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.

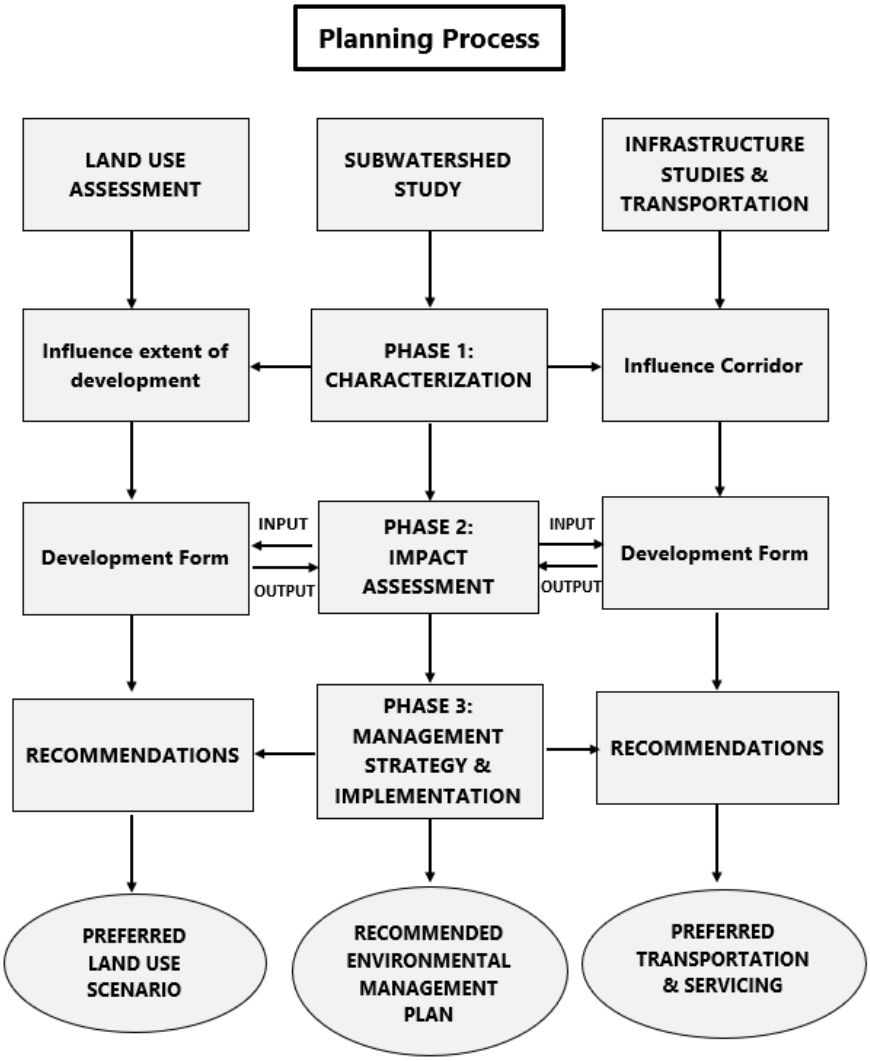

Figure 1: Integrated Land Use, Subwatershed, and Infrastructure Study Process

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.

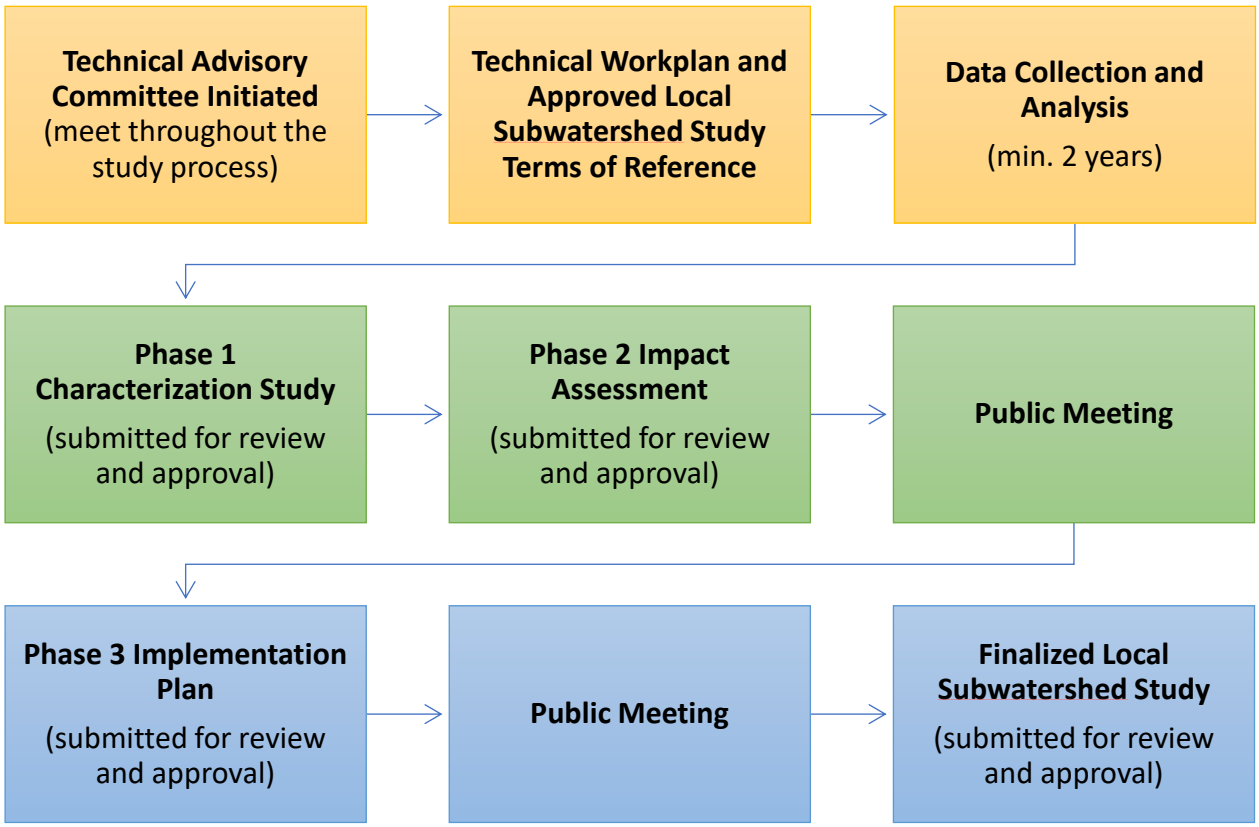

Figure 2: Local Subwatershed Study Process

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).

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					• 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.