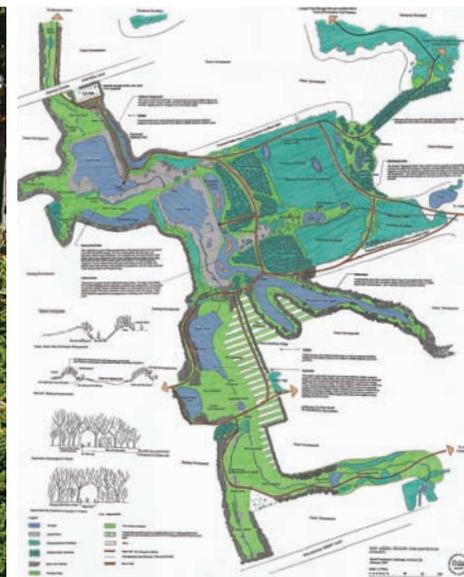


# TOWN OF AURORA



## The Economic Value of Natural Capital Assets

ASSOCIATED WITH ECOSYSTEM PROTECTION



## Credits

Thanks to the extensive library of information prepared and the research completed by all the agencies and organizations listed within the bibliography section of this report, including but not limited to the David Suzuki Foundation, the Friends of the Greenbelt Foundation and the Lake Simcoe Region Conservation Authority (LSRCA). The completion of this report was made possible by the per-hectare evaluations determined within these reports and other research undertaken within the referenced reports.

Additional thanks to members of The Town of Aurora's Environmental Advisory Committee and other staff members who contributed to this report.

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June 2013

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The Town of Aurora's Corporate Environmental Action Plan is a five-year action plan. The Plan serves to protect and enhance the natural environment, promote environmental sustainability, integrity and conservation of resources and create a practice of environmental stewardship within the community. For more information, visit [www.aurora.ca/CEAP](http://www.aurora.ca/CEAP)



The Town of Aurora developed a Strategic Plan to identify and assess growth and development opportunities that ensure the future economic, social and environmental sustainability and health of Aurora. The Strategic Plan emphasizes the development of local assets which capitalize upon the many strengths and opportunities in the area. For more information, visit [www.aurorastrategicplan.ca](http://www.aurorastrategicplan.ca)

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## Purpose

The purpose of this report is to conduct an initial baseline estimate of the benefits provided to residents of Aurora from the existing stock of natural capital in the Town. From this baseline analysis, economic costs associated with changes to the features related to natural capital can be factored into future land use decisions and other Town initiatives.

## Introduction

Natural Capital Assets are defined as the natural assets (or “stocks”) and the ecosystem goods and services (or “flows”) that those assets provide. The stocks of ecosystem resources are natural capital in the sense that these resources are assets that yield goods and services (flows), which over time are essential to the sustained health and survival of our population and economy.

Natural ecological areas within Aurora provide numerous benefits that have economic value. These areas of natural capital provide economic benefits such as clean water supply, natural filtration of contaminants, water flow stabilization, greenhouse gas mitigation, erosion control, nutrient cycling, habitat, recreation, health benefits and cultural pursuits. A large portion of Aurora is located on the Oak Ridges Moraine which forms a portion of the provincial Greenbelt. It is important for Aurora to quantify the economic benefits of ecosystem protection and understand the costs associated with replicating these natural functions in response to the loss or destruction of any components of the ecosystem.

There is a growing recognition of the pivotal role that all natural areas play in providing ecosystem services. For example, the David Suzuki Foundation has estimated that the Greenbelt’s non-market ecosystem services are valued at \$2.6 billion annually.

The market value of Natural Capital Assets is straightforward for commodities such as fish and timber. However, in many cases Natural Capital Assets do not have a market value. In these situations their value can be calculated using a non-market valuation technique that calculates the cost society would incur if the good or service were lost. Converting our natural landscapes may be economically inefficient in the long term. By destroying natural capital, we are forced to find substitutes for the services they once provided. The substitutes for natural capital can be much more expensive to duplicate and operate than those provided by nature. Also, there are many goods and services only nature can provide. There are no substitutes which humans can create. As with other forms of capital, the value of natural capital can depreciate. Each time we lose another hectare of natural land, we are depreciating our asset base and losing the goods and services they once provided. Destruction and degradation of natural capital occurs continually. We may only recognize the loss of important ecosystems once they are gone, a loss that is often irreversible.”<sup>1</sup>

<sup>1</sup> “Natural Capital and Ecological Goods & Services”, Ducks Unlimited Canada, *Natural Values: Linking The Environment To The Economy*

## Methodology

The Friends of the Greenbelt Foundation has prepared a report pertaining to the value of the natural assets for the entire Lake Simcoe Basin<sup>2</sup>. This report is an excellent resource, which describes both the amount of Natural Capital Assets and value of such assets within Aurora.

In addition, several other reports have been completed and research undertaken by the Canadian Urban Institute, David Suzuki Foundation, Ducks Unlimited, Credit Valley Conservation Authority and others. Within these reports is extensive background research pertaining to the per hectare values associated with protecting the various components of the natural ecosystem. This data is relatively current, so there is no need for The Town of Aurora to duplicate this research.

The main task for the Town will be determining the breakdown of areas of natural capital using The Town of Aurora's Geographic Information System (GIS) and using this data in association with the per hectare economic values previously determined within several reports associated with the entire watershed and Greenbelt areas.

<sup>2</sup> *The Friends of the Greenbelt Foundation Occasional Paper Series Number 6 – June 2008*

## Geography

The Town of Aurora is 49 square kilometers. The majority of Aurora (28.7 square kilometres or 59 per cent) is located on the Oak Ridges Moraine, which forms part of the provincial Greenbelt. The Oak Ridges Moraine is one of Ontario's most significant land-forms and has been called the "rain barrel of southern Ontario." The Greenbelt Plan (2005) builds upon The Oak Ridges Moraine Conservation Plan. Both plans promote the protection, maintenance and enhancement of natural heritage, hydrologic and landform features and functions, including protection of habitat for flora and fauna.

The vast majority of Aurora is within the Lake Simcoe watershed (East Holland sub-watershed) with all watercourses flowing into Lake Simcoe. A small portion of Aurora located along Bloomington Road is located within the Lake Ontario watershed (East Humber and Rouge sub-watersheds).



## Ecosystem Goods and Flows

The following benefits flow from the protection of Aurora's ecosystem:

### Climate Change – Carbon Storage and Carbon Sequestration

To help society adapt to climate changes, climate regulation is one of the most beneficial services provided by the ecosystem, especially forested areas. Climate regulation is assisted by carbon storage (banking of carbon) and carbon sequestration (uptake of carbon) which both drastically reduce greenhouse gases in the atmosphere.

### Pollutant Regulation

Like climate regulation, the ecosystem is also essential in removing pollutants such as carbon monoxide, sulfur dioxide, ozone and others, while producing oxygen.

### Water Regulation and Treatment

Natural areas within the ecosystem, especially wetlands, regulate water flows in several ways, including evaporation, infiltration and natural flow restrictions. These flow regulations help reduce flooding and erosion and yield large benefits compared to the impermeable asphalt and concrete surfaces which dominate most built-up, urban areas. In addition, wetlands are instrumental in removing numerous contaminants and waste as described below.

### Waste Treatment

The natural environment is very effective in removing and treating human and animal waste. For example, wetlands are very efficient in removing excess nitrogen and breaking down many components of waste.

### Pollination

Most flowering plant species rely on pollination from insects, notably bees, birds and bats. Without this service, many interconnected species and ecosystem functioning would collapse. Insect pollination is necessary for most fruits and vegetables such as tomatoes, peppers, strawberries, apples and peaches.

### Habitat

Healthy natural systems also provide essential habitat for flora and fauna. Such habitat is essential for species diversity and especially for species at risk.

### Recreation

The protection of an interconnected ecosystem provides for recreational opportunities such as biking, hiking, bird watching and other recreational activities. These activities also greatly benefit tourism and yield economic benefits.

### Health Benefits

All of the above "flows", from active transportation to removal of pollutants, result in health benefits, yielding overall economic benefits related to reduced health care costs.





# The Aurora Community Arboretum

## “Where trees and the Aurora Community grow together”

The more than 100-acre Aurora Community Arboretum is a living showcase of trees, shrubs and wildflowers along with largely native grasslands, woodlands and wetland areas. It functions as a community destination point of interest and an educational tool in promoting familiarity and appreciation of ecological diversity. The Aurora Community Arboretum generally aligns with the Holland River Valley Open Space System associated with the Holland River and Nokiidaa trail system and extends from Wellington Street to St. John’s Sideroad. The lands are owned by The Town of Aurora and the management of the lands are a co-operative initiative between Town staff and the Aurora Community Arboretum’s extensive group of volunteers who donate countless hours to the design, upkeep and enhancement of the area. The Aurora Community Arboretum welcomes grants and donations to help support the ongoing improvements to the Arboretum.

Over the last four years in a joint project with the Lake Simcoe Conservation Authority, the Arboretum has germinated and grown more than 1,030 trees and shrubs, consisting of rare, unique and native species, which were then planted or are to be planted in the Arboretum. This amount is over and above the other planting programs the Arboretum undertakes and in the spring of 2012 alone, a total of 1,700 trees and shrubs were planted.

In addition to the large education and eco-tourism roles that that the Arboretum provides, it is also a significant component of Natural Capital Assets within the Town, showcasing examples of natural heritage enhancement plans. The future of the Arboretum is guided through a Master Plan. Additional details can be found at [www.auroraarboretum.ca](http://www.auroraarboretum.ca)



### 1 Case Woodlot

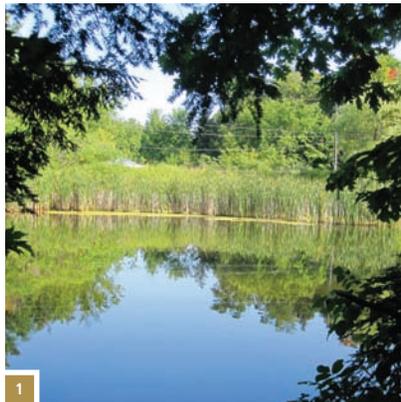
The Case Woodlot is mature woodland consisting of a mixture of predominantly deciduous species, wildlife habitat, trails, wetland areas and watercourses. The Case Woodlot is the only area of Aurora that is designated “Oak Ridges Moraine Core Area” which is the most environmentally-sensitive designation on the moraine. The Town of Aurora recently purchased an additional 10 hectares of the woodlot, bringing the total area owned by the Town to approximately 27 hectares.

### 2 Sheppards’ Bush Conservation Area

Consisting of approximately 23 hectares, Sheppards’ Bush is owned by the Ontario Heritage Trust and managed by the Town and the LSRCA. The site contains mixed forest, a significant amount of trails and recreational playing fields. The site is listed as a cultural heritage site within the Town.

### 3 Vandorf Woodlot

Located adjacent to Sheppards’ Bush, the Vandorf Woodlot is approximately 34 hectares, which is owned and managed by the Town. The woodlot consists of mature deciduous and coniferous trees, wetlands, wildlife habitat, trails and watercourses.

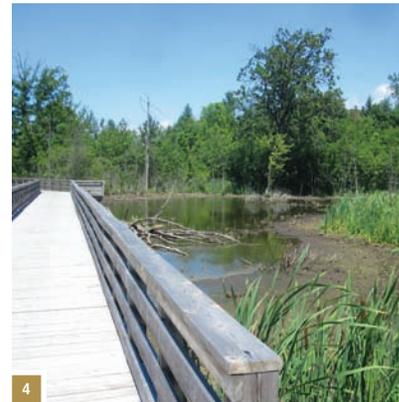


### 4 McKenzie Marsh

McKenzie Marsh is a provincially-significant wetland complex consisting of approximately 22 hectares. Portions are owned by The Town of Aurora and the remainder is owned by the McKenzie family. The Town recently constructed a trail system and boardwalk to connect the Nokiiddaa Trail to Newmarket’s trail system. In addition, significant habitat improvements are planned for the areas adjacent to the trails.

### 5 Anne Bartley Smith Property

The Anne Bartley Smith Property is approximately 38 hectares and is owned by the Ontario Heritage Foundation (OHF). The property consists of a coniferous woodland, wildlife habitat, trails and grasslands. The Town is working with OHF on management plans for these lands.



## Stronach Eco-Park

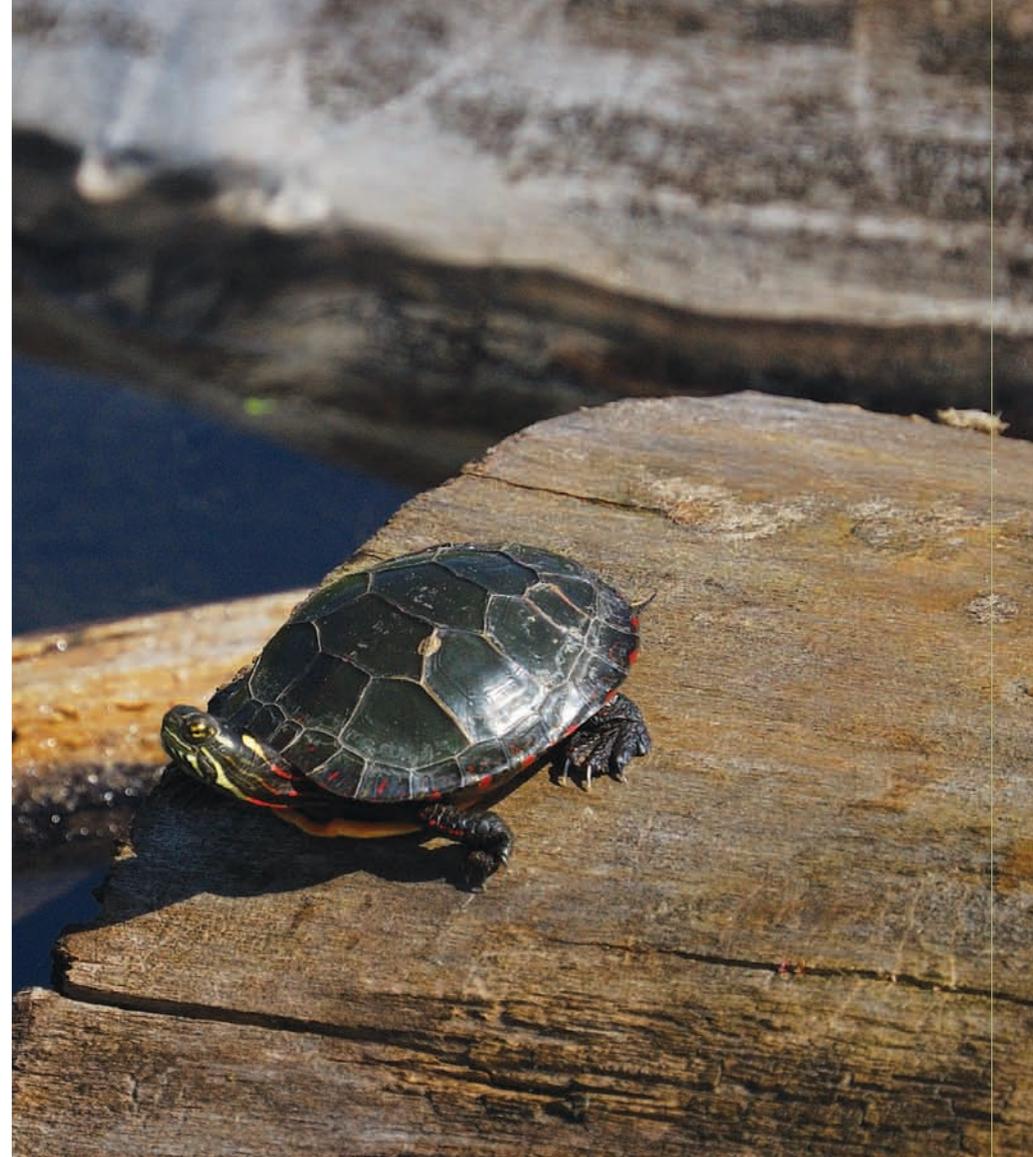
The Stronach Group has submitted a proposal for an “Eco-Park” on the east side of Bayview Avenue, south of Wellington Street. The components of this park are still under review however the current proposal indicates that the park will have significant wildlife habitat, nature trails including boardwalks and lookouts, watercourses, wetlands and wooded areas. The lands are approximately 34 hectares and the proposal includes three full-size soccer or other sport fields. An exciting component of the proposal is the “Environmental Interpretation Centre” which will benefit the entire Town and surrounding communities. Potential partners in the project include the Town, the Stronach Group, the LSRCA and the Windfall Ecology Centre. As a result of the efforts of Mr. Frank Stronach and the Stronach Group, this park will preserve open space lands and additional lands that were slated for housing, thereby preserving more of Aurora’s natural capital.



# Economic Value Calculation – The Value of Nature

## The Value of Nature

A significant amount of recent global research exists on the per hectare value of individual ecosystem components. This report does not attempt to duplicate this research but synthesizes the most accurate and current data. Values have been applied to a more local scale than other studies providing a great local perspective for Aurora. The source for data is included within each category.



## The Value of Watershed Protection

One of the most famous examples of the value of protection of watersheds and natural environment is the Catskill/Delaware watershed and the water it supplies to New York City. The watershed has provided clean water to New York City since 1915, without the need for filtering. In the early 1990s, the Environmental Protection Agency introduced new requirements for public water systems. These requirements mandated the building of filtration systems for unfiltered sources and specified that water supplies meet certain criteria in order to avoid filtration. City managers determined that a new filtration system would cost US\$6 to \$8 billion to build and another US\$300 million annually to operate. The alternative approach would include a comprehensive watershed protection program including land purchase, pollution reduction and conservation easements that would allow the natural ecosystems to purify the water. This would cost between US\$1 billion and US\$1.5 billion. New York City chose to invest in the natural ecosystem services of the watershed rather than build new infrastructure, based on calculations which determined that protecting the watershed had a better rate of return (90 to 170 per cent) and a shorter payback period of four to seven years. The complex network is the largest unfiltered surface water supply in the world, supplying 1.3 billion gallons of water each day. *(Source: Lake Simcoe Basin Natural Capital – See Page 12 of 45 footnotes)*

## Value per hectare – How the values are calculated

A complex analysis of each component of the ecosystem and all related benefits is required to calculate a per hectare value to be assigned for each individual natural asset.

For the Lake Simcoe Watershed report, “CITYgreen” software was used to calculate value of air cleansing of trees by using the average removal rates of carbon monoxide, nitrogen dioxide, particulate matter and sulfur dioxide. The value per kilogram was then calculated and these calculations yielded the value of air pollutants removed by tree cover. This data is only one aspect of the overall economic benefits of woodlands. All other benefits from soil formation, nutrient cycling, recreation and others were factored in to yield the overall value per hectare.

The value placed on other components of the ecosystem were derived from calculation of combinations of carbon values, air quality protection values, watershed values, recreational values and other similar values.



# Table 1: Summary of Non-Market Ecosystem Service Values

Land Cover Type	Value per hectare (\$/hectare/year)
Forest	\$4,798
Grasslands	\$2,727
Wetlands	\$11,172
Water	\$1,428
Cropland	\$529
Hedgerows/Cultural Woodland	\$1,453
Pasture	\$1,479
Urban Parks	\$824

Source: *Lake Simcoe Basin Natural Capital, June 2008*

Land Cover Type	Value per hectare
Forest	\$5,149
Plantations	\$3,802
Wetlands	\$9,651
Croplands	\$378
Grazing/Pasture	\$1,728
Hedgerows	\$3,110
Idle Land	\$1,728
Green Space	\$785
Rivers	\$1,421
Shoreline	\$541
Average	\$2,846

Source: *Canada's Wealth of Natural Capital: Rouge National Park, September 2012*

Land Cover Type	Value per hectare (\$/hectare/year)
Wetlands	\$14,153
Forest	\$5,414
Grasslands	\$1,618
Rivers	\$335
Cropland	\$477
Orchards	\$494
Hedgerows	\$1,678
Idle land	\$1,667

Source: *Ontario's Wealth Canada's Future, 2008*

## Table 2: Ecosystem Functions, Processes and Services

Functions	Ecosystem processes	Ecosystem services
Gas regulation	Role of ecosystems in bio-geochemical cycles (e.g. CO <sub>2</sub> /O <sub>2</sub> balance, ozone layer)	UVb protection by ozone, maintenance of air quality
Climate regulation	Influence of land cover and biological mediated processes on climate	Maintenance of a favourable climate, carbon regulation, cloud formation
Disturbance prevention	Influence of ecosystem structure on environmental disturbances	Storm protection, flood control, drought recovery
Water regulation	Role of land cover in regulating runoff and river discharge	Drainage, natural irrigation, transportation
Water supply	Filtering, retention and storage of fresh water	Provision of water by watersheds, reservoirs and aquifers
Soil retention	Role of the vegetation root matrix and soil biota in soil retention	Prevention of soil loss/damage from erosion/siltation; storage of silt in lakes and wetlands; maintenance of arable land
Soil formation	Weathering of rock, accumulation of organic matter	Maintenance of productivity on arable land; maintenance of natural productive soils
Nutrient cycling	Role of biota in storage and re-cycling of nutrients (e.g. nitrogen)	Maintenance of healthy soils and productive ecosystems; nitrogen fixation
Waste treatment	Role of vegetation and biota in removal or breakdown of xenic nutrients and compounds	Pollution control/detoxification, filtering of dust particles, abatement of noise pollution
Pollination	Role of biota in the movement of floral gametes	Pollination of wild plant species and crops
Biological control	Population and pest control	Control of pests and diseases, reduction of herbivory (crop damage)

Functions	Ecosystem processes	Ecosystem services
Habitat	Role of biodiversity to provide suitable living and reproductive space	Biological and genetic diversity, nurseries, refugia, habitat for migratory species
Food production	Conversion of solar energy as well as nutrient and water support for food	Provision of food (agriculture, range), harvest of wild species (e.g. berries, fish, mushrooms)
Raw materials	Conversion of solar energy, nutrient and water support for natural resources	Lumber, fuels, fodder, fertilizer, ornamental resources
Genetic resources	Genetic materials and evolution in wild plants and animals	Improve crop resistance to pathogens and crop pests, health care
Medicinal resources	Biochemical substances in and other medicinal uses of biota	Drugs and pharmaceuticals, chemical models and tools
Recreation	Variety in landscapes	Ecotourism, wildlife viewing, sport fishing, swimming, boating, etc.
Education, culture & spirituality	Variety in natural landscapes, natural features and nature	Provides opportunities for cognitive development: scenery, cultural motivation, environmental education, spiritual value, scientific knowledge, aboriginal sites

Source: Adapted from De Groot, R.S. 2002 "A typology for the classification, description and valuation of ecosystem functions, goods and services".

# Natural Assets

## Wetlands

Wetlands include swamps, marshes, bogs and fens and are seasonally or permanently covered by water. Wetlands are nature's water filtration systems, providing numerous essential functions that yield economic benefits.

Wetlands contribute to climate regulation, water regulation, water supply, soil formulation, pollination, nutrient cycling and waste treatment.

Wetlands are one of the highest values per hectare due to their high value for water regulation, water filtration, flood control, waste treatment, recreation and wildlife habitat. The Friends of the Greenbelt Foundation Occasional Paper Series Number 6, completed in 2008, places the values of wetlands at \$11,172 per hectare per year. The *Ontario's Wealth, Canada's Future: Appreciating the Value of the Greenbelt's Eco-Services* report, completed in 2008, places the amount at \$14,153 per hectare per year. This report also breaks down the benefits by wetland components being open water, bogs, marshes, swamps and fens. However, there is very little difference in value between the various wetland components and as most wetlands function as complete system there is little benefit to using a more detailed breakdown. For the purpose of this report, the average of these two estimates is to be used, which yields an amount of \$12,662.50 per hectare per year.



## Forests/Urban Forests

Forests consist of upland forests, riparian forests and urban forests. These contain a number of forest types and species diversity. Forests are essential for carbon uptake and storage and the reduction of greenhouse gases while producing oxygen. Forests provide several types of habitat and also provide shielding from the impacts of wind and flooding.

Forests contribute to climate regulation, water regulation, water supply, pollination, habitat and recreation.

Urban forests can refer to the entire forest cover in an urban municipality or to the treed areas associated with developed lands (mostly residential and park lands). Within Aurora there is data pertaining to significant woodlands from the Regional Municipality of York's *Significant Woodlands Study*. This data does not, however, include smaller treed areas typically associated with mature developments, with the exception of the larger lots associated with Yonge Street south.

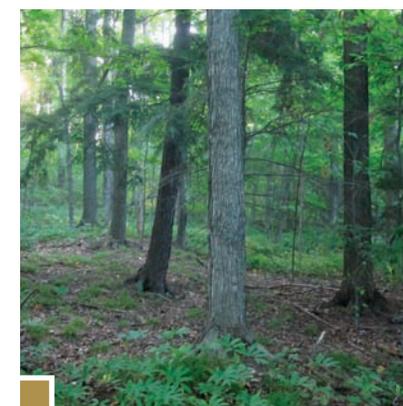
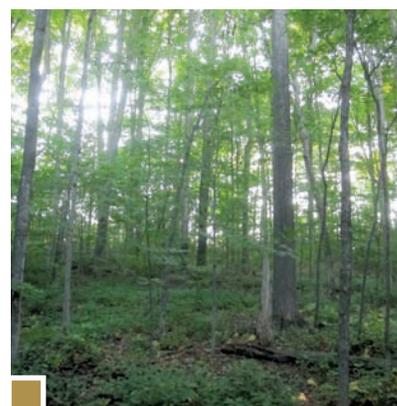
The City of Toronto produced a report entitled *Every Tree Counts – A portrait of Toronto's Urban Forest* and the following key summaries were made:

- Toronto's urban forest provides the equivalent of at least \$60 million in ecological services each year. The benefits derived from the urban forest significantly exceed the annual cost of management.
- Toronto's trees store 1.1 million metric tonnes of carbon annually or the equivalent of annual carbon emissions from 733,000 automobiles.
- Gross carbon sequestration by trees in Toronto is estimated at 46,700 metric tonnes of carbon per year with an associated value of \$1.3 million. Net carbon sequestration in the urban forest is 36,500 metric tons.
- Trees affect energy consumption by shading buildings, providing evaporative cooling and blocking winter winds. Toronto's urban forest is estimated to reduce energy use from heating and cooling of residential buildings by 41,200 MWH (\$9.7 million/year).

- Toronto's urban forest improves air quality, intercepting 1,430 metric tonnes of air pollutants annually (the equivalent value of \$16.1 million/year).
- Urban tree canopy helps to mitigate storm water runoff. Simulations that doubled the tree canopy in the Don watershed indicate a 2.5 per cent decrease in overall flow. Simulating removal of impervious cover in the watershed reduces total flow by an average of 23.8 per cent.

Woodlands also yield a high value per hectare due to their importance for water filtration services, carbon uptake and storage, habitat and recreation. As for the value related to wetlands, an average is appropriate for woodlands, which yield an amount of \$5,106 per hectare per year.

The Town of Aurora is planning to complete a more detailed evaluation of forests. This evaluation will use Urban Forest Effects (UFORE), a science-based peer-reviewed computer model designed to calculate urban forest ecosystem services and values based on field data inputs and available data sets from external sources (e.g. weather and pollution data sets). UFORE can calculate urban forest structure and several ecosystem services and values for any area of any size.



## Street Trees

Although street trees and individual trees on existing lots do not have the same overall benefit as a contiguous woodlot, ecologically they reduce air pollution, enhance storm water control by water uptake, provide carbon storage, improve water quality through slowing runoff and reduce energy consumption by screening properties.

In 2003, The Town of Aurora completed a tree inventory for trees within the municipal right of way and Town parks. This inventory indicates that there are 18,739 street trees with 3,468 of these being within Town parks. In addition there are 1,973 street trees along regional roads in Aurora and a joint project was recently completed between the Town and York Region to plant 312 additional trees along Wellington Street. This results in a total of 21,024 street trees within Aurora.

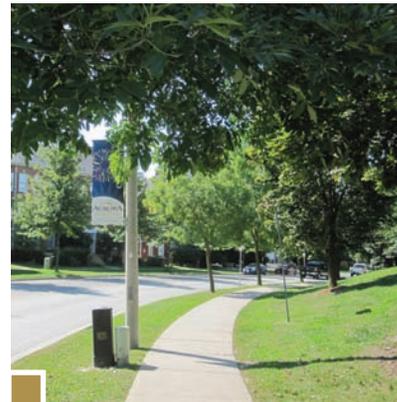
Although a detailed analysis of the value of street trees has not been undertaken, it is important to know that there are software programs (UFORE) and web sites such as [www.yourleaf.org/estimator](http://www.yourleaf.org/estimator) that calculate a comparative benefit of various tree species. In addition, such analysis also provides details on benefits, based on the location of the tree in proximity to the homes. In completing some sample reports within Aurora, it was concluded that planting on the west side of the house yielded the largest overall benefits and planting on the north side yielded the least overall benefits.

The planting of native trees with the highest carbon net storage capabilities and high carbon removal capacity should be promoted and locational benefits should also be considered when a homeowner plants new trees. These include sugar maple, bitternut hickory and swamp white oak (carbon storage) and silver maple (carbon removal).

## Grasslands/Meadows

Grasslands and meadows with their dynamic succession processes are typically rich in species diversity and provide habitat for a changing array of animals. They are especially important breeding and nesting areas for rapidly declining grassland bird species.

In addition to habitat, grasslands and meadows contribute to climate regulation, carbon storage, pollination and increased water permeability, all of which yield economic benefits. The average value for grasslands is \$2,173 per hectare per year.



## Water

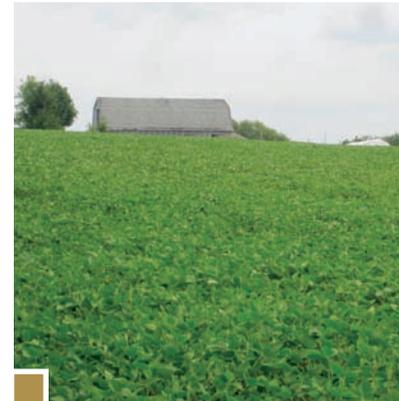
Water refers to streams and rivers but does not include wetlands or storm water ponds which are covered elsewhere. There are no large lakes in The Town of Aurora.

Water features contribute to water regulation, water supply, soil formulation, waste treatment, shading and erosion control and habitat.

Water features also include a 15-metre riparian buffer on each side of the watercourse. The value for streams and rivers is \$335 per hectare per year.

## Groundwater

The water category listed above refers to surface water only. However, Aurora has a vast resource of underground aquifers, springs and related subsurface features. These groundwater resources are invaluable and part of a larger regional resource, the protection of which are enhanced by the Oak Ridges Moraine Conservation Plan and the *Clean Water of Ontario Act* and related watershed protection plans. While clean drinking water is one of the most important benefits, the provision and maintenance of base flow for local and regional watercourses is a responsibility that Aurora shares with all downstream communities.



Forest and wetlands filter and enhance the quality and quantity of the groundwater supply and this report places the appropriate value on such services. However the overall value of the groundwater resources has not been calculated, as this evaluation would require a more detailed regional or watershed wide analysis.

## Agricultural lands

Statistics Canada indicates that the annual Gross Domestic Product (GDP) for the agriculture, forestry and fishing sectors of the economy in Aurora are approximately \$3.1 million. The value of Aurora's capital assets deals with only the non-market value benefits to the natural environment, such as the organic carbon stored in agricultural soils. In addition, agricultural lands contribute to pollination, nutrient cycling, localized cooling and groundwater recharge.

The ecological value for agricultural land is \$5,106 per hectare per year.

## Park land and other open space

Parks and open space provide opportunities for passive and active recreation pursuits. The Town of Aurora currently owns and maintains more than 313 hectares of parkland across 96 park sites. Parks have significant social benefits including promotion and contribution to improved physical health of Aurora residents, thus reducing health care costs. However, for the purpose of this report, only the ecological value of parks has been calculated. These benefits include carbon storage, carbon sequestration, pollination and urban forest cover.

For the purpose of evaluating the value of parklands, total parkland cover for the Town was calculated at a rate of 60 per cent natural surfaces and 40 per cent hard and other non-natural surfaces, so that only 60 per cent of the total parkland is assigned a capital value and considered to perform natural ecological functions.

The value placed on parks is \$824 per hectare per year.



## Other

The “other” category shown on the schedules includes features that do not readily fit into a natural heritage classification. These include the Aurora Cemetery and other open areas that have not been used in the calculation of Natural Capital Assets.

## Trails

There are approximately 40 kilometres of off-road trails within Aurora. Included within the trails network are the Nokiidaa Trail which forms part of the Lake Ontario to Lake Simcoe trail system and the Oak Ridges Moraine Trail. The off-road trails network also forms a portion of the Town’s active transportation system. Active transportation is a key component to creating a healthy community and reducing greenhouse gases. The recent study by the Organization for Economic Co-operation and Development reported that traffic congestion in the Greater Toronto Area and Hamilton area is costing the Ontario economy an estimated \$3.3 billion per year in lost productivity.



In Canada, the majority of trips made by automobile are short trips. Each Canadian makes an average of 2,000 car trips of less than 3 kilometres each year according to the Public Health Agency of Canada. Therefore, a shift towards active transportation modes for utilitarian trips (e.g. work, school, errands) or recreational purposes, coupled with public transit and the use of transportation demand management programs (e.g. carpooling) would increase the capacity and efficiency of the transportation system. As an added benefit, bicycle tourism can have positive impacts on local economic development.

Trails are typically located within the previously-described natural features, open space areas and parklands. Thus the area associated with trails has been calculated at the value associated with the feature that the trail is located in. However, trails yield significant additional value ranging from reducing greenhouse gases due to motor vehicle trip reductions, to reduction in health care costs due to better physical fitness.

## Storm Water Management Facilities

Storm water management facilities are not typically identified as Natural Capital Assets since they are constructed features and typically required to offset the increased impermeable areas associated with development. However, retrofitting facilities and constructing engineered wetlands help offset phosphorus loading to Lake Simcoe and reduces weed growth. Thus the value of improving facilities and constructing engineering facilities that mimic natural wetlands can be partially considered natural assets over and above the status quo.

The Town of Aurora with the assistance of the LSRC, has been very proactive in upgrading and enhancing storm water management facilities. Since 2004, five facilities have been upgraded.

See appendix 3 for more details on storm water retrofits and engineered wetlands.



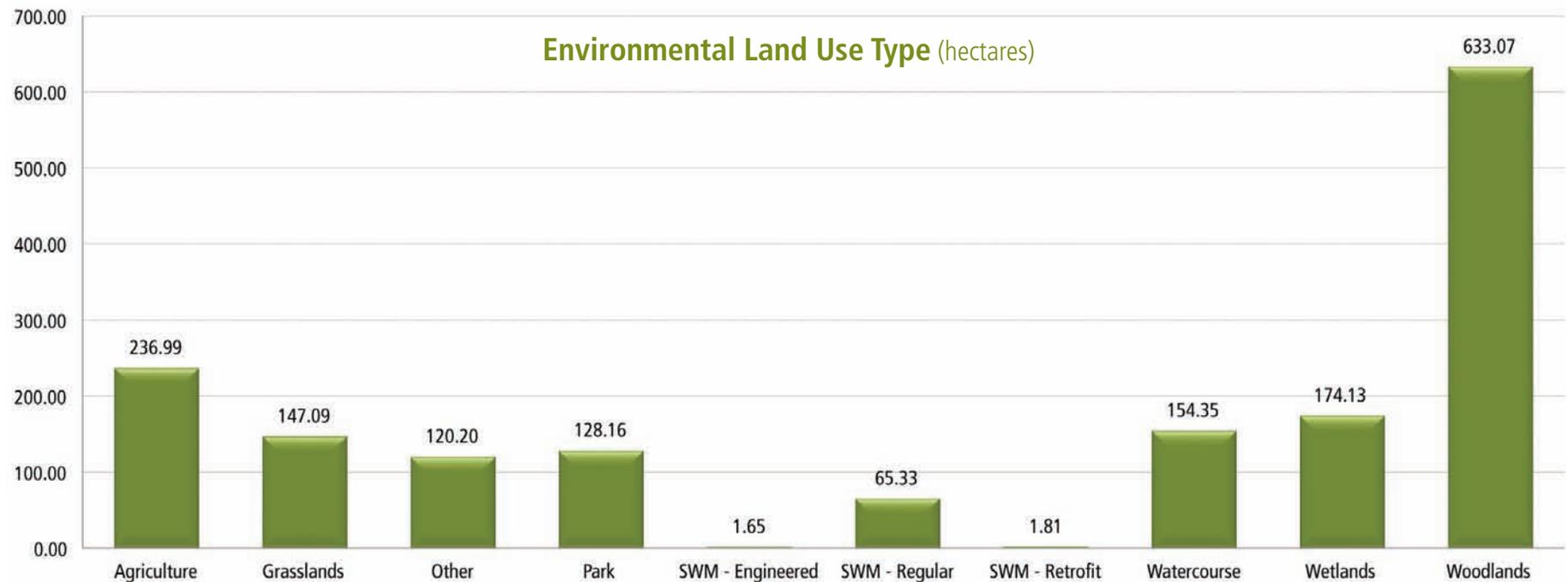
# Analysis

## The detailed mapping exercise of all of Aurora’s Natural Capital Assets has resulted in the following land use breakdown:

Aurora’s greenland system is composed of open space/natural areas, environmentally-protected areas and parkland. In addition to the greenland system there are also agricultural lands and storm water management facilities which are considered natural assets. Furthermore, golf courses are shown on the mapping but the lands associated with golf courses are not added to the capital assets of the Town. Additional work and scientific research would be required to determine the contribution of golf course lands to Natural Capital Asset values. Given that golf courses contain wooded area, ponds/wetlands and

open grassy areas they would certainly make some contribution to Natural Capital Asset values, however there are also associated impacts such increased pesticides, fertilizers and other such impacts.

The value of trails as mentioned previously is calculated based on the underlying feature where the trail is located. Two of the main economic values of trails are public health and tourism, both of which are outside of the scope of this report. However, reduction of greenhouse gases based on active transportation is a huge environmental value and worthy of further research.

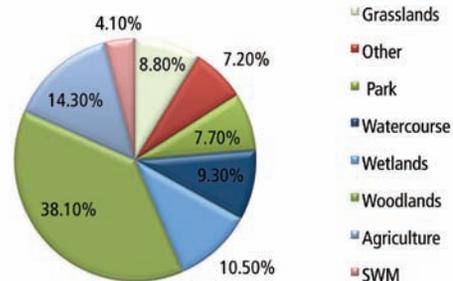


Please refer to map on page 31

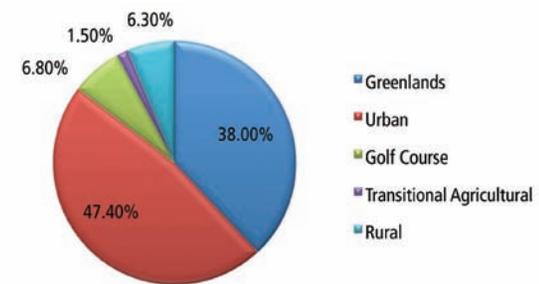
# Total Natural Capital Assets within Aurora

Land Use Type	Area (hectare)	Value per hectare (\$/hectare/year)	Phosphorus reduction per year (kilogram)	Value per kg of phosphorus reduced	Total Value (\$/year)
Agriculture	236.99	\$5,106.00			\$1,210,070.94
Grasslands	147.09	\$2,173.00			\$319,626.57
Other	120.3				
Park	128.16	\$824.00			\$63,362.30
SWM - Engineered	1.65		60	\$2,500	\$150,000.00
SWM - Regular	65.33				
SWM - Retrofit	1.81		84.2	\$2,500	\$210,500.00
Watercourse	154.35	\$335.00			\$51,707.25
Wetlands	174.13	\$12,662.50			\$2,204,921.13
Woodlands	633.07	\$5,106.00			\$3,232,455.42
<b>Total</b>	<b>1662.88</b>				<b>\$7,442,643.61</b>

**Note:** Parkland is calculated at a rate of 60 per cent natural surfaces and 40 per cent hard and other non-natural surfaces so that only 60 per cent of parkland is included within the total value amount within this report.



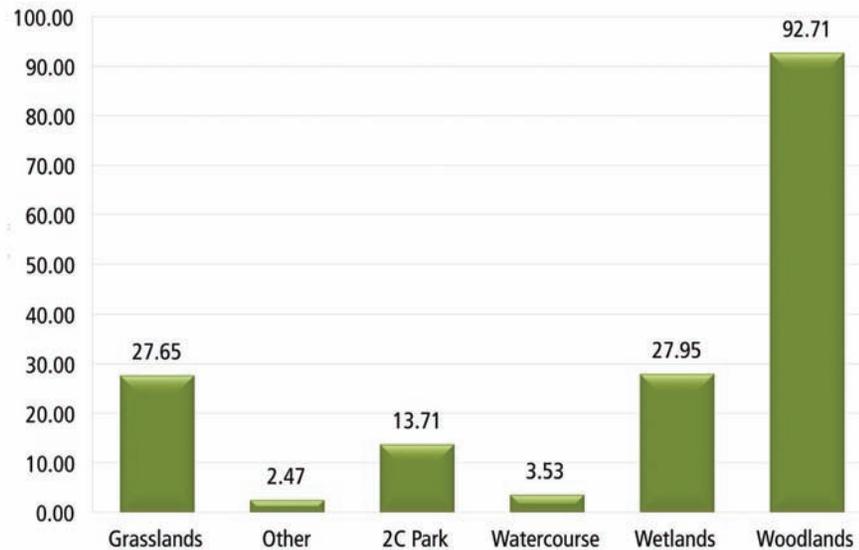
**Aurora Natural Features**  
(% of total features)



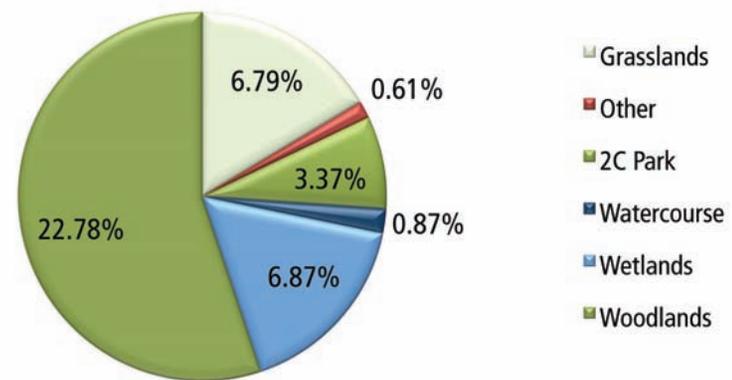
**Aurora**  
(% of total land)

# 2C Breakdown

The 2C Secondary Plan was adopted by Aurora Town Council on September 28, 2010 and has recently been approved by the Ontario Municipal Board. The vision for the 2C Secondary Plan area is to create a complete community that protects the environment and includes well-designed residential neighbourhoods and a business park. The 2C community is expected to be leading edge in implementing green building technologies and is to be developed at densities and in a pattern that is compact and transit-supportive. The community will encourage an active, healthy lifestyle through highly interconnected greenlands and trail systems. The following 2C values are not over and above the totals calculated for the entire Town but form a portion of the overall totals.

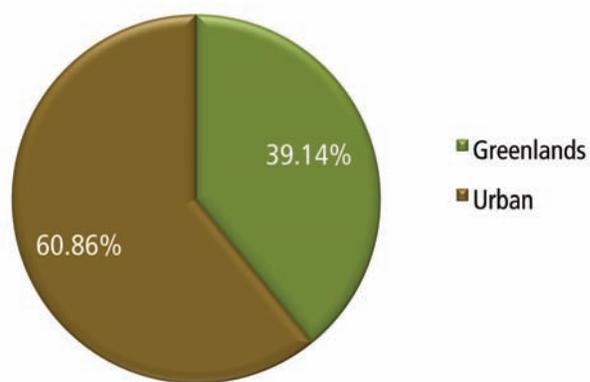


**2C Natural Features Land Use**  
(hectares)



**2C Natural Features**  
(% of total features)

2C Land Use Type	Area (hectare)	%	Value per hectare \$/hectare/year	Total Value (\$/year)
Grasslands	27.65	6.79%	\$2,173.00	\$60,083.45
Other	2.47	0.61%		
2C Park	13.71	3.37%	\$824.00	\$4,518.82
Watercourse	3.53	0.87%	\$335.00	\$1,182.21
Wetlands	27.95	6.87%	\$12,662.50	\$353,916.88
Woodlands	92.712	2.78%	\$5,106.00	\$473,377.26
<b>Environmental features</b>	<b>168.02</b>	<b>41.29%</b>		
<b>Urban</b>	<b>238.94</b>	<b>58.71%</b>		
<b>Total</b>	<b>406.95</b>			<b>\$893,078.61</b>



**2C % Land Total**

The 2C community does more than an admirable job of protecting and enhancing Natural Capital Assets with approximately 40 per cent of the lands being protected and yields approximately \$893,000 per year.

## Summary

The value of the natural assets for the entire greenbelt is estimated at \$2.6 billion annually. The value of the natural assets for the entire Lake Simcoe Watershed is estimated at \$975 million annually. The value of Aurora's natural assets is estimated at approximately \$7.4 million annually. This amount does not include the value of street trees and other urban trees. This is a significant value attributed to the protection of environmental features, reduction in greenhouse gases and other ecological benefits. The entire budget for Aurora in 2012 including water rates, was approximately \$62 million. Without the values of Aurora's natural capital assets it is possible that the overall budget of the Town could potentially be increased by \$7.4 million, which is a 12.4 per cent increase per year, to replicate or replace the ecosystem services and other benefits that Aurora's Natural Capital Assets provide. Typically natural assets provide economic benefits that do not require an outlay of tax dollars to maintain.

Protection and investing in Natural Capital Assets along with the implementation of Low Impact Development (LID) standards can yield significant overall economic benefits to The Town of Aurora. These include the environmental benefits listed within this report, as well as the significant physical and mental health benefits associated with reduction of greenhouse gases, promotion of active transportation/recreational pursuits and appreciation of nature.

Residents of Aurora rely on nature to sustain and improve the quality of life enjoyed today and into the future. Preserving and enhancing Natural Capital Assets will benefit Aurorans now and for generations to come. The Natural Capital Assets within Aurora help to reduce the overall ecological footprint of the residents of Aurora and enhance the sustainability of Aurora.

This report was completed in a manner to allow a quick analysis of the value of Natural Capital Assets for any specific area of the Town as shown in the breakdown of the 2C planning area. Thus future growth areas, redevelopment areas and intensification areas can benefit from a pre- and post-development analysis of the value of Natural Capital Assets without a significant investment in time and or money. This analysis can help guide land use planning decisions and assist in enhancement plans for new and existing developments. As such, consideration should be given to preparing *Official Plan* policies to require applicants to prepare detailed natural asset economic valuation of pre- and post-development scenarios (based on the methodology used within this report) with any new planning applications that include natural assets.

## Recommendations

Ecosystem protection should also be augmented by the enhancement of the resiliency of ecosystems and the benefits they provide. This includes wetland creation, tree planting and environmentally-sensitive park and trail creation. Such enhancements should be evaluated by not just ecological benefits but also by economic benefits. Thus consideration should be given to developing a mechanism to analyze such economic benefits. In addition, a work plan and budget should be established to support these enhancements. Such work plans should be coordinated with the LSRCA and other partners.

All development applications and applications for site alteration should prioritize protection and enhancement of natural features with re-creation of natural features only being considered for areas that were previously developed or in very limited circumstances.

### Green Development Policies

Green Development standards, including Low Impact Development (LID) can be applied to all development applications to promote more naturalized and energy-efficient developments. LID standards attempt to mimic the natural environment in reducing the impact of storm water runoff and as such, reduce the overall costs associated with storm water treatment.

The implementation of Green Development standards helps reduce greenhouse gas emissions, improves energy efficiency, promotes active transportation, reduces water runoff and promotes water infiltration and the reuse of water.

In 2009, The Town of Aurora adopted Green Development and LID policies through an *Official Plan* amendment.

The 2009 policies were further updated in *The Town of Aurora Official Plan* which was adopted in 2010 and approved in 2012. The new policies take the concept of Green Development standard and apply them to all land uses within the municipality.

The implementation of the Green Development policies should occur with all development applications and consideration should be given to implementing a monitoring program to determine the benefits derived. The value of Green Development standards is significant in the reduction of storm water management facility costs alone.

In addition, land use planning decisions should be analyzed on the basis of the value of the Natural Capital Assets and cost that may be associated with destruction/removal of natural features and the cost to replicate their natural functioning and the ecosystem services that they provide.

### Landowner Education

Additional information can be obtained within the reports identified within the bibliography section of this report and also the following websites:

- David Suzuki Foundation - [www.davidsuzuki.org](http://www.davidsuzuki.org)
- Lake Simcoe Region Conservation Authority - [www.lsrca.on.ca](http://www.lsrca.on.ca)
- Toronto Region Conservation Authority - [www.trca.on.ca](http://www.trca.on.ca)
- York Region - [www.york.ca](http://www.york.ca)
- York Region Greening Strategy - [www.york.ca](http://www.york.ca)
- Oak Ridges Moraine Land Trust - [www.oakridgesmoraine.org](http://www.oakridgesmoraine.org)
- Stewardship Ontario - [www.stewardshipontario.ca](http://www.stewardshipontario.ca)
- Ontario Environmental Network - [www.oen.ca](http://www.oen.ca)
- Nature Conservancy of Canada - [www.natureconservancy.ca](http://www.natureconservancy.ca)

In addition, websites such as [www.yourleaf.org/estimator](http://www.yourleaf.org/estimator) (LEAF) and a proposed site by the Suzuki Foundation provide homeowners with the tools to analyze the value of trees on residential lots pertaining to reduction of greenhouse gases and energy efficiency for the homes. Such sites also assist homeowners in determining the best trees to plant to achieve the highest benefits.

The Town should promote these websites to existing and new homeowners. Currently the Town does a good job in requiring Homeowners Manuals to be provided to all new developments to help with the stewardship of natural features and these manuals should be expanded to include a section on the value of the Natural Capital Assets associated with the development.

### **Other Important Programs**

The Town of Aurora should also encourage and support the existing federal and provincial programs and mechanisms in order to improve the environmental strategy of the Town. These programs are listed as follows and described in more detail within Appendix 2:

1. The Town of Aurora should encourage the protection of the Natural Capital Assets in the Town by communicating directly with land owners pertaining to the opportunities for ecological donations when offering income tax benefits for their donations. *(Appendix 2: Ecological Gifts Program –Federal program).*
2. The Town to encourage and communicate to land owners the tax benefits from the transfer of woodlots from one generation to another. *(Appendix 2: Intergenerational Capital Gains Exemption and Rollovers for Transfers of Commercial Farms/Woodlots – Federal program)*
3. The Town to encourage and to become an active participating member in the development of “Managed Forest Plans” for the woodlots in the Town *(Appendix 2: Managed Forest Tax Incentive Program – Ontario provincial program )*
4. The Town should consider initiating pilot projects for stimulating the woodlots/farmers land owners to protect the environment on their properties; for example, tax benefits for protecting and revitalizing woodlots and green spaces. *(Appendix 2: “Alternative Land Use Services” (Ontario and other provinces)*

5. The Town to encourage and communicate to land owners the tax benefits of the Conservation Land Tax Incentive Program *(Appendix 2: “Conservation Land Tax Incentive Program”)*
6. The Town shall encourage the participation in the Habitat Conservation through “Conservation Easements” *(Appendix 2: “Ducks Unlimited Canada and other environmental conservation easements”)*
7. The Town should continue to explore best practices in other provinces such as the “Riparian Tax Credit”- The Province of Manitoba and the Alternative Land Use Services (ALUS).
8. The Town should continue to cooperate with York Region and conservation authorities and other partners pertaining to protection, enhancement and securement of natural capital assets.
9. The Town should continue to support and encourage volunteer organizations such as the Aurora Community Arboretum Inc. not-for-profit organization.

The Town should also consider the creation of a fund through which it could, when necessary, contribute to the purchase of lands to protect natural ecological functions independently or in partnership with other conservation/protection program to advance common interests *(e.g. “York Region Greening Strategy”)*.

## Bibliography

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Monlar, Michelle. "Natural Capital Policy Review." *A Review of Policy Options to Protect, Enhance and Restore Natural Capital in B.C's Urban Areas*. 2011.

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Olewiler, N. "The Value of Natural Capital in Settled Areas of Canada." 2004.

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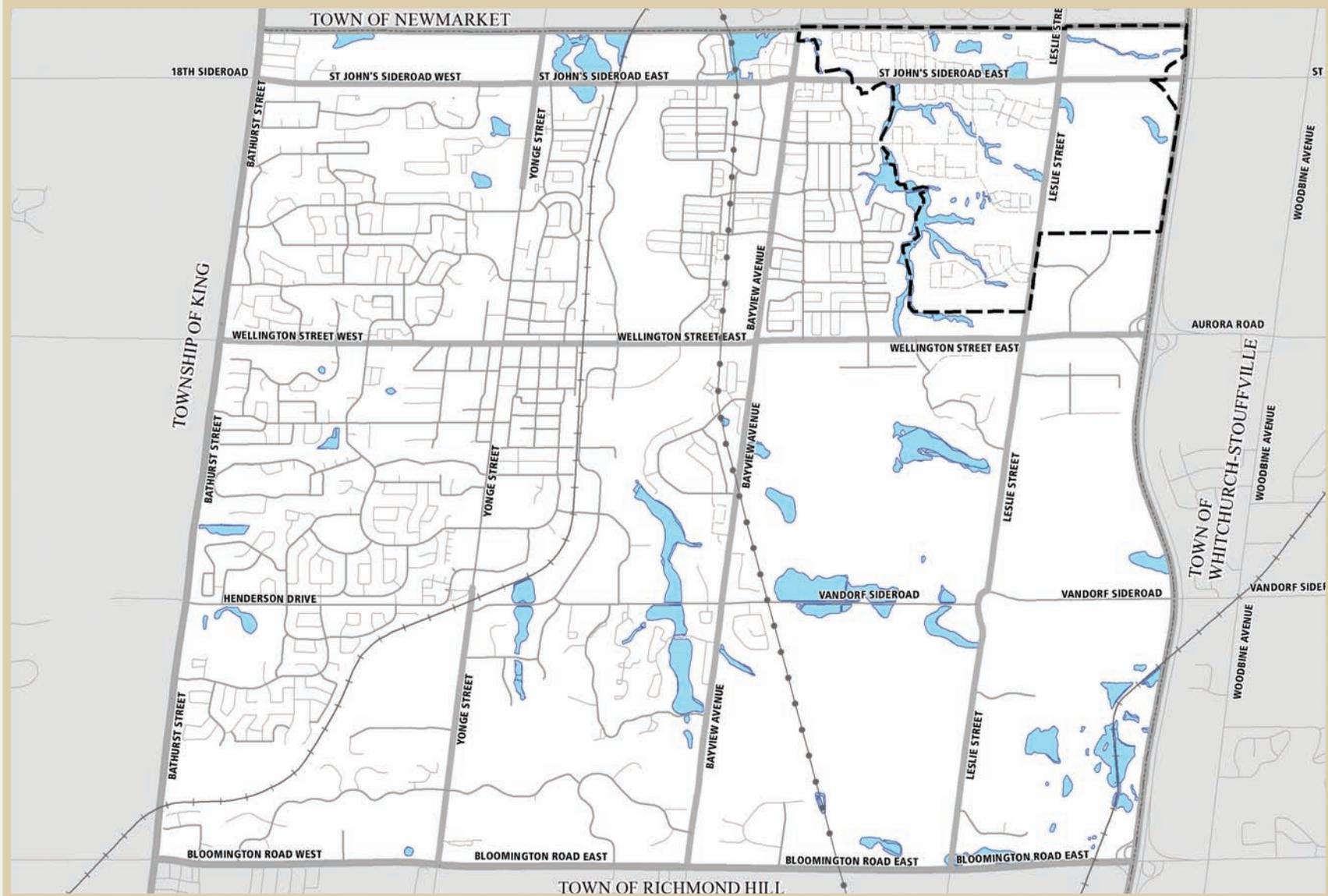
Wilson, Sara J. "Ontario's Wealth, Canada's Future: Appreciating the Value of the Greenbelt's Eco-Services." Gibsons, BC: 2008.

# Appendix 1 – Maps

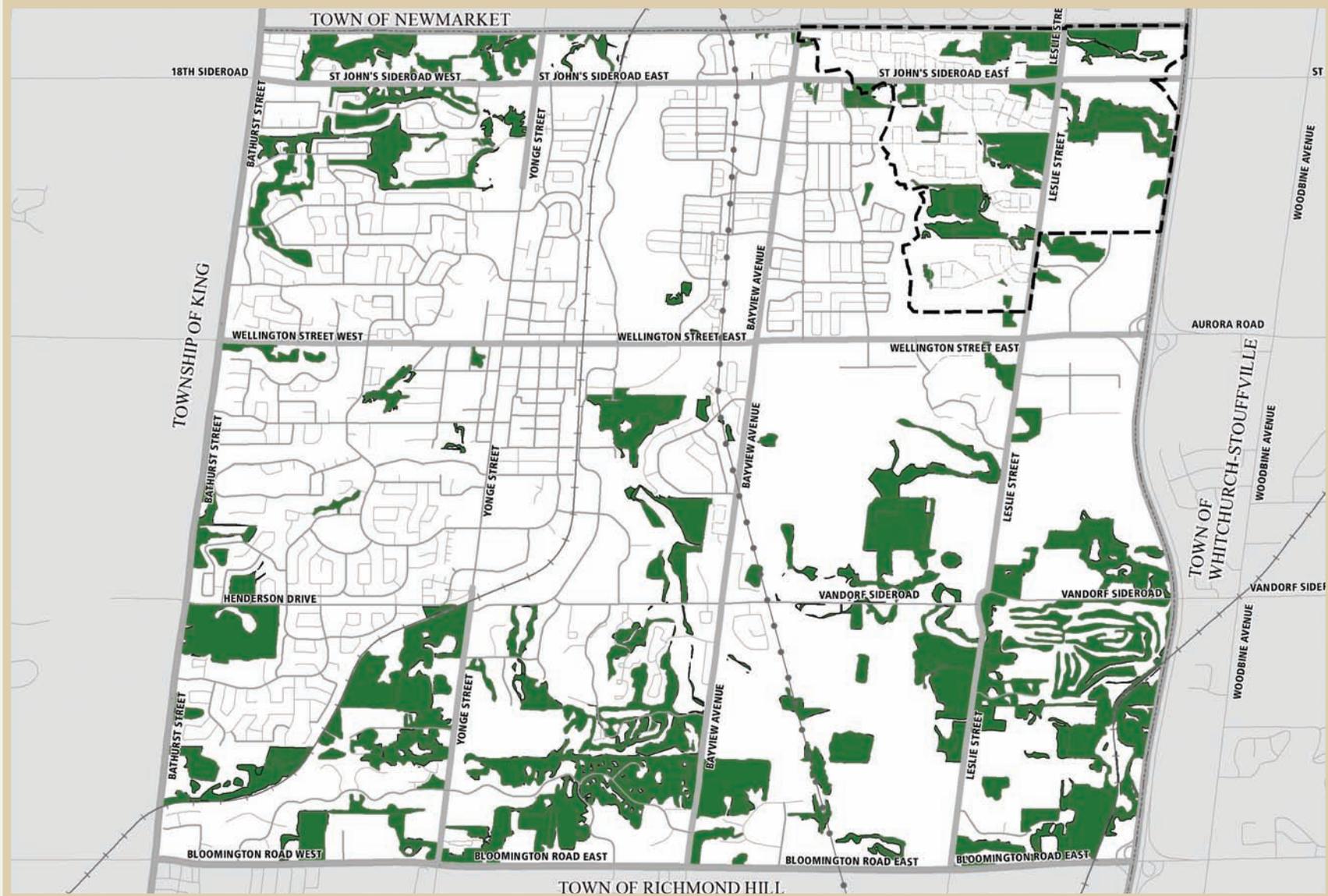
- Map 1** Natural Capital Assets
- Map 2** Wetlands
- Map 3** Woodlands
- Map 4** Watercourses
- Map 5** Grasslands
- Map 6** Agricultural
- Map 7** Parks and open spaces
- Map 8** Stormwater ponds
- Map 9** Other
- Map 10** Golf Course
- Map 11** Rural
- Map 12** Urban



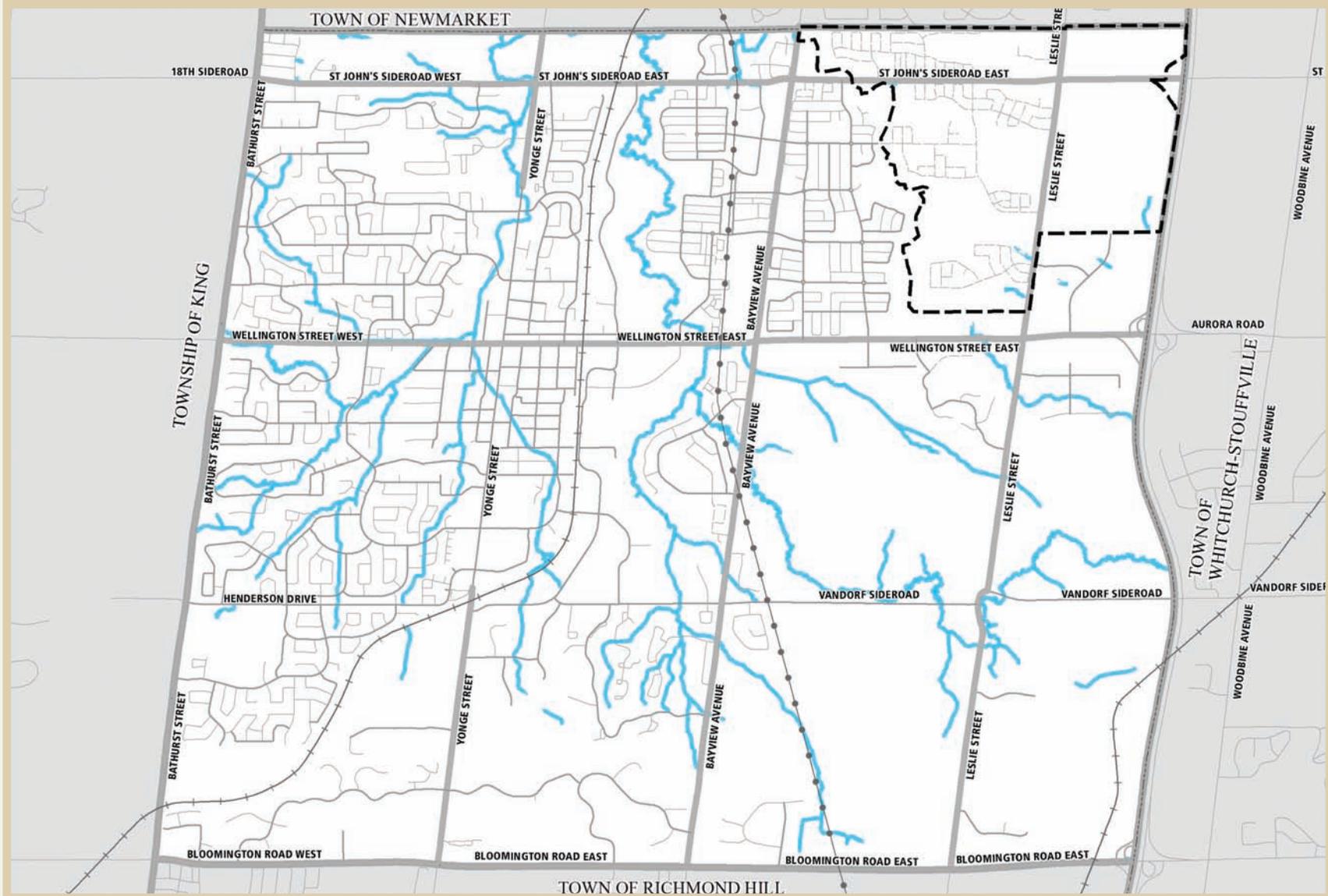
# Map 2 – Wetlands



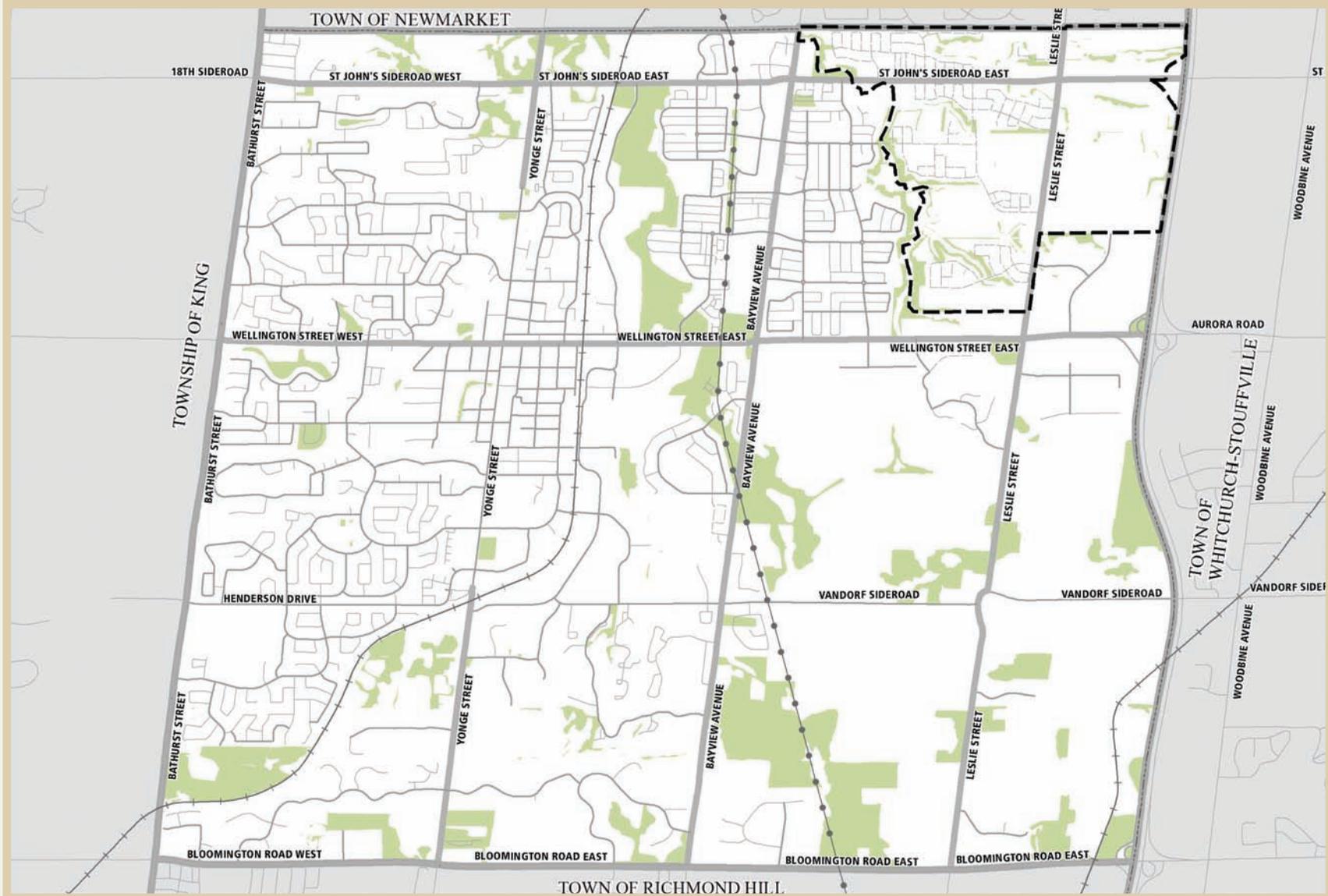
# Map 3 – Woodlands



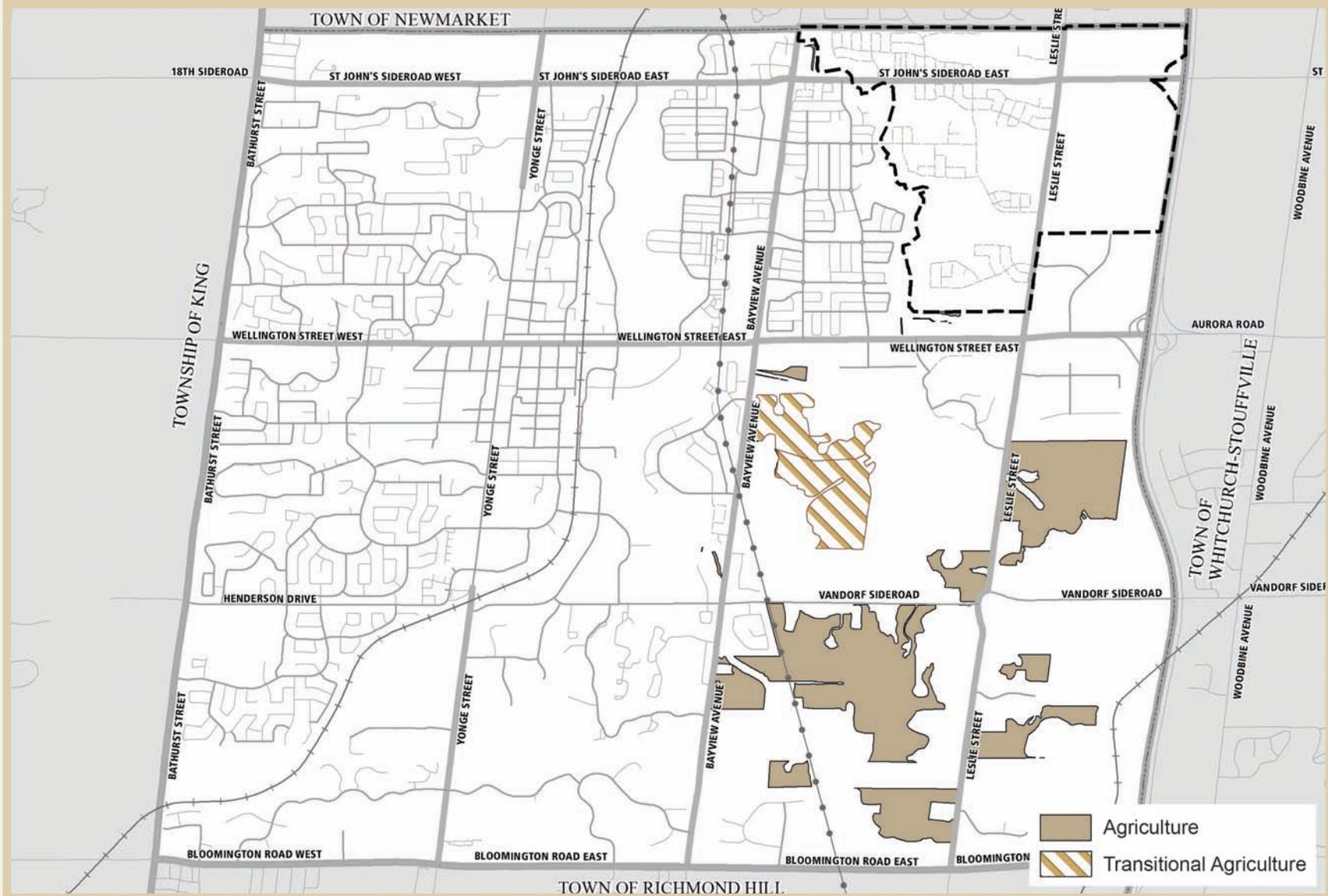
# Map 4 – Watercourses



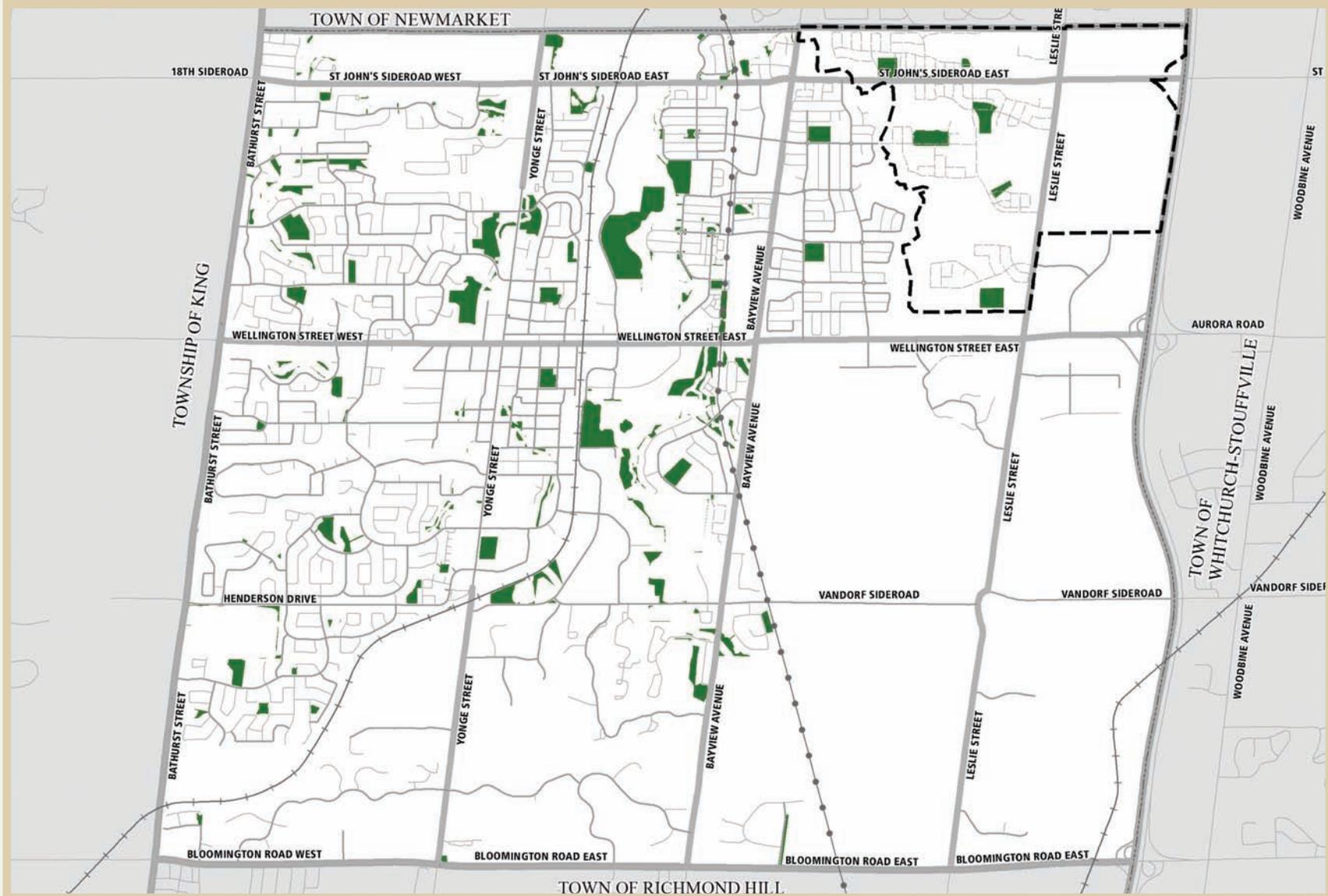
# Map 5 – Grasslands



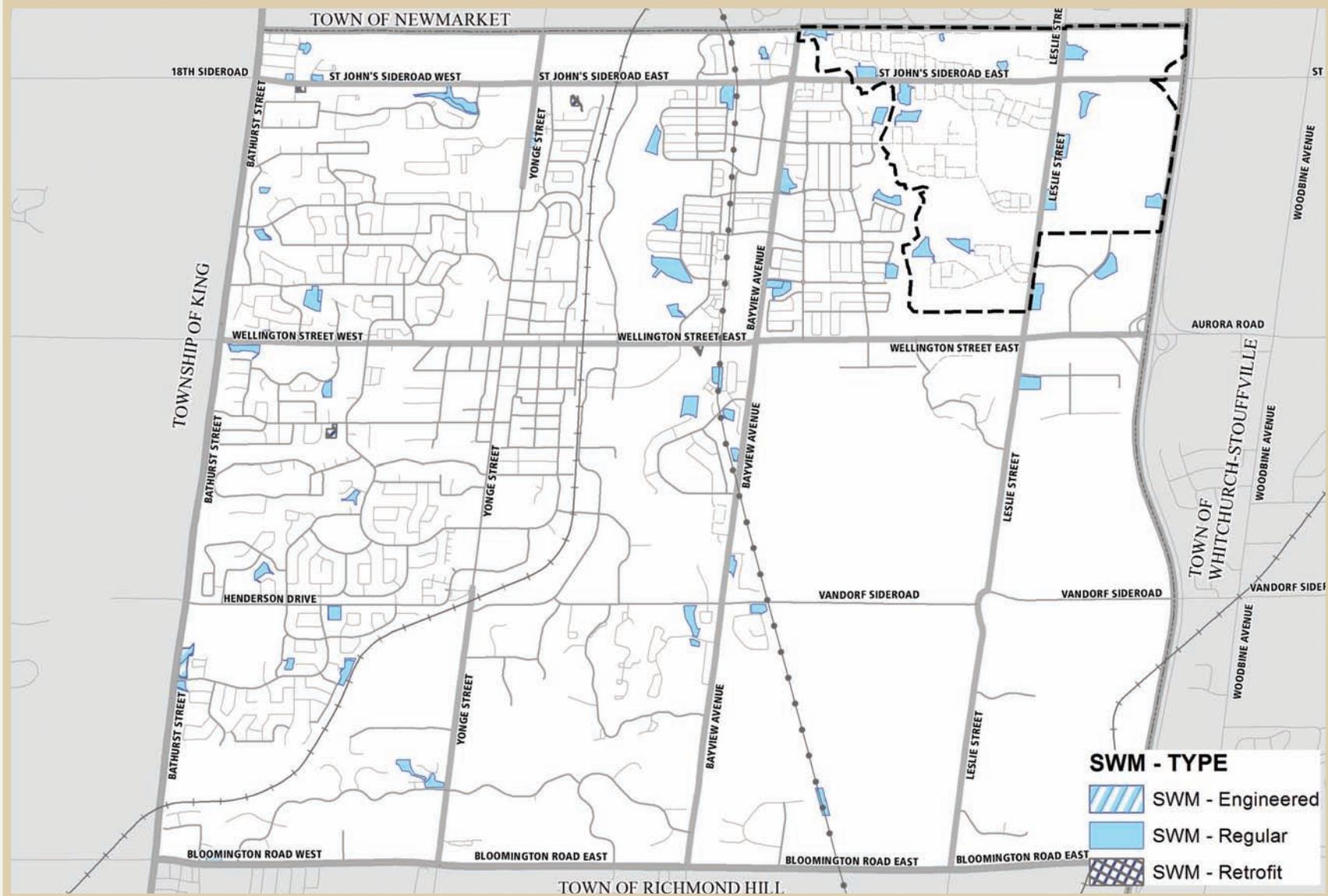
# Map 6 – Agricultural



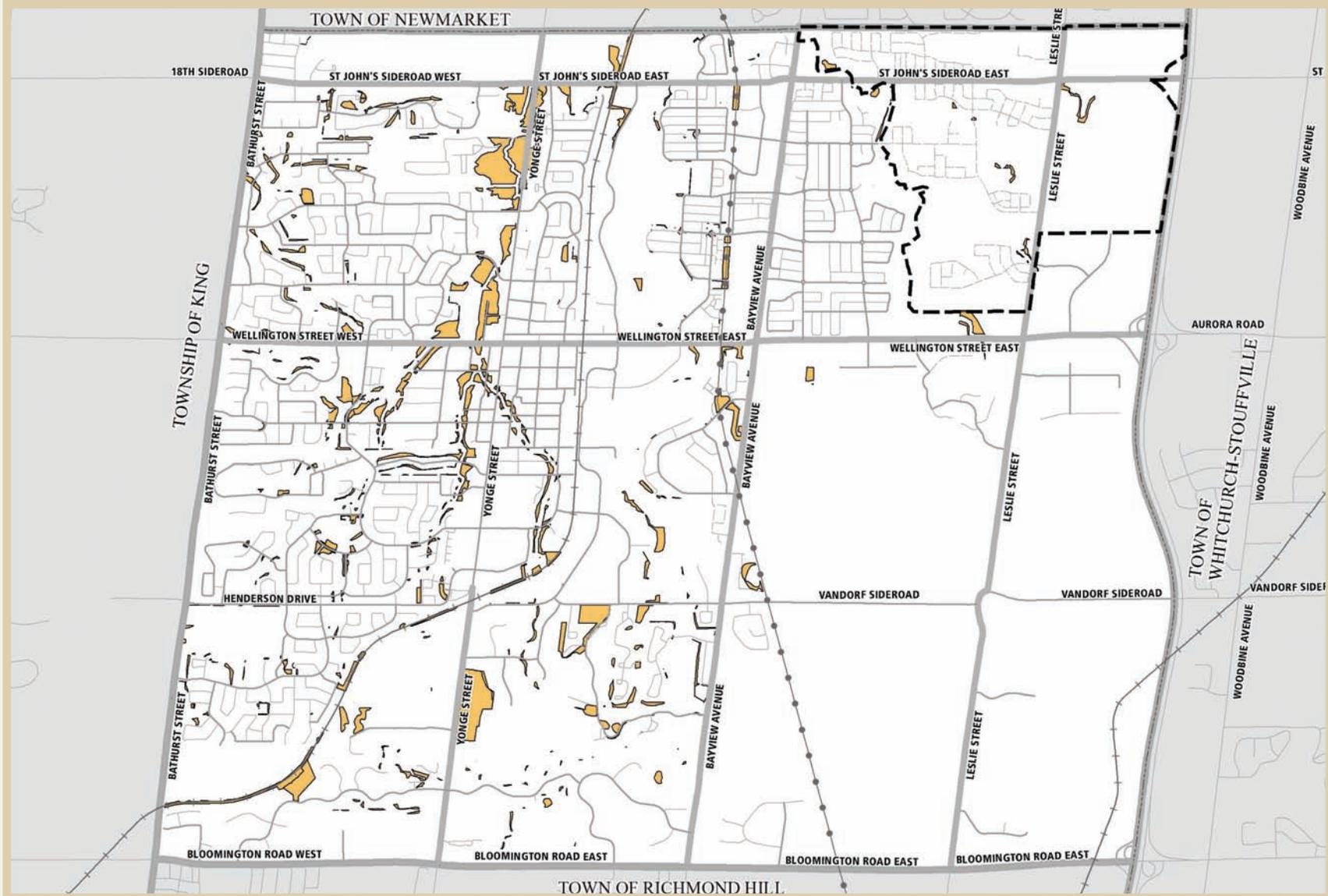
# Map 7 – Parks and open spaces



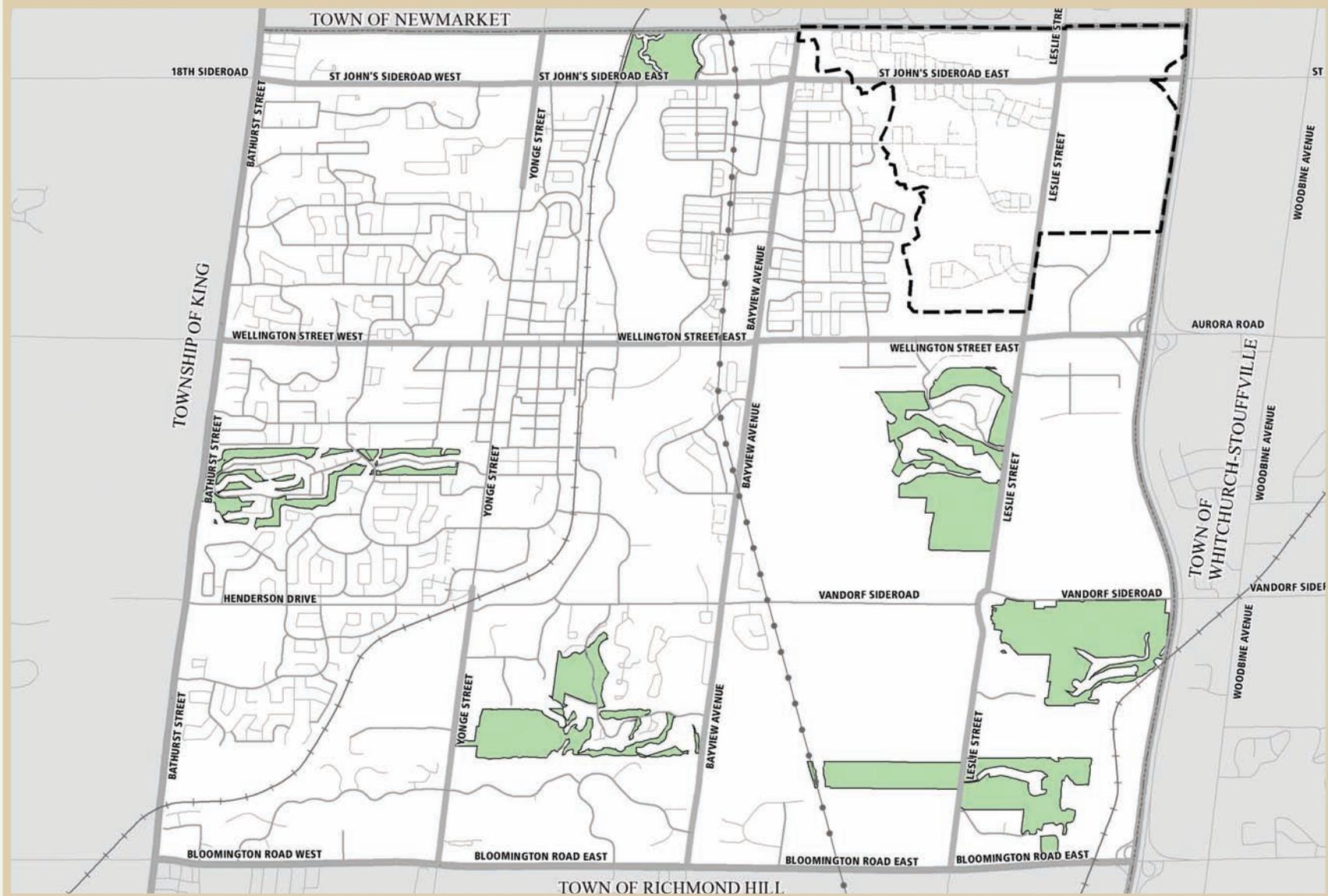
# Map 8 – Stormwater ponds



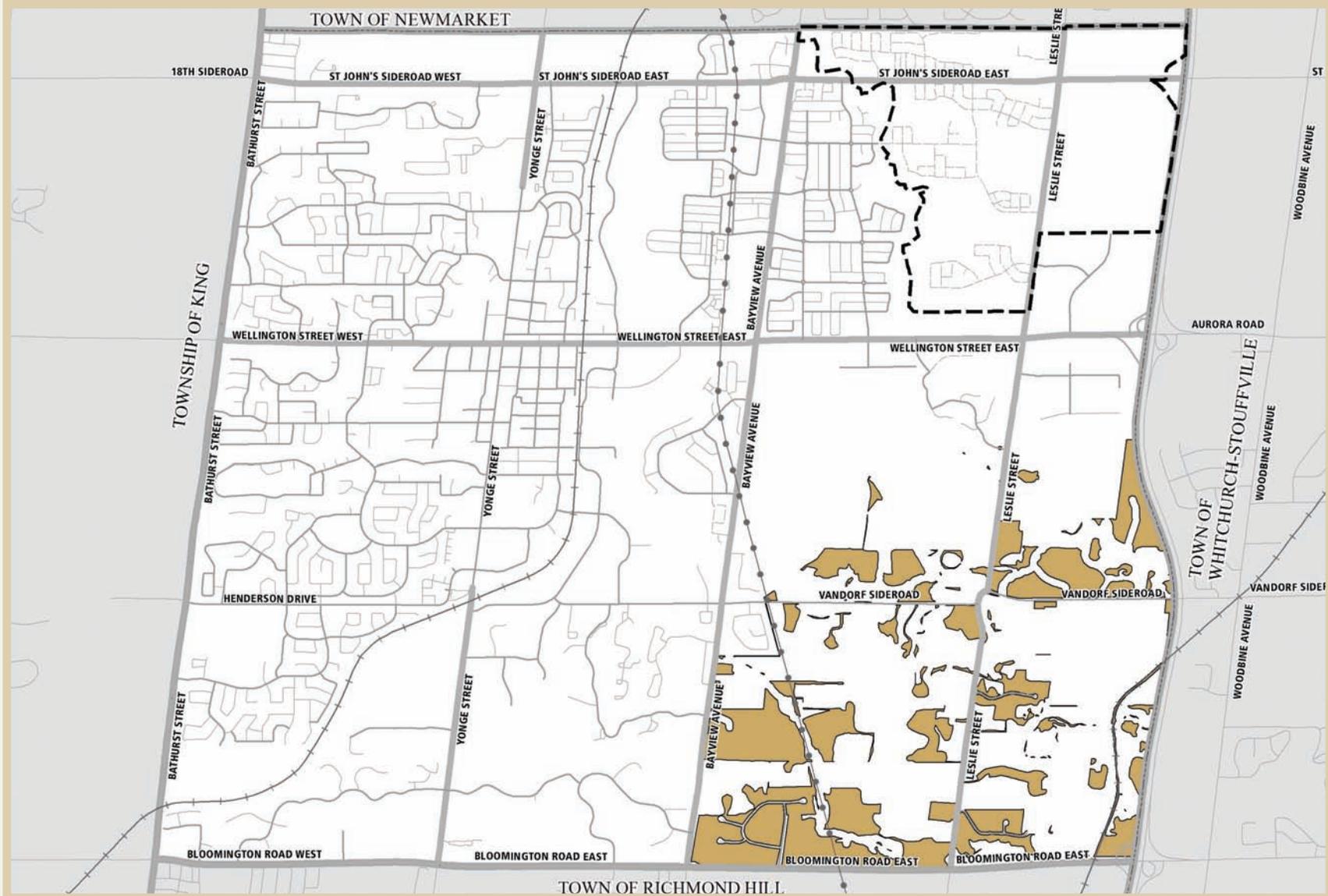
# Map 9 – Other



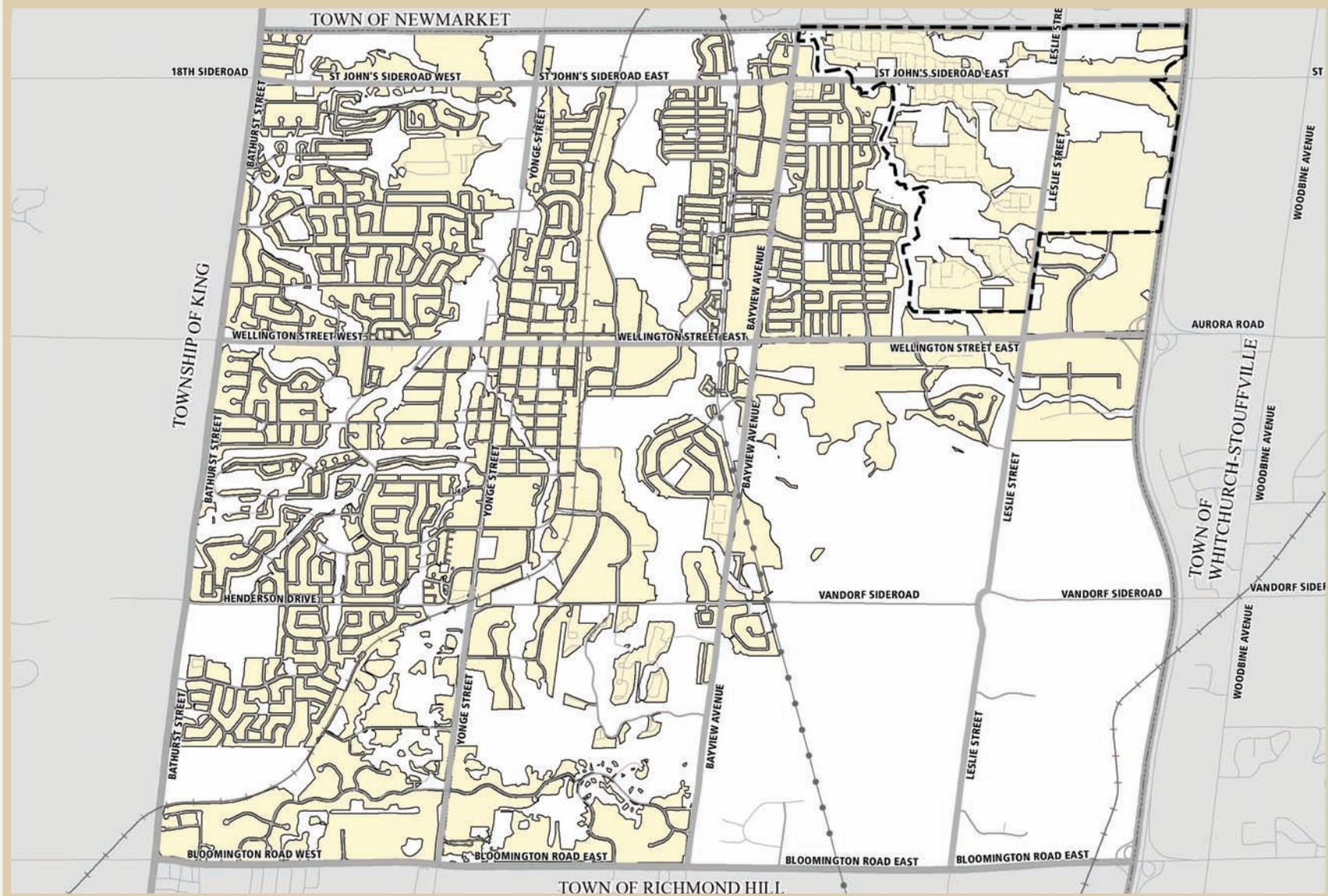
# Map 10 – Golf Course



# Map 11 – Rural



# Map 12 – Urban



## Appendix 2 – Best Practices

### Ecological Gifts Program (Federal)

The Ecological Gifts Program encourages individual and corporate landowners to protect nature in perpetuity by donating ecologically-sensitive lands or a partial interest in their lands (i.e. through land transfer, conservation easements, covenants or servitudes) to environmental charities or government bodies. Donors can receive income tax benefits in return. The financing mechanism is a tax credit or deduction to donors and a reduction in the taxable capital gain realized on the disposition of the property. Corporate donors may deduct the amount of their gift directly from their taxable income, while the value of an individual's gift is converted to a non-refundable tax credit.

An ecological gift of a conservation easement allows landowners to protect the ecologically-sensitive features of their property in perpetuity, retain title and be eligible for enhanced income tax benefits. Conservation easements are legally binding instruments whereby the landowner transfers specific rights, such as the ability to create building lots or cut trees, to an easement holder (usually a nature conservation organization or agency).

### Intergenerational Capital Gains Exemption and Rollovers for Transfers of Commercial Farms/Woodlots (Federal)

This federal program allows for the exemption and/or deferment of the capital gains tax on the transfer of woodlots from one generation to another. Before the establishment of this incentive, the burden of the inheritance tax would result in the new owners paying the capital gains by harvesting the timber on the woodlot. This tax therefore had been a perverse incentive, encouraging landowners to harvest.

### Managed Forest Tax Incentive Program (Ontario)

This provincial program encourages landowners, who own four hectares or more of forest, to carry out specific management activities and to prepare and follow a Managed Forest Plan for their property. Management activities approved under this program include: tree planting or harvesting; recreational activities; wildlife management involving habitat work or participating in monitoring programs; protecting environmentally sensitive areas; and education. Under this program the property is reassessed and classified as a Managed

Forest, and is eligible for a tax reduction at 25 per cent of the municipal tax rate set for residential properties. A Five-Year Progress Report must be submitted in the fifth year of the agreement, and Ministry audits including field visits can take place at any time.

### Oak Ridges Moraine Land Trust

A citizen directed charitable non-profit, the ORMLT aims to maintain and manage a system of nature reserves. The trust works through outreach and communications and other means to encourage all citizens to further protect and restore the natural environment of the Oak Ridges Moraine.

To date the trust has secured more than 3,326 acres with 27 registered conservation easements, three restricted covenants, six properties donated to the land trust for direct, fee simple ownership and two properties in joint ownership.

### Alternative Land Use Services (Ontario and other provinces)

The Alternative Land Use Services (ALUS) is a voluntary, incentive-based program providing payments to farmers for returning marginal and environmentally-sensitive farmland into native vegetative cover and wetlands for the production of ecosystem services. ALUS focuses on maintaining existing natural habitat in farmed regions of Canada, as well as restoring lost natural features. ALUS is currently being demonstrated in Ontario, Saskatchewan, Manitoba and Alberta and is a provincial program in PEI. The program provides a “fee for service” that recognizes and rewards farmers and ranchers for the changes they make in land use and practices.

Due to the success of the pilot program in Norfolk, many other jurisdictions are now implementing a similar program.

### Conservation Land Tax Incentive Program (Ontario)

This program encourages the protection of Ontario's provincially-significant conservation lands as determined by the Ontario Ministry of Natural Resources by providing property tax relief to landowners who agree to carry out specific activities to conserve the natural

heritage values of their properties. Landowners participating in this program retain full ownership and property rights. The financing mechanism is a 100 per cent tax-exemption on the eligible portion of the property.

### **Habitat Conservation (Ducks Unlimited Canada)**

Ducks Unlimited Canada's (DUC) Wetland Retention Program in Ontario focuses on the protection of critical, high-value and at-risk habitat. The tools that DUC uses include:

- Land purchase
- Land-title transfer: The title of the land is gifted to DUC so the property can be carefully stewarded into the future
- Conservation easements: The landowner retains title to the land but gifts or sells certain property rights to DUC through a legally-binding agreement to protect specific property values
- Binding long-term landowner conservation agreements: A landowner enters into a written agreement with DUC that is typically not registered on title, to protect specific property values

### **Riparian Tax Credit (Manitoba)**

The Riparian Tax Credit is designed to encourage farm operators to upgrade their management of lakeshores and river and stream banks and it recognizes those who have already done so. This property tax credit is the first program of its type in Canada.

### **Lake Simcoe Region Conservation Authority and York Region**

Natural Capital Asset protection, enhancement and securement programs are promoted by the LSRCA and York Region.

The Lake Simcoe Protection Plan and funding promotes opportunities to enhance riparian corridors and other water quality improvement initiatives associated with ecosystem protection, enhancement and stewardship. In 2011-2012, the LSRCA's Landowners Environmental Assistance Program (LEAP) funded more than 210 projects within the

watershed, valued at more than \$3.2 million. Together, these projects are expected to reduce phosphorus loading to the lake by approximately 463 kilograms per year. Projects were completed with agricultural producers, urban and rural landowners, municipalities, community groups and other watershed stakeholders. These projects deliver many side-benefits, including increased community awareness of the watershed, and the positive impact of improved land use practices.

In 2001, Regional Council adopted the Greening Land Securement Strategies with a \$1.4M annual budget allocation. In 2007, this allocation was reduced to \$1.35M annually to support the delivery of Greening Strategy programs (tree planting, environmental education, stewardship, etc.) and strategic environmental land securement. The natural environment interest on properties can be secured using a number of means ranging from restoration, tree planting, and stewardship agreements to the donation of land, conservation easements, and fee simple acquisition by the Region and/or a partner.

Since 2001, a total of 35 properties, including 872 hectares (2,155 acres) of conservation lands have been secured through a Regional Greening contribution of \$10M with a total property value exceeding \$50M (at time of acquisition).

### **Volunteers and not-for-profit organizations**

Volunteers and not-for-profit organizations such as the Aurora Community Arboretum Inc. can provide local real life examples of natural enhancement programs that benefit the community and natural ecosystem. The master plan concept of the Arboretum leverages local skills and embraces volunteers to achieve a positive impact in terms of increased natural capital assets and ecosystem/watershed enhancements. Other similar programs can benefit from the extensive experience and track record of the Arboretum organization.

## Appendix 3 – Storm Water

The Lake Simcoe Region Conservation Authority and its Lake Simcoe Environmental Management Strategy Partners awarded the 2005 Award of Merit to The Town of Aurora for the Kennedy Street and Deerhorn Crescent Storm Water Management Facility. The facility demonstrates the Town’s commitment to natural water resources, by helping to reduce the amount of phosphorus entering Lake Simcoe by an estimated 37.2 kilograms per year. This represents a significant step in protecting and restoring Lake Simcoe, which is a \$200 million annual economic resource and source of drinking water for five communities in York Region.

### The following action items were associated with this project:

- 1. Create a sediment forebay and associated wetland** to trap particulate matter and absorb nutrients.
- 2. Reconstruct the facility inlet and install a new diversion structure** to collect runoff from previously uncontrolled residential lands.

- 3. Establish an extended detention pond** to hold, polish and slowly release waters back into the natural environment.
- 4. Construct a new outfall channel** to minimize impacts on Tannery Creek.
- 5. Plant native trees and shrubs** to further reduce nutrient loading, improve water quality and enhance local wildlife habitat.

Benefits further to those described above include: Controlling storm water runoff from 37.2 hectares of previously uncontrolled land, improving water quality by approximately 67 per cent and enhancing wildlife habitat along Tannery Creek and the East Holland River.

### Summary of Storm water pond retrofits

Pond ID	Location	Drainage Area (hectares)	Quality Improvement	Phosphorus Reductions (kilograms per year)	Reduction of downstream weeds (metric tonnes)
WC3	Kennedy Street and Deerhorn Crescent	37.2	67%	37.2	18.5
NC2	St. John’s Sideroad	10.2	80%	9.3	4.5
NW1	St. John’s Sideroad	16.1	80%	14.7	7
C1	Wellington Street	25.28	70%	23	11.5
<b>Totals</b>		<b>88.78</b>		<b>84.2</b>	<b>41.5</b>

A report by Conservation Ontario – “Watershed Economic Incentives through Phosphorus Trading and Water Quality” indicates that there is a cost of up to \$25,000 per kilogram of phosphorus reduction associated with required waste treatment facilities (Page 35).

The cost of retrofitting storm water management facilities can be compared with the cost of other methods of phosphorus reduction (such as those associated with agricultural runoff) and the best overall management plan for phosphorus reduction in the watershed can be determined.

The conservation authorities are also reviewing potential of phosphorus trading which may allow, for example, an increase of 1 kilogram of phosphorus discharge into the lake provided 8 kilograms of inflow are mitigated by storm water retrofits.

This example of 8-1 would equate to a benefit of approximately \$3,125 ( $\$25,000/8$ ) to the municipality for each kilogram of phosphorus removed by the retrofits. Based on the information available this report is using a conservative estimate of \$2,500 for each kilogram reduced per year.

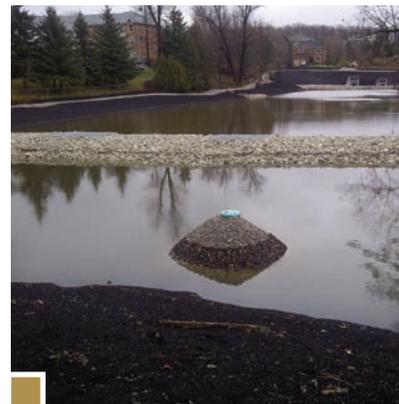
## Engineered wetlands

Engineered wetlands (EW's) are a significant improvement over traditional storm water management ponds. These man-made facilities attempt to mimic traditional wetlands and as such remove a significant amount of pollutants and serve as an excellent water filtration system. Research has shown that engineered wetlands are effective in removing a significant amount of phosphorus.

Engineered wetlands are highly advanced, semi-passive kinds of Constructed Wetlands (CW) which provide enhanced secondary (biological removal) treatment. They are capable of achieving greater than 95 per cent removals of most pollutants, summer and winter, in facilities which are only a fraction the size of CW's.

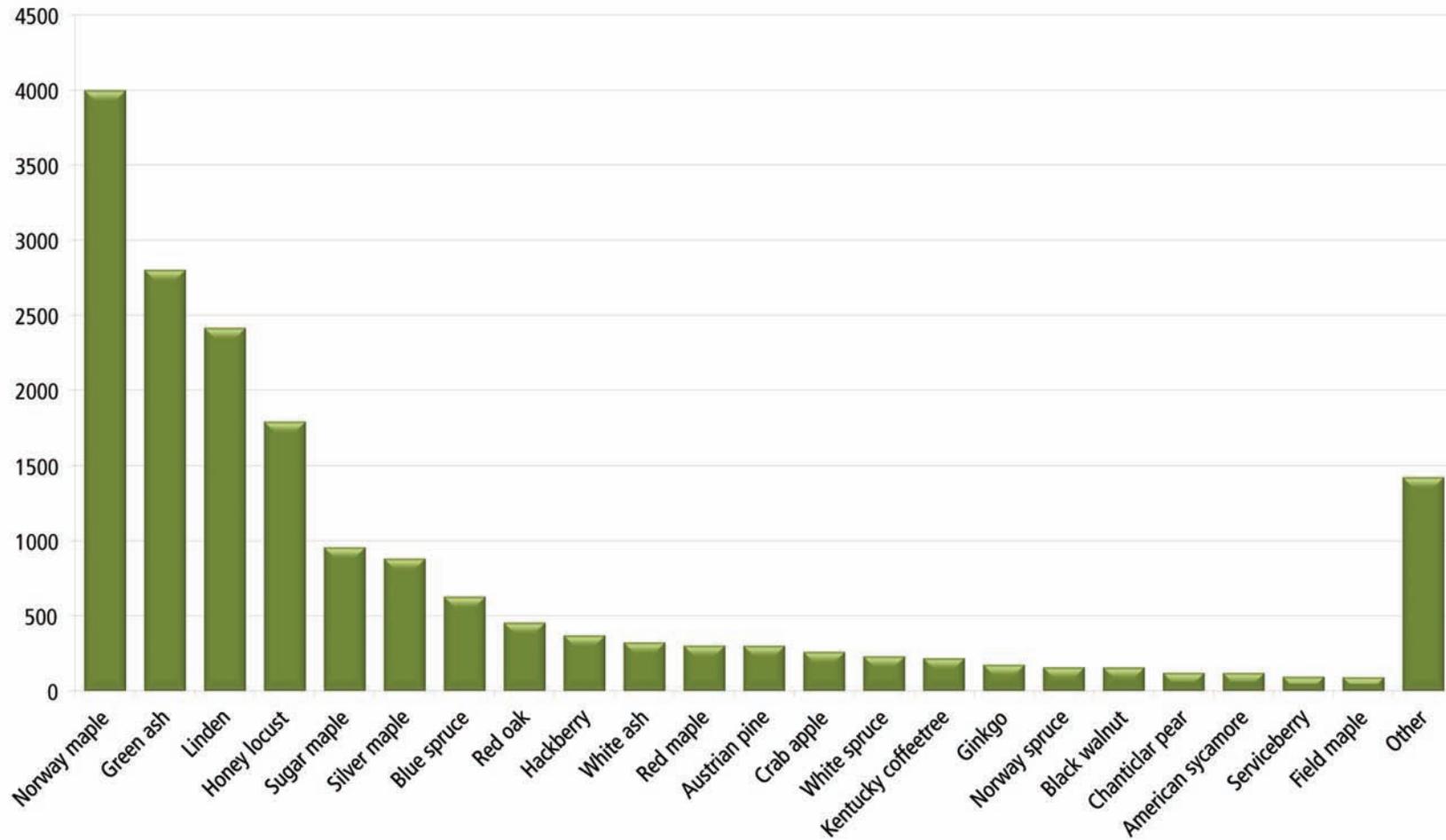
The Town has completed an engineered wetland at the corners of Bathurst Street and McLellan Way.

- Controlling storm water runoff from 58 hectares of previously uncontrolled land
- Improving water quality by approximately 95 per cent
- Reduce the amount of phosphorus entering Lake Simcoe by an estimated 60 kilograms per year
- As each unit of phosphorus has the potential of generating close to 500 times its own weight in aquatic plant life the retrofitted facility has the potential of cutting back weed growth in local waterways by an estimated 30 metric tonnes each year
- The project is unique, it demonstrates the effectiveness of an Engineered Stormwater Wetland technology and it is the first application of its kind in Ontario
- Presently the facility is being monitored by the LSRCA and the results may form the basis for future storm water management design guidelines in Ontario



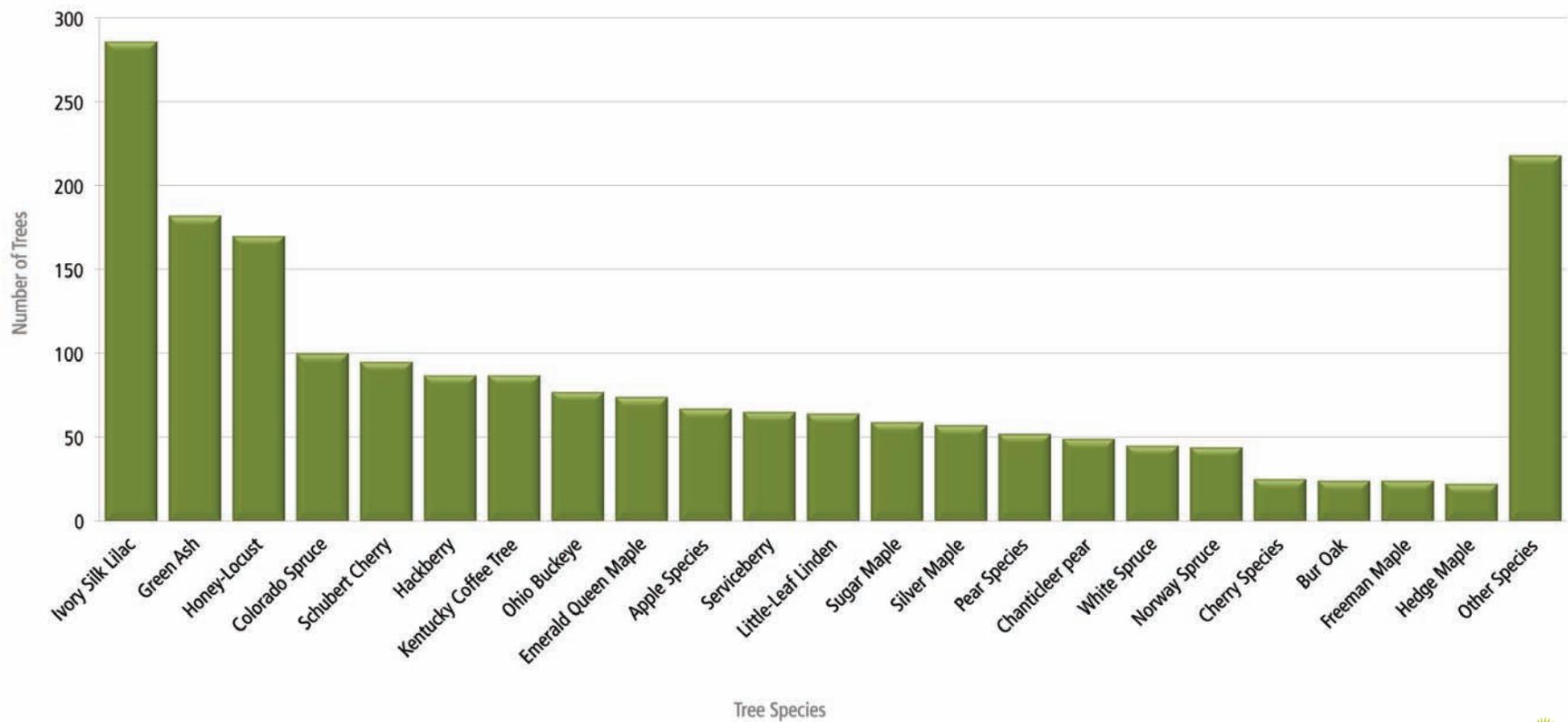
# Appendix 4 – Street Trees

## Aurora Street Trees



# Appendix 4 – York Region Street Trees in the Town of Aurora by Species

## York Region Street Trees in the Town of Aurora by Species





THE ECONOMIC VALUE OF NATURAL CAPITAL ASSETS

