



City of
Peterborough

To: **Members of the General Committee**

From: **Jasbir Raina, Commissioner of Infrastructure and Planning Services**

Meeting Date: **September 12, 2022**

Subject: **Watershed Planning Study Update, Report IPSIM22-023**

Purpose

A report to provide Council with an update on the Watershed Planning Study and outline the next steps to finalize the plan.

Recommendation

That Council approve the recommendation outlined in Report IPSIM22-023 dated September 12, 2022, of the Commissioner of Infrastructure and Planning Services as follows:

That Report IPSIM22-023 be received for information.

Budget and Financial Implications

There are no budget or financial implications associated with approval of this report.

Background

Watershed Planning as a Provincial Requirement

Watershed planning is a crucial tool for integrated and long-term municipal planning with consideration for the cumulative impacts of development and climate change on all components of a watershed. The process of watershed planning is identified in the Greenbelt Plan (2017) and the Growth Plan for the Greater Golden Horseshoe (2020) as being required to inform the protection of water resource systems and decisions related to planning for growth. In these documents, the watershed planning process is also identified as informing site-specific land use planning decisions as well as planning for water, wastewater, and stormwater infrastructure through a comprehensive water or wastewater master plan or equivalent.

Recent amendments to the Growth Plan, beginning in 2017, placed specific responsibility on Municipalities to ensure that watershed planning is undertaken to support a comprehensive, integrated, and long-term approach to the protection, enhancement, or restoration of their watershed(s).

City of Peterborough Watershed Planning Study (WPS)

The City of Peterborough Watershed Planning Study (WPS) is being undertaken to provide a management framework for the protection of water resources, the management of human activities, land, water, aquatic life, and resources within the subwatersheds of the City of Peterborough. Along with subwatersheds that are fully contained within the City of Peterborough, the study area also includes subwatersheds that have headwaters external to the City that flow through the municipal boundary before their confluence with the Otonabee River.

The WPS incorporates a three-phase process, following guidance provided by the province.

- Phase 1(a) included characterizing the watershed and collecting all available background information.
- Phase 1(b) involved drafting a vision for the study area and developing a set of goals and objectives.
- Phase 2 included the completion of various technical components, such as groundwater and water quality modeling, natural hazard assessments (flooding), defining the natural heritage systems, and assessing cumulative impacts.

Throughout Phase 2, the impacts associated with climate change have been an integral focus, with the intent to provide direction for climate adaptation strategies in Phase 3.

- Phase 3, which is currently under development, is the Watershed Plan which includes an Implementation Strategy. The Implementation Strategy will provide direction to the City for areas to be protected, enhanced, or rehabilitated, guidance on appropriate land-use and development criteria, servicing requirements, water management practices and performance measures, targets for protection and restoration, as well as best management practices for the management of water quality and quantity. It will also inform the development and prioritization of projects in the City's capital program, further advancing recommendations from the City's Flood Reduction Master Plans and Stormwater Quality Master Plan using the latest watershed science. Through implementation of the Watershed Plan the City will expand upon recent investments Council has made in improving priority watersheds (i.e., recent upgrades made in the Curtis Creek (urban portion) watershed to reduce flood risk, improve water quality, and restore a naturalized creek corridor) to more areas of the City.
- Valuable components of Phase 3 include a well-defined approach to urban growth within the watershed with consideration for environmental sustainability and climate risk mitigation.

Consultation and Engagement

Watershed planning is an important topic that requires transparent and meaningful stakeholder and community engagement. The public engagement plan for this project has three principal goals:

1. Educate and increase the public understanding of watershed planning;
2. Collect input and feedback regarding watershed planning in Peterborough; and
3. Assist in the identification of issues, constraints, and opportunities.

In addition to public engagement, the consultation for Phase 1 and 2 of the project included consultation with key stakeholders and First Nations, as follows:

1. Watershed Coordinating Committee (WCC)

The Watershed Coordinating Committee included study area Municipalities (including representatives from Peterborough County, Selwyn, Douro-Dummer, Otonabee-South Monaghan, and Cavan-Monaghan Townships), First Nations and Otonabee Region Conservation Authority (ORCA) and provides a forum to review, discuss, and share information in relation to the watersheds and the Watershed Plan. This group was

consulted during Phase 1 and 2 via virtual consultation.

2. First Nations

Phase one included direct consultation with Williams Treaty First Nations having an interest in the watershed planning process. To date, the Hiawatha First Nation and Curve Lake First Nation have been involved in the project as part of the WCC. Through consultation with members of Curve Lake First Nation and Hiawatha First Nation, issues, concerns, and insight associated with long-term watershed health that were raised included:

- Traditional knowledge should be incorporated into the WPS wherever possible.
- Water is the bloodline for all of Mother Earth, all plants, and animals in the world. It is our obligation to ensure that it is protected.
- Within First Nations communities, people are taught to think seven generations ahead when making decisions about the future and that this strategy should be considered for long-term watershed health.
- High nutrient levels in the Trent Severn Waterway and connecting lakes due to agricultural runoff was highlighted as a watershed health stressor.
- The water quality impact of septic systems in floodplains and along waterways was highlighted as a watershed health stressor.
- The impact of tourism was highlighted as a watershed health stressor.
- The long-term sustainability of trapping and its relationship to terrestrial ecology was highlighted as an important social component of the watershed.
- The health of wetlands and associated aquatic life was highlighted as a priority. Poor water quality was noted as a stressor for wetlands. It was noted that many people still harvest plants from wetlands.

3. Technical Working Group (TWG)

The Technical Working Group consists of technical subject matter experts who live and work in the community. The membership included volunteers from local academic institutions, municipal staff, land development consulting, conservation authorities, public health, and environmental stewards with subject matter expertise in various relevant fields, including:

- Water Quality
- Hydrogeology
- Terrestrial/Aquatic ecology
- Infrastructure

- Water Resources and Civil Engineering
- Climate Change

This committee has provided input and expertise on the various technical aspects of the study.

4. Stakeholders

Key stakeholders such as community groups, major landowners, academia, businesses, and the development community attended a Stakeholder Workshop during Phase 1. An additional Stakeholder Workshop to present the findings and preliminary recommendations will be scheduled prior to finalizing the Watershed Plan.

5. Peterborough Environmental Advisory Committee (PEAC)

Findings from Phases 1 and 2 were presented to PEAC. Specific watershed issues and priorities that have been highlighted by PEAC through consultation include the impact of winter roads maintenance (i.e., sanding and salting of roads), the need for pollution control planning, the potential impact of microplastics on ecology, the need for invasive species management, and the value of digitized watershed mapping.

Phase 1 – Characterization and Issue Identification

The Phase 1 component of the WPS provides a detailed baseline inventory of the watershed (e.g., landform, water features, ecology, etc.) then integrates this information to provide a greater understanding of the watershed's natural features and how they function and relate to each other. Watershed characterization was a desktop exercise where background materials and data were reviewed, analyzed, and summarized. The characterization report provides a summary of existing environmental conditions (fisheries, terrestrial, flooding, climate, groundwater resources, etc.) together with a characterization of land-uses and infrastructure which relate to subwatershed health.

Existing issues and stressors that were identified within the watershed by the Phase 1 study included:

- Fragmentation of natural heritage systems resulting from historical agricultural land conversion and urban development;
- Water quality issues related to nutrient loading from agricultural areas and lawn fertilizer, salt loading from winter operations of roads and parking areas, as well as metals and suspended solids consistent with older urban areas lacking stormwater quality controls; and,

- Changes in watercourse temperatures consistent with loss of tree cover or natural landscapes and reductions in baseflow contributions especially within the urban environment.

A key component of the Phase 1 Watershed Characterization was the watershed health analysis and identification of priority subwatersheds. The health analysis used a decision matrix that considered the state of the following health metrics:

- Terrestrial (land-based systems) health
- Stormwater management
- Water quality
- Aquatic health

Priority 1 subwatersheds have the poorest conditions based on the four metrics analyzed, while Priority 4 subwatersheds have the best conditions. However, this does not mean that Priority 4 subwatersheds should be allowed to degrade and management practices will still need to be implemented to protect the subwatershed health and to enhance it where possible.

Priority 1 subwatersheds will have the greatest opportunities to enhance subwatershed health. Priority 1 subwatersheds include:

- Curtis Creek (urban portion)
- Bears Creek (urban portion)
- Stewart Hall (urban portion)
- Byersville Creek
- Fisher Creek
- Whitlaw Creek

Vision, Goals and Objectives

Upon completion of the Phase 1 Watershed Characterization, the project team developed a watershed Vision, Goals and Objectives with input from the various groups listed above. The Vision is:

“A healthy and resilient watershed that protects, sustains and enhances our evolving communities.”

To achieve this vision, five distinct goals have been developed with associated objectives, these include:

1. Protect and enhance the natural hydrological function
2. Enhance or maintain water quality in creeks, wetlands, and rivers
3. Conserve, protect and restore a healthy aquatic ecosystem
4. Conserve, protect and restore a healthy terrestrial ecosystem
5. Support social, economic, and cultural activities that rely on a healthy watershed

Upon completion of the Implementation Strategy, the watershed objectives will be revisited in consideration of the study findings to ensure they align with needs of the community and natural environment. Staff will seek Council approval of the Watershed Goals and Objectives after completion of the WPS. These watershed goals and objectives are used to guide technical analyses and the development of watershed strategies as part of Phases 2 and 3, respectively. As part of the Phase 3 Watershed Plan, each objective is provided with associated target(s) to help guide management activities, future monitoring, and overall implementation of the program.

Phase 2 – Technical Analysis and Cumulative Impact Assessment

The multidisciplinary nature of the WPS and associated watershed objectives requires a suite of tools to measure impacts on the water resource system. As part of Phase 2, several technical reports were undertaken to better understand technical components of the watersheds and how they may be impacted by climate change and development pressures. These reports included:

1. **Future Flood Assessment Recommendations:** For watercourses within the study area, floodplain mapping has been completed by ORCA to various degrees within these subwatersheds, although the year and method of completion varies. The purpose of this WPS component is to identify and prioritize areas within the City where floodplain mapping needs to be updated, taking into account existing floodplain mapping, recent developments, and future climate change projections. Jackson Creek (further refinements downtown), Byersville Creek, Bears Creek and Riverview Creek were identified as modelling priorities. In addition, as recommended through this assessment, an Urban Flood Risk and Storm Sewer Model has also been developed. This work will aid the City in understanding flood risk, informing emergency management and improving its capital planning programs to reduce flooding.
2. **Groundwater Resources Report:** The objective of this report is to describe the groundwater resources in the study area and present our understanding of the

groundwater flow system. Considerable work, largely related to Municipal Groundwater Studies and Source Water Protection (SWP) program studies, has been undertaken in the Otonabee watershed over the last 10 years. This project updates and expands on findings of this and other previous studies. A hydrologic model (surface water/runoff) and a groundwater model were developed as part of this component which was used in the assessment of climate change impacts on subwatershed features including wetlands and woodlands. This modeling activity also identified ecologically significant groundwater recharge (ESGR) areas. These ESGR areas contribute important baseflow to the study area wetlands and watercourses.

3. **Water Quality Modeling Report:** This Phase 2 study component consisted of the development of a water quality model to assess annual loadings of water quality parameters generated from each subwatershed. Water quality parameters analyzed through this model are Biochemical Oxygen Demand (BOD), Chloride, Copper, Nitrate, Total Phosphorus, Total Suspended Solids and Zinc. The impact of development in designated greenfield areas and climate change scenarios were analyzed as part of this modelling exercise. Model results indicate that future development will lead to an increased loading of water quality parameters of concern in all impacted subwatersheds. The existing Stormwater Management (SWM) facilities provide a substantial water quality benefit, however there is a significant discrepancy between the degree of treatment provided in each subwatershed and the removal ability of existing SWM facilities. This indicates the study area is underserviced and that additional SWM is needed.
4. **Climate Change Memo:** This Phase 2 study component summarized future climate projections for different climate scenarios and discussed the potential impacts of climate change on high-level watershed processes and municipal infrastructure. Projected climate change in the study area includes warmer temperatures and more annual precipitation, though the summer season is likely to see less precipitation. Less consistent snowpack as a result of warmer winters is expected to alter the flow patterns especially during spring months as the winter melt is reduced. Larger groundwater inputs are also expected during the winter months. Intensification of short-duration storm events is expected to reduce the level-of-service provided by conveyance and stormwater detention infrastructure. From an ecological perspective some range shift of species is identified as a projected impact along with the warming of watercourses including those that support cold water fisheries.
5. **Natural Heritage Report:** The purpose of this report is to build on the characterization of the watershed by analyzing the potential impacts related to

future development and climate change. As part of this study, a comprehensive Natural Heritage System (NHS) consistent with municipal, provincial, and federal legislative requirements was identified along with any relevant data gaps and the strategies for obtaining the necessary information to address those gaps. This work included combining the NHS completed as part of the City's Official Plan, with the Kawartha's Naturally Connected NHS outside the City boundary, creating one cohesive NHS across the study area. To facilitate the Cumulative Effects Analysis, the potential effects of climate change and development/infrastructure on the NHS was analyzed.

The **Cumulative Effects Analysis (CEA)** used information collected and analyses undertaken during Phase 2 components to determine the projected impacts of development and climate change on natural watershed/subwatershed features, including watercourses, wetlands, and woodlands. Analysis of the impacts on aquatic ecology included those associated with changes in water temperature, the water cycle, and changes in water chemistry. Analyses of cumulative effects on Natural Heritage System features focused on those features within Designated Greenfield Areas. In general, the Cumulative Effects Analyses indicated that both climate change and development result in similar changes to watershed function and that compounded upon each other these may result in further water quality degradation and significant hydrologic changes. As such, a robust set of environmental policies and a strategy that enables future growth to be undertaken in a manner that incorporates Low Impact Development and climate risk mitigation strategies is needed to protect watershed function and ecological integrity.

Phase 1 and 2 reports are available in "draft for consultation" format currently. Links to these documents can be found on ConnectPTBO at www.connectptbo.ca/our-watershed-our-blueprint

Phase 3 – Watershed Plan Management Alternatives and Strategies

A list of management alternatives and watershed strategies has been identified as part of the WPS. Strategies for improving watershed health differ between urban and rural watersheds.

Within **urban areas of the watershed**, the following management alternatives and strategies are being considered as part of the Watershed Plan.

- **Ecological Restoration and Enhancement:** Strategies to protect and enhance natural heritage features and functions within the city limits are often included as a part of a redevelopment or intensification projects. These include ecological restoration, land acquisition opportunities, creek restoration and shoreline restoration along the Otonabee River. The City of Peterborough is set to have many areas intensify over the next 50 years. The natural corridors that already exist within the urban matrix are at risk of being compromised but also represent

a significant opportunity to increase the functionality of the natural heritage system within the city limits. Ecological restoration presents an opportunity to improve poor terrestrial and aquatic ecosystems, improve ecosystems' resiliency to the effects of climate change, improve water quality, create habitat, re-establish ecological linkages, and enhance ecological diversity. Within the urban area, tributaries of the Otonabee River provide linkages through the urban area to large woodland and wetland complexes. These valley lands and wetland areas will play a crucial role in ecological restoration initiatives. The watershed plan will explore the effectiveness of **land acquisition, ecological restoration projects, and policy guidance**.

- **Stormwater Management Measures for New Development Areas:** In urban areas of the watershed, stormwater is discharged from storm sewer pipes and/or treatment systems into watercourses. To ensure new development is able to achieve environmental targets associated with water quality, erosion control and hydrology, a suite of innovative approaches to stormwater will be required. Using a holistic approach to stormwater, where water is treated as a resource, stormwater management solutions can include source and conveyance control. Low Impact Development practices use the natural processes of filtration, infiltration, and evapotranspiration to mitigate impact on the watershed. Following a treatment train approach to meet subwatershed specific targets is a requirement of the Ministry of the Environment Conservation and Parks (MECP) who have implemented a new Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) process for municipalities. The Watershed Plan will identify **policy and targets** needed to meet these stormwater objectives and provide necessary guidance to comply with the City's CLI-ECA.
- **Stormwater Management Measures for existing urban areas:** Many of the City's older urban areas were built prior to the development of stormwater quality policy. As a result, modelling indicates that these areas are responsible for a large volume of untreated runoff which includes metals, bacteria, suspended solids, and nutrients. This pollution can lead to negative impacts such as beach closures, algae blooms, increased costs for drinking water treatment, toxic pollutants and debris for wildlife, and poor overall conditions for aquatic animals. To improve stormwater quality in these older catchments a **targeted retrofit approach** is needed. The Watershed Plan will outline this approach including which areas should be targeted as well as an **implementation plan for infrastructure improvements**.
- **Policy Recommendations:** Many of the recommendations outlined in the Watershed Plan will include new or updated policy frameworks for watershed

protection. Policy recommendations will include:

- A sub-watershed specific water balance policy to be applied to new development and infill.
- Stormwater Management policy consistent with the MECP's CLI-ECA approach.
- Updated NHS policy associated with protection and enhancement of wetlands, woodlands, and watercourses.
- A risk-based strategy for the protection of groundwater recharge especially those areas connected to ecological features.
- Climate change policy reflecting the risks associated with changes in watershed hydrology and its impact on municipal infrastructure.

Within **rural areas of the watershed**, landowner stewardship and cooperative programs undertaken with ORCA are key implementation strategy components. In rural areas outside the City's municipal boundary, the following management alternatives and strategies are being considered as part of the Watershed Plan. These components of the plan will require ongoing collaboration and engagement with members of the WCC as they are outside the jurisdiction of the City. The WPS will recommend the continuation of the WCC to promote a consistent implementation of these strategies to protect water resources across the study area.

- **Ecological Restoration and Enhancement:** Natural heritage features located outside of the city limits transect largely agricultural land use and have significantly different stressors than features within the city limits. Proposed strategies will adapt to the different ecological and economic stressors. As these features are generally outside of the City of Peterborough's jurisdiction, recommended strategies will also consider the need to coordinate with adjacent municipalities and interested parties.
- **Agricultural Best Management Practices:** Agricultural producers are key stakeholders in the protection of environmental resources. Best management practices (BMP) on these properties can have significant benefits to downstream stakeholders. Operation changes such as no-till planting and cover cropping can have significant impact on long term soil conservation. Non-structural BMPs on agricultural properties include establishing/rehabilitating watercourse buffers and terrestrial corridors. Structural BMPs on agricultural properties include improvements to manure storage and handling facilities can also greatly benefit water quality for those stakeholders downstream.

- **Rural Estate Measures:** Rural residential and recreational properties can impact water quality and watershed function both during the development and post-development phases. During development, ensuring natural heritage system function is preserved through sustainable development planning is critical. Over the long-term, the continued function of septic system is important to maintain both groundwater and surface water quality. Septic inspection and replacement programs are thus important especially in areas sensitive to nutrient loading.

Next Steps and Timelines

The last component of the Watershed Plan is the development of an **Implementation Strategy**. The Implementation Strategy undertaken through the WPS must be consistent with the other municipal programs, policies, and standards; and recognize existing and proposed land uses as well as the potential impacts of climate change. Key components of the Implementation Strategy include:

- Key next steps after approval of the Watershed Plan;
- Future study recommendations, such as subwatershed studies, master plans or site-specific studies in support of development;
- Prioritization of subwatersheds and their strategies, based on those with the greatest needs or with the best opportunity for improvements;
- Identify all policy considerations, including those related to future Secondary Plans;
- Identify other agencies or groups that can facilitate and contribute to all or parts of the Watershed Plan;
- Develop clear requirements and expectations for greenfield and infill development;
- Provide estimated capital and operating costs for the implementation of the Watershed Plan and identify other opportunities for funding;
- Define the short, medium, and long-term timeframes associated with each component of the Watershed Plan;
- Present opportunities for integration with other municipal programs and ORCA programs;

- Provide details to inform Asset Management Planning and preliminary components for use in Natural Asset Management; and
- Identify all watershed monitoring needs, develop preliminary implementation strategies organized with other stakeholders including ORCA, and define how the City will adaptively manage the watershed based on watershed monitoring.

The next step to finalize the Watershed Plan, is for the project team to organize and convene the final phase of stakeholder and community consultation in the fall/winter of 2022. The purpose of this last phase of engagement is to review and seek feedback on key elements of the Implementation Strategy and gather additional insights prior to presenting the final Watershed Plan to Council in 2023. The project team will also continue to engage with the Watershed Coordinating Committee, Technical Working Group, and local First Nations as we develop this final component of the Plan.

Summary

The Watershed Planning Study has been a significant undertaking for the City of Peterborough. The study findings have combined in-depth technical analysis with feedback from the public, stakeholders, and First Nations to create a comprehensive understanding of our water resource system. Completion of the Watershed Plan is a first step in ensuring the ongoing protection and enhancement of our natural resources, and ensures the City satisfies policy direction of the Growth Plan and Provincial Policy Statement. Furthermore, the City's new Official Plan includes various policy direction related to watershed planning, and the implementation of this plan will ensure these requirements will be met, while promoting growth and maintaining our leadership in resilience and environmental sustainability.

Submitted by,

Jasbir Raina, CEng., M.Tech, MBA, PMP, MIAM
Commissioner, Infrastructure and Planning Services

Contact Name:

Michael Papadacos, P.Eng.
Manager, Infrastructure Management
Phone: 705-742-7777 Ext. 1756
Toll Free: 1-855-738-3755
E-Mail: mpapadacos@peterborough.ca

Ian Boland, C.E.T.
Senior Watershed Project Manager
Phone: 705-742-7777 Ext. 1504
Toll Free: 1-855-738-3755
E-Mail: iboland@peterborough.ca