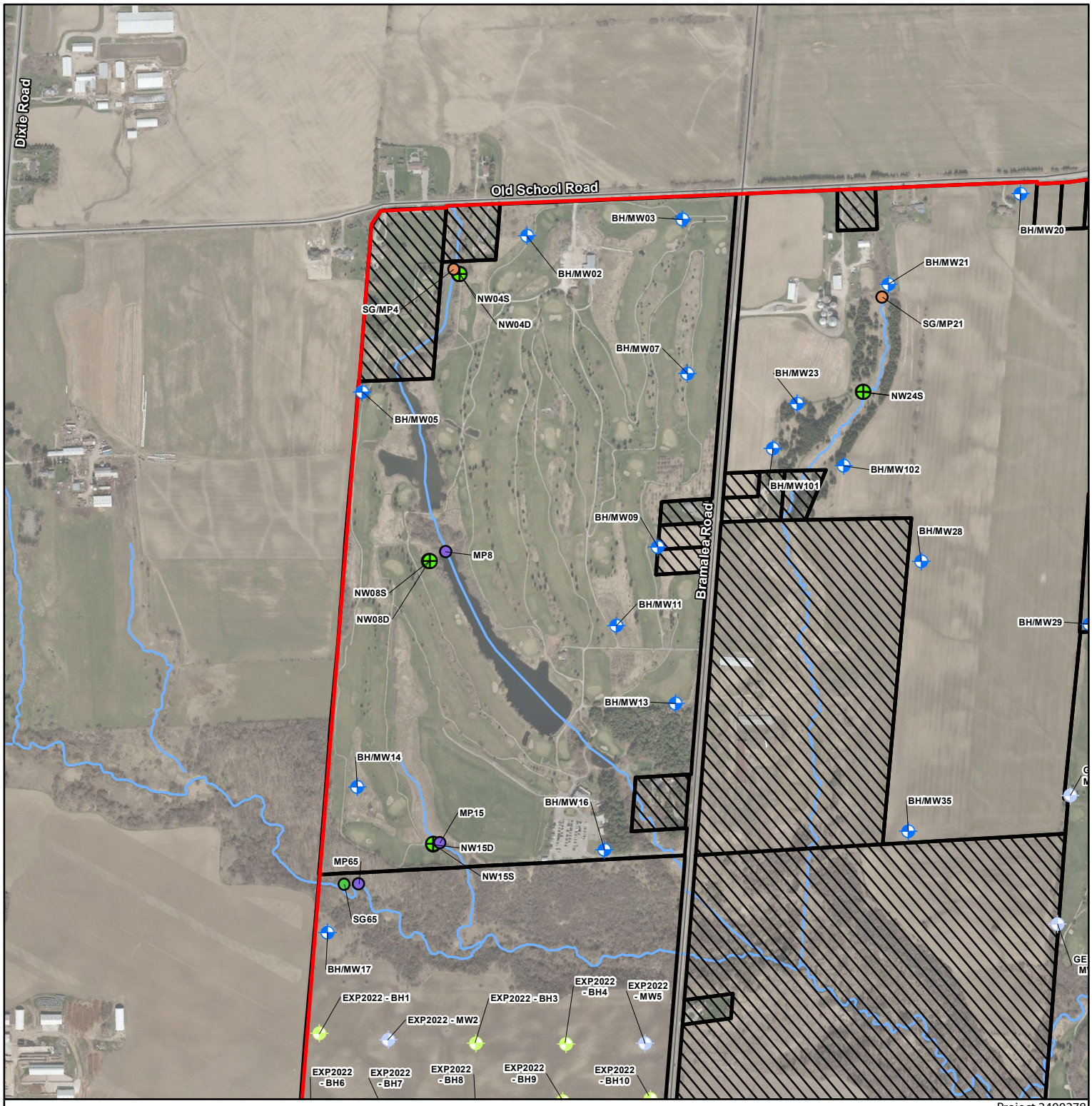
GEI Consultants



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Legend

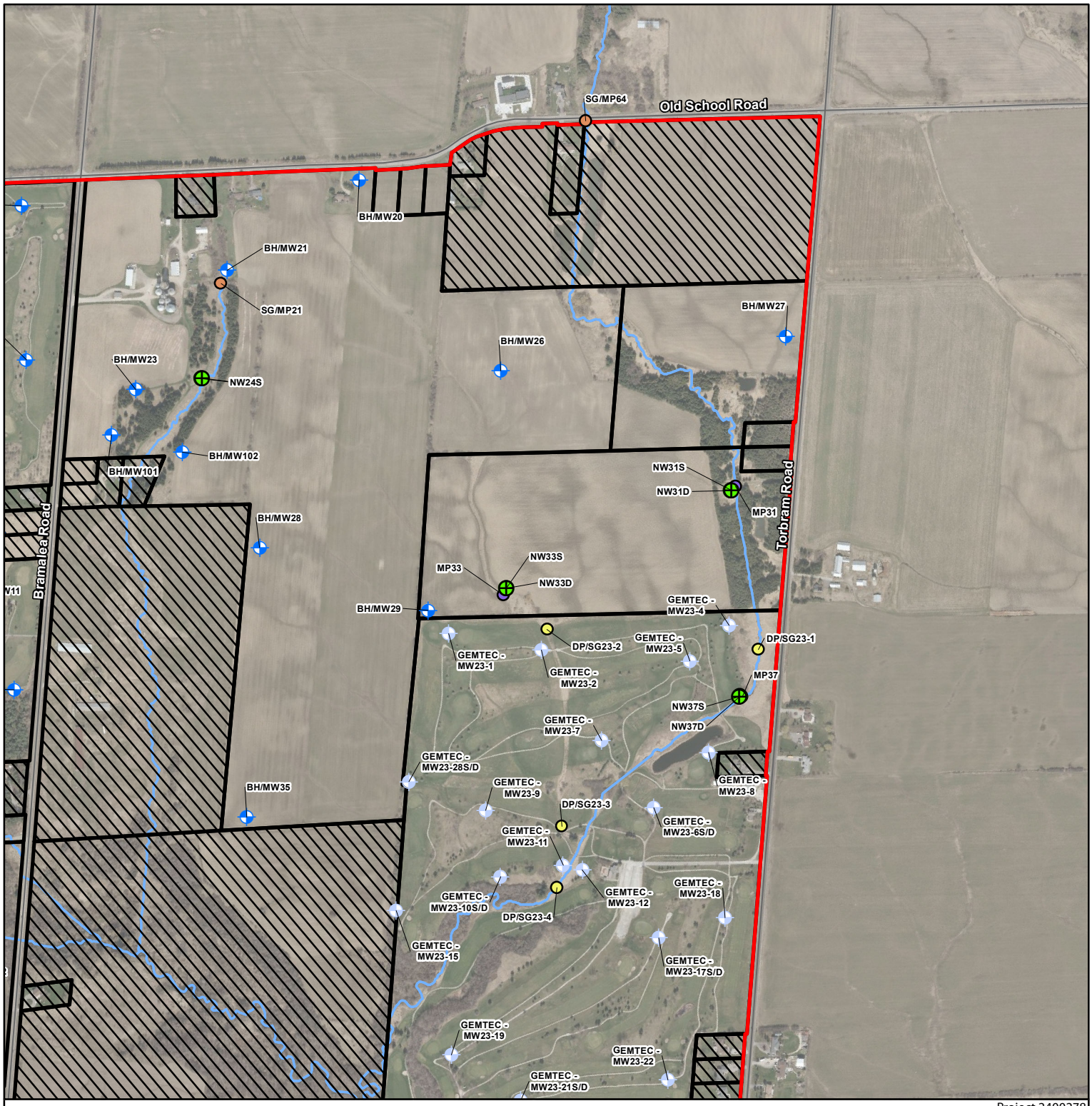
- Study Area
- Non-Participating Property
- Participating Property
- Borehole/Monitoring Well (GEI 2024)
- Nested Well (GEI 2024)
- Monitoring Well (EXP 2021, 2022 & GEMTEC 2023)
- Borehole (EXP 2021, 2022)
- Mini Piezometer (GEI 2024)
- Staff Gauge (GEI 2024)
- Staff Gauge/Mini Piezometer (GEI 2024)
- Drive Point/Staff Gauge (GEMTEC 2023)

Mayfield Tullamore Landowner Group
Local Subwatershed Study Work Plan

Figure 3 B Hydrogeological and Geotechnical Monitoring Locations

0 220 m
1:10,000

GEI Consultants



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Legend

- Study Area
- Non-Participating Property
- Participating Property
- Borehole/Monitoring Well (GEI 2024)
- Nested Well (GEI 2024)
- Monitoring Well (EXP 2021, 2022 & GEMTEC 2023)
- Borehole (EXP 2021, 2022)
- Mini Piezometer (GEI 2024)
- Staff Gauge (GEI 2024)
- Staff Gauge/Mini Piezometer (GEI 2024)
- Drive Point/Staff Gauge (GEMTEC 2023)

Mayfield Tullamore Landowner Group
Local Subwatershed Study Work Plan

Figure 3 C Hydrogeological and Geotechnical Monitoring Locations

0 220 m

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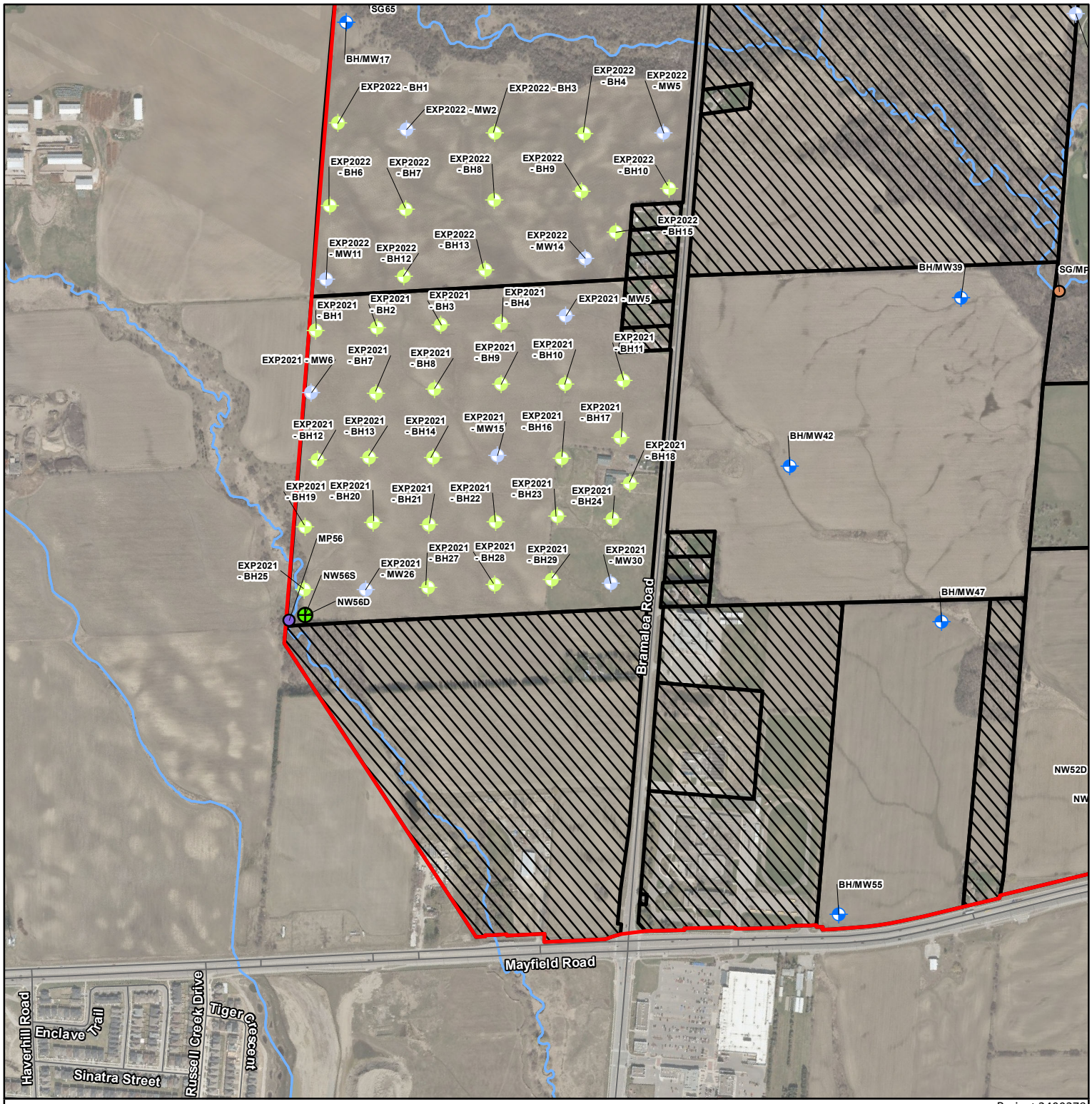
GEI Consultants



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Legend

- Study Area
- Non-Participating Property
- Participating Property
- Borehole/Monitoring Well (GEI 2024)
- Nested Well (GEI 2024)
- Monitoring Well (EXP 2021, 2022 & GEMTEC 2023)
- Borehole (EXP 2021, 2022)
- Mini Piezometer (GEI 2024)
- Staff Gauge (GEI 2024)
- Staff Gauge/Mini Piezometer (GEI 2024)
- Drive Point/Staff Gauge (GEMTEC 2023)

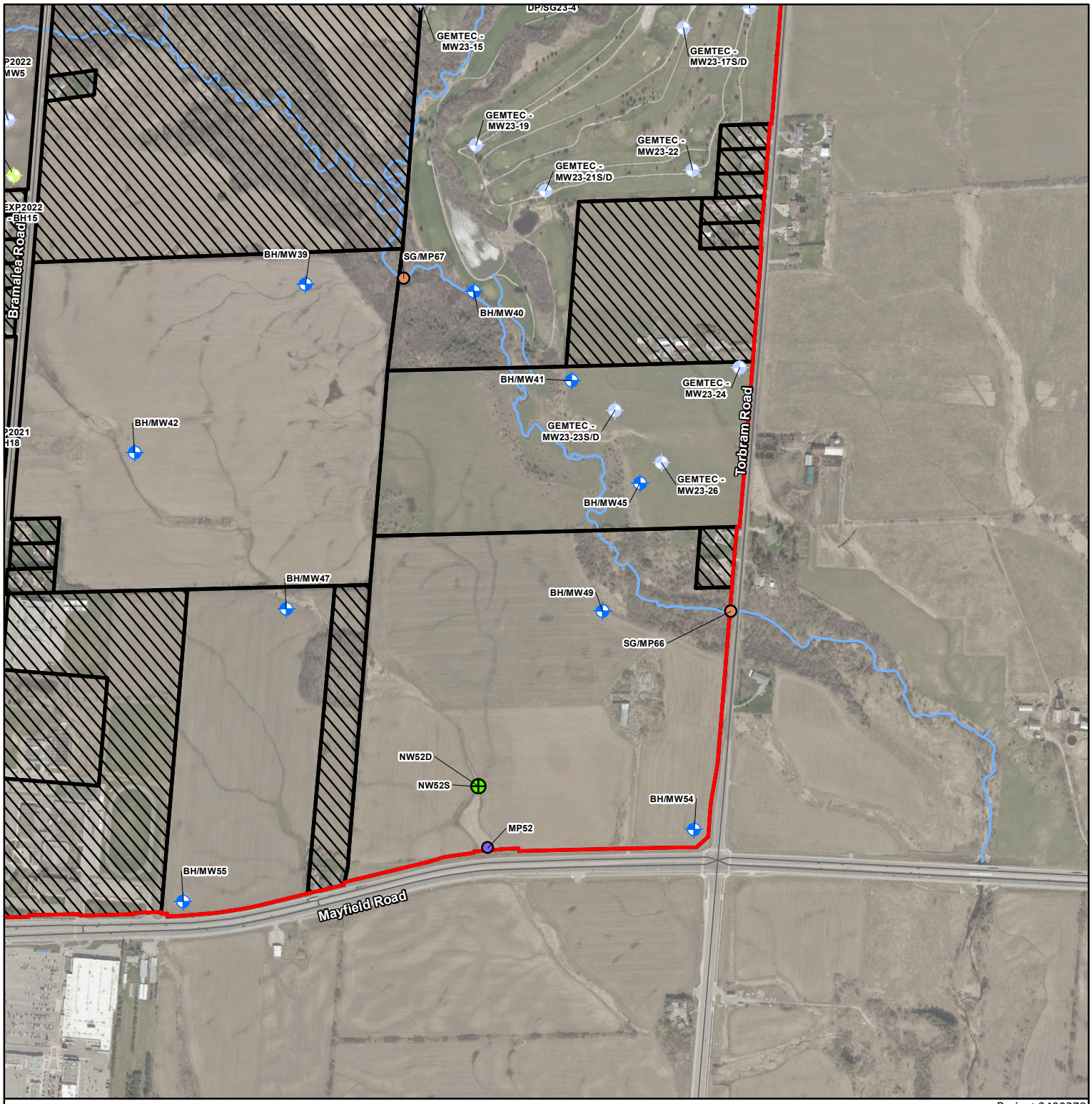
Mayfield Tullamore Landowner Group
Local Subwatershed Study Work Plan

Figure 3 D Hydrogeological and Geotechnical Monitoring Locations

0 220 m

1:10,000

GEI Consultants



Project 2400278

NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2024.
3. Contains information made available under the Toronto and Region Conservation Authority (TRCA's) Open Data License v1.0

Legend

- Study Area
- Non-Participating Property
- Participating Property
- Borehole/Monitoring Well (GEI 2024)
- Nested Well (GEI 2024)
- Monitoring Well (EXP 2021, 2022 & GEMTEC 2023)
- Borehole (EXP 2021, 2022)
- Mini Piezometer (GEI 2024)
- Staff Gauge (GEI 2024)
- Staff Gauge/Mini Piezometer (GEI 2024)
- Drive Point/Staff Gauge (GEMTEC 2023)

Mayfield Tullamore Landowner Group
Local Subwatershed Study Work Plan

Figure 3 E
Hydrogeological and Geotechnical Monitoring Locations

0 220 m

1:10,000

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APPENDIX C

Tables

Table 1 – Field Studies and Natural Inventories

Table 1: Field Studies and Natural Inventories (2024)

COMPLETE?	SURVEY ROUND	SURVEY TYPE	DATE (2024)	TIME		AIR TEMP (C°)	HUMIDITY (%)	CLOUD COVER (%)	BEAUFORT WIND SPEED	PRECIPITATION COMMENTS
				START	END					
Y	1	Winter Raptor Survey	08-FB	07:15	16:15	6	70	100	0	Freezing Fog
Y	1-1	Bat Habitat Assessment & Structure Screening	12-FB	08:40	17:00	0	70	90	2	None
Y	1-2	Bat Habitat Assessment & Structure Screening	15-FB	10:05	17:00	-3	70	100	3	None
Y	1-1	Headwater Drainage Feature Assessment	18-MR	09:00	15:30	1	65	100	4	None
Y	1-2	Headwater Drainage Feature Assessment	19-MR	09:00	16:00	1	73	90	4	Snow
Y	1-3	Headwater Drainage Feature Assessment	22-MR	09:00	16:00	-3	69	100	3	Snow
Y	1-4	Headwater Drainage Feature Assessment	27-MR	09:00	16:00	9	65	75	4	None
Y	1-1 1-1	Turtle Basking and Nesting Survey & Snake Transect Survey	09-AP	09:30	14:30	13	62	10	1	None
Y	1-2 1-2	Turtle Basking Survey & Snake Transect Survey	10-AP	10:00	14:40	17	72	10	1	None
Y	1	Spring Fish Community Sampling	15-AP	09:00	18:30	16	32	70	4	None

Table 1: Field Studies and Natural Inventories (2024)

COMPLETE?	SURVEY ROUND	SURVEY TYPE	DATE (2024)	TIME		AIR TEMP (C°)	HUMIDITY (%)	CLOUD COVER (%)	BEAUFORT WIND SPEED	PRECIPITATION COMMENTS
				START	END					
N	2	Headwater Drainage Feature Assessment – Round 2								
		Headwater Drainage Feature Assessment - Round								
Williamson, L. Love, S.	2-1 2-1	Snake Transect Survey & Turtle Basking Survey	16-AP	10:00	14:20	15	67	10	1	None
Williamson, L. Love, S.	1-1	Amphibian Call Count Survey	17-AP	20:30	22:00	11	38	10	1	None
Williamson, L. Cartwright, C.	2-2 2-2	Turtle Basking Survey & Snake Transect Survey	26-AP	13:00	16:00	11	29	5	2	None
Leslie, J.	1-1	Spring Ecological Land Classification and Botanical Inventories	2-MA	09:00	16:30	16	61	20	3	None
Williamson, L. Brunelle, P.	3-1 3-1	Snake Transect Survey & Turtle Basking Survey	2-MA	12:40	16:45	15	73	5	2	None
Leslie, J.	1-2	Spring Ecological Land Classification and Botanical Inventories	3-MA	09:00	16:00	16	64	80	3	Rain

Table 1: Field Studies and Natural Inventories (2024)

COMPLETE?	SURVEY ROUND	SURVEY TYPE	DATE (2024)	TIME		AIR TEMP (C°)	HUMIDITY (%)	CLOUD COVER (%)	BEAUFORT WIND SPEED	PRECIPITATION COMMENTS
				START	END					
Leslie J.	1-3	Spring Ecological Land Classification and Botanical Inventories	6-MA	09:00	15:00	18	45	80	3	None
Williamson, L. Love, S.	3-2 3-2	Snake Transect Survey & Turtle Basking Survey	6-MA	09:15	13:00	14	60	15	2	None
Leslie, J.	1-4	Spring Ecological Land Classification and Botanical Inventories	7-MA	09:00	15:30	20	45	80	3	None
Leslie, J.	1-5	Spring Ecological Land Classification and Botanical Inventories	8-MA	09:00	14:00	20	54	65	4	None
Williamson, L. Love, S.	2-1	Amphibian Call Count Survey	16-MA	21:00	23:00	17	73	5	1	None
Williamson, L. Love, S.	2-2	Amphibian Call Count Survey	17-MA	21:00	23:00	15	100	95	2	Rain, Fog
Robinson, O. Leslie, J. Wiginton, R. Huang, F. TRCA, Town of Caledon	1-1	Staked Top of Bank and Treed Limit	30-MA	09:00	16:00	17	36	0	3	None

Table 1: Field Studies and Natural Inventories (2024)

COMPLETE?	SURVEY ROUND	SURVEY TYPE	DATE (2024)	TIME		AIR TEMP (c°)	HUMIDITY (%)	CLOUD COVER (%)	BEAUFORT WIND SPEED	PRECIPITATION COMMENTS
				START	END					
Stemberger, H. Lohnes, S. Leslie, J. Wiginton, R. Huang, F. TRCA, Town of Caledon	1-2	Staked Top of Bank and Treed Limit	31-MA	09:00	16:00	21	37	5	2	None
Nieroda, M. Brunelle, P.	1-1	Bat Acoustic Survey Set-up	31-MA	08:00	18:00	22	36	5	2	None
Robinson, O. Lohnes, S. Doyle, T. Wiginton, R. Huang, F. TRCA, Town of Caledon	1-3	Staked Top of Bank and Treed Limit	03-JN	09:00	16:00	20	88	85	2	Fog
Burke, P.	1-1	Breeding Bird Survey	04-JN	05:25	10:00	17	93	75-50	0	None
Nieroda, M. Fleming, D. Kimble, B.	2	Headwater Drainage Feature Assessment	04-JN	08:30	17:00	24	60	80	3	None
Burke, P.	1-2	Breeding Bird Survey	05-JN	05:25	10:00	19	77	75	1	None
Burke, P.	1-3	Breeding Bird Survey	06-JN	05:15	09:30	19	100	100	2	Fog

Table 1: Field Studies and Natural Inventories (2024)

COMPLETE?	SURVEY ROUND	SURVEY TYPE	DATE (2024)	TIME		AIR TEMP (C°)	HUMIDITY (%)	CLOUD COVER (%)	BEAUFORT WIND SPEED	PRECIPITATION COMMENTS
				START	END					
Nieroda, M. Brunelle, P.	1-2	Bat Acoustic Survey Pick-up	10-JN	08:30	12:30	13	66	60	3	None
Williamson, L. Brunelle, P.	3-1	Amphibian Call Survey	24-JN	21:30	23:30	23	53	0	3	None
Williamson, L. Brunelle, P.	3-2	Amphibian Call Survey	25-JN	21:30	23:30	23	74	30	3	None
Burke, P.	2-1	Breeding Bird Survey	25-JN	06:30	08:30	19	72	50	3	None
Burke, P.	2-1	Breeding Bird Survey	26-JN	05:35	09:15	18	100	85	4	None
Stemberger, H. Leslie, J. Robinson, O. TRCA	1-1	Staked Wetland Limit	04-JL	09:00	16:00	26	62	80	4	None
Stemberger, H. Leslie, J. TRCA	1-2	Staked Wetland Limit	05-JL	09:00	16:00	26	52	0	1	None
Stemberger, H. Leslie, J. Robinson, O. TRCA	1-3	Staked Wetland Limit	08-JL	09:00	16:00	26	59	75	4	None

Table 1: Field Studies and Natural Inventories (2024)

LEGEND:

BEAUFORT WIND SPEED SCALE	
0	Calm (<1 km/hr)
1	Light Air (1-5 km/hr)
2	Light Breeze (6-11 km/hr)
3	Gentle Breeze (12-19 km/hr)
4	Moderate Breeze (20-28 km/hr)

MONTH (CODE)	
JA	January
FB	February
MR	March
AP	April
MA	May
JN	June
JL	July
AU	August
SE	September
OC	October
NO	November
DE	December