

BEST PRACTICES REVIEW TECHNICAL MEMO

Review of Regional Official Plan
Natural Heritage Systems Policies + Mapping

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The Region of Halton

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SECTION 1.0 OVERVIEW

1.1 Introduction

- The Regional Municipality of Halton (Halton) has retained Gladki Planning Associates, in association with North-South Environmental Inc. and Wood Group, to assist in Phases 2 and 3 of the *Regional Official Plan Review (ROPR)* in accordance with the legislative five-year requirement under Section 26 of the *Planning Act*. This project addresses the Natural Heritage System Policies and Mapping theme. Other themes (e.g., agricultural system) are being addressed as part of other initiatives. Phase 2 generally constitutes the technical analysis of the policies and mapping, while Phase 3 focuses on the development of policy refinements.
- The purpose of this project is to strengthen the long-term viability of Halton's natural heritage and water resources, as well as explore opportunities to update existing policies and mapping, and introduce new land use policies where appropriate.
- The *Review of the Regional Official Plan Natural Heritage System Policies + Mapping* project provides an opportunity to examine policies and mapping that may need to be updated, enhanced, and refined based on evolving land use trends, the 2020 *Provincial Policy Statement*, the applicable 2017 Provincial Plans (Greenbelt Plan and Niagara Escarpment Plan) and Growth Plan 2019 and the recently released Provincial Natural Heritage System Mapping Technical Report.
- Phase 2 of the *Review of the Regional Official Plan Natural Heritage System Policies + Mapping* project provides detailed policy recommendations for the Regional Official Plan, utilizing a series of four Technical Memos and a Natural Heritage System Report which provide analysis to inform the policy refinements in Phase 3.
- This current report is the *Best Practices Review Technical Memo*, as defined in Section 2.3.2 of the Terms of Reference.

1.2 Structure

- Land use planning and development in Halton is regulated by legislation, plans and policies, which include the Planning Act, the Provincial Policy Statement (2020), the Growth Plan for the Greater Golden Horseshoe (2019), the Niagara Escarpment Plan (2017), the Greenbelt Plan (2017) and the Halton Regional Official Plan (ROP). The Background Review Technical Memo (DRAFT November 20, 2018), prepared as part of this project, provides a review of the current policy, guidance and regulatory documents that are relevant to the Natural Heritage System (NHS) theme of the ROPR.
- A number of modifications to definitions and policies have been made in Provincial Plans that impact the management of the NHS in Halton. To better understand potential approaches to the changes, this memo examines currently accepted best practices in NHS planning from a land use planning policy perspective.
- The Region has identified a number of topic areas of particular interest that are addressed in this memo. They are divided into two sections:

Best Practices in Natural Heritage System Policy and Planning, addressing the following topic areas:

- Rounding of Measurements of Natural Heritage Features
- Linkage and Enhancement Area Delineation, Protection and Enhancement
- Impact Assessments for Essential Infrastructure Projects
- Acknowledging Changes in Landscape Ecology
- Length of Time Studies are Considered Relevant
- Wildland Fire Policies
- Buffer Width Determination and Buffer Width Refinement Frameworks
- Mineral Resource Extraction Area De-designation Process
- Cumulative Impact Assessment and Ecological Enhancement for Mineral Resource Extraction Applications
- Excess Soils / Fill Site Alteration Policies
- Approaches to Waiving Environmental Impact Assessment Requirements

Best Practices in Water Resource System Policy and Planning, addressing the following topic areas:

- Watershed Planning
 - Water Resource System
- Discussion of best practices for each topic area is broken into several sub-sections:
 - Summary of Existing Approaches** provides an introduction to the topic area and summarizes current approaches in policy.
 - Summary of Best Practice** identifies and summarizes general conceptions of best practice as identified in key guidance documents.
 - Approaches of Other Municipalities** describes approaches taken by other jurisdictions within Ontario.
 - Key Takeaways** provides a summary of key ideas that can be drawn from the review of best practice that are relevant to the Halton ROPR and can be taken into the next stage of policy analysis.
 - The exception to this format is the treatment of the Water Resource System topic areas. Changes in provincial policy have introduced a requirement for planning for the Water Resource System. The Water Resource System section addresses the topic in two ways:
 - The first, is a discussion of watershed planning: the history of watershed planning in Ontario; the state of draft watershed planning guidance being prepared by the Province; and the experience of other municipalities.
 - The second is a discussion of the Water Resource System: clarifying the definition of the Water Resource System and the elements that comprise it; and, for each element, identifying best practice in how each element is characterized and classified.

SECTION 2.0 BEST PRACTICES IN NATURAL HERITAGE POLICY + PLANNING

2.1 Rounding of Measurements of Natural Heritage Features

2.1.1 Summary of Existing Practices

Determining the significance of an ecological feature often involves meeting criteria including a threshold of a specified size or distance. For example, the minimum size of a woodland to be considered “significant” in Halton Region is 0.5 ha. Similarly, the *Natural Heritage System Definition and Implementation report* (NSE 2009) considered size thresholds based on Environment Canada’s *How much habitat is enough?* (2004) report, to establish thresholds for NHS patches, including: core woodlands – 20 ha; core wetlands (marsh thicket) – 10 ha; core wetlands (treed swamp); core open habitat – 15 ha; and centres of biodiversity – 200 ha.

Determining if a natural heritage feature will be considered significant will therefore involve measuring their attributes. A variety of methods are used to accomplish this. For example, woodland patch size may initially be determined using GIS software through on-screen digitizing of orthoimagery. Generally, however, the final determination of woodland patch size will be established through a field verification exercise involving experts representing interested parties including land owners, conservation authorities, and municipal or provincial governments meeting on site and agreeing on the placement of stakes that define the edge. These would be based on the outer canopy drip-line for woodlands or changes in vegetation for wetlands according to Ontario Wetland Evaluation System (OWES) protocols, for example. Stakes are then surveyed to yield digital information that may be analysed using GIS software. The outer boundary of the feature is interpolated by connecting the survey points representing the field staking exercise and the area of the feature can be accurately determined.

There are many factors that may influence the final patch size determined. The fact that many natural heritage features are made of dynamic, living systems means the edge may be constantly changing. For example, with woodlands the drip-line will expand over time as trees grow and edge succession advances, or may shrink if edge trees die. Factors such as insect pests and disease, or climate events such as windstorms and ice storms may significantly alter the location of all or parts of the drip-line of a woodland.

Although there are no existing policies, frameworks or guidelines that address how or when the size measurements are to be calculated, this is not generally considered an issue. The general practice is to use the measurements taken at the time field verification work is done, and to re-stake feature boundaries if significant changes have occurred (e.g., ice storm event). Another aspect of determining patch size for the purpose of applying policies is the whether numbers that are very close to the policy threshold should be rounded up or not. Policy thresholds are generally expressed in whole numbers (e.g., 10 ha) or possibly to one decimal place (e.g., 4.5 ha or 0.5 ha).

2.1.2 Summary of Best Practices

Regardless of the measuring device or methodology, there is always judgement to be applied to the appropriate degree of accuracy. Calculating the area of a natural feature to fractions of a square meter is unnecessary. Typically, in science when considering a measurement value, measurement is based on a specified number of significant figures which will include all of the digits in a measurement that are known with certainty, plus one more digit, which indicates the uncertainty of the measurement. For example, a measurement of mass may be reported as 1.1 g indicating the measurement is accurate to the nearest 0.1 g.

When applying policies in cases where numbers are very close to the policy threshold, normal scientific rounding of measurement values should be applied to the nearest significant digit. Using the example above, rounding would proceed as follows based on a measurement that include three decimal places. For example:

- values of 1.945 to 1.999 are rounded to 2.0; and
- values of 3.945 to 3.999 are rounded to 4.0, etc.

The normal protocols for measuring the size of a natural feature for the application of policy would generally use two, or at most three decimal places, but for reporting purposes it would be rounded up or down to no more than two decimal places. This is reasonable as the difference between, for example, 0.004 and 0.005 ha is not ecologically meaningful when addressing the ecological function of a woodland or a wetland.

2.2 Linkage and Enhancement Areas: Delineation, Protection and Enhancement

2.2.1 Summary of Existing Practices

In the context of Natural Heritage System (NHS) planning, “enhancements” are ecologically supporting areas adjacent to natural heritage features and/or measures internal to the natural heritage features that increase the ecological resilience and function of that individual natural heritage feature or group of natural heritage features. Enhancement areas can include agricultural land and successional habitat (e.g., meadows or thickets) or may be without obvious natural heritage features. Enhancement areas contribute to the NHS by protecting and restoring critical ecological functions such as ecological connectivity among natural area patches, surface water catchment areas for wetlands, and minimum core area thresholds or improved core area shape that reduce edge effect and enlarge the interior habitat.

“Linkage” means an area intended to provide connectivity supporting a range of community and ecosystem processes enabling plants and animals to move between natural heritage features over multiple generations. Linkages are preferably associated with the presence of existing natural areas and functions and they are to be established where they will provide an important contribution to the long-term sustainability of the overall NHS.

Linkages and enhancement areas are different in their purpose. Linkages are identified for connecting natural heritage features, while enhancement areas increase the area of an ecological feature, often by filling in “embayments” in feature boundaries to improve the feature’s shape and reduce the edge to area ratio, and thus increase its ability to support ecological functions.

Both the Provincial Policy Statement (PPS 2020) and Greenbelt Plan (2017) have policies that state municipalities ‘should’ promote and undertake planning and design to ensure that linkages are maintained or enhanced. An objective of the Region’s NHS includes “... *provide continuous corridors and inter-connections between key features and their ecological functions*” (s.114.1(9)). In addition to Key Features, watercourses, wetlands (other than those considered significant) and buffers, linkages and enhancements to the Key Features are components of the Regional NHS.

The Halton Region Official Plan (June 19, 2018) defines Linkage and Enhancements as:

Enhancement to the Key Feature (Section 229.1.1) means ecologically supporting areas adjacent to *Key Features* and/or measures internal to the *Key Features* that increase the ecological resilience and function of individual *Key Features* or groups of *Key Features*.

Linkage (Section 255) means an area intended to provide connectivity supporting a range of community and ecosystem processes enabling plants and animals to move between *Key Features* over multiple generations. Linkages are preferably associated with the presence of existing natural areas and functions and they are to be established where they will provide an important contribution to the long-term sustainability of the Regional Natural Heritage System. They are not meant to interfere with normal farm practice. The extent and location of the linkages can be assessed in the context of both the scale of the proposed development or site alteration, and the ecological functions they contribute to the Regional Natural Heritage System.

Enhancements and Linkage Areas are protected as components of the Regional NHS according to Policy 118. (2) b), by *"Not permitting the alteration of any components of the Regional Natural Heritage System unless it has been demonstrated that there will be no negative impacts on the natural features and areas or their ecological functions; in applying this policy, agricultural operations are considered as compatible and complementary uses in those parts of the Regional Natural Heritage System under the Agricultural System and are supported and promoted in accordance with policies of this Plan."*

2.2.2 Summary of Best Practices

In order to identify ecologically functional linkages, the Natural Heritage Reference Manual (OMNR 2010) suggests the following considerations:

- The ecological function that a linkage is intended to perform;
- The length and width of the linkage (generally a wider linkage is better than a narrow one and width should increase relative to length) as well as its composition, orientation and configuration depending on the needs of the target species;
- Generally, linkages are identified and designed to meet the known movement requirements of the more demanding species (e.g., species prone to predation or averse to openings, or species that move very slowly);

- Where natural cover is not continuous through a linkage, smaller patches of natural cover that are nearby can serve as stepping stones for species movement and provide the linkage function;
- Avoid, where possible, identifying a linkage where a physical barrier may adversely impact the ecological function of the linkage (e.g., major roads or urban areas); and
- Redundancy in linkages would ensure the system retains its overall connectivity and ecological integrity for the long-term.

The Natural Heritage Reference Manual states that *“Geographic scale is a strong consideration in the identification of linkages. Linkages that are designed to function at the landscape scale may be greater in width (several hundred metres or more) and more generalized relative to connections at the local or site scale. Examples of these differences in scale are found in the provincial land use plan natural heritage systems developed for the Oak Ridges Moraine and Central Pickering. The Oak Ridges Moraine natural heritage system is at a larger scale and generally contains 2-kilometre wide linkages while the Central Pickering Development Plan corridors are at a smaller scale, a minimum of 100 metres wide”* (OMNR 2010). Section A.2.3.5 of the Natural Heritage Reference Manual recommends local corridors have a minimum width of 50 to 200 metres while regional corridors have a minimum width of 300 to 400 metres (OMNR 2010).

There may be substantial flexibility in the location and/or adjustment of linkage boundaries in some cases. For all linkages, the location must be based on providing ecologically functional connections that maintain a consistent width. For example, “bottlenecks” or narrowing of the NHS will adversely impact the ecological function provided by a linkage and should therefore be avoided. In some cases, however, particularly where a natural feature itself is not the linkage, an entire linkage could be shifted one way or another provided the ecological function is maintained. In cases where a linkage is centred on a feature, it is important that the feature continue to be included within the linkage, and this may in turn limit the degree of flexibility in moving the linkage. Where a linkage is associated with a watercourse, it may be possible to move the watercourse feature and the associated linkage function, to a new location within the landscape where permitted by policy and Conservation Authority regulations. The concept of redundancy is sometimes used in establishing linkages, in that two or more linkages may be identified. Where two or more linkages have been defined within the NHS, these linkages should not be regarded as “optional linkages.” While the location of individual connections may be flexible, the number of connections should remain the same.

It is important to note that *"the identification of linkages in agricultural areas would indicate an intention for both interests to be accommodated in the working landscape, for example, through good farming practices and stewardship, and not an intention to restrict existing agricultural uses through land use controls."* (OMNR, 2005). This arises from the recognition that in most places in southern Ontario, agricultural uses have existed for hundreds of years, and that the flora and fauna that is currently present has co-existed with agricultural use for that time.

Environment Canada's publication *How much habitat is enough?* (2013) provides a strategic framework and guidelines for protecting and enhancing wetland, riparian, forest and grassland habitats. It is intended to serve as a starting point for the development of natural heritage systems (NHS). The framework acknowledges the need for a systematic approach that *"better captures the complexity of life and the multiple and often known linkages that allow species to flourish."* (Environment Canada, 2013). Moreover, is the recommendation to look beyond the boundaries of specific planning units, such as municipal boundaries, and to take into account surviving habitat corridors and to promote linkages across the landscape.

Guidelines identified in Environment Canada's (2013) report related to linkages and enhancement considerations include the following:

- Linkages and corridors designed to facilitate species movement between forested habitats should be a minimum of 50 to 100 metres in width. Corridors designed to accommodate habitat for specialist species need to meet the habitat requirements of those target species and account for the effects of the intervening lands
- Wooded corridors 50 metres in width can facilitate movement for common generalist species (Environment Canada, 2013)
- Stream corridors 75 to 175 metres in width have been supported for breeding bird species and 10 to 30 metres have been found to be sufficient to support habitat for 90% of streamside plant species (Spackman and Hughes, 1995)
- For effective restoration (or enhancement), consider local site conditions, use local sources to propagate new vegetation, and wherever possible refer to historic locations or conditions for wetlands (however this could apply to other habitat types as well)

- Restore and create native grassland patches to their historic extent and type at a county, municipal and /or watershed level, taking into consideration past, present and current conditions

2.2.3 Approaches of Other Municipalities

City of Markham

The NHS policies in the City of Markham's Official Plan (2014) serve to provide functional linkages among the natural heritage features in the city and to the broader ecosystem encompassing the Oak Ridges Moraine (ORM), the Niagara Escarpment, and the surrounding watershed system identified by the Province, the Region and the Toronto and Region Conservation Authority (TRCA). Markham's NHS, referred to as the "Greenway System," identifies policies that support ecological linkages that connect and integrate the natural landscape in Markham across multiple watersheds.

The City's Greenway System builds on the NHSs of the ORM Conservation Plan 2017 and Growth Plan 2019 to provide a continuous linkage among key natural heritage features and supporting functions. The components of the Greenway System also include Natural Heritage Network Enhancement Lands, which are defined as "*areas that have the potential to increase the resilience of the Natural Heritage Network by facilitating movement of wildlife and dispersal of plants among features.*"

The Natural Heritage Network Enhancement Lands are shown symbolically on the Greenway System Map as "Core Area Enhancements", "Core Linkage Enhancements" and "Natural Heritage Restoration Areas," and are described as follows:

- **Core Area Enhancements** *have been identified as areas that would enhance the function of existing natural areas by improving their shape and marginally increasing their size to provide the minimum area required to support valued species in the long term.*
- **Core Linkage Enhancements** *are intended to provide wildlife corridors and mitigate the reduction in connectivity among natural features that generally occur when agricultural lands are urbanized."*
- **Natural Heritage Restoration Areas** *are publicly owned lands that are targeted for natural heritage restoration activities such as reforestation and wetland rehabilitation."*

Because the components of the Natural Heritage Network Enhancement Lands are conceptual in nature, their identification, delineation and protection are determined *"through the development approval process for development, redevelopment and site alteration, particularly on lands designated as 'Future Urban Area' on Map 3 – Land Use, to maintain existing connectivity among natural heritage and hydrologic features and create large blocks of habitat"* (Markham Official Plan, 2014 Policy 3.1.3.3). The Official Plan policies do not provide criteria or direction for delineating "Core Area Enhancements," "Core Linkage Enhancements" nor "Natural Heritage Restoration Areas."

York Region Official Plan

York Region was one of the first municipalities to adopt a systems-based approach into NHS policy in the 1990s. Its Regional Greenlands System preserves and enhances natural features within a connected natural heritage system. The function and vision of the Greenlands System is the protection of natural heritage features in a system of cores connected by corridors and linkages. The connections follow recognizable landscape features such as valleys and watercourses. Policies are written that provide limited development within the Regional Greenlands. It includes the Oak Ridges Moraine (ORM) Conservation Plan 2017 Natural Core Area and Natural Linkage Area designations, the Natural Heritage System (NHS) within the Protected Countryside of the Greenbelt Plan 2017, key natural heritage features, key hydrologic features and functions, and the lands necessary to maintain these features within a system. Furthermore, the ROP acknowledges that the NHS as it exists today is fragmented, and therefore provides strategic areas for enhancement and restoration, with the intention of strengthening the core areas to ensure that foundations of the system are strong. Development and site alteration are prohibited within the Greenlands System. Proposed developments and/or site alterations are to be accompanied by an Environmental Impact Study (EIS) on lands located within 120 metres of the Greenlands System. In addition, the Greenlands System Vision is illustrated on Map 2 of the Regional Official Plan where it has conceptually identified with broad arrows, the general location of corridors within and beyond the Region that serve to perform major linkage functions on a regional scale.

The City of Hamilton Official Plan (2013)

The City's NHS consists of Core Areas as well as *supportive features or linkages* that maintain the ecological functionality and connectivity of the natural system. Linkages are defined as *"natural areas within the landscape that ecologically connect Core Areas,"* yet there is no delineation, identification, or criteria of linkages in the Official Plan. Policy 2.7

notes that *"Linkages be protected, restored, and enhanced to sustain the Natural Heritage System wherever possible."* The sub-sections of Policy 2.7 provide further guidance for the identification and protection of linkages. Policy 2.7.5 requires that *"where new development or site alteration is proposed within a Linkage in the Natural Heritage System as identified in Schedule B – Natural Heritage System, the applicant shall prepare a Linkage Assessment"*, either as a stand-alone report or part of an EIS. In November 2013, the City released a Draft Linkage Assessment Guidelines document that provides direction for when a Linkage Assessment is required and what studies need to be undertaken to complete a Linkage Assessment. The Linkage Assessment Guidelines do not provide direction for identifying linkages, direction is provided for delineating linkages, largely based on using Ecological Land Classification to identify the boundary of vegetation communities regardless of quality and ecological integrity.

City of Guelph Official Plan

In the City of Guelph's Official Plan (OP), the Natural Heritage System is comprised of a combination of Significant Natural Areas (including Ecological Linkages, Restoration Areas and Minimum Buffers), Natural Areas, Restoration Areas and Wildlife Crossings. Ecological Linkages are mapped on the OP schedules and are 100 metres in width except where existing narrower linkages have been approved or identified. Ecological Linkage are defined as *"areas identified based on the principles of conservation biology that connect Significant Natural Areas and/or protected Habitat for Significant Species and along which wildlife can forage, genetic interchange can occur, and populations can move from one habitat to another in response to life cycle requirements. Ecological Linkages provide or enhance connectivity where it is otherwise lacking, ensuring a systems based approach, and supporting natural connections between Significant Natural Areas and/or protected Habitat for Significant Species. Ecological Linkages can also include those areas currently performing, or with the potential to perform linkage functions through restoration measures. Although linkages help to maintain and improve the Natural Heritage System and related ecological functions, they can also serve as habitat in their own right."*

According to policy 4.1.2, *"development and site alteration shall not be permitted within the Natural Heritage System, including minimum or established buffers."* The following exceptions are permitted: essential infrastructure (limited to the extent possible), legally existing uses, buildings or structures, passive recreational activities, low impact scientific and educational activities, fish and wildlife management, forest management, habitat conservation, and restoration activities. In addition to the General Permitted Uses of Section 4.1.2, the following additional uses may be permitted in Ecological Linkages

subject to the requirements of 4.1.2.7 and 4.1.2.8, where it has been demonstrated through an EIS or EA, to the satisfaction of the City, in consultation with the Grand River Conservation Authority (GRCA) and/or Ministry of Natural Resources and Forestry (MNRF) where appropriate, with consideration for the MNRF's technical guidance that there will be no negative impacts to the function of the linkage: essential linear infrastructure and their normal maintenance; flood and erosion control facilities and their normal maintenance; and water supply wells, underground water supply storage and associated small scale structures (e.g., pumping facility).

Additional guidance and policy pertaining to Ecological Linkages is provided in Policy 4.1.3.9., subsections 8 to 13 of Guelph's OP. These policies provide the opportunity to further study linkages and propose an alternate location or width according to the direction provided in these policies.

Restoration Areas are identified on Schedule 4 of the OP, and are "*generally located on public lands, and identify potential areas where restoration may be directed.*" Restoration areas can include:

- Existing and new stormwater management areas abutting the NHS;
- Areas within City parkland (including portions of the Eastview Community Park) and GRCA lands which are not intended for active uses; or
- Isolated gaps within the NHS.

The latter two restoration areas could also be considered "enhancement areas" in their role and function within the NHS. Policies prohibit development and site alteration within Restoration Areas except for the uses permitted by the General Permitted Uses of Section 4.1.2.

2.2.4 Key Takeaways

Linkages and enhancement areas are identified in a number of provincial guideline documents and have been incorporated into several municipal official plans. They are regarded as necessary components of a robust NHS. However, linkages and enhancement areas are not consistently designated in the same way across municipal OPs, and there are a general lack of criteria for the identification and delineation of these components of the NHS. Often, the identification of linkages and enhancements will vary depending on the level of urbanization and extent of natural features and will vary between rural and urban areas. There is some guidance for determining linkages and

guidance in the Natural Heritage System Definition & Implementation & Definition report (North-South Environmental Inc 2009), but it is recommended that it be reviewed and updated in the EIA Guidelines (or other similar guidelines that may be developed in the future). The definitions in the ROP should include a description of enhancements and linkages to provide clarity on how they are identified. In addition, the EIA Guidelines should give guidance on when refinements to enhancements and linkages can be contemplated as permitted by s. 116 of the ROP.

Further, guidance relating to planting/landscaping in linkage and enhancement areas when development and site alteration is proposed should also be explored, acknowledging that exemptions for agriculture, agricultural-related and on-farm diversified uses be provided.

What is consistent across municipal OPs is the flexibility provided in the policies that allows for assessment, realignment/reconfiguration, and even types of development that may be permitted in these components of the NHS. The main test for allowing modifications to the extent and location of linkages and enhancements is the function these components are expected to provide, and this function must be maintained following any form of development. This would be consistent with permitting certain forms of infrastructure (e.g., stormwater management ponds) to be located within linkage and enhancement areas so long as the function of the enhancement and linkage is not compromised. This can be determined by evaluating if the modification meets the test of *no negative impact*. Furthermore, the policy audit should review permissible uses and exceptions for modifications within linkages and enhancement areas to determine if additional guidelines (i.e., Linkage Assessment) or further guidance is required through the EIA Guidelines.

2.3 Impact Assessments for Essential Infrastructure Projects

2.3.1 Summary of Existing Approaches

As stated in the Growth Plan for the Greater Golden Horseshoe (MMA 2017), hereafter referred to as the Growth Plan 2019:

- *"Well planned infrastructure is essential to the viability of Ontario's communities and critical to economic competitiveness, quality of life, and the delivery of public services."* The Infrastructure referred to are physical structures built to support

transportation, communication, energy generation and transmission and water supply and wastewater treatment systems.

In the PPS 2020, "*activities that create or maintain infrastructure authorized under an environmental assessment process*" are excluded from the definition of development. As such, infrastructure approved through an environmental assessment is excluded from policies that protect natural heritage features and areas and ecological functions through the restrictions they place on development. Approval requirements for infrastructure, including environmental protection requirements, are assessed and approved through the Environmental Assessment (EA) Act. However, they should still have regard to the Official Plan/Secondary Plan and Subwatershed Planning process.

The EA Act requires systematic evaluation of net environmental effects. It does not, however, require that environmental impacts be compensated for to achieve no net environmental impact or a net environmental gain or benefit.

In the regional landscape, most infrastructure tends to be constructed in linear patterns, including roads, power lines, and pipelines. The linear nature of infrastructure often results in direct impact to natural heritage features like woodlands, wetlands, and watercourses. The impacts can include a loss of forest cover and forest fragmentation. In practice, this could mean that a large woodland patch is severed into two smaller patches, which results in increased woodland edge, loss of interior woodland and restrictions on plant and animal movement between the resulting patches.

Large scale impact on NHS is often associated with infrastructure projects and may also result in additional significant impacts during the construction phase due to requirements for access, release of noise, dust and light pollution, potential for toxic spills, increased erosion and sedimentation, and disruption of surface and ground water flow. Long term maintenance can also add to impacts on NHS.

Infrastructure impacts are often seen as unavoidable due to factors such as historic linear development patterns that must be expanded or linked, a lack of alternative routes to avoid impacts, or the higher cost associated with avoiding natural features when building infrastructure. As such, the negative impact to natural heritage features and functions is accepted and justified by the services which infrastructure provides to society.

In the current ROP, essential transportation and utility facilities (or "essential infrastructure projects") are permitted uses within the RNHS as per Section 117.1(9);

however, all permitted uses, including essential infrastructure projects, are subject to constraints associated with the RNHS protection and enhancement policies contained in Section 118. Policy refinement in the ROP needs to address conflicts between essential infrastructure not being considered *Development* if approved through an EA, and Section 24.1 of the Planning Act which requires Public Works to conform to Official Plans.

2.3.2 Summary of Best Practices

The guidance for best practices provided in the Ontario Ministry of Natural Resources' Natural Heritage Reference Manual (NHRM) 2010 is limited to keeping infrastructure crossings of natural heritage features to a minimum and incorporating suitable design and mitigation measures such as eco-passages to maintain connection between and among natural heritage features.

More recently best practice advice from the province is largely aimed at cost efficiency rather than environmental issues (Ontario, 2013). Provincial plans such as the Oak Ridges Moraine (ORM) Conservation Plan 2017, Greenbelt Plan 2017 and the Growth Plan 2019 acknowledge infrastructure may impact natural heritage features and areas and provide policy guidance which in relation to impacts states: *"if avoidance is not possible, [it should be] minimized, and to the extent feasible, mitigated."*

In 2008, Halton introduced a protocol to identify tree canopy replacement requirements to be considered where individual trees are to be removed in relation to Regional infrastructure projects on Regional Lands. This protocol is referred to as the "Tree-Canopy Replacement Policy on Regionally Owned Lands" and it was endorsed for implementation by Regional Council on November 19, 2008 through the adoption of Staff Report No. LPS31-08 re. "Tree-Canopy Replacement Policy on Regionally Owned Lands".

The Tree-Canopy Replacement Policy on Regional Owned Lands could provide a helpful model for a similar ecological offsetting measure for Essential Infrastructure Projects. Elements of the policy that may be useful for an Offsetting Protocol include the Tree-Canopy Replacement Policy's predetermined replacement schedule, the emphasis it places on replacement onsite first and foremost, the possibility it provides to explore offsite replacement should onsite opportunities not be available, and the option it allows for cash-in-lieu if no suitable offsite replacement opportunities can be identified. If cash-in-lieu of replacement is ever considered in relation to the Tree-Canopy Replacement

Policy, the appropriate value is payable to the Halton Green Fund (which is established pursuant to Sections 203-205 of the ROP).

While the concept of net environmental gain or benefit is not discussed in provincial plans, the inclusion of a policy for appropriate mitigation of environmental impacts would require ecological restoration to mitigate the loss of forest interior, significant wildlife habitat or the loss of ecological connectivity. Given that ecological restoration would need to proceed within areas which do not currently have ecological features (e.g., agricultural land) and this may be considered a net environmental gain approach.

In their report *The Nexus Between Infrastructure and Environment* (World Bank, 2007), the World Bank recommends the adoption of regional, provincial and national scale consideration of alternatives to conventional infrastructure, alternatives that reduce the need for infrastructure and therefore avoid environmental impacts. Alternatives may include energy and water conservation projects, improved public transportation, local scale sewage treatment, decentralized power production, improved management and maintenance of existing infrastructure, and co-locating new infrastructure projects.

2.3.3 Approaches of Other Municipalities

The City of Guelph Official Plan 2018 is similar to other municipal plans in that it recognizes infrastructure as a permitted use within natural heritage features and areas. As such, policies acknowledge the potential environmental impacts of infrastructure within designated buffer areas or natural heritage features. Policies are included to minimize these impacts and restore disturbed areas where possible. For example, policy 4.1.2 8. states:

- i) the area of construction disturbance shall be kept to a minimum; and
- ii) disturbed areas shall be re-vegetated or restored with site appropriate indigenous plants wherever opportunities exist.

The Official Plan does not include policies for net gain or net benefit.

The City of Toronto Official Plan 2015 discusses infrastructure in the traditional context of its importance to supporting communities, but also recognizes the benefits of reusing existing infrastructure, ensures infrastructure adapts to climate change, and an increases recognition of the important role played by Green Infrastructure.

For municipalities that include the Greenbelt, ORM or Greater Golden Horseshoe planning areas, the policies of the provincial plans are reflected in official plans. The provincial plan requirements to “mitigate” to the extent feasible (e.g., Growth Plan

3.2.5(d)) for infrastructure impacts may lead municipalities to address the environmental impacts of new infrastructure projects through approaches that also include net environmental gain or benefit.

2.3.4 Key Takeaways

Halton may consider the following key takeaways for policy refinement to address impact assessments for essential infrastructure projects:

- The Environmental Assessment Act does not require environmental impacts be compensated for to achieve no net environmental impact or a net environmental gain or benefit.
- Generally, municipalities do not include policies for net gain or net benefit. However, the Tree-Canopy Replacement Policy on Regional Owned Lands could provide a helpful model for a similar ecological offsetting protocol for Essential Infrastructure Projects.
- Impacts to ecological connectivity are often associated with linear infrastructure projects.
- Provincial requirements focus on mitigation such as the construction of eco-passages.
- Provincial requirements for the mitigation of environmental impacts of infrastructure projects provide an opportunity for the inclusion of a net environmental benefit approach when an environmental assessment is conducted.
- Where public infrastructure is deemed essential and negative impacts are unavoidable, policies (such as EIA requirements in Section 118 (3.1) of the ROP) can require demonstration of a net gain or overall environmental benefit.
- The ROP should address the apparent conflict in policy between essential infrastructure not being considered *Development* if approved through an EA, and Section 24.1 of the Planning Act which requires Public Works to conform to Official Plans.

2.4 Acknowledging Changes in Landscape Ecology

2.4.1 Summary of Existing Approaches

Landscape ecology is *"the study of the pattern and interaction between ecosystems within a region of interest, and the way the interactions affect ecological processes, especially the*

unique effects of spatial heterogeneity on these interactions" (Clark 2010). Disturbances, whether anthropogenic or from natural processes, create spatial heterogeneity and influence landscape ecology. Changes in landscape ecology can occur as a result of shifting land use (e.g., change from agricultural production to urban uses) or as a result of natural disturbances (e.g., effect of Emerald Ash Borer on ash-dominated woodlands). These disturbances can change the ecological interactions and processes between and among components of the NHS.

For example, intermittent streams within an agricultural landscape can become permanent streams following development as a result of an increase in impervious surfaces that direct water to storm water management ponds releasing of large volumes of water over longer periods of time. As a result, a stream that previously provided marginal fish habitat could become permanent fish habitat, thereby providing a different ecological function including an enhanced linkage function. Another example would be the impact of Emerald Ash Borer on the canopy of an ash-dominated woodland. Following a substantial reduction in the woodland canopy, the characterization and ecological function of the woodland will change. Depending on the composition of species in the sub-canopy and understory, the successional trajectory of the woodland could result in a woodland dominated by a different tree species, a cultural woodland with a reduced canopy of trees, or thicket vegetation community dominated by shrubs. These changes in the vegetation composition can change the status of the woodland. For example, changes could potentially change woodland status as a significant woodland if it no longer meets the criteria, or if the canopy reduction is severe it may not even have sufficient density to be considered woodland. Canopy change could also affect the role the woodland plays within the larger ecosystem (e.g., stepping stone function, wildlife habitat function, redundancy of habitat types, etc.)

Regardless of the cause (intentional or natural) or processes influencing landscape change, how to treat the resulting impacts to the NHS are not well addressed, either from ecological or policy perspectives. The PPS 2020 provides some direction by encouraging municipalities to establish 'performance indicators' to monitor the implementation of policies and how they respond to impacts and changes in landscape ecology.

2.4.2 Summary of Best Practices

The ORM Conservation Plan Technical Paper Series 7, *Identification and Protection of Significant Woodlands*, (MMAH, undated) and the Greenbelt Plan Technical Paper (OMNR, 2012) provide technical guidance for the identification, delineation and

protection of significant woodlands. Both provincial documents acknowledge that *“Woodlands experience changes such as harvesting, blowdown or other tree mortality are still considered woodlands. Such changes are considered temporary whereby the forest still retains its long-term ecological value.”* However, exclusions may be considered *“...for communities which are dominated by non-native tree species such as buckthorn (*Rhamnus* species) or Norway maple (*Acer plantanoides*) regardless of cause (e.g., emerald ash borer infestation) which may threaten good forestry practices and environmental management. Such exceptions may be considered where native tree species cover less than 10% of the ground and are represented by less than 100 stems of any size per hectare.”* The exclusion may result in the change of the status of Significant Woodland where an ash-dominated canopy dies, leaving a buckthorn-dominated thicket. The change in status may remove the protection afforded to the feature and potentially result in a reduction in the redundancy, resilience, connectivity and size of an NHS.

The Ontario Wetland Evaluation System (OWES) recognizes wetlands as dynamic systems that can change over time (due to natural succession, changes in hydrology, etc.) and thus, the wetland evaluation files maintained by the Ministry of Natural Resources and Forestry District Offices are considered ‘open files’. These files can be amended from time to time as new information becomes available. For example, changes to the status of species, wetland boundary modifications, and changes to the social values of the wetland would be recorded. As new science and technology becomes available, periodic revisions to the OWES itself may trigger the review and update of existing evaluated wetland files. Until the review or updating of existing evaluated wetland files is completed, the existing status of a wetland remains valid, regardless of the edition or version of the OWES originally used.

The Ontario Ministry of Natural Resources’ 2010 Natural Heritage Reference Manual (NHRM) recommends undertaking Natural Heritage Inventories for protecting NHSs which could be considered in acknowledging changes to landscape ecology. The NHRM recommends *“Undertaking a natural heritage inventory to support the five-year review of an official plan”* and recognizes that:

- *Natural features are dynamic, and thus the potential exists for natural area boundaries to change and for new natural areas to regenerate*
- *The status of existing features may change as new information becomes available and/or the feature changes*

- *A planning authority can use the information obtained from a natural heritage inventory to identify significant natural features and areas that should be incorporated into official plan mapping*
- *Such information could also support other comprehensive planning processes such as secondary plans*

By monitoring key performance indicators, or even size, planners should be able to identify the extent to which NHS have undergone change, and/or are achieving objectives and targets. For this purpose, the Natural Heritage Reference Manual (OMNR, 2010) recommends that monitoring programs should include the following:

- *A process for reviewing and incorporating the findings of new scientific research on NHSs and documentation of the protocols for data collection*
- *Schedules and field requirements (including required expertise for data collection and analysis)*
- *A mechanism for data storage and access by appropriate people, organizations or agencies*
- *A process for quality assurance and control as well as a process and schedule for periodically analyzing the monitoring data*
- *A mechanism for initiating a response to trends and findings from the analysis*
- *Identification of responsibilities for data collection, storage, analysis and reporting*
- *A protocol for documenting findings and reporting them to the appropriate agency (e.g., municipality, NHIC, MNR district office, MOE or conservation authority)*

Municipal NHSs that apply systems-based principles usually recognize that natural features that are proximate to each other are more likely to function well over the long-term, have higher biodiversity and can better withstand natural and anthropogenic influences which may lead to changes in landscape ecology. This is often referred to as the “proximity criterion.” Thus changes to features that may increase the distance between them (e.g., the loss of a “stepping stone” feature) can be expected to have a cascading impact to other nearby features.

2.4.3 Approaches of Other Municipalities

Generally, there is recognition that change from either anthropogenic influences or natural events are likely, and that monitoring is required to detect, and preferably measure, the change. Municipalities thus address change through policies that require or encourage monitoring features within an NHS, particularly when it is associated with a

development application that may impact a NHS. What is not as well addressed is how to respond to change, especially when it involves degradation that changes the status of a feature, or in extreme cases results in the total loss of the feature.

City of Kitchener

The City of Kitchener provides a policy objective in Section 4.2.4: *"To support the ongoing monitoring and management of Kitchener's Natural Heritage System"* with supporting monitoring policies which include developing a monitoring plan and defining roles and responsibilities for pre-, during- and post-construction monitoring to determine and address the impact of development on features and the NHS (Section 7.C.3.7 h). In addition, the City of Kitchener adopts the same long-term thinking and approach to impacted woodlands such that *"significant woodlands which have undergone change such as harvesting, blowdown or other tree mortality are still considered significant woodlands as such changes are considered temporary whereby the woodland still retains its long-term ecological-value"*.

City of Guelph

The City of Guelph provides a policy objective which acknowledges the connection between ecological monitoring to determine change in features and sustainability: Section 6A.1, includes *"To support the ongoing monitoring and management of the City's Natural Heritage System to ensure its long-term sustainability and resilience in relation to the impacts and stresses associated with being in an urban context, as well as other factors, such as climate change."* Further, in Section 6A.6.5 a number of ecological monitoring policies have been identified, which include:

- *A city-wide environmental monitoring program will be developed and implemented to assess the effectiveness of the policies, decisions and programs in meeting the objectives of the Natural Heritage System and the Urban Forest.*
- *Opportunities for collaborating with the Grand River Conservation Authority (GRCA) and the Ministry of Natural Resources and Forestry (MNR) will be incorporated into the environmental monitoring program (e.g., fisheries, threatened species)*
- *Short-term, site-specific monitoring may be required as a condition of the planning approval process and the results will be integrated into the City-wide monitoring program, where applicable.*

Region of Peel

The Region of Peel recognizes that Natural Areas and Corridors contain important ecological features, forms and/or functions which play a crucial role in supporting the integrity of Core Areas and that any changes, modifications or losses to the features or functions could have an immediate or cumulative impact on ecosystem integrity. In Section 2.2.4.1, the Region of Peel has provided policy for Regional Council to:

- Consider the role of monitoring programs in watershed and subwatershed plans
- Work jointly with neighbouring municipalities, conservation authorities, and other provincial agencies to determine planning and monitoring information requirements for inclusion in watershed and subwatershed plans;
- Work jointly with the conservation authorities, the area municipalities and, where applicable, the Niagara Escarpment Commission to integrate subwatershed planning and monitoring information on a regional and *watershed* basis, in order to assess the cumulative effects of land use changes and the implementation of subwatershed plans; and
- Integrate ground and surface water quality and/or quantity monitoring conducted by Regional departments with watershed and subwatershed plans and other environmental monitoring, including the analysis of cumulative effects.

Further, the Region of Peel in Section 2.3.2.7 of their ROP requires that Core Areas of the Greenlands System in Peel, as described in Policy (see 2.3.2.2 and 2.3.2.3 for reference), and as further detailed in the area municipal official plans, are not damaged or destroyed. In the event that portions of the Core Area are damaged or destroyed, the Region includes policy that there should be no adjustment to the boundary or redesignation of these areas in municipal OPs. In addition, the Region requires replacement or rehabilitation of the ecological features, functions and/or landforms that have been damaged or destroyed. Regional Council supports area municipalities in applying this policy to other environmental features that are protected in an approved area OP.

2.4.4 Key Takeaways

Halton may consider the following key takeaways for policy refinement to acknowledge changes in landscape ecology and key features within the Regional Natural Heritage System:

- As natural and anthropogenic stresses affect ecological conditions at a landscape scale, connectivity becomes ever more critical as it facilitates the movement of flora and fauna to accommodate the stress. A robust and protected systems-based approach to natural heritage planning will serve to maintain connections to habitats and to ensure that functional linkages among areas of natural heritage value are maintained, thus mitigating the impacts of changes to features.
- Natural heritage features and landscapes are subject to a variety of natural and anthropogenic impacts and stressors. Opportunities to mitigate influences of landscape change through regional monitoring programs and adaptive management considerations should be explored.
- Any change in the status of a key feature (e.g., Significant Woodland) resulting from anthropogenic, climate change-related, or natural causes, could also remove the policy protection afforded to the feature and potentially compromise the Region's NHS goal of increasing the certainty that the biological diversity and ecological functions of the NHS will be preserved and enhanced for future generations (ROP s.114).
- Changes to the RNHS resulting from pre-emptive feature removals (e.g., Significant Wildlife Habitat) for features that are unmapped can, in some cases, result from land owners opting to simply remove features without triggering Site Alt By-laws rather than having to protect these components on their property.
- A change in the status of a key feature or supporting function should not necessarily be used as a basis or justification for changing boundaries of land use designations as defined by the policies, definitions and criteria set out in the Halton ROP. Such changes could be considered temporary, as the feature and/or its function could be managed or restored such that it retains its ecological value.
- A key decision to make is whether there needs to be policies that explicitly retain the area and/or status of a feature following changes, or at least require an evaluation to determine whether the feature should continue to be recognized after the change. This will be addressed in the policy audit.

2.5 Length of for which Time Studies are Considered Relevant

2.5.1 Summary of Existing Approaches

The Halton Environmental Impact Assessment Guidelines (Halton, 2014) are primarily intended to cover Site Specific Planning and do not provide guidance in regard to when environmental data become out of date. It is implicit in the guidelines that any EIA

report prepared will be based on current conditions. The Guidelines include guidance to provide a record of dates when field studies are undertaken and to make use of the most up-to-date aerial photography. Where the guidelines reference provincial plans, policy documents, guidelines, technical documents and legislation, it is noted that the most up-to-date version of these documents must be used. Some examples are:

- PPS 2020
- Natural Heritage Information Centre Database and Rarity Ranking Tables
- Species at Risk Public Registry
- Fisheries Act
- Significant Wildlife Habitat Technical Guide
- Ontario Wetland Evaluation System - Southern Manual

2.5.2 Summary of Best Practices

Best practice requires initial inventory studies be undertaken in a comprehensive manner to provide all necessary environmental information regarding the current conditions. Biophysical inventory studies may take one or two years to complete and the preparation of a development application may involve a number of disciplines and undergo several iterations before submission. Development applications may be completed in a few years, but complex or problematic applications can last as ten years or more. The length of time environmental studies may be considered valid would typically range between three to five years, thus lengthy applications may require that environmental studies be updated.

Should there be a lag between the time when field studies are completed and when a development application is submitted, there may be a need to verify existing conditions have not changed. This could involve re-doing studies where data are most likely to have changed (e.g., breeding bird surveys), but is less likely to affect features that change more slowly (e.g., vegetation, unless it is the result of a specific event).

2.5.3 Approaches of Other Municipalities

There are many municipal guidelines for environmental reporting in Ontario. The majority of municipal guidelines reviewed do not specify requirements in regard to the use of existing data. However implicit in the guidelines is that environmental studies are reporting on current conditions. The City of Guelph Guidelines for the Preparation of an Ecological Impact Study (EIS) (City of Guelph, 2017) notes that natural heritage records

are generally considered in need of field verification after a period of five years. Guelph also recognizes the lag which may occur between studies being completed and the review and approval process, stating, *"If an approved EIS is not implemented within a reasonable timeframe (~ 5 years), determine need for updated data or inventories through pre-consultation with City staff"*.

Conservation Halton's Guidelines for Ecological Studies (Conservation Halton, 2017) specify biophysical inventory data must have been collected within the five years of a submission. Toronto Regional Conservation Authority Ecological Impact Study (EIS) Guidelines (TRCA, 2014) specify that Ecological Land Classification descriptions are acceptable if completed within the previous 5 years. The Grand River Conservation Authority EIS Guidelines (2005) specify data must be no more than 5 years old.

Historically municipalities have used professional judgement to determine when an update to environmental information is needed, accounting for circumstances such as:

- it is known that the current conditions are not reflected in the data provided;
- guidelines for appropriate field data collection have not been followed or guidelines have been revised and as such field data collection must be repeated;
- policy or legislation requirements have changed requiring additional information or requiring the use of specific methods regarding environmental assessment of specific ecological features, ecological functions or individual species; and
- a desire to understand how environmental conditions vary over time.

2.5.4 Key Takeaways

Halton may consider the following key takeaways for policy refinement related to the length of time studies are considered relevant:

- For clarity, EIA guidelines should specify how long data are considered valid. The typical duration is five years.
- EIA guidelines may also suggest that, should there be a delay in the implementation of an EIA, there may be a requirement to verify and update some or all of the supporting data.

2.6 Wildland Fire Policies

2.6.1 Summary of Existing Policies

Under the Fire Protection and Prevention Act 1997, municipalities have a significant responsibility to prevent and control fire. As such, municipalities may prepare plans that assess hazards, including fire, with approaches to addressing hazards should they occur. Dufferin Community's Community Risk Profile and Emergency Management Plan is a good example of this (Dufferin County, 2011). Alternatively, they may develop plans specific to fire hazards like Toronto Fire Services Master Fire Plan 2015 – 2019 or Review of Fire Protection Services in the United Townships of Head, Clara and Maria 2018.

Historically, municipal planning has not included an assessment of wildland fire risk or the implementation of mitigation measures for wildland fire risks as part of the municipal planning process. The new PPS 2020 requires that municipal planning assess wildland fire hazards as part of the development planning process. Where a wildland fire hazard is present, a municipality may prohibit development or require the implementation of appropriate mitigation measures.

The PPS 2020 policy is in Section 3.0, Protecting Public Health and Safety, 3.1 Natural Hazards. The natural hazard policies introduction states "*Development shall be directed away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety or of property damage and not create new or aggravate existing hazards.*"

The specific policy in regard to wildfire, policy 3.1.8, states:

Development shall generally be directed to areas outside of lands that are unsafe for development due to the presence of hazardous forest types for wildland fire.

Development may however be permitted in lands with hazardous forest types for wildland fire where the risk is mitigated in accordance with wildland fire assessment and mitigation standards.

The PPS 2020 provides the following definitions related to the wildland fire policy:

Hazardous forest types for wildland fire: means forest types assessed as being associated with the risk of high to extreme wildland fire using risk assessment

tools established by the Ontario Ministry of Natural Resources and Forestry, as amended from time to time.

Wildland fire assessment and mitigation standards: means the combination of risk assessment tools and environmentally appropriate mitigation measures identified by the Ontario Ministry of Natural Resources and Forestry to be incorporated into the design, construction and/or modification of buildings, structures, properties and/or communities to reduce the risk to public safety, infrastructure and property from wildland fire.

The current Halton Region Official Plan (June 19, 2018) does not currently include policies or definition of terms related wildland fire.

2.6.2 Summary of Best Practices

When new communities are proposed in close proximity to forested areas, the manner in which development occurs may affect the level of risk to human life and infrastructure from wildland fires. The MNRF has prepared a document “Wildland Fire Risk Assessment and Mitigation Reference Manual in support of the PPS 2014” (OMNR, 2017) to assist municipalities in developing best planning practice where there may be a risk of wildland fire. The purpose of the manual is to:

- Outline how wildland fire, a natural hazard, can be addressed in the municipal land use planning process in a manner that achieves consistency with the PPS 2014, including policy 3.1.8;
- Provide background information regarding hazardous forest types for wildland fire and the risks they pose;
- Identify “wildland fire assessment and mitigation standards” as referred to and defined in the PPS 2014;
- Provide techniques for implementing wildland fire policies through municipal planning policies and processes including official plans, zoning by-laws and site-specific applications, as well as other municipal planning tools; and
- Recognize that land use planning is a critical part of the province’s framework for managing emergencies.

The manual provides comprehensive direction to assist municipal planning within areas of wildland fire risk to ensure appropriate assessment risk and where necessary

determination of environmentally appropriate measures to mitigate risks as part of the development application and approval process.

2.6.3 Approaches of Other Municipalities

Since this is policy appears for the first time in the PPS 2014 and few municipalities have undertaken comprehensive OP reviews since it was released, there are few examples of how wildland fire is being addressed.

The District Municipality of Muskoka has developed official plan policies in response to the new PPS (2014) policy regarding wildland fire. In particular, within the natural hazards section of their official plan (Section H Protecting Muskoka: Natural Hazards and other Constraints), there is a general policy for hazards (including wildland fire) that directs development outside hazard areas. See policy H1.2 b) below.

H1.2 WHERE DEVELOPMENT SHALL GENERALLY BE DIRECTED

Development shall generally be directed to areas outside of:

- b) Hazardous lands adjacent to river, stream and small inland lake systems which are impacted by flooding hazards and/or erosion hazards or areas at risk for wildland fire; and,

Additional policy direction regarding wildland fires is provided in policy section H1.8.

H1.8 WILDLAND FIRES

- a) Development shall generally be directed to areas outside of lands that are unsafe for development due to the presence of hazardous forest types for wildland fire.
- b) Development may be permitted in lands with hazardous forests types for wildland fire where the risk is mitigated in accordance with wildland fire assessment and mitigation standards.
- c) The District and/or Area Municipalities may request an assessment undertaken by a qualified professional during the appropriate time of year and using accepted protocols to determine the wildland fire risk and required mitigation measures where development is proposed in areas identified as Extreme, High and Needs Evaluation identified on Appendix D.

Mapping prepared by the MNRF is used to provide The District Municipality of Muskoka Official Plan Appendix D: Generalized Wildland Fire Hazard Risk.

The Muskoka Official Plan includes policy L10.3(c) that may require the preparation of a Wildland Fire Hazard Risk Assessment Report as part of a development application submission.

A development proponent could use the Wildland Fire Risk Assessment and Mitigation Reference Manual (OMNR, 2017) as guide for the preparation of a Wildland Fire Hazard Risk Assessment Report.

2.6.4 Key Takeaways

The 2014/2020 update of the PPS includes new policy which requires municipalities to consider wildland fire risks and mitigation during the development planning process. Mapping prepared by MNR shows “Potential Hazardous Forest Types for Wildfire” present within the Region of Halton (Figure 1) which should be incorporated in to the ROP as part of this current review. This will be addressed in the policy audit technical memo.

The policy approach taken by the District Municipality of Muskoka to address Wildland Fire Hazards is an example that can be drawn on in developing policies for the Halton ROP.

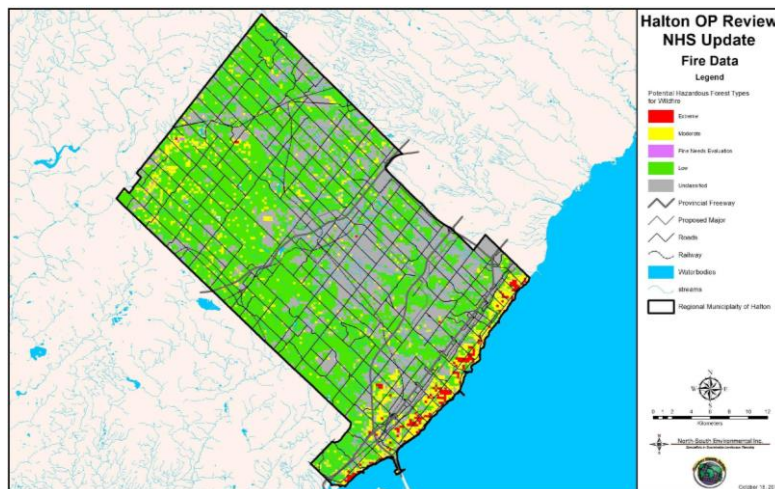


Figure 1: Potential Hazardous Forest Types for Wildfire, Region of Halton

2.7 Buffer Width Determination and Buffer Width Refinement Frameworks

2.7.1 Summary of Existing Approaches

A buffer is a swath of land separating protected natural features and areas from adjacent land uses. As such, buffers are usually included as part of mitigation strategies when new development is proposed. The primary function of buffers is to reduce negative impacts on protected ecological features and functions that may arise from an adjacent land use. Buffers make an important contribution to the protection and long-term viability of wetlands, woodlands, valleylands and other key natural features and functions. Buffers may have secondary functions such as providing habitat for wildlife. In some official plans and provincial documents (e.g., City of Markham OP, the Greenbelt Plan 2017, and Growth Plan 2019), buffers are referred to as Vegetation Protection Zones (VPZ). The Greenbelt Plan and Growth Plan require a minimum 30 m VPZ from key features with very little flexibility to modify. The minimum buffer widths are to be applied from the edge of the feature being protected. It should be noted that in some cases more detailed studies may recommend a buffer width greater than the minimum 30 m buffer width defined in order to protect natural heritage features (e.g., Provincially Significant Wetlands or significant wildlife habitat) and critical function zones. The buffer width required to adequately mitigate impacts from land use change, and the permitted uses in a buffer, are among the most controversial aspects of many development applications adjacent to natural features.

The appropriate width of a buffer or VPZ should be based on the significance and sensitivity of the ecological features and functions to be protected and the severity of negative impacts likely to be associated with the adjacent land use activities (OMNR, 2010). There is little direction in the scientific literature on the exact buffer width needed to mitigate specific impacts, thus buffer width may also be affected by the degree of confidence that is sought in protecting features, with wider buffers being sought when a high degree of confidence is required.

The PPS 2020 natural heritage policies do not specifically require or address the delineation of buffers. However, it is widely accepted that buffers are an appropriate approach to assist in meeting the test of no negative impacts on natural features or on their ecological functions. Most municipal official plans do require buffers, and generally take one of two approaches:

1. They specify minimum buffer widths, with the caveat that an environmental study must be done to determine the adequacy of the minimum width and recommend greater widths where warranted; or
2. They leave the determination of buffer width completely up to site-specific studies.

The Regional Natural Heritage Systems identified on Map 1 of the Halton OP includes a 30 m buffer applied to woodlands, wetlands and watercourses outside of the urban areas, however, this is not explicitly articulated in the policies, although s.115.2 indicates that "*The Regional Natural Heritage System consists of areas so designated on Map 1*", thus *de facto* include the 30 m buffer as mapped. Halton's OP policy 116.1 permits refinement of the buffer as part of RNHS refinement as outlined below.

- 116.1 The boundaries of the Regional Natural Heritage System may be refined, with additions, deletions and/or boundary adjustments, through:
- a) a Sub-watershed Study accepted by the Region and undertaken in the context of an Area-Specific Plan;
 - b) an individual Environmental Impact Assessment accepted by the Region, as required by this Plan; or
 - c) similar studies based on terms of reference accepted by the Region.

In the Ontario Municipal Board (OMB) decision for the "Evergreen" application, (Case No(s). PL111358, 110857, and 091166 - see section 4.0 in the Background Review Technical Memo for more details), the Board considered an appeal to the Region's 30 m buffers for significant woodlands. The appeal was unsuccessful and the requirement for a 30 m buffer was upheld at the Secondary Plan stage, pending detailed field studies which were to address buffer width adequacy. The Board's decision to dismiss the appeal for reducing buffer widths supports the Region's position regarding the need for certainty that the natural heritage features and functions are protected for future generations.

2.7.2 Summary of Best Practices

The Natural Heritage Reference Manual (NHRM) for Natural Heritage Policies of the 2005 PPS (OMNR, 2010), as well as subsequent studies on buffers (e.g., Beacon 2014) note that our understanding of the efficacy of buffers is currently evolving. As the impacts of adjacent development become better understood and more research is conducted on the ecology of various features, buffer requirements may change; therefore, the most current literature must be consulted to review the impacts relevant to the feature under

consideration. The NHRM provides an annotated bibliography of adjacent lands and buffer research. The Greenbelt Plan 2017, Oak Ridges Moraine Conservation Plan 2017 and the Growth Plan 2019 all require a 30 m VPZ for the protection of significant ecological features. Consequently, there is no flexibility to refine buffer widths below 30m for various planning applications in large portions of the Region (approx. 40%).

A comprehensive literature review was recently prepared for Credit Valley Conservation in the report *Ecological Buffer Guideline Review* (Beacon, 2014). The literature review provides an assessment of the effectiveness of varying buffer widths for various ecological features and functions. The review provides an eight-step evaluation methodology to determine buffer width for urban planning that considers intrinsic conditions (i.e., vegetative structure, soils, slope and hydrology) and extrinsic conditions (i.e., nature and extent of land use impacts), as well as sensitivities of the protected natural feature and functions, and buffer design and management options that may improve buffer effectiveness. Two important key findings from the review recognize the importance of buffers for mitigating disturbances and increasing certainty that they will protect biodiversity and NHS functions:

1. There is affirmation that buffers are an appropriate mitigation tool: "... *there is substantial empirical evidence that vegetative buffers can and do perform a number of functions that help protect various types of natural features and mitigate the impacts of human disturbances or changes in land use in the adjacent lands.*" (Beacon, 2014 p. 83), albeit this is qualified by noting that there are gaps in the science.
2. There are very few studies that provide guidance on buffer widths for some aspects of upland woodlands (which is probably the most common feature affected by development). The review took an innovative approach to presenting the ranges of appropriate buffer widths organized by the "*Risk of Not Achieving the Desired Buffer Function*" (Beacon, 2014 Table 7, p. 88). Not surprisingly, the risk declined as buffer widths increased. This approach fits well with Halton's policy approach which speaks to "increasing the certainty" that biodiversity and ecological function will be preserved (Halton ROP, s.114). Based on the Beacon framework, providing a wide buffer reduces risk of not achieving the desired function and thus increases the certainty that biodiversity and ecological function are preserved.

The Region of Halton has recently prepared a comprehensive Framework for Regional Natural Heritage System Buffer Width Refinements for Area-Specific Planning (Halton

2017). The framework provides a detailed methodology that includes a three-part assessment for determining buffer width that consists of:

1. The sensitivity and significance of ecological features and functions protected;
2. The potential negative impacts on ecological features and functions arising from adjacent land use; and
3. The management and uses within the buffer which may mitigate and/or exacerbate potential negative impacts on ecological features and functions.

Based on the outcome of the assessment the “base buffer” of 30 m may remain the same, be reduced by five to ten metres in certain situations or be increased in width as determined through more detailed studies.

2.7.2 Approaches of Other Municipalities

Municipal official plans generally include requirements for the identification and protection of buffers or VPZ from protected ecological features such as wetlands and woodlands. In official plans where buffer widths are prescribed, the width may vary depending on the ecological feature. For example, wetlands, particularly provincially significant wetlands, may require a 20 to 30 m buffer, whereas buffers for protected woodlands are generally in the range of 10 to 15 m.

Some municipalities prescribe minimum buffers from key features that vary in width depending on the significance and sensitivity of the feature and the location of the feature (e.g., urban vs. rural areas). For example, in the rural area of the City of Hamilton the following buffers are prescribed:

- 30 m from each side of watercourses, wetlands, lakes, fish habitat, significant woodlands (drip line), Life Science Areas of Natural and Scientific Interest; and
- 15 m from other woodlands (drip-line) and top of bank of significant valleylands.

Whereas in the urban area in the City of Hamilton the following buffers are prescribed:

- 30 m from cold water watercourse, critical habitat, and provincially significant wetlands;
- 15 m from warm water watercourses, unevaluated and locally significant wetlands, significant woodlands (drip-line) and Life Science Areas of Natural and Scientific Interest; and

- 10 m from other woodlands (drip-line).

It should be noted that although these buffers are identified as minimums, the policies do provide flexibility for site-specific applications to recommend a greater or lesser buffer where supported by an approved ecological study.

The City of Guelph prescribes minimum buffers as follows:

- 30 m from provincially significant wetlands
- 15 m from locally significant wetlands
- 30 m from cold/cool water fish habitat
- 15 m from warm water fish habitat
- 10 m from the drip-line of significant woodlands

These buffers are considered minimums that are reviewed through an ecological study that may recommend larger buffer widths depending on the sensitivity of the feature and potential for impact from the change in land use. It should be noted that minimum buffers are not applied to lands containing existing development which may preclude achievement of the minimum buffers. Rather, redevelopment of such lands would require an EIS to determine an appropriate buffer width.

The City of Markham's Official Plan also specified specific minimum vegetation protection zones (buffer widths) for various features as follows:

- Significant Valleylands: 10 m subject to site-specific tests that may require additional width
- Valleylands: 10 m (with exceptions in the urban areas)
- Significant Woodlands: 10 m
- Woodlands: 10 m
- Provincially Significant Wetlands: 30 m
- Wetlands: 15 m

The Markham Official Plan defers to the provincial plan standards for applications on the Oak Ridges Moraine and in the Greenbelt.

Whether or not official plans specify minimum buffer widths, they generally include a requirement for appropriate ecological studies (EIS, EIA, subwatershed studies, etc.) to be completed and approved to determine the final width of buffers. In the majority of cases

where a municipality has identified minimum buffers in their official plan, these buffer widths are used in development planning applications and are not applied to existing uses. The considerations and direction for determining an appropriate buffer width can be found in some environmental impact assessment/study guidelines. For example, the Region of Waterloo Greenlands Network Implementation Guideline provides guidelines for determining buffers around environmental features based on the following three principles:

- Protection of environmental features from adverse environmental impacts originating on contiguous lands approved for development or site alteration;
- Transition between new development or site alteration and environmental features; and
- Opportunities for net ecological enhancement or wherever feasible, restoration of the ecological functions of the Core Environmental Feature.

The Region of Waterloo's Greenlands Network Implementation Guideline goes further to provide considerations in the design (e.g., width and function) of buffers.

We know of only one example where an ecological study undertaken in support of a development recommended increasing the minimum buffers (a specific instance where a woodland buffer was increased from the minimum 10 m to 20 m). More commonly, ecological studies recommend the minimum buffer required through policy, regardless of the sensitivity or significance of the feature and the potential for negative impacts resulting from a change in land use on adjacent lands. Applying an objective approach to determine ecologically appropriate buffers based on the sensitivity and significance of features and the potential for changes in adjacent land use should be applied.

2.7.3 Key Takeaways

Halton may consider the following key takeaways for policy refinement related to buffers:

- The Region's approach on increasing the certainty that features and functions of the Regional Natural Heritage System (RNHS) are preserved is appropriate given the information gaps in the literature for requiring specific buffer widths.
- The 30 m buffer mapped in the non-urban areas of Halton's RNHS is appropriate when viewed in the context of providing certainty. This buffer approach was supported by the Evergreen OMB decision.

- Halton should consider updating to the provincially consistent terminology of *vegetation protection zones* for buffers.
- Similar to most other municipalities, Halton's OP policies should consider providing policy that clearly requires a buffer be provided when adjacent development is proposed. This could include specific minimum buffer widths as a "base buffer" for small scale, site redevelopment scenarios to act as a starting point for evaluating the adequacy of buffer widths.
- Halton's guideline document "Regional Natural Heritage System Buffer Width Refinements for Area-Specific Planning" (Halton, 2017) provides an objective approach to determining effective vegetation protection zone widths and should be formalized as an implementation tool (possibly through integration with updated EIA Guidelines and Sub-watershed Study Guidelines) for determining appropriate buffer widths for all new development or redevelopment where an EIA is required.
- As new research on the efficacy of vegetation protection zones becomes available, this information should be incorporated into the analysis used to determine the width of vegetation protection zones used in land use planning.
- Given the lack of studies and/or data on the efficacy of buffers, the Region should encourage long-term monitoring of the effectiveness of buffers when development is proposed adjacent to natural features, through a new policy and/or through the EIA Guidelines. This should include collection of baseline data.

2.8 Mineral Resource Extraction Area De-designation Process

2.8.1 Summary of Existing Policies

PPS 2020 section 2.5.3, Rehabilitation, recognizes mineral resource extraction as an interim use, i.e. an area designated as *aggregate resource extraction land use* is a temporary land use designation, remaining in effect while the licence to extract aggregate is in force. When a licence has expired or has been revoked, an official plan amendment is required to re-designate the land.

PPS 2020 section 2.5.3 also requires "progressive and final rehabilitation to accommodate subsequent land uses, to promote land use compatibility and to mitigate negative impacts to the extent possible." This policy also requires that "Final rehabilitation shall take surrounding land use and approved land use designations into consideration."

The PPS 2020 provides further direction for rehabilitation in areas where several mineral resource extraction sites are operating in close proximity to one another. Policy 2.5.3.2 states "Comprehensive rehabilitation planning is encouraged where there is a concentration of mineral aggregate operations."

The Region of Halton OP includes mapping (see Map 1F) that identifies the location of licenced mineral resource extraction areas. The Halton OP includes a number of policies that provide direction for how mineral resource extraction areas are to be planned, managed and rehabilitated to ensure successful implementation of post extraction land uses (see underlined emphasis in policies listed below):

107. The objectives of the Mineral Resource Extraction Areas are:
- (3) To ensure that mineral aggregate resource extraction occur in a manner that minimizes social, environmental and human health impacts.
 - (3.1) To ensure that the functions and features of the Region's Natural Heritage System are maintained or, where possible, enhanced during and after the extraction operations.
 - (5) To ensure the progressive and final rehabilitation of mineral aggregate operations to the appropriate after-use.
109. Subject to other policies of this Plan, applicable policies of the Greenbelt Plan and Niagara Escarpment Plan, applicable Local Official Plan policies and Zoning By-laws, and site plan and conditions of the licence under the Aggregate Resources Act (ARA), the following uses may be permitted:
- (4) associated facilities to a mineral aggregate operation used in extraction, transport, beneficiation, processing or recycling of mineral aggregate resources and derived products such as asphalt and concrete, or the production of secondary related products, provided that such associated facilities are:
 - designed to be temporary and not to be utilized after extraction has ceased; and
 - located in a manner that does not affect the final rehabilitation or enhancement of the site in accordance with an approved rehabilitation and enhancement plan.
110. It is the *policy* of the *Region* to:
- (6) Consider mineral aggregate resource extraction as an interim use and require the rehabilitation of all such sites to form part of the Greenbelt

or Regional Natural Heritage System or the Agricultural Area, with the proposed after-uses being in conformity with the applicable policies of that land use designation.

- (6.1) Require the rehabilitation of mineral aggregate operations on prime agricultural lands, within Prime Agricultural Areas to be carried out so that substantially the same areas and same average soil quality for agriculture are restored.
- (6.2) Any after use not permitted in Section 109 of this Plan shall require an amendment to the Regional Plan and where applicable, the Niagara Escarpment Plan.
- (7.2.d) Where the proponent has satisfied the requirements of Sections 110 (7.2)a) through 110(7.2)c) as applicable, require any application for a new or expanded mineral aggregate operation to consider a “net environmental gain” approach to the preservation and enhancement of the Greenbelt and/or Regional Natural Heritage System (based on principles outlined in s. 110.7.2.d in the ROP).
- (8) Evaluate each proposal to designate new or expanded Mineral Resource Extraction Areas based on its individual merits and consideration of all the following factors:
- proposed rehabilitation plan and compatibility of the proposed after-use with the goals and objectives of this Plan, and
 - risk of public financial liability during and after extraction where continuous active on-site management is required.

Protection from long-term liabilities to the public could be ascertained through agreements with proponents (i.e., a requirement of local approvals) and/or financial security requirements such as ARA Site Plans which include rehabilitation requirements governed by the MNRF.

On December 10, 2018 the Ontario Ministry of Agriculture and Rural Affairs (OMAFRA) provided direction to the Region that there should be no Mineral Aggregate Designation. Rather these areas should continue to be designated Prime, with site specific exceptions for existing aggregates. In doing so, the ROPA needs to include new site-specific exceptions for approved new aggregate operations.

The Region of Halton has also prepared a comprehensive guideline document for mineral resource extraction operations titled *Aggregate Resources Reference Manual* (Halton, 2014). The reference manual includes guidelines for supporting studies that may be required to be submitted with an application for resource extraction. The Rehabilitation/Monitoring Study is intended to:

1. Demonstrate how mineral resource extraction sites will be rehabilitated to a land use that is compatible with the land use of the area and in conformity with Provincial, Regional and local policy.
2. Identify requirements for monitoring and rehabilitation to ensure that the rehabilitation of the site is consistent with the requirements of applicable policy documents.

2.8.2 Summary of Best Practices

Cornerstone Standards Council (CSC) is a collaboration of community, environmental and industry stakeholders committed to developing a world-class certification program that establishes a leadership Standard for the responsible siting and operation of all pits and quarries in Ontario (www.conerstonestandards.ca). Several mineral extraction operations in Ontario are certified by CSC, including Dufferin Aggregates' Acton Quarry.

Savanta has prepared *Best Practice Guidelines for Aggregate Rehabilitation Projects: Extracting the Benefits for Species At Risk and Rare Habitats* (Savanta, 2008). The report notes that sites slated for closure or abandoned sites may represent assets in the natural landscape because they can be used to establish and/or recreate habitats for species at risk and other more common wildlife. The report offers a series of best restoration and management practices for rehabilitating former aggregate sites to achieve the goal of maximizing the biodiversity value (including species at risk) while minimizing maintenance costs. The recommendations are outlined within the context of the latest developments in recovery planning and implementation for species at risk, best management practices and ideas that the industry or its related clients may be able to follow or to build upon.

2.8.3 Approaches of Other Municipalities

In 2012, Halton Hills undertook a study of *Stand Alone Aggregate Related Uses*, to clarify the land use planning framework, and associated zoning regulations, with respect to land

uses related to mineral aggregate extraction, but which are not associated with a mineral resource extraction operation licensed under the Aggregate Resources Act. The study examined land use compatibility issues associated with three stand alone aggregate related uses: asphalt plants, concrete plants and aggregate transfer stations.

The study resulted in Halton Hills OPA 16 “Re-designation of Former Licensed Aggregate Extraction Sites” (March 18, 2013). The purpose of the OPA was to re-designate two properties formerly licensed for aggregate extraction to a more appropriate land use designation. One property was redesignated to Protected Countryside Area and Protected Countryside Area with a Natural Heritage System Overlay. The second property was redesignated to Greenlands A, Escarpment Natural Area, Greenlands B, and Escarpment Rural Area.

Wellington County (Official Plan, Section 6.6.7), Dufferin County (Official Plan, Section 4.4.2.2) and Rural Hamilton (Official Plan, Section 6.21) provide rehabilitation policies similar to those of Halton Region, which include providing progressive rehabilitation, being compatible with surrounding land use designations, and, for agricultural areas, providing rehabilitation which restores, at a minimum, average soil quality to that present before extraction occurred. In Section 4.4.2.2(d), Dufferin County provides further guidance that local municipal plans may establish policies for the removal of accessory buildings and other structures, after the aggregate operation ceases.

2.8.3 Key Takeaways

Halton OP policy 110 (6.2) defines permitted land use activities after extraction. These include uses defined by policy 109, which include a variety of rural land uses such as *agricultural operations, normal farm practices, forest, fisheries and wildlife management; incidental uses, etc.* Policy 109 uses also include “associated facilities to a *mineral aggregate operation*”, which as defined by policy 109(4)c are “designed to be temporary and not to be utilized after extraction has ceased”. The majority of applications in Halton have involved below-water extraction and thus excepting for a few instances the post-rehabilitation options are limited, and this is expected to be true in the future. In recognition of this, consideration should be given to revising Halton OP policy 110 to remove the conflict associated with permitting “associated facilities to a mineral aggregate operation” and for below-water post-extractive land uses.

Currently there is no policy requirement for ongoing engagement and review of site rehabilitation over the life of a quarry operation such as is recommended by CSC

standards. Halton's *Aggregate Resources Reference Manual* does identify requirements for monitoring and rehabilitation which may be used as a basis for ongoing review and engagement. Consideration should be given to establishing a requirement for regular review of site rehabilitation to include:

- Compliance with rehabilitation requirements as established by the operating licence;
- Engagement and sharing of site rehabilitation information with the public; and
- Review, with revisions as appropriate, of the rehabilitation strategy to best meet the proposed after-use of the site.

With the exception of below-water extraction activities, after-use of remaining mineral resource extraction sites is based in large measure on the land use which existed prior to licence approval. Due to changes in surrounding land uses and/or changing needs to protect the environment, the land use which existed prior to licence approval may not be the optimum after-use choice. The review of site rehabilitation should:

- Anticipate an end date for extraction based on when the site has an estimated 10% of its total reserves remaining (as per the operation's site plan), or when the site has an estimated 5 years of operations remaining
- Based on the end date established above, initiate a process to define the preferred after-use of mineral resource extraction sites. The process should at a minimum include:
 - Engagement of relevant stakeholders including the public;
 - Review of environmental protection needs and opportunities on and off site; and
 - Review of current or proposed surrounding land uses.

The Region should evaluate the CSC Program and consider a policy to encourage mineral resource extraction operators to adopt Cornerstone Standards Council certification to establish the highest possible standards for mineral resource extraction. To further encourage adoption of CSC standards, Halton's procurement practices may include preference for CSC certified aggregates when aggregate is required for Regional projects.

2.9 Cumulative Impact Assessment and Ecological Enhancement for Mineral Resource Extraction Applications

2.9.1 Summary of Existing Approaches

Cumulative impacts are the successive, incremental and combined impacts of an activity on society, the economy and the environment. They can arise from the compounding activities of a single operation or multiple mining and processing operations, as well as the interaction of mining impacts with other past, current and future activities that may not be related to mining.

Assessing cumulative environmental effects requires monitoring, tracking and predicting the effects of multiple natural and man-made influences on environmental components (e.g., air, land, water, and biodiversity) over space and time, thus requiring the integration of many complex pieces of information.

In Ontario, cumulative effects assessment is required as part of the aggregate resource licensing process and the often associated permit to take water application process. The Aggregate Resources Act (ARA) requires the rehabilitation of aggregate pits/quarries and defines "rehabilitate" as "to treat land from which aggregate has been excavated so that the use or condition of the land, (a) is restored to its former use or condition, or (b) is changed to another use or condition that is or will be compatible with the use of adjacent land."

A recent study (Port, 2013) shows progressive rehabilitation of quarries in Ontario is not keeping pace with new quarry development. This is resulting in an increase in the number of hectares of land in need of rehabilitation and an increase in the resulting cumulative impacts associated with disturbed land.

Halton's *OP PART III Land Use Designations* includes Mineral Resource Extraction Areas policies that provides several references to cumulative effects assessment. Section 110 (3.1) acknowledges the complex nature of cumulative effects assessment through requirements for multi-agency consultation, data and research and the use of Halton's "Aggregate Resources Reference Manual" (Halton undated).

Policy 110 (7.2)d in the ROP includes good policy to encourage 'net environmental gain' for new or expanded mineral aggregate operations to support and enhance the Provincial and RNHS. Further, Policy 110(8)(c.1) in the ROP requires new proposals to

designate or expand Mineral Resource Extraction Areas to evaluate cumulative impacts of the proposal and other extractive operations in the general area. As well, ongoing assessment of cumulative impacts must be reported every two years in a report to council on the state of aggregate resources in Halton.

Much of the concern regarding cumulative impacts of development in the Region (including mineral resource extraction) is related to cumulative development impacts to surface and ground water. Halton ROP section IV, Environmental Quality, includes policy 145(6)(d) requiring the preparation of watershed plans that address the cumulative impact of development.

2.9.2 Summary of Best Practices

Port recommends improved rehabilitation practices that would require setting a maximum allowable disturbed area at operating aggregate sites, the implementation of a security deposit for site rehabilitation, the institution of citizen advisory committees to oversee aggregate site management, and the enforcement of rehabilitation timelines (Port, 2013) regulated by the MNRF.

In 2010 Grand River Conservation Authority outlined a collaborative process by the Conservation Authority, the Ministry of Natural Resources and Forestry, and the Minister of the Environment) to address concerns associated with mineral resource extraction and cumulative impacts to surface and groundwater. The process begins by identifying priority watersheds where the potential for significant sand and gravel extraction below the water table is high, but extraction has not yet occurred or has occurred on a limited basis, or the Subwatershed already has significant sand and gravel extraction occurring below the water table. Evaluation then begins with data provided by monitoring programs that establish conditions prior to extraction (and possibly the use of control sites for existing extraction operations), followed by local (licenced site) and regional (watershed) scale analysis and reporting. This process must also be supported by an appropriate response by licenced operators who must develop and implement a mitigation plan as needed while also acknowledging that applications may be submitted to extract residual sand and gravel at the few existing ARA-approved sites within the Region.

McWilliam emphasizes the need to adopt a landscape approach to the restoration of aggregate sites. This approach by its nature addresses cumulative effects assessment. A landscape analysis will consider factors such as regional priorities for restoring native

habitats, the need for ecological linkage among habitat patches, past and potential future rehabilitation of adjacent aggregate sites. McWilliam also notes that conventional rehabilitation approaches lead to a lower native species diversity rather than maximizing the ecological potential of extraction sites (McWilliam, 2010).

Corry et al. also promote a landscape approach to ecological restoration of pits and quarries in Ontario, noting that rehabilitation efforts rarely attempt to restore ecological function to a site, and even more rarely consider the ecological implications of landscape context (Corry et al. 2008).

Ontario Nature prepared a report entitled "Bioregional Planning for Aggregate Extraction in the Townships of Uxbridge and Scugog". The report made a number of recommendations to the province to improve the outcomes of aggregate extraction planning. The recommendations emphasized the need for bioregional approaches to planning (i.e., beyond single site planning, in part to address cumulative impacts), and the need for greater transparency, data sharing and engagement among stakeholders (Ontario Nature, 2014).

Ontario Stone, Gravel and Sand Association suggests rehabilitated quarries provide opportunities for water storage and diverse wetland habitats, which can address water quantity issues and minimize flooding in flood-prone areas, which in some cases may offset the impacts of climate change. In addition, there are examples of quarries that have been rehabilitated to biologically diverse wetland ecosystems that support native biodiversity (OSSGA, 2016).

In a Savanta report entitled "Best Practice Guidelines for Aggregate Rehabilitation Projects", the summary conclusion states: "*The potential contributing role of the aggregate industry in efforts related to the recovery of at risk and rare species and habitats in Ontario is more important than ever before.*" The report recognizes that after extraction, some quarry sites present opportunities to create or recreate habitats that support native biodiversity and contribute to the protection of cumulative tracts of land in Ontario (Savanta, 2008).

2.9.3 Approaches of Other Municipalities

The collaborative, data rich, and engaged regional approaches recommended by current best practices are not yet reflected in aggregate planning at the municipal level.

Municipalities have participated and contributed to the work conducted by GRCA 2010 and Ontario Nature 2014 in the development of best practices, but these have yet to result in substantive change in cumulative impact assessment and ecological enhancement of mineral resource extraction operations.

2.9.4 Key takeaways

Halton may consider the following key takeaways for policy refinement related to the cumulative impact assessment and ecological enhancement for mineral resource extraction applications:

- There is a lag between mineral resource extraction and rehabilitation leading to a net gain in disturbed area, which contributes to the cumulative impact of licenced mineral resource sites.
- Conventional rehabilitation generally results in simple vegetation cover supporting lower native biodiversity than that which existed pre-development. Policy 110 (7.2)d however should be enforced in that it requires 'net environment gain' be considered for new or expanded mineral aggregate operations to support the protection and enhancement of the RNHS.
- The implementation of best practice is dependent upon all stakeholders making a greater effort to access, share and analyse data regarding existing extraction and rehabilitation operations.
- Best practice in rehabilitation planning must go beyond examining single site operations, preferably taking a bioregional or landscape approach with a multi-disciplinary and multi-stakeholder team.
- The Region could improve rehabilitation practices by developing a citizen advisory committee to comment on aggregate site rehabilitation plans.
- Pre-consultation, and continuous, committed engagement and transparent data sharing by industry, government and the public throughout the licensing, operation and rehabilitation stages of mineral resource extraction leads to improved outcomes in post site rehabilitation.

2.10 Excess Soils and Fill Site Alteration Policies

2.10.1 Summary of Existing Policies

In Ontario, the *Municipal Act, 2001* permits municipalities to pass by-laws to prohibit and regulate site alteration:

Powers of local municipality:

- (2) Without limiting sections 9, 10 and 11, a local municipality may,
- (a) prohibit or regulate the placing or dumping of fill;
 - (b) prohibit or regulate the removal of topsoil;
 - (c) prohibit or regulate the alteration of the grade of the land;
 - (d) require that a permit be obtained for the placing or dumping of fill, the removal of topsoil or the alteration of the grade of the land; and
 - (e) impose conditions to a permit, including requiring the preparation of plans acceptable to the municipality relating to grading, filling or dumping, the removal of topsoil and the rehabilitation of the site. 2006, c. 32, Sched. A, s. 76 (1).

Delegation to upper-tier:

- (3) A lower-tier municipality may delegate all or part of its power to pass a by-law respecting the dumping or placing of fill, removal of topsoil or the alteration of the grade of land to its upper-tier municipality with the agreement of the upper-tier municipality. 2001, c. 25, s. 142 (3).

Section 142 provides a definition for topsoil as follows:

- (1) In this section, "topsoil" means those horizons in a soil profile, commonly known as the "O" and the "A" horizons, containing organic material and includes deposits of partially decomposed organic matter such as peat. 2001, c. 25, s. 142 (1).

The Ontario Ministry of the Environment (MOE), under the Environmental Protection Act (EPA), is responsible for the legislative and policy framework governing excess excavated soil (i.e., fill). The MOE EPA recognizes that owners of both excess soil source sites and receiving sites may need to submit a Record of Site Condition (RSC) for approval under Ontario Regulation 153/04. The MOE has established generic contaminant standards set out in, "Soil, Ground Water and Sediment Standards, for Use under Part XV.1 of the Environmental Protection Act".

On April 16, 2018, the Environmental Registry of Ontario (ERO) posted notice 013-2774 for a new Ontario Regulation under the EPA for On-Site and Excess Soil Management. The sixty-day commenting period is now closed and it is anticipated that regulatory changes to the management of excess soil in Ontario are forthcoming. The ERO posting includes the following supporting materials:

- A New proposed On-Site and Excess Soil Management Regulation
- Proposed Amendments to O. Reg. 153/04 – Record of Site Condition
- Ontario’s Excess Soil Management Policy Framework and Proposed Legislation
- Rules for On-Site and Excess Soil Management
- Proposed Complementary Amendments to O. Reg. 347 – Waste
- Rationale Document for Development of Excess Soil Standards
- Proposed Beneficial Reuse Assessment Tool

The PPS 2020 includes reference to the placement of fill as constituting *site alteration*, an important PPS policy term, because it sets out limitations and prohibitions in the context of natural heritage features and functions, water, cultural heritage and archeology, and natural hazards. The PPS also refers to “soil” in the context of several defined terms used, including:

- *specialty crop areas* and *prime agricultural land* – where soil condition is one of the factors contributing to definition of these areas;
- *hazardous sites* which may be characterized by unstable soils;
- *hydrologic function* which, in part, is influenced by soil type;
- *surface water features* which are defined, in part, by soil type; and
- *wetlands* which are defined by hydric soils.

New policies introduced in the Growth Plan 2019, Greenbelt Plan 2017 and ORM Conservation Plan 2017 encourage municipalities to develop soil reuse strategies and official plan policies, as part of planning for growth and development and they are intended to support integration of sustainable soil management practices into planning approvals and implementation of best management practices for excess soil.

The Growth Plan 2019 and the Greenbelt Plan 2017 policies both include:

Municipalities should develop excess soil reuse strategies as part of planning for growth and development.

Municipal planning policies and relevant development proposals shall incorporate best practices for the management of excess soil generated and fill received during development or site alteration, including infrastructure development, to ensure that:

- a) Any excess soil is reused on-site or locally to the maximum extent possible and, where feasible, excess soil reuse planning is undertaken concurrently with development planning and design;
- b) Appropriate sites for excess soil storage and processing are permitted close to areas where proposed development is concentrated or areas of potential soil reuse; and
- c) Fill quality received and fill placement at a site will not cause an adverse effect with regard to the current or proposed use of the property or the natural environment, and is compatible with adjacent land uses.

Another important change in 2017 was the Modernizing Ontario's Municipal Legislation Act, 2017 (Bill 68), which repealed provisions that prohibited municipal by-laws having effect in areas under jurisdiction of conservation authorities. The change allows municipalities and conservation authorities to work together to implement best practices for the regulation and management of excess fill both within and outside areas regulated by conservation authorities.

The current Halton ROP includes policies in Part IV Healthy Communities Policies under Environmental Quality – Land as follows:

146. The *objectives* of the *Region* are:

- (10) To promote soil conservation and minimize soil erosion.

147. It is the *policy* of the *Region* to:

- (12) Enact, or encourage the Local Municipalities to enact, by-laws that:
 - a) regulate the removal of topsoil;
 - b) restrict the stripping or mining of agricultural soils; and
 - c) restrict activities that erode, deplete, render inert, or contaminate soils.

It is noteworthy that Halton's "enact or encourage" policy above does not include a reference to the "placing or dumping of fill" or "the alteration of grades" as outlined in the Municipal Act (2001).

It is also notable that Halton policy 117.1, which lists permitted land use within the RNHS, includes:

(18) "...stockpiling and processing of soil".

Similar to the PPS 2014, the Halton ROP definitions also make reference to soil as a factor characterizing *prime agricultural land*, *specialty crop area*, and *wetlands*.

Current ROP NHS policies relate to Site Alteration, such as:

118(1.1). Require Local Municipalities, when undertaking the preparation of *Area-Specific Plans*, Zoning By-law amendments and studies related to *development* and/or *site alteration* applications, to protect, through their Official Plans and Zoning By-laws, the Key Features listed in Section 115.3(1) but not mapped on Map 1G in accordance with policies of this Plan.

2.10.2 Summary of Best Practices

In January 2014, the Ministry of the Environment (MOE) released a guide entitled *Management of Excess Soil – A Guide for Best Management Practices* (BMP). This BMP sets out the province's expectations for all those managing soil and encourages the beneficial reuse of excess soil in a manner that promotes sustainability and the protection of the environment. It assists those managing excess soil, particularly when the excess soil may be impacted by contamination, and in preventing and mitigating the potential for adverse effects. The BMP encourages reuse of soil and provides guidance on managing excess soil at the site where it is excavated and during its transportation as well as where it is received.

Following the release of MOE's BMO guide, the ministry undertook a review of excess soil management and produced Ontario's Excess Soil Management Policy Framework 2016 which led to new policies in provincial plans including the Greenbelt Plan 2017, Growth Plan 2019 and ORM Conservation Plan 2017, as well as a new proposed *On-Site and Excess Soil Management Regulation for Ontario* currently under review.

Natural Resources Canada has prepared a short "Guide to Soil Salvage" (NRC, 2017) to conserve a site's topsoil through the adoption of appropriate pre-disturbance steps to improve reclamation outcomes.

TRCA (2012) has prepared "Preserving and Restoring Healthy Soil: Best Practices for Urban Construction", directed at soil management best practices during construction to

help maintain the capacity of landscaped areas to hold moisture and reduce stormwater runoff.

Industry guidelines are reflected in Landscape Ontario's "Horticultural Trades Association Landscape Guidelines" which include a chapter on topsoil guidelines and Cornerstone Standards Council guidelines for the aggregate industry encouraging adoption of Ontario's Management of Excess Soil – A Guide for Best Management Practices (Landscape Ontario, 2004).

2.10.3 Approaches of Other Municipalities

Regional and local municipalities continue to implement traditional site alteration policies that can be improved and expanded to address excess soil based on recent BMP and policy reviews.

The Town of Oakville has By-Law No. 2003-021 to regulate site alteration, which includes "the placement or dumping of fill on land, the removal of topsoil from land, or the alteration of the grade of land by any means including the removal of vegetative cover, the compaction of soil or the creation of impervious surfaces, or any combination of these activities." Oakville may also include a provision in new by-laws for landowners to review opportunities for the salvage of topsoil when applying for an Official Plan Amendment.

The City of Burlington has By-Law No. 64-2014 "to prohibit and regulate the placing, dumping, cutting or removal of fill or the altering of grades or drainage on any lands."

The Town of Milton has By-Law No. 33-2004 "to protect and conserve topsoil and for prohibiting or regulating the alteration of property."

The Town of Halton Hills has By-Law No. 2017-0040 to prohibit or regulate site alteration which includes "the alteration of the grade, the placing, dumping, or removal of fill in, on, or from a site, and the removal of topsoil from a site."

The local municipal by-laws include restrictions on the quantity of fill removed or placed, the quality of fill and requirements for inspection and compliance. There are some restrictions on the location of site alteration, such as areas regulated by a conservation authority or in some cases in relation to natural features such as water courses or

designated Greenlands. The by-laws also defer to policy restrictions that may apply under the Greenbelt Plan 2017, ORM Conservation Plan 2017 or Niagara Escarpment Plan 2017.

The local municipal by-laws also make reference to “clean” fill, including terms such as free of waste, asphalt, trash, rubbish, glass, liquid or toxic chemicals, hazardous waste or contaminants within the meaning of the Environmental Protection Act (EPA).

2.10.4 Key Takeaways

There are initiatives to improve the management of excess soil as reflected by new and evolving regulations, policies, and best practice guidelines and technical documents. Municipalities play a lead role in the development, implementation and enforcement of excess soil regulations, policies and BMP.

The province has recognized that the current system for oversight and management of excess soil requires stronger direction and clear and enforceable rules which clearly identify the roles and responsibilities as excess soil is generated and then moved from a source site to a final receiving site.

In response, Ontario has been working to develop new policies to ensure relocation of excess soil is undertaken properly and sustainably. To guide policy development, Ontario released the *Excess Soil Management Policy Framework* (Framework) in December 2016. In 2017, new excess soil policies were introduced into the Greenbelt Plan 2017, ORM Conservation Plan 2017 and Growth Plan 2019. Ontario is currently consulting on a proposed regulation that would implement a new framework for excess soil management.

Referring to significant contraventions of the existing site alteration by-laws, Loopstra stated that “Municipalities need to become more pro-active to ensure that such illegal activities do not result in serious damage to the environment or to innocent third parties who may become affected” (Loopstra, 2014).

Halton Region polices should be updated and made consistent with existing provincial policies and to promote BMPs for excess soil management. The following is recommended:

- Expand Halton’s policies to include reference to the “placing or dumping of fill” or “the alteration of grades” as outlined in the Municipal Act 2001;

- Update Halton’s policies to reflect recent additions to the Growth Plan 2019 and Greenbelt Plan 2017 policies in regard to excess soil;
- Introduce policies to reflect changes in the Municipal Act that allow municipalities to develop by-laws having effect in areas under jurisdiction of conservation authorities and policies to encourage collaboration with conservation authorities to implement best management practices for excess soil;
- Introduce or update policy that prohibits the stockpiling and processing of soil within the RNHS and which also considers appropriate buffers or requires an EIA to determine appropriate buffer widths adjacent to the RNHS; and
- Include direction for local municipalities to review, update and introduce policies for both site alteration and excess soil management (e.g., soil recovery, higher standards for excess soil management, use of local products, etc.) and by-laws (e.g., temporary processing facilities permissions) which reflect Halton’s updated policies.

2.11 Approaches to Waiving Environmental Impact Assessment Requirements

2.11.1 Summary of Existing Approaches

The PPS (2020) prohibits development and site alteration outright within some natural heritage features and areas. In other cases it prohibits development and site alteration unless *“it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.”* Similarly for adjacent lands, both development and site alteration are prohibited unless *“the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.”*

The PPS 2020 definition states that assessment of *adjacent land* includes development impacts within areas contiguous with a “natural heritage feature or area”, or in areas that are not contiguous where development has the potential to impact a protected “natural heritage feature or area.” The extent of adjacent lands may be defined by the province or municipal approaches which achieve the same objectives.

The Greenbelt Plan 2017, ORM Conservation Plan 2017 and the Growth Plan 2019 all identify adjacent lands widths of 120 m. The province’s Natural Heritage Reference Manual (NHRM) identifies adjacent land widths of 120 m for natural heritage features and 50 m for Earth Science Areas of Natural and Scientific Interest (OMNR, 2010). The

manual also states in some circumstances the potential impact of development may extend beyond 120 m and, as such, the final determination of adjacent land width may be determined based on site specific information and the type of impacts arising from the proposed development.

The Halton ROP requires an Environmental Impact Assessment (EIA) be completed for development or site alteration that meets the criteria set out in Section 118(3.1) of the ROP. The trigger for completing an EIA is in part based on the proximity of development and site alteration to Key Features and the Regional Natural Heritage System (RNHS): this includes two adjacent land widths, one for agricultural development and a second for all other development. The completion of an EIA is required for:

- agricultural buildings under 1,000 sq m that are located wholly or partially inside or within 30 m of a Key Feature of the RNHS;
- agricultural buildings over 1,000 sq m that are located wholly or partially inside or within 30 m of the RNHS; and
- *development or site alteration* within 120 m of the RNHS.

The Halton OP also provides criteria to waive the requirement for an EIA under certain conditions. Policy 118(3) waives the requirement for an EIA where:

- a) the proponent can demonstrate to the satisfaction of the Region that the proposal is minor in scale and/or nature and does not warrant an EIA;
- b) it is a use conforming to the Local Official Plan and permitted by Local Zoning By-laws;
- c) it is a use requiring only an amendment to the Local Zoning By-law and is exempt from this requirement by the Local Official Plan; or
- d) it is exempt or modified by specific policies of this Plan.

The Halton OP also waives the requirement for an EIA in specific circumstances for agricultural development based on the policy 118(3.1)(a). This policy would be applicable in such a circumstance as: "if the proposed buildings or structures are located entirely within the boundary of an existing farm building cluster surrounded by woodlands, no EIA is required as long as there is no tree removal within the woodlands".

2.11.2 Summary of Best Practices

The NHRM provides some direction in regard to waiving criteria. Below, in Figure 2 from the NHRM, is an example of Tailoring an Adjacent Lands Study, which shows that if the

adjacent lands include existing development (see built-up areas in Figure 2), the need to consider the impact of new development may not be necessary.

Site specific factors which may increase or decrease the width of adjacent lands should be considered to determine the width of adjacent lands which will require assessment during the development review process. Site specific factors may include the following:

- Increased adjacent land assessment may be relevant where protected natural areas are of high significance and/or sensitivity (e.g., Species at Risk, groundwater discharge areas);
- Site topography which may increase the width of adjacent lands where steep slopes may lead to increased surface water runoff entering a protected natural area or decrease adjacent land where a steep ridge acts a barrier between development and a protected natural area;
- Increased adjacent land assessment may be relevant when considering ecological linkage factors to ensure functional ecological linkage among protected natural areas will be sustained post development (e.g., wetland to woodland linkages, isolated features potentially surrounded by development);
- Increased adjacent land assessment may be needed to assess catchment areas critical to sustaining features dependent on surface water runoff (e.g., wetlands, headwater streams, amphibian breeding ponds);
- Increased adjacent land assessment may be necessary for development with a large impact footprint (e.g., quarries may impact surface and groundwater beyond 120 m and noise and light pollution can extend over large distances): and
- Increased adjacent land assessment may be needed to accommodate areas with natural hazards (e.g., flooding, erosion).

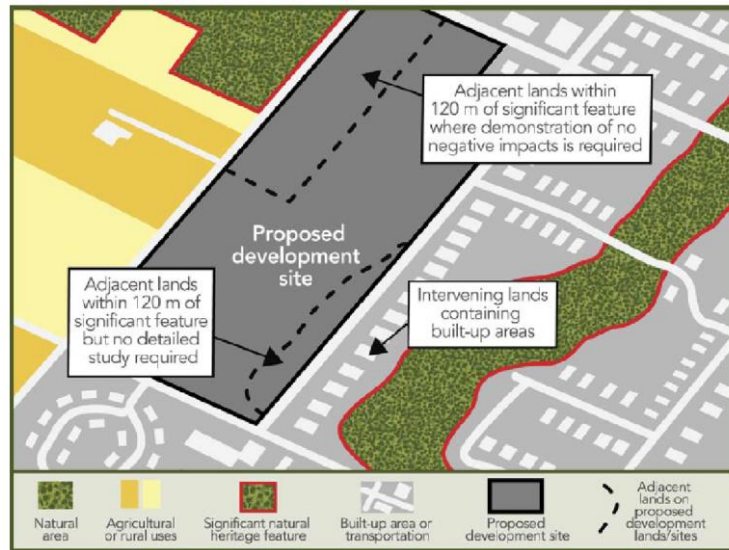


Figure 2: Waiving criteria in relation to adjacent lands. From the NHRM
Tailoring an Adjacent Lands Study, Figure 4.1

The development and use of waiving criteria is a practical approach to ensuring protection of natural heritage features and areas, and their functions, while also reducing the need for unnecessary field work, reporting and agency review, and not unnecessarily burdening individuals proposing small developments (e.g., a single residence) with substantial reporting requirements. The development of good waiving and scoping criteria requires the use of precise and clear language and they are often accompanied by figures to illustrate the spatial nature of the criteria. See for example Figure 3 from the Region's EIA Guidelines (Halton 2014) developed to provide guidance for Halton OP policy 118(3.1)(a).

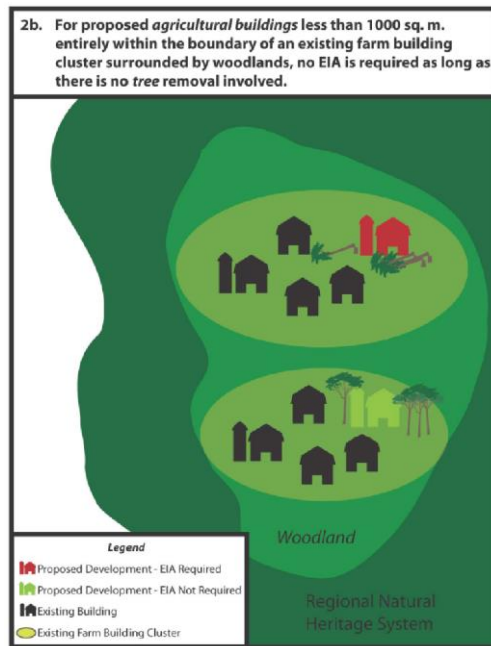


Figure 3: Waiving criteria in agricultural building clusters. From *Halton (2014) Environmental Impact Assessment Guidelines, Figure 2b*

2.11.3 Approaches of Other Municipalities

In our experience all Environmental Impact Studies/Assessments (EIS/EIA) Guidelines, including those that were reviewed here (City of Markham, Region of Niagara, Middlesex County) contain require similar structure to EIS/EIA reports and typically include:

- Introduction: study area, purpose;
- Policy Context: the relevant policies and regulations that pertain to the application;
- Inventory: a biophysical characterization of the site based on a full season of studies using accepted protocols for physical attributes, surface and groundwater, and vegetation, flora and wildlife;
- Evaluation of the significance of Natural Heritage features;
- Description of the Proposed Development: including the physical structure, servicing, stormwater management and construction considerations when relevant;
- Impact Analysis: a thorough analysis of potential impacts of the proposal;
- Mitigation: proposed mitigation to reduce and/or avoid impacts;

- Policy Conformity: an analysis demonstrating how the various policies and regulations are met; and
- Conclusions and recommendations.

The emphasis placed on these sections varies to some degree, for example, the City of Markham EIS Guidelines (Draft, 2018), provides a long list of potential impacts to consider (Appendix D), whereas Middlesex County provides only general guidance (Appendix C “A Guideline for Development Assessment Reports (2007)”, Middlesex OP, 1997).

The approach used by most municipalities and conservation authorities is a strict requirement to conduct an environmental impact assessment where development is proposed on lands adjacent to natural heritage features. Municipalities and conservation authorities typically require development proponents to consult with staff through a pre-consultation exercise to develop a terms of reference. In Markham, pre-consultation is a policy requirement (s.3.5.1 and 10.6.1 Markham OP 2014). This step in the development application process, often referred to as a *scoping exercise*, allows review agencies the opportunity to consider the scale and severity of potential development impacts and review the known information regarding the sensitivity and significance of natural heritage features and areas and ecological functions.

Some municipalities (e.g., Middlesex County, Appendix C “A Guideline for Development Assessment Reports”, Middlesex OP), like Halton, require that the terms of reference for an EIS/EIA be approved prior to the work being undertaken (often with caveats for allowing seasonally sensitive fieldwork to be undertaken). Others, such as Markham, only encourage applicants to get staff agreement on the Terms of Reference for an EIS (s.5.0, Markham Draft EIS Guidelines, 2018). This is done in an attempt to ensure the completeness and thoroughness of the inventory and analysis undertaken, the lack of which is a common complaint from municipalities in regard to EIS/EIA reports.

Determining the extent to which a study should be scoped uses existing information and professional judgement to establish what environmental studies will be required, the methods to be used and the geographic area to be covered. Scoping may waive all or some of the requirements for an EIA. Scoping may also require environmental studies be conducted beyond the area identified as adjacent lands. Like Halton, Niagara Region provides substantial guidance on the scoping and/or waiving for EIS/EIA reports.

Niagara Region EIS guidelines provide several waiving criteria to be considered in the initial screening process to determine if an EIS is required. The waiving criteria are complex and take into consideration specific types of development, environmental features and minimum distances. This risk assessment approach recognizes that where forms of development are proposed that pose little risk to the natural environment, an EIS/EIA is not required. As an example, a EIS would not be required if "the proposed development is within the waiving zone and is a re-development wholly contained within an existing footprint, or a re-development with a minor addition to the existing footprint which maintains a > 15 m buffer from the natural heritage feature, or is a re-development with a major addition to the existing footprint which extends away from the feature."

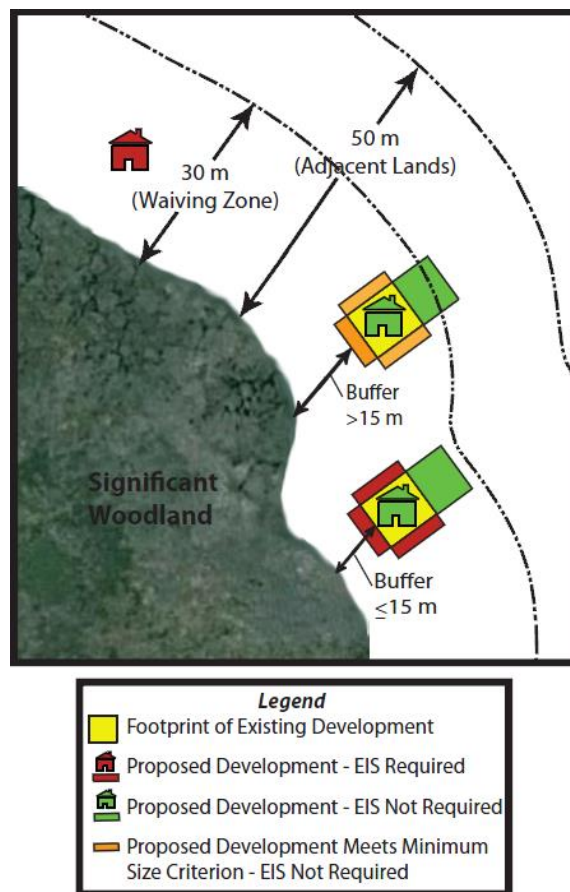


Figure 4: Waiving criteria in relation to significant natural heritage features

One unique aspect of Markham's Guidelines is the detailed guidance they provide for the evaluation of Significant Wildlife Habitat. Appendix E in Markham's Draft Guidelines (2018) used the MNRF's EcoRegion Criteria Schedules for evaluating Significant Wildlife Habitat to extract the categories that were relevant to Markham, as well as providing a process for evaluation.

Although useful in that it stresses that these schedules must be used, they are subject to becoming dated if and when there is a MNRF update. Markham's EIS Guidelines also provide a detailed description of survey methods to inventory flora and fauna (Appendix F), while most municipal guidelines would simply defer to accepted provincial protocols.

2.11.4 Key Takeaways

Halton may consider the following key takeaways for policy refinement related to approaches to waiving EIA requirements:

- Definition of adjacent lands 120 m wide is commonly used to trigger when an EIA is required in a development application.
- Best practice suggests there should be a review of all development applications, even when the development is located outside adjacent lands, to determine when an EIA may be required based on the scale or severity of potential development impacts or the significance or sensitivity of the natural heritage features and areas or their ecological functions.
- EIA waiving criteria can be extremely useful for streamlining development applications and review for small scale applications such as minor variances or consents, however, because of the wide variety of potential development impacts and the diversity of natural heritage features and areas and their ecological functions, waiving criteria can only be defined for a limited set of specific circumstances.
- Pre-consultation is an important first step in the development application process to determine the environmental studies required, the methods to be used and the geographic area to be covered.
- Include a scoping checklist in the updated EIA Guidelines;
- Requiring agency approval of Terms of Reference for EIS/EIA reports provides a common expectation of the issues to be addresses in the report.
- The review of all development applications requires the use of professional judgement to assess EIA requirement of each application on a case by case basis.

SECTION 3.0 BEST PRACTICES IN WATER RESOURCE SYSTEMS POLICY + PLANNING

3.1 Watershed Planning

3.1.1 Summary of Existing Approaches

Ontario has been conducting formal watershed planning since the advent of the Conservation Authorities Act in 1946. In the early days, Conservation Authorities led the preparation of watershed plans for their jurisdictional area, typically focussed on water resources at a broad scale and most often for larger watersheds. For instance, the Grand River Watershed Plan was first prepared by the Conservation Authority in 1954, with subsequent updates in 1971, 1982 and most recently 2014. The primary rationale for conducting water resource studies at a watershed scale related to the need to consider resource interactions at a watershed rather than political or municipal scale, inherently recognizing that communities needed to work together to protect, maintain and enhance their water resources. This was particularly true for large watersheds with multiple communities such as the Grand River and Credit River.

While these watershed plans provided high-level guidance for resource management, largely for conservation authorities and their partners, they tended to be too broad to provide the necessary insights to direct land use planning and impact management at a more local or municipal scale. In the 1980's, master drainage plans (MDPs) were common, focussing on managing impacts (post-with) related to proposed urbanization, predominantly through structural means, including floodplain management. Typically, these MDPs only considered environmental resources and impacts at a high-level, and rarely were conducted proactively to advise on appropriate land use planning objectives and needs. Notwithstanding, in the later 1980's and early 1990's, there was an emergence of thinking at the government level which recognized the need for more integrated land use and resource planning, whereby detailed watershed-based studies would be conducted concurrently with land use planning studies, to provide contemporary direction on land uses and management strategies. In 1993, the Province released a series of documents focussed on ecosystem-based, integrated planning and introduced Subwatershed Planning guidance. The subwatershed was inherently understood to be a smaller geographical unit, but with commonalities to a watershed, in that resource management and land use planning at this scale were linked. Moreover, the subwatershed scale (as part of broader watersheds) was also considered more aligned

with municipal and developer interests, as local planning could proactively build upon the findings from subwatershed-based studies, typically as part of Official Plan amendments and Secondary Plans. In 2003, the Ministry of the Environment (MOE) released the Stormwater Management Planning and Design Manual, an update to the 1994 manual, which provided guidance on stormwater management practices to achieve set watershed goals. The Manual detailed the functional framework between environmental planning and municipal land use planning, and the role of pertinent approval agencies, to streamline the review process and help ensure input is captured from all appropriate agencies.

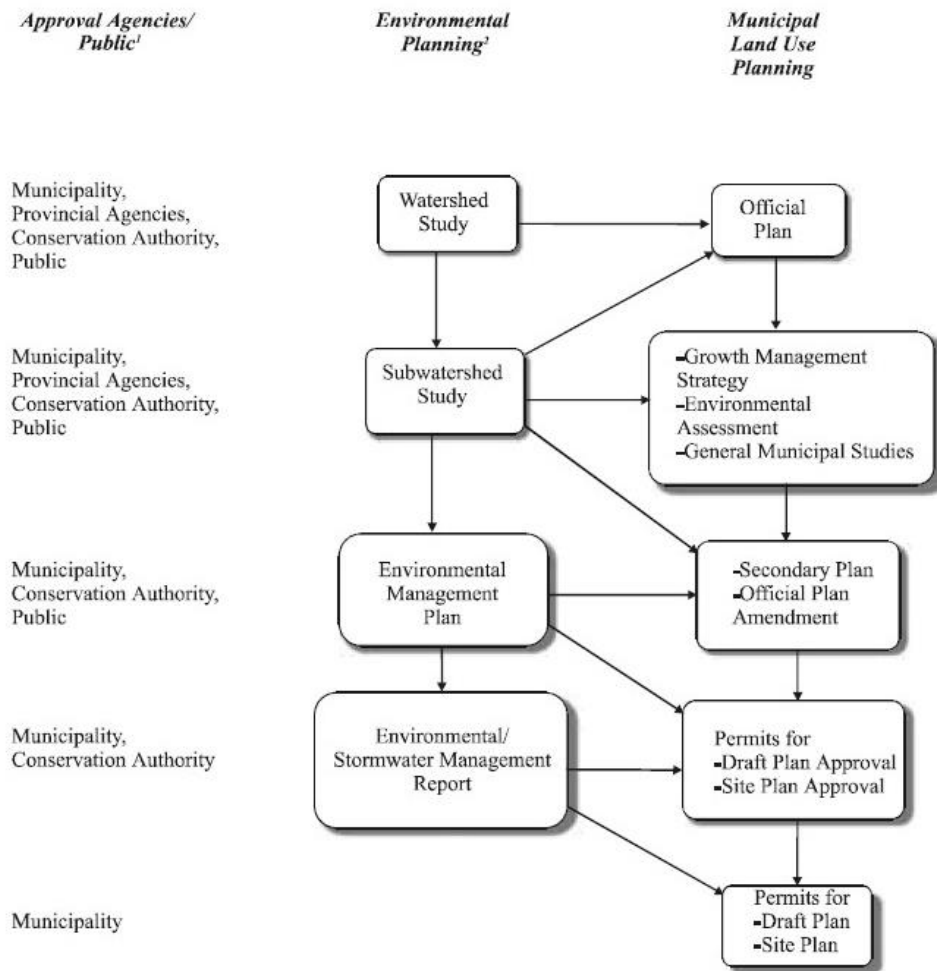


Figure 5. Environmental Planning and Municipal Land Use Planning Relationship. From MOE (2003) Stormwater Management Planning and Design Manual, Figure 2.1

In Halton Region, one of the first integrated environmental studies focussed on modern watershed planning principles was the Sixteen Mile Creek Watershed Plan (1996) conducted in support of the Halton Urban Structure Plan (HUSP). This Watershed Plan was inherently conducted at the broader watershed scale, however it identified smaller

tributary-based subwatersheds and also provided an inventory of resources in each subwatershed, along with key constraints and opportunities to be considered in future subwatershed studies. The Sixteen Mile Creek Watershed Plan involved hydrologic modelling (surface water) to assess impacts at a high-level associated with urbanization proposed within Halton (predominantly in north Oakville, Milton and South Georgetown / Halton Hills).

Shortly after the release of the HUSP, Oakville and Milton initiated land use planning studies (North Oakville and Bristol Survey Phase 1), which included subwatershed studies. These early examples of subwatershed planning included detailed investigations of surface water, groundwater, stream morphology, fisheries, aquatic resources and terrestrial resources. These plans and studies provided a characterization of the subwatershed, focussed on the area proposed for land use change (i.e. Secondary Plan Area). An impact assessment was conducted and management strategies developed accordingly, followed by implementation guidance and monitoring protocols.

Watershed and subwatershed planning has been an important component of sound environmental planning in Halton Region for many years. The ROP introduced the requirement of subwatershed planning for greenfield developments in 2006, and includes watershed and subwatershed objectives in Section 145(9) which provide guidance on study content, as detailed in the Background Review and Policy Audit Memos. While ROP policies provide a framework to guide watershed and subwatershed planning within the Region, further policy integration of watershed and subwatershed planning with land use and infrastructure planning is recommended.

3.1.2 Summary of Best Practices

As noted in the Background Review, the Province of Ontario has released a draft document, Watershed Planning in Ontario – Guidance for Land Use Planning Authorities, DRAFT February, 2018. This document has been under preparation for some time and has involved engagement with various stakeholders across the Province, including municipalities, conservation authorities, consultants, developers, Indigenous communities and other interest groups.

The document attempts to cover both Watershed Planning and Subwatershed Planning. While the core phased task structure from the earlier plans cited above remains, the Province has slightly amended these to:

- Phase 1 - Existing Conditions
- Phase 2 - Impacts, Scenarios and Directions
- Phase 3 - Watershed Plan Implementation

The current best practices document offers a number of newer considerations and concepts not contemplated in the earlier plans, including:

- Water budgets and water conservation plans
- Climate change planning
- Integration of water and wastewater servicing in addition to stormwater
- Landscape based analyses

Furthermore, the document advocates for enhanced public and Indigenous consultation and engagement, including opportunities for stewardship and education.

The current guidance document for Watershed Planning notably aligns its terminology with that of the PPS, Growth Plan and Greenbelt Plan, specific to its definition of the Water Resources System, comprised of:

- Groundwater features and areas
- Hydrologic functions
- Natural heritage features and areas
- Surface water features and areas

To this end, the current guidance document provides a step-wise outline of how to identify the Water Resource System:

- Step 1 - Determine what information already exists and identify gaps
- Step 2 - Undertake review or studies to identify water resource system features
- Step 3 - Identify functions and interrelationships
- Step 4 - Identify linkages to support connectivity

3.1.3 Interpretation of Provincial Watershed Planning Guidance

The Provincial Watershed Planning Guidance document remains under review and is currently acknowledged to be a “working” draft. As such, many of the proposed approaches remain unvetted, and can at best be characterized as recommendations. Based on extensive practitioner experience, there are a number of concerns with respect

to the document and its guidance, however for the purpose of the Halton's Natural Heritage System ROPR, the following insights hold important relevance:

- As an overarching commentary, the Watershed Guidance document continues to confuse the requirements of Watershed Plans versus Subwatershed Plans; there is a fundamental difference and this needs to be better clarified and addressed accordingly.
- Numerous references are made to outdated Provincial guidance documents (e.g., Technical Guide River and Stream Systems: Flood Hazard Limit, 2001) or emerging draft documents (i.e. Draft LID SWM Guidance Manual, 2017); neither is helpful and must reflect approved and contemporary practices.
- In terms of water resource system elements, there is an acknowledgement that much of the information exists, making reference to municipal and provincial databases on Natural Heritage System, subwatershed plans, monitoring data, etc. However, much of the data is quite dated and the recommended methods and protocols may vary widely. These aspects need to be considered when assembling and vetting the data for use in planning studies.
- Field studies are suggested to fill gaps, which is strongly supported. Although some protocols are provided for some features, the list presented is not exhaustive and some are under provincial review (i.e. Ontario Wetland Evaluation System). It is suggested that the techniques be aligned with current and accepted protocols and in each case, detailed Terms of Reference need to be prepared and reviewed in advance of field studies.
- The Provincial Watershed Planning Guidance suggests that on a NHS scale, linkages need to be considered to support connectivity, however limited acknowledgement is provided as to the role of water resource systems in achieving these objectives.

The Halton Area Planning Partnership (HAPP) provided comments on the Watershed Guidance document in the Watershed Planning Guidance Joint Submission (April 6, 2018). Many of the comments reflected similar concerns to those listed previously, which included the following insights:

- The Guidance document does not clearly distinguish between the scope and scale of watershed and subwatershed plans.
- Municipalities are directed to identify the water resource systems as part of the watershed characterization work, however delineating key features and areas at the

watershed scale may result in unrefined data. The Joint Submission recommends municipal data should be used to refine the water resource system where appropriate policies are in effect.

- The Guidance document does not clearly distinguish guidance from policy. It contains overly prescriptive language that goes beyond Provincial policy and does not distinguish between the requirements of watershed planning versus a watershed plan.
- Additional guidance is required regarding the transition of watershed planning in order to avoid delays to ongoing review processes.
- The structure of the document is challenging to follow; distinguishing between technical guidance and background information would benefit the reader.

3.1.4 Approaches of Other Municipalities

Watershed (subwatershed) planning has largely been led by municipalities and conservation authorities, as provincial guidance has only recently emerged with the release of the Provincial DRAFT Watershed Planning Guidelines in 2018 and updates to the Greenbelt Plan in 2017 and Growth Plan in 2019. Accordingly, official plans which have been recently updated are more likely to capture best practices for watershed planning. Two neighbouring Regional municipalities have recently undertaken an official plan update, namely the Region of Peel Official Plan (2017) and the Region of Durham Official Plan (2016).

The Region of Peel Official Plan 2017 (Peel ROP) provides high-level guidance regarding watershed planning (2.2.4.1), stating that the Region will work jointly with the area and neighbouring municipalities, conservation authorities, and other provincial agencies to determine the requirements for watershed and subwatershed plan content, monitoring, planning and scheduling.

The Peel ROP provides additional requirements regarding watershed planning in the form of water related studies in Sections 2.2.9.21 through 2.2.9.25. The Peel ROP states it will prepare watershed plans, in partnership with the local municipality and conservation authority, including water budgets and water conservation plans for every watershed in Peel having streams originating in the Moraine, in order to meet the Oak Ridges Moraine Conservation Plan (ORMCP) requirements. The Peel ROP states it will incorporate, by official plan amendment, the applicable objectives and requirements of a completed watershed plan into the ROP. It includes additional policy to ensure the impervious surface area within a subwatershed does not exceed 10 percent, and that a minimum of

30 percent of a subwatershed located within the ORMCP area has self-sustaining vegetation.

The Region of Durham Official Plan (Durham ROP) (2016) addresses watershed planning at a high-level as well, stating watershed plans will be completed in accordance with currently accepted practices. The Durham ROP states that it will ensure appropriate policies are incorporated into the Regional and area municipal official plans to implement individual watershed plans.

Credit Valley Conservation published Watershed Planning and Regulation Policies in 2010 which takes a natural heritage systems (NHS) approach to watershed planning by recognizing that individual natural features and areas have important ecological linkages that need to be maintained in order to achieve a healthy sustainable ecosystem. The NHS approach recognizes that the watershed is the ecologically meaningful scale for planning and is an integrated system of human and natural processes and requires an integrated and comprehensive approach to watershed planning.

3.1.5 Key Takeaways

Halton may consider the following key takeaways for policy refinement related to watershed planning:

- The *Provincial DRAFT Watershed Planning Guidelines* (2018) provide new guidance for watershed planning in Ontario, with best practices for key component undertakings, including water budgets and water conservation plans, climate change planning, integration of water and wastewater servicing, and landscape based analyses. As noted above, the document continues to require refinements in order to accurately capture best practices for watershed planning across Ontario.
- The neighbouring Regional Official Plans and approaches to watershed planning remain relatively high-level and may inform the Halton ROP, however, they do not necessarily represent best practices. Watershed planning should take a comprehensive approach that recognizes the integrated system between the natural heritage system and water resource system, and best practices should continue to be monitored and evaluated as they evolve.

3.2 Water Resource Systems

The identification of water resource systems and their components, as commonly defined elements, has only recently emerged in provincial policy. As such, there is limited policy guidance that addresses best practices regarding water resource system identification and management.

Subwatershed Studies provide inventories and assessments of water resource system features within a subwatershed. They identify key hydrologic functions and key hydrologic areas, and consider existing conditions and future conditions associated with urban development and other impacts. In the absence of specific policy, Subwatershed Studies provide a basis for establishing best practices for water resource system identification and management, as they inherently apply current best practices in their characterization and management recommendations for water resource system features.

As part of the Background Review technical memorandum, Wood reviewed twelve Subwatershed Studies completed in Halton Region. The Subwatershed Studies were reviewed to determine which features of the water resource system had been assessed, and the methodology used for the assessment of each feature in order to evaluate and consider best practices for their identification and classification. These findings are provided in detail in Appendix A of the Background Review, Subwatershed Study Findings.

Wood identified the three Subwatershed Studies that applied the most contemporary best practices (two studies located in Halton and one supplementary study located in Markham):

- South Milton Urban Expansion Area Subwatershed Study (2018-ongoing)
- Vision Georgetown Subwatershed Study (2017)
- North Markham Future Urban Area (2018)

Given the lack of specific policy addressing best practices for water resource systems, Wood has taken the following approach to seeking best practices:

- Summarize Provincial Plans and policy updates to define the water resource system and its features.
- Summarize available guidelines and policies regarding best practices for individual feature identification and classification.

- Supplement policy with best practices employed in the Subwatershed Studies.

The identification of best practices will support the determination of preferred methodologies to be applied in the identification and classification of water resource system features and areas for the information to be considered accurate and supportable. The Subwatershed Studies completed in Halton Region will be assessed against this standard as part of the pending mapping audit and will determine which features are viable for incorporation into the Region's water resource system mapping.

3.3 Water Resource Systems Definitions

The Provincial Policy Statement (PPS) 2014/2020, the Growth Plan 2019 and the Greenbelt Plan 2017 were each updated in the last five (5) years to include the requirement for planning authorities to identify water resource systems and their features/areas to facilitate their management and protection.

The PPS 2020, Section 2.2.1(d), states that "planning authorities shall protect, improve or restore the quality and quantity of water by identifying water resource systems consisting of ground water features, hydrologic functions, natural heritage features and areas, and surface water features including shoreline areas, which are necessary for the ecological and hydrological integrity of the watershed".

The Growth Plan 2019 expands on this, stating that "water resource systems will be identified, informed by watershed planning and other available information, and the appropriate designations and policies will be applied in official plans to provide for the long-term protection of key hydrologic features, key hydrologic areas, and their functions" (Section 4.2.1.2).

The Growth Plan 2019 provides the following pertinent definitions related to water resource systems:

- *Water Resource System:* A system consisting of ground water features and areas and surface water features (including shoreline areas), and hydrologic functions, which provide the water resources necessary to sustain healthy aquatic and terrestrial ecosystems and human water consumption. The water resource system will comprise key hydrologic features and key hydrologic areas.

- *Ground water features:* Water-related features in the earth's subsurface, including recharge/discharge areas, water tables, aquifers and unsaturated zones that can be defined by surface and subsurface hydrogeologic investigations. (PPS, 2020)
- *Hydrologic function:* The functions of the hydrological cycle including the occurrence, circulation, distribution and chemical and physical properties of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere. This includes and interactions between water and the environment including its relation to living things. (PPS, 2020)
- *Key Hydrologic Areas:* Significant groundwater recharge areas, highly vulnerable aquifers, and significant surface water contribution areas that are necessary for the ecological and hydrologic integrity of a watershed.
- *Key Hydrologic Features:* Permanent streams, intermittent streams, inland lakes and their littoral zones, seepage areas and springs, and wetlands.
- *Significant Groundwater Recharge Area:* An area that has been identified as:
 - as a significant groundwater recharge area by any public body for the purposes of implementing the PPS 2020;
 - as a significant groundwater recharge area in the assessment report required under the Clean Water Act, 2006; or
 - as an ecologically significant groundwater recharge area delineated in a subwatershed plan or equivalent in accordance with provincial guidelines. For the purposes of this definition, ecologically significant groundwater recharge areas are areas of land that are responsible for replenishing groundwater systems that directly support sensitive areas like cold water streams and wetlands (Greenbelt Plan, 2017).
- *Significant Surface Water Contribution Area:* Areas, generally associated with headwater catchments, that contribute to baseflow volumes which are significant to the overall surface water flow volumes within a watershed. (Greenbelt Plan, 2017)
- *Surface Water Features:* Water-related features on the earth's surface, including headwaters, rivers, stream channels, inland lakes, seepage areas, recharge/discharge areas, springs, wetlands, and associated riparian lands that can be defined by their soil moisture, soil type, vegetation or topographic characteristics. (PPS, 2020)
- *Vegetation Protection Zone:* A vegetated buffer area surrounding a key natural heritage feature or key hydrologic feature. (Greenbelt Plan, 2017)

The Greenbelt Plan 2017 provides additional guidance regarding key hydrologic features and key hydrologic areas (Section 3.2.5), stating they include:

Key Hydrologic Features, including:

- Permanent and intermittent streams;
- Lakes (and their littoral zones)
- Seepage areas and springs; and
- Wetlands.

Key Hydrologic Areas, including:

- Significant groundwater recharge areas;
- Highly vulnerable aquifers; and
- Significant surface water contribution areas.

The Niagara Escarpment Plan (NEP) 2017 reiterates this definition for key hydrologic features in Section 2.6.1. The notable difference in the NEP 2017 definition of key hydrologic features is the inclusion of lakes (and their littoral zones), as opposed to inland lakes as defined in the PPS 2014.

The PPS 2020 defines large inland lakes as waterbodies that have a minimum surface area of 100 square kilometers where there is not a measurable or predictable response to a single runoff event. Apart from the Great Lakes, no additional large inland lakes exist in Southern Ontario. Rather, many of the lakes that exist in Southern Ontario and Halton Region are kettle lakes.

While the PPS 2020 identifies inland lakes as a hydrologic feature, the Greenbelt Plan 2017 and NEP 2017 simply identify lakes as a key hydrologic feature. The Oak Ridges Moraine Conservation Plan 2002 further expands on this definition and identifies kettle lakes and their surface catchment areas as hydrological features. As there are no inland lakes in Halton Region in addition to Lake Ontario, and many of the lakes are kettle lakes, it represents best practice to include kettle lakes in the definition of key hydrologic features in order to account for their presence and role in the water resource system.

Accounting for all provincial policy requirements and additional policy guidance, the water resource system will consist of groundwater systems, surface water systems, key hydrologic features, areas and functions, and include:

- Surface Water Features (and their functions):
 - Watercourses: Rivers, permanent and intermittent streams, and stream channels;

- Inland lakes and their littoral zones, and kettle lakes;
 - Wetlands;
 - Riparian areas and vegetation protection zones;
 - Shoreline areas and shoreline natural areas;
- Ground Water Features (and their functions):
 - Headwaters and significant surface water contribution areas;
 - Seepage areas and springs, discharge areas;
 - Significant groundwater recharge areas (ecological and drinking water source); and
 - Aquifers and unsaturated zones and highly vulnerable aquifers.

3.4 Watercourses: Rivers, permanent and intermittent streams, and stream channels

3.4.1 Summary of Existing Approaches

Historically, watercourses have been identified based upon a review of topographic mapping, watercourse mapping, and air photos. The features have typically been verified by field reconnaissance, and assessed by detailed analyses of the fluvial geomorphological and aquatic ecology of the features. The constraint rankings are established by an integrated and multi-disciplinary review of the engineering hazards, terrestrial and aquatic ecology, hydrogeologic interactions, and fluvial geomorphological characterization.

3.4.2 Summary of Best Practices

The best practices associated with the classification and characterization of watercourses have evolved through Subwatershed Studies. The most current practices applied in recent Subwatershed Studies involves a higher degree of integrative support and multi-disciplinary assessment of the features, based upon the surface water, groundwater, aquatic ecology, terrestrial ecology, and fluvial geomorphologic conditions within the features. The characterization of the features is similarly discipline-specific, and in part incorporates the following guidance documents:

- The Stream Permanency Handbook for South-Central Ontario (MNR, 2003) which details the assessment practice to classify the feature as ephemeral, permanent, or intermittent and associated management options.
- River & Stream Systems Technical Guides (MNR, 2002) which provides guidance for defining the flood and erosion hazard for watercourses.

The guidance from these documents and others is complemented by varying degrees of field reconnaissance to further characterize the watercourse features. The following summarizes some of the information which provides input to characterizing watercourse features:

- Classification of flow conditions within feature (i.e. ephemeral, permanent, or intermittent).
- Low flow contributions from drainage infrastructure.
- Size of contributing drainage area to feature and associated extent of regulatory floodplain.
- Characterization of system as confined or unconfined.
- Quality and abundance of fish habitat within the watercourse.
- Value of terrestrial features within watercourse corridor and adjacent floodplain.
- Channel substrate classification, and bankfull geometry.
- RGA and RSAT assessment to determine the stability and permanence of the feature.
- Meander beltwidth and erosion limit.

This information is used to establish the constraint ranking for the watercourse (i.e. "high", "medium", or "low"). The constraint ranking, in turn, leads to the management approaches for the feature. It is noteworthy that, under current practices, watercourses previously classified as "low" constraint features represent headwater drainage features. Consequently, under current practices, "low" constraint watercourses are assessed separately and more formally as headwater drainage features, as discussed further below. All "medium" or "high" constraint watercourses are classified as regulated watercourses.

3.4.3 Key Takeaways

The classification and characterization of watercourses has been developed as a component of Subwatershed Studies to establish recommendations for the management of these features in future urban land use plans. Although no formal documentation or guidelines exist specific to the classification and characterization of watercourses, current

best practices have built upon applicable technical guidelines and field studies associated with each discipline providing input to the overall characterization and management recommendations. Ultimately, the final classification and management recommendations are determined with consideration for site-specific conditions, hence necessarily requires a consultative process between the technical specialists and the agencies and regulators. Under current best practices, the distinction between headwater drainage features and watercourses results in the classification of all watercourses as regulated watercourses, under the Conservation Authorities Act. These features are considered key hydrologic features and are subject to all associated Provincial and Regional policies.

3.5 Waterbodies: Inland lakes and their littoral zones and kettle lakes

3.5.1 Summary of Existing Approaches

Historically, waterbodies have been mainly identified on a presence/absence basis, based upon a review of topographic mapping and air photos, and verified through field reconnaissance. The site investigations may also have included assessments of the ecological significance of the feature from a terrestrial and/or aquatic perspective, as well as characterization of the hydrologic and hydrogeologic function of the feature.

3.5.2 Summary of Best Practices

Contemporary practices have evolved to further define the zone of influence of the feature on terrestrial and aquatic environments, defining the feature's ecological, hydrologic, and hydraulic functions. Waterbodies are typically identified in conjunction with watercourse assessments and constraint ranking, and evaluated for significance on terrestrial and aquatic ecology.

Field data collection and associated modelling techniques associated with defining bathymetry have advanced and are able to more accurately assess influence areas and functions, resulting in improved modelling of system functionality (i.e. influence of loads on receiving systems). Hydrologic characterization of the feature may be undertaken to inform understanding and management alternatives regarding the water budget or water balance.

Natural infrastructure is increasingly recognized in Southern-Ontario for its important role in providing watershed services and off-setting impacts on water quality and quantity. Identification of these features and their functions as natural infrastructure facilitates their management and allows managing authorities to recognize their value within an asset management framework.

3.5.3 Key Takeaways

Currently, no formal documentation exists related to establishing best practices for characterizing waterbodies and determining their management requirements. Current practice requires input from conservation authorities, both upper and lower tier municipalities, and MNRF, with consideration for site-specific conditions. In many instances, the management requirements for these features is integrated with requirements to manage groundwater systems and/or water budget or water balance.

3.6 Groundwater: Seepage areas and springs, discharge areas, significant recharge areas, aquifers and unsaturated zones

3.6.1 Summary of Existing Approaches

Seepage areas and springs, discharge areas, significant recharge areas, aquifers and unsaturated zones all represent locations of hydrogeologic importance. Historically, these locations have been identified based upon a review of available mapping and a characterization of the area groundwater resources. These are typically based upon a desktop review of soils data and basic modelling with findings were verified through field reconnaissance. This may have included field monitoring of groundwater levels and/or groundwater modelling, or field investigations integrated with assessments of the terrestrial and/or aquatic ecology to confirm whether the findings related to the groundwater interaction are supported by the terrestrial and aquatic species found in the area.

3.6.2 Summary of Best Practices

Best practice for the delineation and characterization of seepage areas, springs, discharge areas, significant recharge areas, aquifers and unsaturated zones have all undergone recent comprehensive analysis of their role in the groundwater system as a whole. In

particular, integrated groundwater and surface water modelling has been completed recently to identify potential locations of recharge/discharge zones.

As a requirement of the Clean Water Act, Source Protection Committees (SPCs) must prepare a Terms of Reference, an Assessment Report and a Source Protection Plan for each Source Protection Area (SPA) that they represent. A required component of the Assessment Report is the identification of wellhead protection areas, intake protection zones, highly vulnerable aquifers, and Significant Groundwater Recharge Areas (SGRAs).

The best practices associated with the assessment of groundwater recharge areas are provided in *Delineation of Significant Groundwater Recharge Areas: Supplemental Technical Guide* (AquaResource, 2012), prepared for the Ministry of Natural Resources and North-Bay Mattawa Conservation Authority. The assessment involves the determination of the threshold for high recharge areas, identifying the spatial scale for averaging, determining the linkage to drinking water systems, and applying professional judgement.

An assessment of the groundwater system is supported by field reconnaissance which provides the following input to define key features and areas:

- Definition of the local and regional geology and hydrogeology.
- Identification and evaluation of the functional relationships and interactions groundwater has with the existing surface watercourses and terrestrial resources.
- Assessment of groundwater uses in the area.
- Assessment of shallow depth to groundwater, seepage areas and areas of potentially strong upward hydraulic gradient.
- Assessment of mapping and cross-sections to identify and delineate aquifer systems.
- Development of groundwater and surface water modelling to identify significant recharge areas, locations of shallow groundwater table, seepage areas, and water budget.

3.6.3 Key Takeaways

The identification of core components of the groundwater system is a requirement of Source Protection Plans and related Assessment Reports. Integrated groundwater and surface water modelling is also an important element to the comprehensive understanding of the groundwater system features, areas and their functions. Detailed

and integrated modelling allows for the assessment of pre-development conditions and the evaluation of impacts of future scenarios to develop management strategies. A consistent approach between Source Water Protection Committees and municipal policy is fundamental to groundwater protection and planning. Future ROP review processes should continue to include a review of the Source Protection Area Assessment Reports completed by the respective conservation authorities, to ensure Regional policy incorporates current groundwater system findings. The creation of Subwatershed Study Guidelines is recommended to specify field reconnaissance and modelling requirements that should be included in all Subwatershed Studies undertaken within the Region to provide an accurate assessment of the groundwater system.

3.7 Headwaters and significant surface water contribution areas

3.7.1 Summary of Existing Approaches

Headwater areas have historically been identified through a review of topographic and watercourse mapping to delineate subcatchments, including a review of air photos to identify headwater areas and features. Field reconnaissance was then conducted to verify and characterize the feature(s). Historically, a multi-disciplinary assessment has been adopted for headwater features as part of watercourse constraint evaluation. Typically, headwaters (or small streams (Schollen & Company Inc., 2008)) were recognized as contributing to ecosystem value but normally these features were 'lost' and their functions replicated through stormwater management. Drainage density was used as a surrogate to ensure sufficient stream length to manage impacts, however this approach has led to less prescriptive and locally relevant management, hence leading to the adoption of headwater drainage feature management.

3.7.2 Summary of Best Practices

More recent practice has applied the headwater drainage features classification protocol to characterize and evaluate the features and establish management requirements accordingly. Best practices regarding headwaters management is provided in *Evaluation, Classification and Management of Headwater Drainage Features Guidelines* (CVC & TRCA, 2014). The evaluation of the feature involves background review and field investigations regarding presence of sensitive biota, feature form and flow and the proposed activity, among others. The feature is then classified based on the value it provides for various functions. These classifications include:

- *Hydrology Classification* to determine the permanency of the feature
- *Riparian Classification* to identify whether the feature has wetland characteristics (i.e. vegetation type and width)
- *Fish and Fish Habitat Classification* determines whether feature is permanent or seasonal and how it contributes to fish habitat
- *Terrestrial Habitat Classification* identifies the habitat and linkage value provided by the feature

Management recommendations are provided based on the classification of the feature, such as:

- Protection (important functions)
- Conservation (valued functions)
- Mitigation (contributing functions)
- Recharge Protection (recharge functions)
- Maintain or Replicate Terrestrial Linkage (terrestrial functions)
- No Management Required (limited functions)

3.7.3 Key Takeaways

The classification process for headwater drainage features mirrors the classification process for watercourses in that it is a multi-disciplinary undertaking, where current best practices have built upon applicable technical guidelines and field investigations associated with each discipline providing input to the overall characterization and management recommendations. Ultimately, the final classification and management recommendation is determined with consideration for site-specific conditions, hence necessarily requires a consultative process between the technical specialists and the agencies and regulators. The management practices need to be carefully considered in the context of the land use planning to ensure that there is a correlation between function and form on the landscape.

Key hydrologic features are generally features that are regulated by the Conservation Authorities. Currently, headwater drainage features (HDFs) are not regulated by the Conservation Authorities per Provincial legislation. The HDF classification process provides management recommendations for the headwater drainage feature. Whether or not HDFs that are classified as "protection" would be regulated by the Conservation Authorities is understood to be a subject of discussion among Conservation Authorities. Should the decision be to regulate HDFs classified as "protection", they would likely be

considered key hydrologic features, and be subject to all Provincial and Regional policies associated with the protection of key hydrologic features, such as Section 2.4.3 and 2.4.4 of the Growth Plan. The Growth Plan 2019 definitions for Significant Surface Water Contribution Areas and Surface Water Features focus on the value of headwaters in relation to the groundwater contribution functions they provide. This is reflected in the hydrology classification of the HDF protocol, which assigns the highest value of “important functions” to features which are present throughout the year as a result of year round groundwater discharge (among other factors). HDFs that are classified as “conservation”, “mitigation”, or “no management” do not include any HDFs which are characterized as providing important hydrology, hence would not be regulated by the Conservation Authorities; consequently, HDFs classified for “conservation” or lesser would generally not be considered key hydrologic features.

3.8 Shoreline areas and shoreline natural areas

3.8.1 Summary of Existing Approaches

Shoreline areas are generally identified based upon a desktop review of regulatory mapping from Conservation Authorities and water levels determined based upon long-term monitoring data collected by Environment Canada. Recession rates are determined using aerial imagery, cross-sections and mapping, and may inform erosion hazard limits and development setbacks. Field reconnaissance may be completed to further characterize the areas.

Shoreline Management Plans have been a common practice in Ontario for shoreline management, with plans existing for Lake Ontario, Lake Erie and Lake Huron. Conservation Halton has additional policy regarding hazard limits and development setbacks to manage shoreline areas.

3.8.2 Summary of Best Practices

As part of the Lake Huron Shoreline Management Plan Update, St. Clair Region Conservation Authority undertook a review of recession rate analyses (Baird, 2018). The review identified best practices in establishing recession rates including the selection of the highest quality data available for the unprotected shoreline. Considerations for datasets include quality, accurate feature definition, spatial resolution, and a scale that provides the longest temporal period available. Shoreline reconnaissance may be

completed to further characterize the areas, including site visits to collect water levels, wind information, and photographs (Baird, 2009).

In developing shoreline management recommendations, best practices include:

- Delineating reaches based on factors such as geology and recession rates.
- Defining the flood hazard limit, considering flood levels and climate change impacts.
- Defining the erosion hazard limit, considering slope stability and recession rates.
- Defining dynamic beach hazards, considering flood and erosion hazard limits.
- Mapping hazards.

The delineation of shoreline reaches and identification of shoreline hazards may be used to inform policies regarding flood hazard limits, erosion hazard limits, and development criteria.

3.8.3 Key Takeaways

Identification of shoreline areas and hazards requires consideration for the associated impacts on other elements of the water resource system, especially in the context of changing water levels due to climate change. Management of shoreline areas involves policy related to flooding and erosion hazard limits, as well as development criteria. The correlation between shoreline area management and land use planning must be carefully considered when developing management practices and policies to ensure the local context and the perspectives of the managing authorities are accurately addressed.

3.9 Wetlands

3.9.1 Best practices for identification and management

Wetlands are a key feature of both the water resource system and the NHS, however they are largely regulated through natural heritage policies due to the ecological functions and services they provide, and as such have not been addressed in detail in this section of the report; rather the reader is referred to the ecology section of the *Background Review Technical Memo*. The Ontario Wetland Evaluation System (OWES) is used to identify significant wetlands and to inform land use and resource use decisions and is discussed in Section 2.8 of the *Background Review*, the MNR Wetland Conservation Strategy 2017. A series of actions the Ontario government may undertake as part of the

strategy are identified, which include improving Ontario's wetland inventory and mapping by standardizing wetland mapping techniques and developing monitoring frameworks to assess trends. These actions provide an indication of what the Ontario government considers best practices to be regarding wetland identification and management and are further discussed in Section 2.8 of the *Background Review*.

3.10 Riparian areas and vegetation protection zones

3.10.1 Best practices for identification and management

Riparian areas and vegetation protection zones (also referred to as buffers) are key elements of both the water resource system and natural heritage system, and are discussed in more detail in *Section 3.7 Buffer Width Determination and Buffer Width Refinement Frameworks* in this document.

SECTION 4.0 NEXT STEPS

The *Review of the Regional Official Plan Natural Heritage System Policies + Mapping* project provides an opportunity to examine policies and mapping that may need to be updated, enhanced, and refined based on evolving land use trends, the Provincial Policy Statement 2020, the applicable 2017 Provincial Plans (Greenbelt Plan and Niagara Escarpment Plan), Growth Plan 2019 and the recently released Provincial Natural Heritage System mapping.

Phase 2 of the *Review of the Regional Official Plan Natural Heritage System Policies + Mapping* project provides detailed policy recommendations for the Regional Official Plan, utilizing a series of four Technical Memos and a Natural Heritage System Report.

This report is the Best Practices Review Technical Memo. The other Technical Memos are:

- Background Review Technical Memo;
- Policy Audit of the ROP Technical Memo; and
- Mapping Audit Technical Memo.

The Technical Memos will be the subject of stakeholder and public consultation with outputs of this process informing the production of the Natural Heritage System Report with recommendations on policy and mapping refinements to be taken into Phase 3 of

the *Review of the Regional Official Plan Natural Heritage System Policies + Mapping* project.

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