SUMMARY AND STRATEGIC MANAGEMENT DIRECTIONS

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10.0 SUMMARY AND STRATEGIC MANAGEMENT DIRECTIONS

This Technical Update has helped to fill gaps and improve our knowledge about the Etobicoke and Mimico Creeks watersheds – how they functioned naturally, how they have been influenced by human activities and how future challenges of urban growth and climate change can be addressed to achieve the watersheds vision.

10.1 THE NATURAL WATERSHEDS

Geology, physiography and climate act as primary drivers to shape the fundamental hydrologic and natural heritage systems of the Etobicoke and Mimico Creeks watersheds. The resulting characteristics of these systems include: relatively low infiltration/recharge rates, weak baseflow, wide shallow bedrock channels and surface water fed wetland complexes.

Low infiltration/recharge

The South Slope and Peel Plain physiographic regions dominate both watersheds with characteristic low permeability silt, clay and silt till soils. Of the 760 to 850 mm of precipitation the watersheds receive per year, only about 100 mm/yr becomes groundwater recharge, due to the predominance of these low permeability soils. An exception is the Brampton Esker, a linear ridge that extends between Mayfield Road and Queen Street, west of Highway 410. Recharge over the esker is estimated to be about 380 mm/yr. The Mimico Creek watershed has two small areas associated with the Lake Iroquois shoreline deposits that are estimated to have annual recharge rates of up to 340 mm/yr. The shoreline is a narrow feature roughly along Dundas Street in the lower portion of both watersheds. The sand plain and the esker both comprise sandy soils that are more conducive to infiltration of rainwater.

Weak baseflow

Groundwater flows from the headwater areas in the northwest toward Lake Ontario in the southeast via three principle regional aquifer systems, from deepest to shallowest: Scarborough Aquifer, Thorncliffe Aquifer, and the Oak Ridges Aquifer (or equivalent) Complex (ORAC). Although the ORAC feeds the headwaters of many other TRCA watersheds, this aquifer appears to be providing significant baseflow only in the middle reaches of the Etobicoke Creek West Branch between Bovaird Drive and Steeles Avenue and Mimico Creek north of Steeles Avenue. There are several locally significant groundwater contributions in the headwaters, believed to be from the ORAC or equivalent sediments found south of the Oak Ridges Moraine. However, many Etobicoke Creek headwater tributaries have intermittent flow in summer and this relatively weak baseflow makes these creeks less reliable as a source of water and less capable of supporting extensive cool or cold water fish habitat. Conversely, the Brampton Esker feature is an important source of groundwater inputs to Spring Creek and Etobicoke Creek West Branch.

Wide shallow bedrock channels

In these watersheds, there is a relatively thin veneer of glacio-lacustrine sediments overlying low-permeability shale bedrock. While the headwater tributaries demonstrate the incised dendritic drainage pattern typical of silt and clay-based channels, the middle to lower reaches of both Creeks have cut through the thin soil layer to the shale bedrock. The bedrock controlled channels are typically less branched, wider and shallower, as the stream's erosive power is directed towards the stream banks. The naturally high chloride concentrations of groundwater associated with the shale bedrock may be contributing to chloride levels in the lower Creeks.

Surface water fed wetlands
The flat topography of the Peel Plain in the central part of the watersheds, combined with the relatively impermeable soils, allows rainwater to pool on the landscape, supporting wetland communities. Large wetland complexes, such as those remaining around Heart Lake and Cheltenham, are primarily surface water fed systems. The extensive forest and wetland communities that once existed throughout these watersheds would have served an important role in the watershed hydrology by reducing runoff and contributing to water losses through evapotranspiration.

10.2 HUMAN INFLUENCES

In the past two centuries, intensive land clearing for agriculture and urbanization has resulted in the loss of natural cover, drainage of wetlands, channelization of watercourses, and introduction of impervious surfaces and pollutants into the watersheds. Since 1960, most of the Brampton Esker has been excavated as a source of sand and gravel. These activities have left a legacy of fragmented and degraded habitats, risks to human life and property and lessons for the management of ongoing activities.

Much positive action has already been taking place to turn the watersheds toward the path to regeneration. Watershed partners have come together to develop plans and strategies and undertake projects for more sustainable urban growth, improved stormwater management, regeneration of degraded systems and various other greening initiatives.

This Technical Update has characterized the current state of watershed systems and identified management recommendations that will help to address current issues and prepare for the future. While geology, physiography and climate are the primary factors influencing natural watershed systems, changes to land cover, introduction of infrastructure and resource use are primary human influences on watershed conditions. Findings of the Technical Update are linked to four key land and resource use issues: the loss of natural cover, extent of impervious urban surfaces (coupled with stormwater management practices from various era), creation of instream structures and water withdrawals/cessation of withdrawals.

Loss of natural cover
Only 12.4% of the watersheds currently has natural cover (forest, wetland, meadow) remaining. The majority of this habitat is rated as "fair" or "poor" quality habitat, although there are still a few species of conservation concern found in the watersheds. Establishment of the target terrestrial natural heritage system would expand natural cover to 14.1% of the watershed areas and re-establish east-west corridors to facilitate exchange with nearby watersheds having relatively higher biodiversity. Modelling results of other recent TRCA watershed plans indicate that an increase in natural cover could effectively contribute toward restoration of a more natural watershed hydrology. However, given the limited opportunities to expand the terrestrial natural heritage system, increased efforts at managing the urban matrix, through stewardship,

naturalized landscaping and urban forest management, will be important in regenerating a healthy system. TRCA and watershed partners are already adopting strategies and undertaking planting projects toward these objectives.

Impervious surfaces and SWM practices
Urban growth has continued in these watersheds in recent years, along with an evolution of stormwater management practices. As of 2002, 63% of the Etobicoke Creek watershed and 88% of the Mimico Creek watershed were classified as urban. Only about 30% of each watershed's urban area has some level of stormwater management, as many areas were developed prior to the introduction of new requirements or when channelization of streams was the accepted approach to local flood and erosion control. Of the urban areas having stormwater control, even fewer areas have the ideal level of control (that is, quantity, quality and erosion), including only slightly more than half the area in Etobicoke Creek and about 10% in Mimico Creek.

These conditions directly affect streamflows, rates of erosion and flooding and water quality. Mean annual streamflows have increased over the past 40 years and the increase has been accelerating in the past 10 years. These trends are believed to be associated with urbanization and the focus of past stormwater management measures on reduction of peak flows, rather than control of the increased volume of runoff generated from urbanization. Increased runoff from frequent events that would not previously have generated runoff can pose risks associated with accelerated erosion of stream channels and threats to infrastructure located in or near watercourses. This study has begun to establish an understanding of the fluvial geomorphology of these creeks, which will assist in informing stormwater management approaches and stream rehabilitation designs in future.

Peak stream flows appear to have increased for certain storm events in parts of each watershed. This, coupled with the continued presence of flood vulnerable area/road clusters identified in earlier studies, underscores the need for updated stormwater management criteria and completion of a flood risk remediation strategy.

Non-point sources of contamination from urbanization are still considered to be the largest contributor to surface water quality impairment in these creeks. Levels of nutrients and metals have decreased over the past decade. Chloride concentrations and bacteria levels show an increasing trend. Stormwater management improvements in new and existing developments are cited as a primary approach to addressing water quality concerns, along with continued investigation into chloride sources and efforts at salt management.

Individual municipalities have prepared stormwater retrofit strategies to guide the improvement of stormwater management in existing urban areas. Along with end of pipe measures, the incorporation of low impact development (LID) measures, such as infiltration measures and green technologies, in new and existing urban areas will be important to restoring a more natural water balance by reducing runoff volume, promoting infiltration and evapotranspiration and improving water quality. A number of stormwater retrofit projects have been initiated by public and private landowners, such as the City of Toronto's Bonar wetland in lower Mimico Creek and actions of the Greater Toronto Airport Authority, City of Mississauga and City of Brampton.

Instream structures
Many instream structures fragment aquatic habitat by altering the flow regime or physically blocking fish passage. Such structures include dams, culverts, and damaged infrastructure. This study has assessed the structures, identified barriers and categorized them into priorities for management. Priority setting considered opportunities to improve linkages between reaches having good quality habitat and build upon ongoing restoration efforts. The potential increase in baseflow in Etobicoke Creek, due to rebounding groundwater levels, stormwater management efforts and impacts of climate change may affect barrier mitigation priorities.

Work is already underway to mitigate the first barrier in the lower Etobicoke Creek. Projects have also been initiated to renaturalize several channelized reaches, such as the upper Mimico Creek channel, with the aim of improving aquatic habitat.

Water withdrawals/cessation of withdrawals
Water withdrawals (surface and ground) and the cessation of withdrawals represent another influence on watershed conditions, with localized effects. Three highly vulnerable stream reaches were classified, in which surface water users could potentially take more than 25% of measured baseflow. These reaches are located in the Etobicoke Creek headwaters, Tributary 4 of Etobicoke Creek and in the lower Mimico Creek. A small nursery operation and two golf courses are among the users located in these reaches. The groundwater use for both watersheds represents less than 1% of the total recharge, representing a low level of stress on the groundwater system. There are no municipal water takings for potable drinking water in either watershed, although the capture zones for the Cheltenham wells extend into the Etobicoke Creek headwaters.

In response to the cessation of dewatering associated with former aggregate extraction in the Brampton Esker, groundwater levels appear to be rebounding in the vicinity of Highway 410 and Bovaird Avenue. This poses potential implications for the design of subsurface infrastructure, increased baseflow in the West Branch of Etobicoke Creek, stormwater management pond operations, and long term pumping. Additional groundwater monitoring and assessment is necessary to confirm trends and develop a detailed action plan for the management of this issue.

Mean summer baseflow in Etobicoke Creek has been increasing by 1.3% per year since 1967. There have been larger increasing trends in both Creeks during the most recent 10 year period (1997 to 2006), among the highest in all TRCA watersheds. Some of the increase in baseflow in Etobicoke Creek may be attributed to the rising groundwater levels in the Brampton Esker area. It will be important to continue surface water and groundwater monitoring to improve our understanding of these systems. This information will guide the management of current and future water use and the protection of aquatic systems, particularly with the additional uncertainties of impacts associated with future climate scenarios.

10.3 FUTURE CHALLENGES AND OPPORTUNITIES

In addition to the management requirements associated with groundwater recovery around the Brampton Esker, further urban growth and climate change represent future challenges and opportunities for these watersheds.

Urban growth and renewal

These watersheds will continue to face challenges of additional urban growth, redevelopment and renovation. Plans are already well underway for developments in Mayfield West Phase 1, Mayfield West Phase 2 Secondary Plan, Snell's Hollow Secondary Plan and Springdale North Secondary Plan, as well as for the intensification of downtown Brampton. Major redevelopment is anticipated in such areas as Dixie/Dundas in south Mississauga. Public infrastructure projects, such as public transit development, parks renewal and road, water and sewer works will be an ongoing activity in support of new urban areas and in the maintenance and upgrade of existing infrastructure. Renovations and retrofits at the individual property scale are common in mature urban areas.

All of these initiatives represent opportunities to protect and enhance natural heritage systems, restore a more natural water balance and incorporate the latest techniques in sustainable urban design to achieve overall net gain. Many municipalities are in the process of updating their Official Plans to guide a new era of more sustainable urban planning.

Climate change

Future climate change predictions for southern Ontario involve an increased frequency of extreme weather, intense rainfall and higher temperatures leading to increased evapotranspiration, all having potential impact on the hydrologic cycle. To further exacerbate the effects of climate change, urban landscapes such as those found in the Etobicoke and Mimico Creeks watersheds, contribute to increased energy absorption and surface runoff, in large part due to the abundance of paved (impervious) surfaces.

These changes have potential implications for lower baseflows, water supply shortages, and impaired aquatic habitat (e.g. aggravate existing barriers to fish movement). The increased intensity of storms could lead to flash flooding and erosion, overtaxing infrastructure such as sewage and water facilities, roads and bridges. Warmer temperatures could create conditions conducive to the survival of non-native invasive species, stress local native species, and generate poorer water quality. The City of Toronto, Region of Peel and TRCA have adopted climate change strategies to guide adaptation and mitigation activities.

10.4 STRATEGIC MANAGEMENT DIRECTIONS

Two hundred years of Euro-American settlement have left a legacy of altered landscapes and degraded watershed systems. The Etobicoke and Mimico Creeks watersheds continue to face the challenges of rebounding groundwater levels, urban growth and the effects of a changing climate. However, there are still signs of health and much potential for regeneration. Watershed partners have already put many innovative policies and programs in place over the past ten years that provide the tools to set a new direction for these watersheds. This Technical Update provides new science and strategic direction to support implementation programs.

A common theme among the detailed management recommendations identified throughout this Technical Update is the need to restore the natural function and resilience of the watersheds and build their capacity to adapt to change. The following five strategic management directions have emerged from this work:

1. **Expand and enhance natural cover and habitat connectivity** - Achieve the target terrestrial natural heritage system of at least 14.1% natural cover by restoring wetlands and regenerating forest communities. Twenty one priority management areas have been identified to guide initial efforts, many of which focus on protection and enhancement of vulnerable existing habitats and re-establishment of east-west connections to neighbouring watersheds. Strengthen the natural heritage system by improving the urban matrix (e.g. urban forest, naturalized landscaping, stewardship and matrix management). Increase riparian cover and mitigate priority barriers to fish movement. While supporting greater biodiversity and resilience of native species, increased natural cover and naturalized landscaping will also help to restore a more natural hydrology within the watersheds. Natural areas promote opportunities for the evapotranspiration and infiltration of rainwater, which will help protect recharge, sustain baseflow and reduce harmful erosive flows associated with urban runoff.

2. **Restore a more natural water balance** - Increase the portion of urban area treated by stormwater management controls, including "low impact development (LID)" controls, which address quality, quantity, erosion, baseflow maintenance and water balance objectives. Implement municipal stormwater retrofit plans. Reduction of runoff volume and flood risk are key objectives of the watershed strategy.

3. **Foster stewardship and sustainable behaviour -** Voluntary uptake of sustainable practices such as backyard naturalization and lot level stormwater retrofits by private residents and businesses, especially in urban watersheds, is essential to achieving the objectives. Stewardship and outreach education to build understanding of the links between landowner action and watershed health will also be key.

4. **Manage the rebounding groundwater levels -** Manage the rebounding groundwater levels in the vicinity of the former Brampton Esker aggregate pits: a) Undertake more monitoring of groundwater levels and surface water levels in this vicinity; b) Assess hydraulic capacity of outlet pipe from Major Oaks Park pond; c) Obtain pumping rates at golf course associated with Esker Lake North; and d) Develop action plans that consider long term risk management, aquatic habitat enhancement opportunities and monitoring needs, as required.

5. **Advance the science and practice of watershed management –** There are still many scientific areas requiring further investigation and there is a need for continued evaluation of innovative lot level stormwater management

technologies and their performance in clay soils. Partnerships will be essential to accelerate this work.

These integral directions reinforce recommendations already set out in *Greening Our Watersheds* and *Turning over a new leaf* and provide additional insights into priorities for action. More details about these and other recommendations are found within specific technical sections of this report.