

Appendix E

Existing Environmental Conditions

Assessing Vaughan's Natural Heritage System

Vaughan Transportation Master Plan





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1. Background

The spirit and intent of this paper is to build upon existing studies, and provide a clear direction for the City of Vaughan to develop integrated transportation and planning solutions, while preserving and enhancing the City's critical ecological infrastructure – essentially its life support system. This can be achieved by making more efficient use of its transportation system through investments in public transit, cycling and walking, transportation demand management (TDM) measures, and other sustainable modes of travel. As such, this TMP supports the sustainable goals and policies of the Vaughan Vision 2020 plan and the Vaughan Environmental Master Plan (EMP), which embrace:

“A city of choice that promotes diversity, innovation and opportunity for all citizens, fostering a vibrant community life that is inclusive, progressive, environmentally responsible and sustainable.

While it is recognized that new population and employment growth will create the need for new or widened roads, these transportation improvements must be integrated with the broader urban structure, and be planned, designed and implemented in an environmentally sustainable way. Gone are the days when the most conventional means to manage traffic growth was through expanding the infrastructure. Today, the City of Vaughan requires a fresh approach to manage growth responsibly, by balancing the need for new infrastructure with the need to promote more sustainable travel modes – all while protecting the City's natural heritage features and functions.

Symbolic of this balance, a recent public opinion poll conducted for the York Region Transportation Master Plan Update indicated that nearly the same percentage of Vaughan residents supported transit as a way to address traffic congestion as those who sought improving its road capacity.¹

To ensure consistency with the City's Official Plan, the Vaughan TMP will comply with the Environmental Principles developed for *Official Plan Amendment (OPA) 600* (City of Vaughan, 2000), that asserts:

- i. The City shall preserve, protect and where possible enhance Vaughan's environmental resources to ensure that they are not compromised by urban development and its related activities;
- ii. The City shall employ an ecosystems approach in its future planning to ensure that planning decisions are made with an understanding of the environmental, social, cultural and economic implications for Vaughan and other influences on the same ecosystem; and,
- iii. The City shall follow the fundamental principles of sustainable development/sustainability in its future decisions, including: integration of environmental and economic decisions; stewardship; shared responsibility; prevention; conservation; recycling; enhancement; rehabilitation and reclamation; scientific and technological innovation; and global responsibility.

The Official Plan Amendment 600, Vaughan Vision 2020, local, regional and provincial policies have established clear guidelines that ensure environmental resources, including the natural heritage network, are

1. *Development of the York Region Transportation Master Plan, Public Opinion Survey, EKOS Research Associates, 2008.*



not compromised at the expense of new growth. This 'ecosystems approach' to planning and transportation also supports managing Vaughan's population and employment growth in a sustainable way, while meeting growth targets established by the *Places to Grow Growth Plan* (2006) while meeting the requirements of provincial policies, including the *Greenbelt Act (2005)* and *Oak Ridges Moraine Conservation Plan*.

Relative to this Transportation Master Plan, the primary goal is to ensure that Vaughan's transportation system functions efficiently and in a sustainable manner, which means the City will:

- Invest in more sustainable modes of transportation, including transit, TDM, HOV lanes, cycling lanes and trail networks;
- Support land use planning and urban design measures that encourage transit use, walking and cycling;
- Use sustainability indicators, benchmarks and other tools to monitor the achievements of its transportation system; and
- Minimize impacts on the natural environment in expanding its transportation infrastructure.

In order to ensure that the City's major natural heritage features are preserved for future generations, this existing conditions report was undertaken in the early stages of the TMP to avoid unacceptable potential conflicts with new transportation infrastructure well before implementation.

Existing conditions require a thorough and critical examination of Vaughan's Natural Heritage Network (NHN) and the various structures, functions and species that comprise the NHN. While this undertaking has essentially been completed within *City of Vaughan Natural Heritage in the City* (AECOM, July 2009), this paper helps to guide the strategic direction of the Vaughan TMP by making the City's natural environment one of the decisive factors in developing short-term and long-term transportation recommendations.

The natural heritage features, functions and structures discussed herein, are also supported by the Regional Municipality of York Official Plan (2009), within the Urban Structure Map and the Greenlands System Network Map. The NHN, therefore, serves as the basis from which all land use, transportation and planning decisions should be assessed.

Natural heritage in the City of Vaughan may be broken down into individual component parts consisting of bedrock and surficial geology; hydrology and hydrogeology; natural cover – forest cover, wetland cover, meadow, successional habitats, and biodiversity. Each component of Vaughan's Natural Heritage Network is explored in this section.



2. Bedrock and Surficial Geology, Hydrology and Hydrogeology

The distribution of subsurface materials influences the rate and direction of groundwater movement. Although characteristics of the underlying bedrock are important to understanding regional-scale aquifers and groundwater protection areas, the shallow overburden sediments are most relevant to this study, given their thickness and the relatively shallow impacts associated with potential development of the area.

2.1 Features

The bedrock and surficial geology features include:

- Regionally important groundwater recharge areas (Oak Ridges Moraine and glacier melt-water soil deposits).
- Discharge areas commonly associated with river valleys.
- Wetlands (approx. 0.7% of Vaughan's area).
- Water supply aquifers – multiple discontinuous aquifers exist throughout the area.

2.2 Importance

- Sustains a minimum flow of water to some streams, even during the dry months of summer.
- Moderates stream temperatures, particularly during hot summer days, and minimized stream temperature fluctuations.
- Groundwater upwelling supports wetland vegetation and animal habitat.
- Substantial below-ground construction that requires draining of groundwater can interfere with groundwater flow patterns and the volume of water discharging to wells and streams.
- Homes whose basements reach the groundwater table are more expensive to heat and maintain.

2.3 Where?

- Main areas of groundwater discharge are the river valleys.
- Primary areas of groundwater recharge are the Oak Ridges Moraine and glacier melt-water soil deposits.



2.4 Consequences

- Hydrologically sensitive areas are identified on the basis of surficial geology, groundwater recharge and discharge areas, and the locations of water wells. These areas are subject to relevant environmental legislation and policies, including the *Greenbelt Plan*, *PPS*, and *Places to Grow*.
- Proximity of infrastructure to recharge or discharge areas may affect water resources that are used by humans and/or support the natural environment.
- Reductions in upwelling in groundwater-fed wetlands could reduce vegetation diversity.
- Reduced discharge into particularly sensitive reaches of streams could also create an impact on fish habitat and spawning grounds (which trigger Federal Department of Fisheries and Oceans policies and regulations).
- Areas that are considered Source Water Protection Zones within Vaughan are subject to relevant policies of the *Ontario Clean Water Act (2007)*.
- The distinct hydrogeology and hydrology of the area must be protected and recognized for their importance to human health. Relevant activities must comply with existing legislation and policies including the *Lake Simcoe Protection Act*.
- Associated best practices (e.g., *MNR Natural Heritage Guidelines*) and municipal and government agency policies (e.g., *York Region Official Plan (2009)*, *Ont. Reg. 166-06*, and *TRCA Valley and Stream Corridor Management Plan*) should be adhered to the extent possible. These best practices/policies are in place to ensure that transportation and development projects occur in an environmentally appropriate and sustainable way, and following them ensures that the development review process is more streamlined and less costly.
- Best management practices, relative to protection of ground and surface waters, should be implemented to the extent possible.

Figure 1 depicts the surficial geological conditions throughout Vaughan.

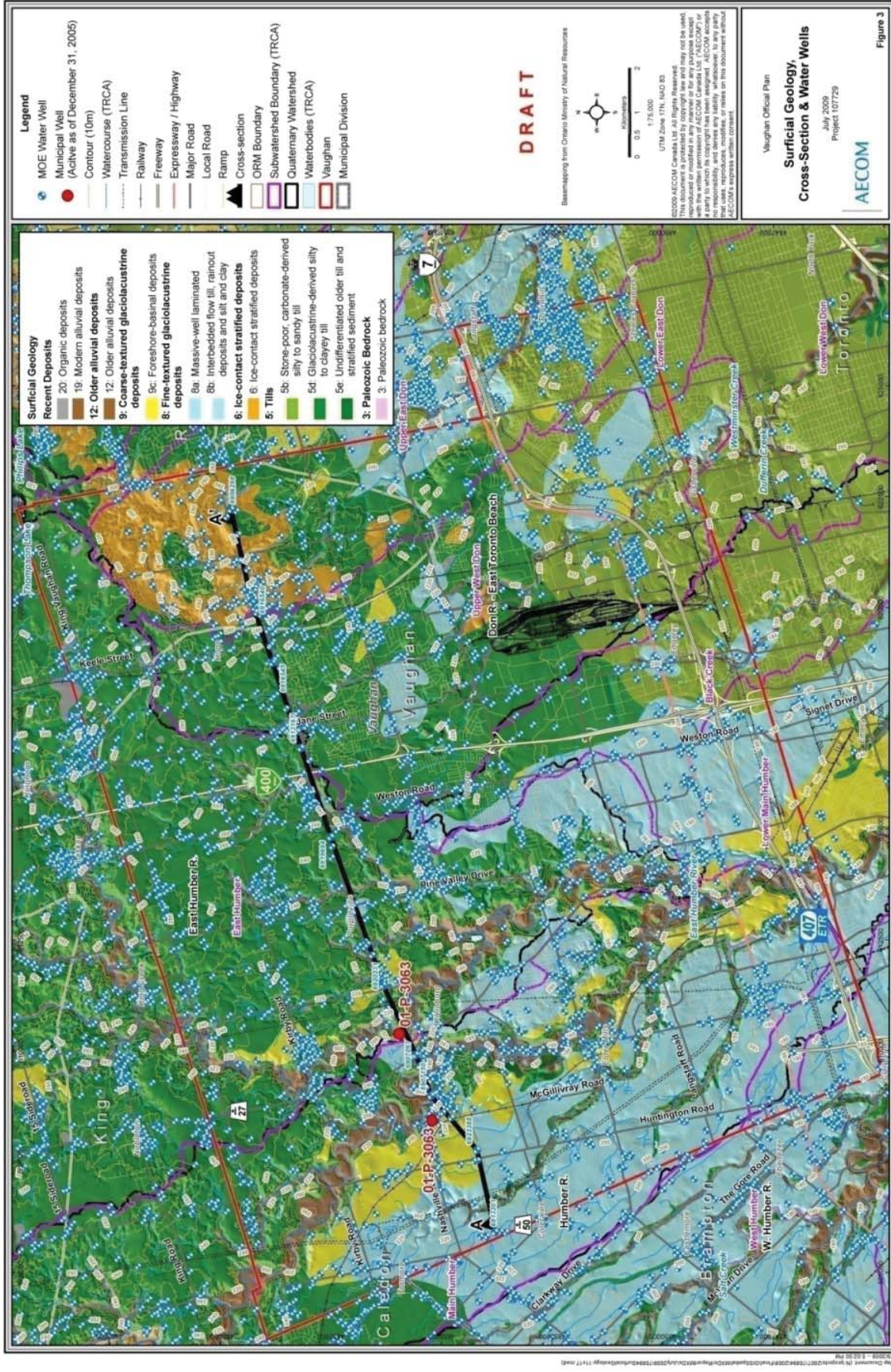


Figure 1. Vaughan's Surficial Geology



3. Drainage, Aquatic Habitat and Fisheries (including Water Quality)

Watercourses are a critical component of the Vaughan landscape. Streams, rivers, ponds and lakes provide valuable habitat for fish, amphibians (frogs, toads and salamanders), reptiles (turtles and snakes), insects and birds. They also provide a function to people living in the watershed, by supplying clean drinking water and opportunities for recreational activities such as hiking, fishing, bird watching and canoeing.

3.1 Fisheries and Aquatic Environment

Typically, natural heritage systems focus on the terrestrial portion of the landscape. However, as a system, the connections among terrestrial features (wetlands, woodlots and meadows), aquatic features (watercourses, ponds) and groundwater are important to recognize in order to identify appropriate land use policies.

The goal of this section is to identify unique characteristics of the aquatic environment that may require sensitive land use policies to maintain and/or enhance the health of the natural heritage system.

There are two primary watersheds in Vaughan (total area 27,500 ha) - the Humber River (18,001 ha in Vaughan) and the Don River (9,499 ha in Vaughan). These watersheds are further divided into subwatershed. Each watershed is described below, providing a general discussion of the water quality, common fish species, Species at Risk and presence of non-native species. Species respond to changes in habitat and their physical environment, so the presence or absence of a species can indicate changes to the aquatic environment. This can include changes in land use, nutrient inputs, water chemistry, riparian cover, and levels of contaminants. Using this information, stressors to the aquatic environment and areas that are sensitive to development can be identified. Areas that provide habitat for Species at Risk require special attention when considering development. The Redside Dace (*Clinostomus elongates*) and the Northern Brook Lamprey (*Ichthyomyzon fossor*) are both classified as Species at Risk, where the Redside Dace is endangered nationally and threatened provincially and the Northern Brook Lamprey is classified as a species of special concern, both nationally and provincially.

3.2 Significance and Sensitivity

The thermal regime and the hydrology of a watershed have a profound influence on the associated fisheries and fish habitat of a particular watercourse. Areas of high recharge (identified in the Hydrogeology section) contribute cold clean groundwater to downstream portions of the watershed. The degree of groundwater discharge, amount of riparian cover and stream morphology will influence the thermal regime, and the fish species occurring within a watercourse or portion of a subwatershed.



3.3 Sensitive Fish Areas

In determining Sensitive Fish Areas the following three primary criteria were used: a) The presence of a cold water thermal regime as determined through a management strategy or upon the characteristics of the fish community present; b) the presence of high fish species diversity; and, c) the presence of Species at Risk or locally uncommon species. These criteria were chosen because they indicate the presence of quality habitat and /or physical and biological functions that are susceptible to land use change. Several of the Sensitive Fish Areas met more than one of the criteria (e.g., coldwater fish species, and Species at Risk), whereas others were identified because only one criteria was met (e.g., presence of uncommon species). Due to consistency of some criteria, there is a definite overlap between the boundaries of the Sensitive Fish Areas identified in this report and the boundaries of the Fish Management Zones for the Don and Humber River watersheds.

Development within these Sensitive Fish Areas should follow the precautionary principle, and more detailed studies of the area may be required. Restrictions limiting the type of land use or densities permitted may be required, together with the use of innovative mitigation strategies and appropriate construction timing.

3.3.1 Species at Risk

Two fish Species at Risk occur in the Don River and Humber River watersheds - the Redside Dace and the Northern Brook Lamprey. The distribution of Redside Dace (*Clinostomus elongates*) in Canada is limited to southern Ontario and primarily within western Lake Ontario tributaries. Biological characteristics, habitat specificity and range limitations are three contributing factors that are theorised to affect the ability of the species to survive and thrive in southern Ontario.

The Redside Dace is a visual feeder and an insectivore; it relies on habitat attributes such as overhanging riparian vegetation as a source of food and shelter as well as relatively clear water conditions for observing prey. Suspended insects within the overhanging vegetation are the primary food source, and this species is capable of breaching the surface of the water in order to capture food. For these reasons, the habitat requirements of the species are very specific and are likely factors in limiting their distribution in Canada. Further to this, the southern Lake Ontario populations represent the northernmost extent of the species range, suggesting that climate likely contributes to the species distribution. Despite being a globally secure species, the Redside Dace is listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered (COSEWIC 2007) and is defined by CASSARO as Threatened within the Province of Ontario (OMNR 2006).

The Northern Brook Lamprey (*Ichthyomyzon fossor*) is classified as a species of special concern by both COSEWIC (COSEWIC 2007) and CASSARO (OMNR 2006). Its range includes the Mississippi and Great Lakes basins. It is found in clear streams, and spawning occurs in fast flowing areas with coarse gravel or rocky substrates. It is a non-parasitic filter feeder, and it feeds on organic detritus, algae and protozoans. The Northern Brook Lamprey is under threat from lampricide used to control the exotic sea lamprey, as well as changes in temperature and pollution.



3.3.2 Invasive Species

Invasive species pose a threat to native species by competing for resources and preying on other species. The Rusty Crayfish (*Orconectes rusticus*) is an invasive exotic species that can displace native crayfish species as well as heavily impact aquatic vegetation. Currently, this species is known to be found in only one location in Vaughan - in the East Don River near Rutherford Road. The Rusty Crayfish was found elsewhere in the Humber watershed in 2003.

3.4 Features

It is important to note that sampling has not occurred in all streams within the Don or Humber watersheds. For this reason, there may be other areas of high quality fish habitat that have not been identified. The following is a summary of the state of Vaughan's aquatic environment, its features and fisheries:

- Two primary watersheds: the Humber River (18,001 ha in Vaughan) and the Don River (9,499 ha in Vaughan).
- Cleanest water is associated with groundwater inputs from the Oak Ridges Moraine.
- Poorest water quality associated with the more highly developed southern portion of the watershed, largely attributed to point-source and non-point source pollution and runoff.
- Forty-eight fish species have been found within the Humber watershed.
- Thirty-five species have been identified within the Don River watershed.
- Two fish Species at Risk: the Redside Dace (*Clinostomus elongates*) and the Northern Brook Lamprey (*Ichthyomyzon fossor*).

3.5 Importance

- Water quality often determines the species found within a watercourse (e.g., some species are only found in pristine, undisturbed habitats while others tolerate more degraded conditions).
- High levels of nutrients such as nitrogen (and ammonia) and phosphorus can lead to excessive algal growth that can choke waterways and decrease oxygen levels in the water, harming fish and other wildlife.
- Nitrogen and phosphorus are commonly found in fertilizers and human or animal waste. High levels of nutrients can occur after heavy rains that wash excess fertilizer and waste into streams. Runoff also carries sediment from the surrounding land, which can decrease water clarity, impacting aquatic plants and other organisms.
- Chlorides from winter road maintenance can also have a negative impact on aquatic species.
- High levels of nutrients, suspended solids, bacteria and chlorides have been found in both the Don and Humber rivers.



3.6 Where?

- Watercourses and wetlands (please refer to **Figure 5** of this report).

3.7 Consequences

- Sensitive Fish Areas were identified on the basis of:
 - areas with cold water and cool water fish species
 - high fish species diversity, or
 - the presence of species at risk, or locally uncommon species
- These areas have quality habitat and /or the presence of physical and biological functions that are susceptible to land use change.
- As a result, the following strategies are recommended:
 - Development within these Sensitive Fish Areas should follow the precautionary principle, and more detailed studies of the area may be required;
 - Above and beyond statutory requirements and construction best practices, development control measures and conditions of approval should be implemented for new transportation infrastructure, to ensure that it meets high environmental sustainability criteria. Bridges should not be constructed across areas with wetlands, fish habitat or where species at risk, or locally uncommon species are present. Mitigation measures must be implemented accordingly.
 - Restrictions limiting the type of land use or permitted density may be required, together with the use of innovative mitigation strategies and appropriate construction timing.

Figure 2 displays the fish management zones and fish species located within Vaughan.

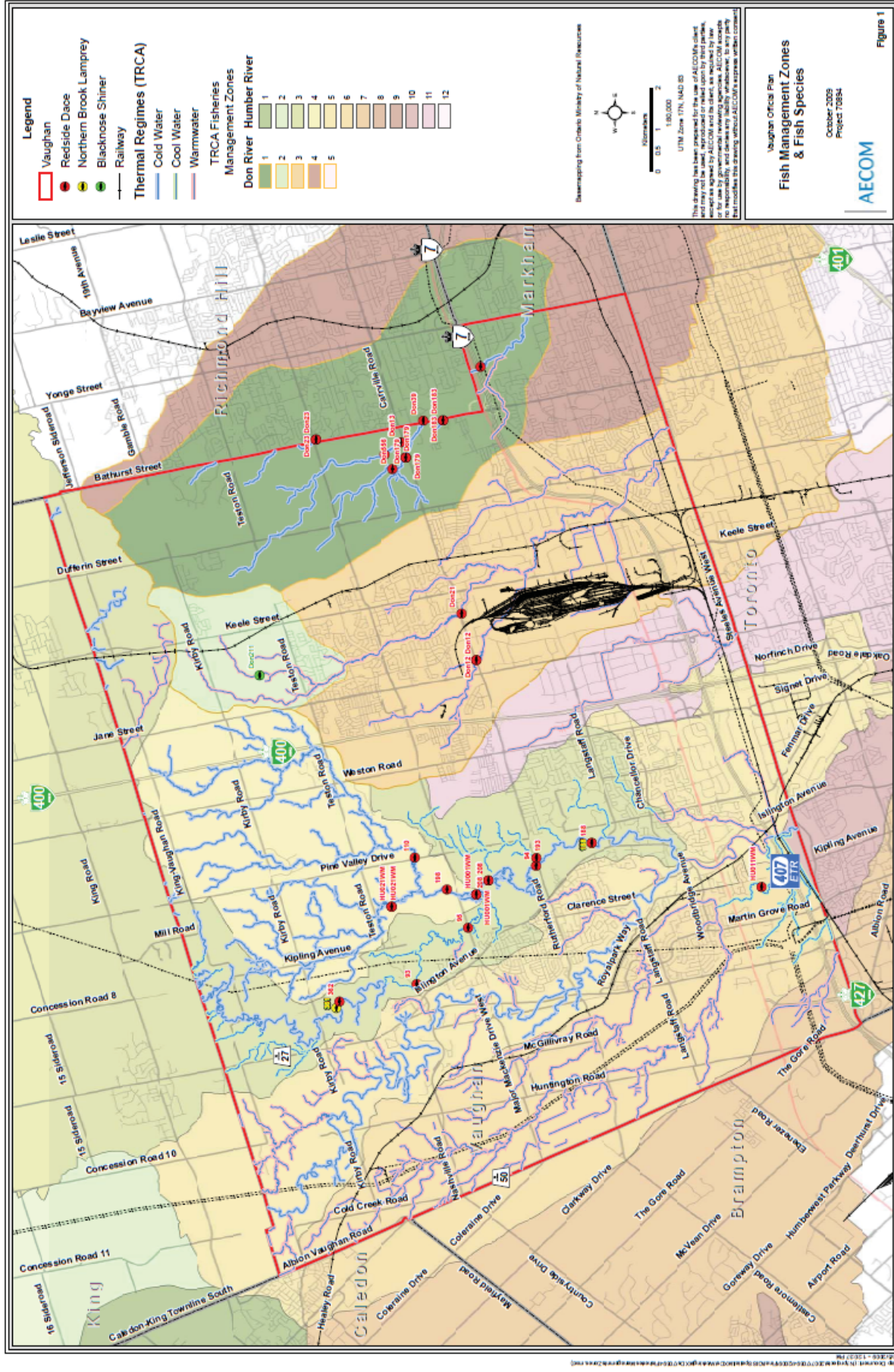


Figure 2. Fish Management Zones and Fish Species



4. Natural Cover

Within Vaughan, 19% of the total land area is comprised of natural cover. The vast majority of the remaining natural cover is found in valleylands, floodplains, some upland forests and Toronto Region Conservation (TRCA) lands. The majority (12%) of natural cover within Vaughan is forest cover, followed by 6% meadow, and 1% successional cover. The overall natural cover target established by Environment Canada is 30%.²

Some 46% of Vaughan's natural cover is within the Ontario Greenbelt area of the City; 14% of this area is on the Oak Ridges Moraine. The distinct geomorphology and high quality natural cover of the Ontario Greenbelt and Oak Ridges Moraine areas of Vaughan, make the City what it is today – a more liveable and healthy place to live, work, play, recreate and enjoy and appreciate nature in the City.

Through uncontrolled growth patterns, much of Vaughan's natural cover has been significantly reduced in size, quality and health over the past fifteen years. The “fragmentation” of the City's natural environment has served as an obstacle in developing progressive regulatory policies that govern uses on those lands. The areas outside of York Region's Core Greenlands System, which runs through the northern portions of Vaughan, are subject to the policies and regulations of the York Region Official Plan. Meanwhile, those areas of the Greenbelt Protected Countryside that are designated as Natural Lands, and the areas of Vaughan that are within the Oak Ridges Moraine, are protected and governed by the *Greenbelt Act (2005)* and the *Oak Ridges Moraine Conservation Plan*.

Below is a summary of the natural cover within the City of Vaughan:

4.1 Features

- Natural Cover in the City of Vaughan comprises approximately 5,336 ha, or 19% of the total area of the City (TRCA, 2004).

Natural cover is higher in the Humber River (22%) is higher than in the Don River (15%).

- Average forest patch size in Vaughan is six ha, versus a mean size of 10 ha in York Region.
- Nearly 0.6% wetland cover remains in the City, which accounts for only 2.8% of the existing natural vegetation communities.
- Comprised of two provincially and three locally significant wetlands.
- Approximately 6% meadow cover exists in Vaughan, which accounts for nearly 30% of the existing natural vegetation communities in the area.
- Nearly 1% thicket exists Vaughan, which accounts for nearly 6% of the existing natural vegetation.
- Sugar Maple-Black Maple Deciduous Forests and sand barren communities are considered to be regionally rare by the Natural Heritage Information Centre (NHIC).
- Twenty-nine regionally rare plant species occur as well as Butternut (*Juglans cinera*), a tree designated “Endangered” due to the lethal threat from a fungal disease - Butternut Canker.

2. Source: Environment Canada



4.2 Importance

Natural cover in its many forms performs a multitude of environmental services, most of which result in social and economic benefits. Some of the functions performed by natural cover include the provisioning of habitat for migratory birds and other wildlife species, improvement of air and water quality and the reduction of stormwater runoff and erosion control. Although forest and wetland communities are frequently described as performing most of the described functions, meadow and thicket communities are also capable of providing many of these services. There is, however, a whole spectrum of performance capabilities according to natural cover type, and generally, communities with greater structural complexity (multiple vertical layers) and a greater woody component (trees) are most effective at providing these services. In addition to community type, the size and health (quality) of a community dictate the capabilities of a system to perform a particular function. Wetlands play an important role in our landscape and have a variety of key attributes including providing habitat for numerous species, flood control, climate regulation, and recreational activities.

4.3 Where?

- 52% of the forested communities are in valleyland systems – areas that are still under pressure from a variety of development interests. This makes the protection and connection of these valleyland systems and hazard lands all the more important, especially given their significance to climate regulation and climate mitigation, as well as quality of life within Vaughan.
- Wetlands are associated with the Oak Ridges Moraine and the Don and Humber River valleys, and are protected by various policy documents and regulatory regimes.

4.4 TRCA Terrestrial Natural Heritage System Strategy (2007)

The goal of the Toronto and Region Conservation (TRCA) Terrestrial Natural Heritage System Strategy (TNHNS) is to identify and evaluate natural heritage features and functions within the landscape, for inclusion in a Natural Heritage System (NHS). The Terrestrial Natural Heritage System (TNHS) is composed of both existing natural cover and potential natural cover that can be restored to complement existing units. It uses a priority ranking system to classify species and natural heritage system features and functions according to specific criteria: size/distribution, shape, quality/health and location. This is consistent with principles of landscape ecology and conservation biology.

The TNHSS provides extensive data, scientific models, mapping and guidance for TRCA staff, TRCA's partner municipalities and community groups for achieving natural heritage protection objectives. In the context of the Vaughan TMP, the TNHSS can be adopted to model the effects of changing land use on existing habitats and determine what it will take to protect and enhance Vaughan's natural habitats for the future.

A desktop exercise involving digital mapping was used to identify existing and potential cover within the TRCA jurisdiction. The quality, distribution and quantity of natural cover were evaluated according to scientifically rigorous Landscape Ecological Principles and combined to form a system that considered both feature and function, in existing natural communities and areas that could potentially be restored. Instead of considering



natural cover on a patch by patch basis, the TRCA analyzed natural cover from a landscape perspective, which is the scale at which most ecological processes function. This holistic process allowed the identification of areas that should be restored to natural cover to enhance existing features. By securing the potential natural cover areas within the NHN, natural cover in the Toronto Region will increase from its current 17% to a 30% goal, likely improving the quality and functioning of cover within the TRCA jurisdiction and Vaughan.

Figure 3 depicts the geographical distribution of the TRCA Terrestrial Natural Heritage System features and functions within Vaughan.

4.5 Consequences:

To ensure a healthy Natural Heritage Network for the 2031 planning horizon, policy recommendations and conservation science best practices must be implemented and their effects actively monitored. Several features and functions are critical components of Vaughan’s urban structure. **Table 1** summarizes the attributes and functions that are important within the study area, and for which consideration should be provided as Vaughan’s TMP is developed.

Table 1. Significance and Sensitivity of Vegetation Features in the City of Vaughan

Attribute	Location	Sensitivity/Significance
Upland Forest Communities	Primarily north of Teston Road and in the Oak Ridges Moraine	Rare vegetation communities in Vaughan. Are usually the first forests to be removed for agriculture and urban development.
Wetland Communities	Primarily in the Oak Ridges Moraine. Smaller units in the southern part of the City within ESAs and in riparian areas associated with tributaries.	Provide a number of important ecological, economic and social functions. Retain base flow and vegetation units. Provide undesignated units protection.
Sand Barren Communities	Two communities in the northeastern part of Vaughan in the Oak Ridges Moraine.	Provincially rare vegetation communities. Protect communities.
Provincially, Regionally and Locally Rare Species	Twenty-nine species. Concentrated in ESA’s and narrow vegetated cover west of Pine Valley Drive.	Sensitive to urbanization.

4.6 Forest Cover

Approximately 12% forest cover remains in the City of Vaughan, which accounts for most (61%) of the existing natural vegetation communities in the area. Forest cover in Vaughan is below the York Region average of 22.5% cover.

The TRCA has classified nearly half of the City’s vegetation communities, according to the standardized method of Ecological Land Classification (ELC; Lee *et al.* 1998). A total of 61 forest community types were identified in the surveyed portions of the City of Vaughan: 29 deciduous, five coniferous, 12 mixed deciduous communities and 15 cultural plantations. Deciduous forest communities are the dominant forest type at 51% cover, followed by mixed deciduous forests at 30%, cultural plantations at 16% and the remaining 8% in coniferous forest cover. The 13 Sugar Maple-Black Maple Deciduous Forest communities identified in Vaughan are considered to be regionally rare by the Natural Heritage Information Centre (NHIC).

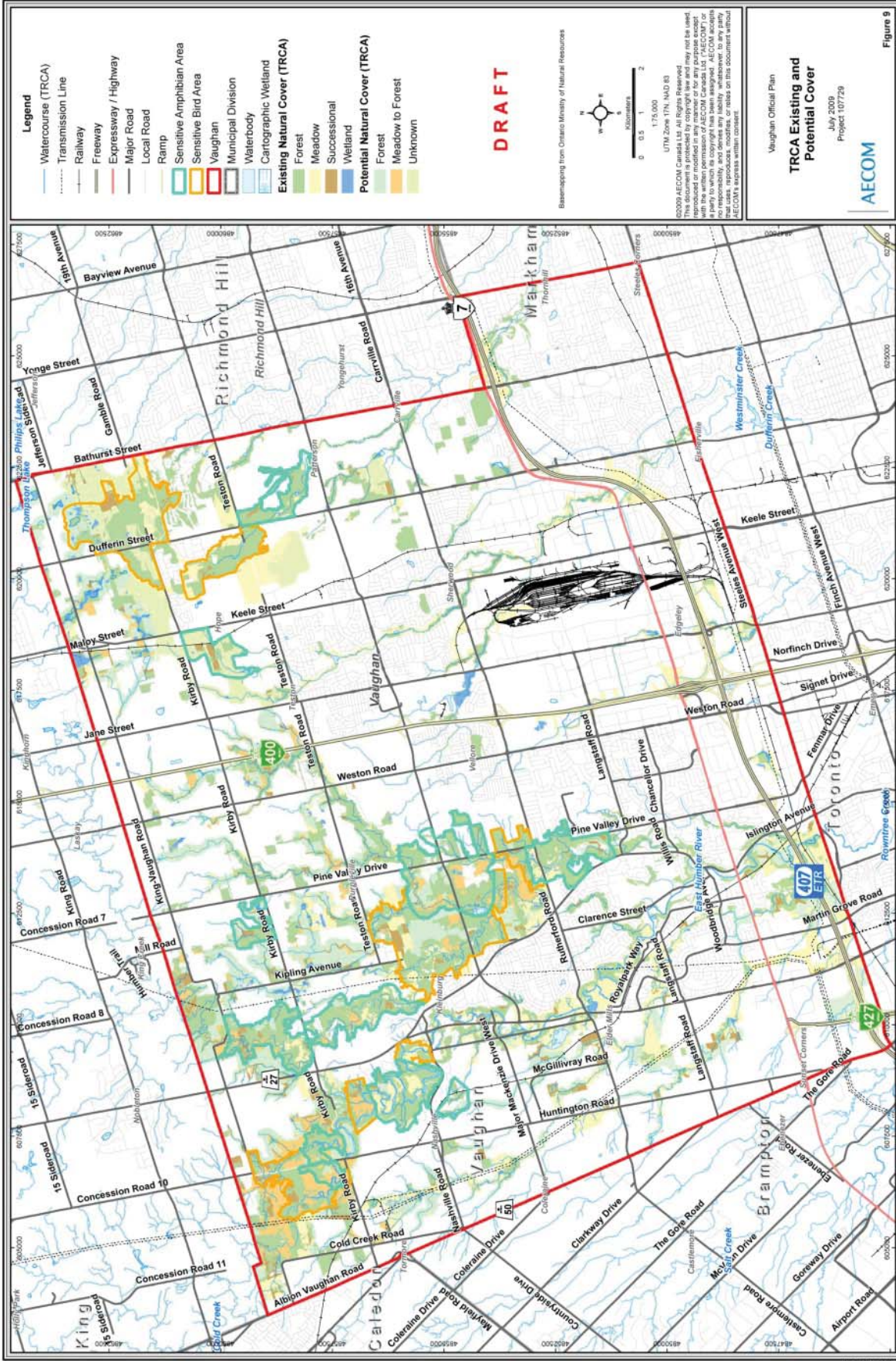


Figure 3. Terrestrial Natural Heritage System (Existing and Potential Cover)



Most of the City's forest cover is located west of Pine Valley Drive in designated ESAs, and north of Teston Road where the water table is relatively high and associated with river valley features. In fact, 52% of the forested communities are below top of bank - in valleyland systems. Natural areas occurring in topographical depressions and containing running or standing water are classified as "valleylands". In southern Ontario, valleylands are often the only remaining natural areas within a region, thereby enhancing their importance as stormwater storage systems, nutrient transport systems, wildlife habitat and habitat connectors. A large portion of the remaining forest cover in Vaughan is in valleyland systems, confirming the importance of these features in a highly urbanized landscape.

Upland forests in the southern portion of the City are unusual due to agricultural and urban pressures. The average forest patch size in Vaughan is six ha, as opposed to a mean size of 10 ha in York Region. Upland forests are larger and more abundant north of Teston Road and in the Oak Ridges Moraine, where agriculture and development pressures are not as extreme due to existing policies and greater land use restrictions.

Two recent studies conducted in Vaughan, evaluated woodlot quality and health based on criteria such as attributes, functions and linkages. Attributes include features such as the presence of ESAs, wetlands, ANSIs, rare species and distinct vegetation communities. Both hydrological and forest habitat functions were assessed. Hydrological functions include erosion control, groundwater discharge and water quality. Forest habitat functions include patch size, shape, maturity and composition (structural diversity). Woodlots linked to other natural cover were also considered to be of higher value than isolated patches.

The Subwatershed Study (1993) evaluated 56 forest patches in three regions south of Teston Road. Seventy-five percent of the high and moderately ranked woodlots were associated with tributaries in valleyland systems. The Focus Rural Area Woodland Ecosystem Assessment (2002) evaluated woodlands primarily north of Teston Road, with a supplementary region in the south. Forty-three of the high and moderately ranked woodlots were in valleylands or had wetland communities within their boundaries. The remaining highly ranked upland forests were large, diverse, mature communities with unique features, or woodlots associated with ESAs.

Forest cover in Vaughan is below the minimum 30% cover required and recommended to maintain healthy forest ecosystems. Forests provide a number of ecosystem functions including the provision of habitat for migratory birds and other wildlife species, improvement of air and water quality, and the reduction of stormwater runoff and soil erosion. In order to benefit from these and additional services, forest cover and connectivity between communities should be enhanced, where possible.

Figure 4 illustrates the sensitive forest cover within the City of Vaughan.

4.7 Wetland Communities

Wetlands are defined as lands that are either flooded by shallow water or areas where the water table is close to the surface, have soils that are characteristic of water saturation, and have vegetation that has



adapted to wet conditions (Mitch and Gosselink 2000). Wetlands are evaluated by the OMNR according to the Ontario Wetland Evaluation System (2002), in which the importance of a wetland is determined based on biological, social, hydrological and special features. Evaluated wetlands are categorized as either provincially or locally significant. These designations protect wetlands from development and alterations according to the Provincial Policy Statement (OMNR 1999). Wetlands on the Oak Ridges Moraine, on Conservation Authority lands, on Federal lands and wetlands associated with valley lands are all protected to some degree.

The Oak Ridges Moraine extends into the northeast corner of Vaughan. There are several kettle wetland complexes associated with the Oak Ridges Moraine in this area, as well as other wetlands or wetland complexes scattered throughout the City - the majority of which are associated with river valleys. This includes a group of wetlands associated with the headwaters of the East Humber (north of Teston Road, between Weston Road and Highway 27), a wetland at Highway 27 and Rutherford Road, a large wetland at Jane and Rutherford Road, a wetland at Langstaff Road and Weston Road and several wetlands south of Highway 407 between Pine Valley Drive and Jane Street.

Currently 1% of wetlands in Vaughan remain - approximately 152 ha of wetlands, which accounts for 2.8% of the existing natural vegetation communities in the area. The few remaining wetland communities are all associated with the Don and Humber River tributaries. Many of the wetlands are kettles around and on the Oak Ridges Moraine.

The Hope Wetland Complex, the Keele Wetland Complex, the Phillips-Bond-Thompson Wetland Complex and the King-Vaughan Wetland complex (63 ha in total area), as well as the Draft East Humber PSW Complex, are all protected, because they lie in the Oak Ridges Moraine. Additionally, the King-Vaughan Wetland Complex and the Phillips-Bond-Thompson wetland complex are considered Provincially Significant Wetlands.

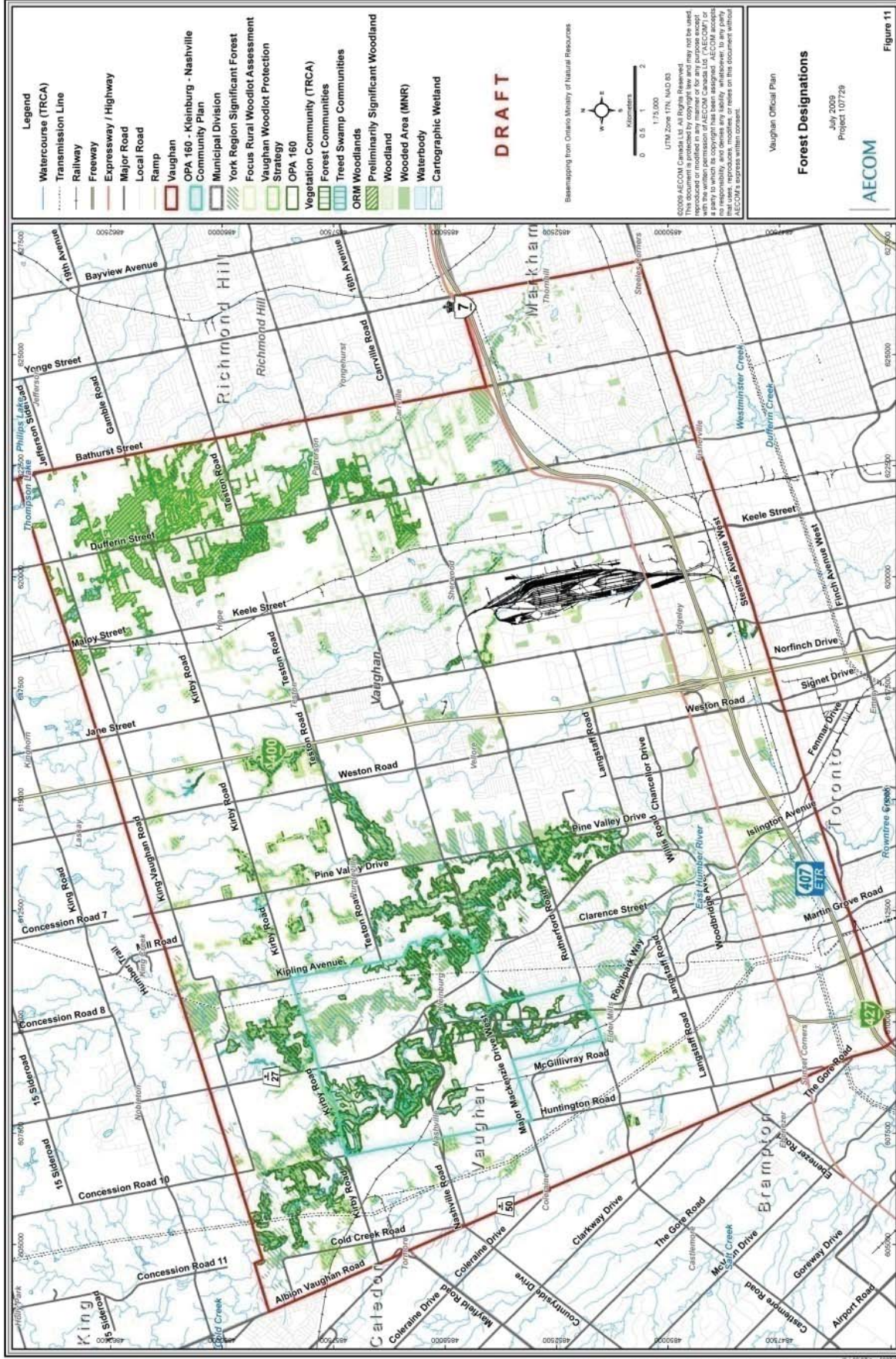


Figure 4. Sensitive Forest Cover in Vaughan



According to TRCA Ecological Land Classification (ELC), a total of 65 wetland community types were identified: 29 marsh communities, 27 treed swamps, two swamp thickets and six shallow water communities. Marsh communities are the dominant wetland type at 47% cover, followed by treed swamps at 41%, swamp thickets at 8% and the remaining 8% in shallow water communities. A total of 16 community types, representing 11% of wetlands identified by TRCA, have organic soils. Organic soils indicate the presence of groundwater seepage. These community types include 10 treed swamps, five marsh community types and one swamp thicket community type. One Bur Oak Deciduous Swamp community identified in the City is considered to be regionally rare by the Natural Heritage Information Centre (NHIC). **Table 2** details the major wetlands within Vaughan.

Table 2. Major Wetlands within the City of Vaughan

Wetland Name	Significance	Year of Last Evaluation	Area (ha)	Wetland Description
Tormore Wetland Complex	Local	September 1993	5.96	Complex composed of six individual wetlands; 100% swamp (NHIC Natural Areas Data Record).
Hope Wetland Complex	Local	June 1990	4.8	Complex composed of four individual wetlands; 79.2% swamp; 20.8% marsh (NHIC Natural Areas Record).
Keele Wetland	Local	July 1995	1.03	Complex of two individual wetlands; 52% marsh; 48% swamp (NHIC Natural Areas Record).
King-Vaughan Wetland complex	Provincial	June 1990	39.1	Complex of 23 individual wetlands; 83.4% swamp and 16.6% marsh (NHIC Natural Areas Record).
Philips-Bond-Thompson Wetland Complex	Provincial	August 1990 Re-evaluated in 2000	61.0	Complex of 50 wetlands 58% marsh, 34% swamp and 8% bog (NHIC Natural Areas Record)
Draft East Humber PSW Complex	Regional	--	--	Since it is draft in 2009, we have no further data from MNR to date.

4.7.1 Significance

The ecological services performed and economic benefits associated with wetland communities are well documented. Ecological services and benefits include provisioning of habitat for a diversity of wildlife species, including amphibians and birds, nutrient retention, water filtration, flood control, groundwater recharge and micro-climate stabilization. In addition, wetlands are used both recreationally (i.e., boating, birding, fishing) and for commercial harvesting of nuts, berries, fish and lumber. The function and quality of the few remaining fragmented wetlands within Vaughan have the potential to be severely compromised by additional growth and new infrastructure. Wetlands are sensitive to increases in nutrient loads, suspended solids, and contaminants from runoff as well as from changes in hydrology (Mitch and Gosselink 2000).

Figure 5 depicts the extent of wetland complexes in the Vaughan.



4.8 Meadow

Nearly 6% meadow cover exists in Vaughan, which accounts for nearly 30% of the existing natural vegetation communities in the area.

Meadows are early successional, open vegetation communities that are dominated by wildflowers and grasses. These communities are created by natural or anthropogenic disturbance, and if allowed to function in their natural state, will succeed to communities with a woody composition. Meadow communities in the City are primarily associated with tributaries and found in riparian areas, both within and along the periphery of forest communities. Several meadow communities exist with straight edges that are likely abandoned agricultural fields reverting to natural cover. An exceptionally large unit is found at Teston Road and Keele Street (see **Figure 3**). Meadow functions are generally undervalued; however, these communities provide important buffering services to the forest and aquatic communities they surround. Meadows provide habitat for a diversity of plant and animal species, especially communities that are greater than 10 ha in size. As natural cover, they can also function as connectors between forest and wetland communities.

4.9 Successional Habitats

Nearly 1% successional cover exists in Vaughan, which accounts for 6% of the existing natural vegetation communities in the area. Successional habitats are in a transitional phase that cannot be classified according to any of the conventional definitions. They are found along forest boundaries and function as edge habitats. One community also exists along a transmission line in the north. Successional habitats can be actively restored to natural cover and contribute to vegetation cover, provide a buffering service or connectivity between patches.

4.9.1 Significance

Two regionally rare sand barren communities were identified in the northern part of Vaughan.³ Over half (53%) of the existing natural cover in Vaughan is located in valleyland systems and ESAs. By enhancing the vegetation communities and existing linkages to the west of Pine Valley Drive and north of Kirby Road, several benefits can be realized. The City has already undertaken a Significant Woodlot Study, and has acquired some lands for the NHN. However, larger more systemic issues related to natural heritage may also be addressed through the Vaughan TMP process. For example, the TMP should conduct a closer review of the environmental constraints in this area, as well as the policies protecting the features, functions and species from land use changes.

The Oak Ridges Moraine Conservation Plan Technical Paper on Significant Wildlife Habitat suggests that thickets as small as 10 ha with 20 or more breeding pairs of area-sensitive breeding birds that require habitat between meadows and thickets, should be identified as meeting the test for “significance”. These habitats require active management to ensure that they do not transition into woodlands/forests. As a result, there is a unique opportunity to purchase and acquire agricultural lands, since they can be restored and included in the overall natural heritage network.

3. Source: NHIC



5. Wildlife Habitat and Landscape Connectivity

Wildlife habitat and landscape connectivity have a positive correlation. Generally, landscape connectivity and the ability of biodiversity to support its lifecycle needs, genetic variability and healthy populations depends on the size, shape, quality and connectivity of their habitat(s).

5.1 Features

The following is a summary of the wildlife features that have been observed within Vaughan:

- 147 breeding bird species have been recorded in the City, three of which are non-native.
- Five of the observed species have been detected as Provincially Rare or Species at Risk.
- Forty area-sensitive bird species occur (i.e., bird species are found at higher breeding densities in larger habitat patches).
- Larger thickets will support area sensitive species such as Brown Thrasher (*Toxostoma rufum*), Yellow-billed Cuckoo (*Coccyzus americanas*) and provincially threatened Golden-winged Warbler (*Vermivora chrysoptera*).
- Twelve amphibian and five reptile species have been reported including one Species at Risk and one Provincially Rare species.
- A total of 22 mammal species occur, two of which are non-native (Coyote and Virginia Opossum) and tend to be common urban-tolerant species.
- One mammal observed in Vaughan – the Southern Flying Squirrel - is designated as a species of Special Concern by COSEWIC and OMNR, and is provincially vulnerable (S3).⁴

5.2 Importance

- Fourteen animal species observed in Vaughan were designated as “At Risk” provincially and/or nationally.
- Seven observed species are classified as provincially rare.⁵
- A total of 22 species are designated as Species at Risk or provincially rare species in Vaughan.⁶

Figure 6 shows the concentration and distribution of biodiversity and ecosystem services throughout Vaughan. The “Biodiversity hotspots”, or areas with the highest concentration of biodiversity, are identified in red. It is important that these areas of high biological diversity be protected from inappropriate development and non-conforming land uses and enhanced wherever possible. This is consistent with upper and lower-tier municipal Official Plan goals and provincial policy statements, as well as natural heritage policies and guidelines.

4. Source: NHIC

5. Source: OMNRs Natural Heritage Information Centre

6. *ibid*

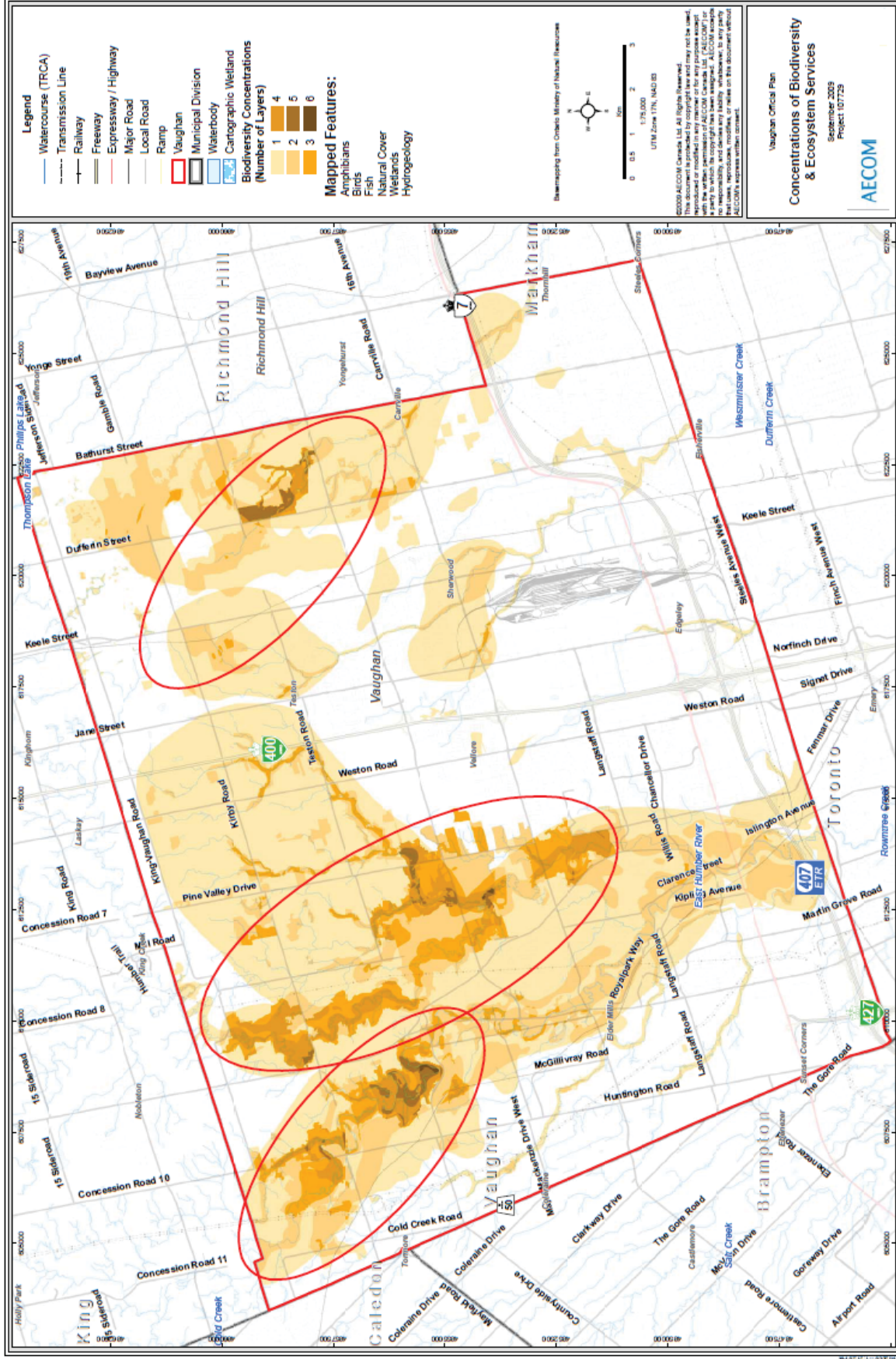


Figure 6. Concentrations of Biodiversity and Ecosystems Services in Vaughan



Through Vaughan's Official Plan conformity exercise, its Growth Management Strategy and its TMP, the City should implement best practices and policies to protect these important habitats that comprise a high concentration of flora and fauna.

5.3 Landscape Connectivity

The Don and Humber River valleys provide a significant natural cover in the City. In most areas, the valleys are treed, providing habitat for terrestrial birds and mammals and many ecosystem services, such as slowing runoff and providing shade for streams to maintain coldwater fish habitat. The orientation of the Don and Humber River valleys allows for adequate movement of species in a north-south direction. Unfortunately, these corridors are largely isolated from each other, so there is little connectivity in the east-west direction. Highway 400 acts as a major barrier to species movement between the Don and Humber watersheds, and there are many barriers to connectivity in the southern portion of Vaughan, including new growth and major infrastructure.

Landscape connectivity can be restored, maintained and/or enhanced using a variety of strategies that depend on the remnant cover, the proximity of patches, and the intervening matrix (e.g., agricultural vs. residential). Delineating actual corridors for wildlife movement is one approach in which corridor dimensions need to be sensitive to particular species targeted to use the corridors. This may be an appropriate approach for parts of the river network running generally north-south in Vaughan. The other approach is to identify functional connectivity by ensuring that the matrix land uses are permeable to the species that are targeted for movement and/or dispersal. This approach may be more practical for east-west connections.

Currently, there is little connectivity between the East and Upper Humber river valleys. The northern portion of the Humber watershed affords the best opportunity to improve landscape connectivity. Much of the northern portion of the City (north of Teston Road) has yet to be developed. There are numerous isolated woodlots that could be enlarged and connected to other woodlots by planting native shrubs and trees. This would also benefit streams in the area by providing more riparian cover.

A similar situation occurs in the Don River watershed, with little connectivity between the East and West Don. The majority of the forested cover is associated with the East Don, but there is an opportunity to improve connectivity and forest cover in the undeveloped portion of the East and West Don, north of Teston Road.

Many of the streams in the Don River watershed would benefit from improved woody riparian cover, which would in turn provide greater connectivity for terrestrial mammals and birds. In the context of urban development and fragmented habitat, connectivity also has to be considered in a regional context.

Figure 7 illustrates the City's existing natural heritage system. This map represents a visual 'snap shot' of Vaughan's natural cover, using existing conservation science and information.



Figure 7. Draft Natural Heritage Network - City of Vaughan



6. Environmentally Significant Areas

Environmentally Significant Areas (ESAs) are natural areas that are considered significant and worthy of protection based on three criteria (ecology, hydrology, and geology). Often times, ESAs overlap with designated ANSIs, and therefore multiple policy objectives and policies/regulations apply.

Vaughan comprises 24 ESAs, accounting for nearly 1,150 ha, or 4% of the City's total land area. Of these, 22 are considered to have ecological importance and are therefore designated as Life Science Sites. The remaining two sites include a geologically important feature, and are designated as Earth Science Sites. For a complete list of Environmentally Significant Areas (ESAs) in Vaughan, please refer to Table 15 of Appendix C in *Natural Heritage in the City* (AECOM 2009).

7. Conclusions and Recommended Strategies

This Natural Heritage Existing Conditions paper documents the natural heritage features, functions and structures that will serve as a blueprint to guide the development of Vaughan's future transportation needs. In so doing, the City supports a more balanced and sustainable transportation system that seeks to avoid negative impacts to its natural heritage system, wherever possible.

The significance of Vaughan's natural heritage system cannot be emphasized enough. It connects the City's past to its future. Simply put, it is a resource that cannot be replaced. As David Suzuki, the famous Canadian environmentalist once said:

"With an estimated population of nine billion people by 2050, we cannot continue to consume resources at the same rate and maintain our quality of life."

In consideration of the City's natural environment, the following strategies are recommended to be explored further in this Transportation Master Plan:

- In assessing the need for new or widened roads, give priority to more sustainable modes of transportation that would address the same challenges;
- Plan and design the location of new or modified transportation infrastructure (i.e., widenings) to avoid Vaughan's major natural heritage features, wherever possible;
- Incorporate NHN goals and targets, as well as sustainability indicators into the Vaughan TMP to measure progress in overall sustainability goals and benchmarks;
- Design "complete and liveable" neighbourhoods that ensure retail services, schools and other community services are provided access to natural heritage features within walking distance of large populations; and



- Increase the use of alternative fuel and vehicle technologies (i.e., electric, hybrid) by retrofitting its entire fleet of vehicles as part of Vaughan's Green Fleet Strategy.

This existing conditions paper provided a thorough overview of Vaughan's structures, functions and species that comprise the City's Natural Heritage System. The results should guide the strategic direction of the Vaughan TMP by making the City's natural environment one of the decisive factors in developing future transportation solutions that are balanced, more sustainable and economically viable.