

***HANNON CREEK SUBWATERSHED  
STEWARDSHIP ACTION PLAN 2013***



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## HANNON CREEK SUBWATERSHED CHARACTERIZATION

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### GEOGRAPHIC LOCATION

Hannon Creek subwatershed is 10.46 km<sup>2</sup> in area and is comprised of four catchment basins. In descending order from the headwaters to the outlet these are: Headwaters South, Headwaters West, Headwaters East and Hannon North (**Map HA-1**). These catchments are 2.9km<sup>2</sup>, 4.5km<sup>2</sup>, 1.2km<sup>2</sup> and 1.8km<sup>2</sup> in size, respectively.

This subwatershed falls within the former municipal boundaries of the City of Hamilton and Town of Glanbrook. The majority of the subwatershed is within City of Hamilton Wards 11 and 6, with a small portion of the subwatershed in Ward 7. The majority of the subwatershed is within Glanford Township, with smaller portions in Barton and Binbrook Townships.

The boundaries of the Hannon Creek subwatershed and its associated catchments have recently been updated to include the sewer system into the overall drainage system for the subwatershed. No significant changes to the subwatershed boundaries have occurred as a result. An attempt was made to generally retain the number and size of catchments previously delineated by HCA for this subwatershed so that reference between previous uses is possible.

The southernmost point of the Hannon Creek subwatershed originates north of Dickenson Road, between Nebo and Glover Roads. Headwater streams continue to originate east and west of this location, north of Twenty Road and east and west of Trinity Church Road.

The westernmost point of the subwatershed occurs west of Miles Road, near Upper Wentworth Street. The easternmost point of the subwatershed occurs west of Fletcher Road. The subwatershed tapers northward where it joins Upper Ottawa Creek before flowing over the crest of the Niagara Escarpment at Albion Falls, into the Red Hill Valley subwatershed.

Portions of several neighbourhoods fall within Hannon Creek Subwatershed. They include: Broughton West, Chappel East, Eleanor, Hannon North, Hannon South, Hannon West, Rymal and Templemead.

Some major arterial roads traverse the subwatershed. Stone Church, Rymal and Twenty Roads cross the subwatershed in an East-West direction. Miles, Nebo, Glover and Trinity Church Roads cross the subwatershed in a North-South direction.



# HANNON CREEK SUBWATERSHED CHARACTERIZATION

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## HYDROLOGY

### Surface Water

The Halton Hamilton Source Water Protection Preliminary Draft Watershed Characterization Report for the Hamilton Conservation Authority Watershed, 2008 describes Red Hill Creek as having approximately 87 km of watercourses, excluding storm sewers, drainage swales or ditches. The report states that the watershed has a drainage density of 1.3 km / km<sup>2</sup>, and describes it as “quite low compared with other watersheds of similar physical characteristics (area, shape, geology)”. The report attributes the low drainage density to three reasons, including: urbanization and substitution of the surface drainage network with storm sewer networks; the existence of agricultural tile drains; and the quality of the software package used in delineating ephemeral or intermittent channels and produced digital information. The report also asserts that urbanization has produced a dramatic effect upon the stream network within the urban drainage area (HHSWP, 2008).

Hannon Creek is one of 7 subwatersheds of Red Hill Creek that drain a 68 km<sup>2</sup> area into Hamilton Harbour and ultimately, Lake Ontario. Hannon Creek subwatershed has a drainage area of 10.46 km<sup>2</sup>. A portion of the drainage in this subwatershed is conveyed through the City of Hamilton sewer system. There is 30.74km of storm sewer within this subwatershed with 43.89km open watercourse, primarily headwater streams. The combined length of conveyance infrastructure, natural and built is 75.2km (**Table HA-1**).

**Table HA - 1: Watercourse and Sewer System Length**

Feature	km
Open Watercourse	43.89
Culvert	0.57
Combined Sewer	0.00
Storm Sewer	30.74

The 2008 Halton Hamilton Source Protection Region Preliminary Draft Watershed Characterization Report for the Hamilton Conservation Authority Watershed and the 2012 HHSWP Hamilton Assessment Report indicate the following about the Hannon Creek Subwatershed:

The subwatershed has several headwater tributary streams located near its southern boundary with Grand River Conservation Authority between Trinity Church Road and Glover Road. These streams join together at different locations

and flow toward the north as a single stream. Between Miles Road and Nebo Road north of Twenty Road, the Hannon Creek subwatershed also has four headwater tributary streams. All four streams flow in a northeast direction. Two of these streams join together 600 m west of Nebo Road and meet with another headwater stream near Kilbride Road. The combined stream flows toward the northeast and joins with another headwater tributary stream, originating from Miles Road, downstream of the intersection between Rymal Road and Nebo Road. The confluence of this combined tributary stream, which crosses Dartnall Road, with the main branch of Hannon Creek, is located 550 m downstream of the intersection of Dartnall Road and Rymal Road (HHSWP, 2008).

The Hannon Creek subwatershed has two more headwater tributary streams originating near its eastern boundary with the Upper Davis Creek Subwatershed and southern boundary near Trinity Church Road. These two tributaries jointly cross Glover Road and meet with Hannon Creek downstream of Rymal Road. Ultimately, Hannon Creek flows north, parallel to Dartnall Road, and crosses Stone Church Road. Hannon Creek joins Upper Ottawa Creek near Lincoln M. Alexander Parkway (HHSWP, 2008).

Within the Hannon Creek subwatershed, a network of tributaries drains the undeveloped Niagara Falls Moraine. This area is used for agricultural purposes. The tributaries coalesce and their channels are altered through residential areas downstream. The tributaries feed the main channel, which has been classed as having warm water conditions. The main channel drains the Red Hill Escarpment Valley ESA to its point of discharge into Upper Ottawa subwatershed at the Lincoln M. Alexander Parkway (HHSWP, 2012).

For a more detailed description of the hydrology of Red Hill Creek refer to the Halton Hamilton Source Protection Region Preliminary Draft Watershed Characterization Report for the Hamilton Conservation Authority Watershed, 2008 and any subsequent updates thereof.

The 2012 Halton-Hamilton Source Water Protection (HHSWP) Hamilton Assessment Report identified Hannon Creek as having a surface water quality score of ‘Fair’. The surface water stress assessment yielded a significant stress level result for this subwatershed. For more details of the source protection planning process refer to the Halton Hamilton Source Protection Region Hamilton Assessment Report (HHSWP, 2012).

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

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There are no flow or precipitation monitoring stations for the HCA hydrometeorological network in the Hannon Creek subwatershed. There are no surface water quality sampling stations within the HCA water quality monitoring network within this subwatershed.

The 2012 Land Use and Water Quality Linkages in Red Hill Creek Report examined the spatial and temporal linkages between water quality and impervious surface area and flow conditions in a portion of the Red Hill Creek watershed (Hutchinson Environmental Sciences Ltd., 2012).

Two subcatchments of the Red Hill Creek watershed were defined for the purpose of the study, upstream of Albion Falls and between the Albion Falls and Queenston Road stations. The remaining area of the watershed is located downstream of Queenston Road.

The report indicated that “a large increase in impervious surface area occurred between 1985 and 2010 upstream of Albion Falls, at which time imperviousness in the area between Albion Falls and Queenston Road increased only slightly, as the area was already highly developed in 1985” (Hutchinson Environmental Sciences Ltd., 2012).

The report also found that:

While water quality in Red Hill Creek has generally improved since the 1960s-1990s, median concentrations of some parameters exceed guidelines, particularly at Albion Falls. Nutrient concentrations have generally declined during 2002–2011, whereas concentrations of certain metals have recently increased. *E. coli* and several nutrients & metals increased dramatically during periods of high flow, and were significantly correlated with TSS, suggesting that surface runoff and/or erosion negatively affect surface water quality in the creek (Hutchinson Environmental Sciences Ltd., 2012).

The report did not find a clear correlation between land use (as % impervious surface area) and water quality in Red Hill Creek.

The water quality at Albion Falls has generally been worse during the past decade than further downstream at Queenston Rd., even though impervious surface area is lower in the Albion Falls subcatchment area than Queenston Rd. subcatchment area. Concentrations of nutrients have declined in the creek in

recent years despite increases in impervious surfaces in the watershed (although the concentrations of some metals have increased). Improved stormwater management practices may be responsible for the declines in nutrients, and increased impervious surfaces (e.g., the Red Hill Valley Parkway) may be responsible for the increases in metals, but more information is needed to draw firm conclusions” (Hutchinson Environmental Sciences Ltd., 2012).

### Groundwater

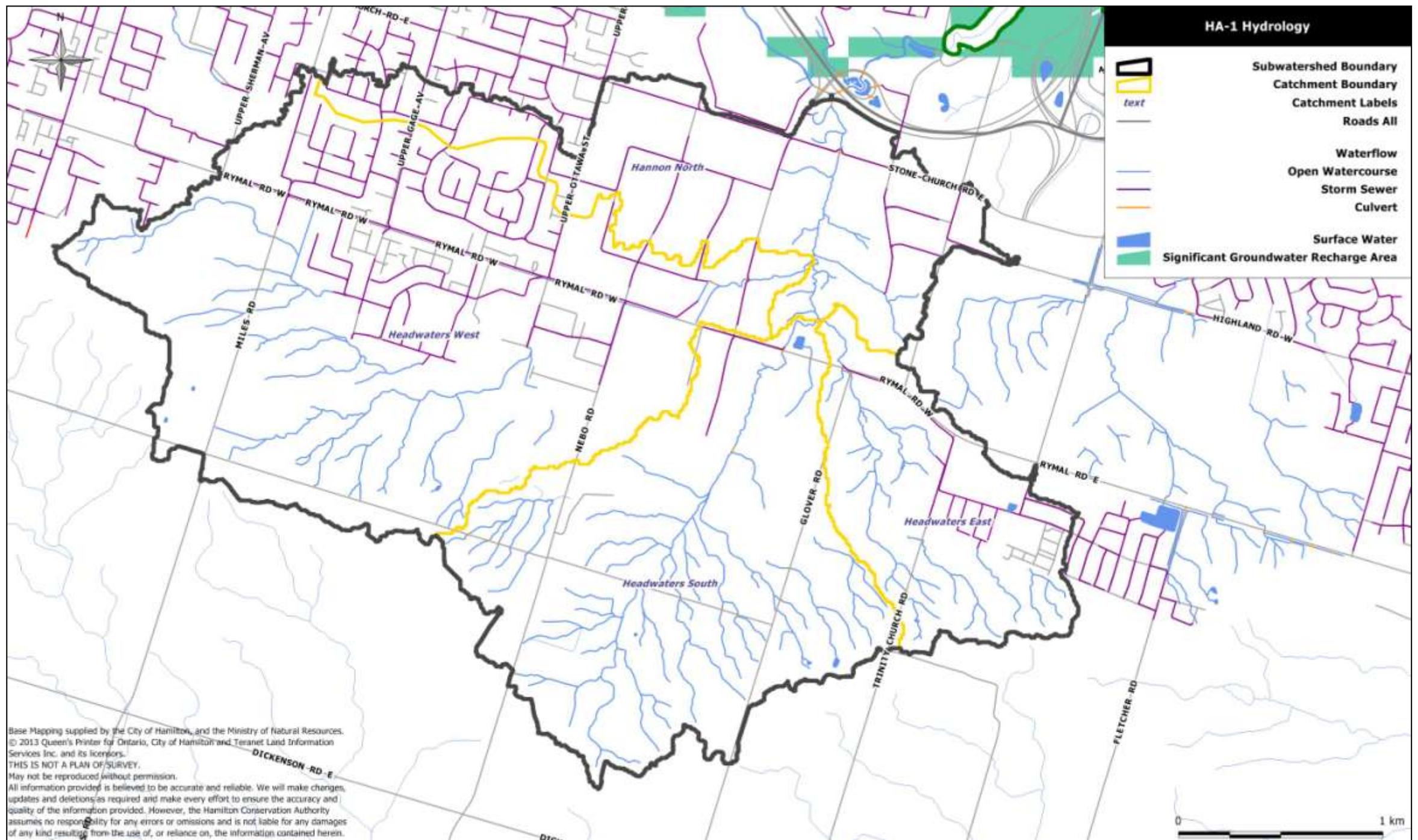
A number of karst features have been identified within this subwatershed in the June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park (NGIBP) Master Drainage Plan. The Plan indicates that “an understanding of the spatial distribution of karst features is essential when developing a strategy to mitigate the risks (e.g. potential contamination) associated with surface water rapidly moving downward through sinkholes into the underlying groundwater aquifer system” (TSH, 2010). Karst feature locations are illustrated on the Environmental Considerations mapping for each catchment in the Catchment Summaries section in the remainder of this document.

Continued evaluations of the North Glanbrook Industrial Business Park, now referred to as the Red Hill Business Park, are planned for 2014. Characterizations and recommendations related to karst features resulting from these evaluations will need to be incorporated into management decisions for this subwatershed.

There is one Provincial Groundwater Monitoring Network station in the Hannon Creek subwatershed. It is located at the Mount Albion Conservation Area.

The HHSWP 2012 Hamilton Assessment Report identified the Hannon North, Headwaters East and Headwater South catchments as well as the western portion of the Headwaters West catchment as a highly vulnerable aquifer (HHSWP, 2012).

The 2012 Hamilton Assessment Report also included an evaluation of the annual and monthly percent water demand. Annual and monthly groundwater stress assessments for the Hannon Creek subwatershed yielded low stress levels for both existing and future conditions. For more details of the source protection planning process refer to the Halton Hamilton Source Protection Region Hamilton Assessment Report (HHSWP, 2012).



Map HA - 1: Hydrology



**HANNON CREEK SUBWATERSHED CHARACTERIZATION (excerpts from the Hamilton Source Protection Region Preliminary Draft Watershed Characterization Report for the Hamilton Conservation Authority Watershed, 2008)**

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**SOILS AND PHYSIOGRAPHY**

The Niagara Escarpment is a prominent feature extending through Hamilton’s watersheds in a westerly direction. It is characterized by steep cliffs on the eastern side and gently sloping terrain to the west (SNC Lavalin and Charlesworth & Associates, 2006).

The Niagara Escarpment is characterized by a number of bedrock re-entrant valleys that are believed to have been created by pre-glacial rivers and were subsequently modified during glaciation of the area (Tovell, 1992). Many of the present day major rivers that drain the uplands of the Niagara Escarpment flow in these re-entrant valleys. Red Hill Creek flows in one of the significant reentrant valleys (HHSWP, 2008).

Chapman and Putnam (1984) suggested that three physiographic regions straddle the Red Hill Creek Watershed. These physiographic regions are: 1) Haldimand Clay Plain; 2) Niagara Escarpment; and 3) The Iroquois Plain. The Haldimand Clay Plain’s soils, which lie on top of a series of subdued moraines, consist of clay and silt sediments. The plain has generally flat to rolling topographic characteristics. In the Red Hill Creek Watershed, the Vinemount Moraine and Niagara Falls Moraine run parallel to the Niagara Escarpment and cut the Haldimand Clay Plain transversely. This area of the watershed has subdued relief except near the Escarpment (HHSWP, 2008).

The watershed is intersected by the Niagara Escarpment, which is characterized as a significant physiographic region. The top of the Escarpment has dolostone bedrock of the Lockport Formation. The bedrock possesses erosion-resistant properties. The Escarpment also has a steep rock bluff followed by a talus till covered slope below its bluff. Along the Escarpment, soil thickness is low on the crest; however, the thickness at its base is on the order of 30 m. At the head of the larger Mount Albion re-entrant valley, Red Hill Creek has created a small gorge into the Escarpment (HHSWP, 2008).

The Red Hill Creek Watershed has total surface relief on the order of 150 m. Most of the relief occurs due to the height of the Niagara Escarpment, which is approximately 70 m (Blackport & Associates, 2003).

The glaciolacustrine clay and silt deposits overlying the Vinemount and Niagara Falls Moraines cover most of the Red Hill Creek watershed. These moraines consist of Halton Till which was deposited during the late Wisconsinan glaciation.” (HHSWP, 2008) “The Halton Till deposited onto the Queenston Shale or the Escarpment rock during the same era as the moraines above the Escarpment. Following retreat of the Ontario glacial lobe, the area below the Escarpment was exposed and submerged on various occasions. King Street was built along a sand and gravel bar, which represents a historic Lake Iroquois shoreline. Red Hill Creek flows through this shoreline (Blackport & Associates, 2003).

The main types of soils within the Red Hill Creek Watershed are silty loam, silty clay loam, loam and sandy loam. In the Hannon Creek subwatershed, soils are mostly silty loam. The middle part of this subwatershed has loam and silty clay soils (HHSWP, 2008) .The soil characteristics of the Hannon Creek subwatershed are shown on **Map HA-2**. Nine types of soils have been identified within this subwatershed, as summarized in **Table HA-2**.

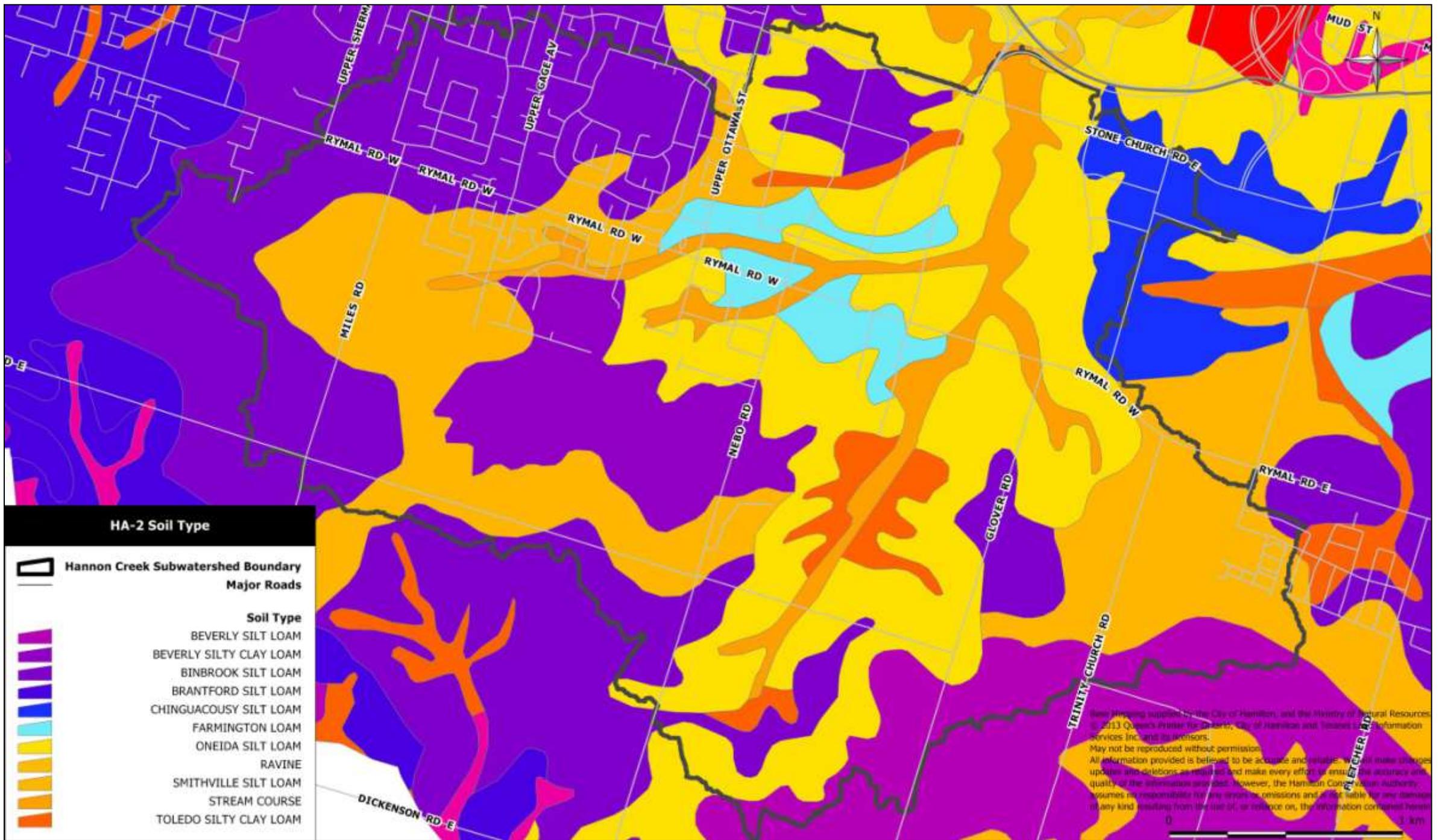
**Table HA - 2: Soil and Erosion Potential in the Hannon Creek Subwatershed**

Soil Type	Natural Drainage	Erosion Factor*	Topography (slope)***	Erosion Potential**
Bl - Beverly Silt Loam	Imperfect	2	3.5	Moderate
Bv - Beverly Silty Clay Loam	Imperfect	3	3.5	Low
Bi - Binbrook Silt Loam	Imperfect	3	3.5	Low
Br - Brantford Silt Loam	Well	2	7.5	High
Cs - Chinguacousy Silt Loam	Imperfect	2	3.5	Moderate
Fl - Farmington Loam	Well	1	3.5	Moderate
Oi - Oneida Silt Loam	Well	2	11.9	High
Ravine	n/a	n/a	n/a	n/a
Sm - Smithville Silt Loam	Well	2	7.5	High
To - Toledo Silty Clay Loam	Poor	3	1.2	Very Low

\* Based on the Region of Hamilton-Wentworth Soil Summary Sheet

\*\* Based on the Ontario Environmental Farm Plan Workbook, Ontario Farm Environmental Coalition

\*\*\*Based on average topography in the subwatershed



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 of any kind resulting from the use of, or reliance on, the information contained herein.

0 1 km

Map HA - 2: Soils

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

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### NATURAL HISTORY AND SIGNIFICANT SPECIES

#### AQUATIC

Some fisheries monitoring stations had been sampled in Hannon Creek between 1970 and 2009. Prior to the introduction of the HCA Aquatic Resources Monitoring Program (ARMP) in 2004, the data collected was sporadic. The ARMP now provides for routine monitoring of fish, fish habitat and benthic macroinvertebrates throughout the HCA watersheds. The parameters monitored allow for an assessment of ecological health.

The ARMP now provides for one ecological monitoring station in the Hannon Creek subwatershed. The monitoring station is in the Hannon North catchment. The station is monitored in Year 3 of a three year cycle.

Recent and historical fisheries data are listed in the Hannon North catchment datasheet in the remainder of this document. The ARMP Report for 2009 states:

The only fish species inventoried at this site in 1991, 2006 and 2009 was the brook stickleback. In previous years 53 and 98 brook sticklebacks were recorded in 1991 and 2006, respectively; no biomass was recorded. In 2009 there were only 17 brook sticklebacks with a total biomass of 15.8 grams (HCA, 2009).

The condition of the monitoring site included, deciduous trees such as willows and herbaceous ground plants covering the majority of the shoreline at the monitoring site; a few narrow-leaved emergents were intertwined. Submerged plants, narrow-leaved emergents and herbaceous vegetation provided the only little water cover that was present. The substrate comprised mainly of silt, sands and gravel. The physical habitat present within the creek included brush and woody debris, fallen logs, as well as undercut banks. The trees on the shoreline created adequate shelter along the stream edge (HCA, 2009).

The 2008 Halton Hamilton Source Protection Region Preliminary Draft Watershed Characterization Report for the Hamilton Conservation Authority Watershed states:

Limited benthic monitoring has been completed within the Hannon Creek subwatershed. Benthic invertebrate collections on the main channel and tributaries of this watercourse have all indicated impaired water quality conditions. The benthic fauna was predominantly composed of sludge worms, leeches, and midges, all which are characteristic of lake, as opposed to stream, environments. This type of community is suggestive of organically enriched, depositional conditions which periodically may lack dissolved oxygen. The surrounding urban land use and substantial stormwater discharges received by this watercourse are likely the cause of these water quality impairments (Griffiths, 2003).

The ARMP Report for 2009 indicated that a total of 368 invertebrates were collected. The most dominant taxa present was Asellidae and Nematoda with 266 and 63 organisms each, respectively. The least dominant taxa were Hemiptera, Gastropoda and Coleoptera, each with only one organism present (HCA, 2009).

A site condition assessment based on indices of health for benthic communities is included in the Hannon North Catchment Environmental Considerations map (**Map HA-9**). Comprehensive benthic data is not currently available due to the incomplete status of the Ontario Benthos Biomonitoring Network on-line database. However, all other available data for this and other historic monitoring stations are included in Appendix B.

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

The June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan indicates that

All of the watercourses within its study area are headwater systems originating within its study area. Largely these systems provide little or no in-situ fish habitat. The extreme headwaters area is plowed through with little or no defined channels present and only contribute flow during snowmelt or storm events to downstream reaches. The main branch of Hannon Creek however, does provide in-situ fish habitat but may only be obtainable by fish during seasonal flows (TSH, 2010).

Downstream of the NGIBP study area, a series of fish barriers are present during periods of low flow. A karst just south of Rymal Road directs flow underground, creating a barrier to fish migration, and a series of bedrock ledges also create an impassable channel during periods of low flow. During seasonal high flows however, fish may be able to pass these barriers and gain access to the upper reaches of Hannon Creek within the NGIBP. Natural riparian vegetation is present throughout most of the main branch of Hannon Creek, but absent through most of the first-order tributaries (TSH, 2010).

The NGIBP study area has been heavily used for agricultural purposes. Historical stream modification including realignment, riparian vegetation removal, and plowing through the watercourse have resulted in the

elimination of aquatic habitat in the majority of outlying areas of the subwatershed. The main stem of the stream, which runs in a north-south direction, has been less impacted by agriculture and continues to support high quality aquatic habitat. Feeding into this main stem are some tributaries which have maintained important and/or marginal aquatic habitat characteristics and are still functioning as aquatic habitat (TSH, 2010).

These headwater streams support fish habitat within the remainder of the Red Hill Creek system. These watercourses provide source waters and beneficial nutrient and sediment transport to watercourses in the Red Hill Valley subwatershed.

Continued evaluations of the North Glanbrook Industrial Business Park, now referred to as the Red Hill Business Park, are planned for 2014. Characterizations and recommendations related to aquatic ecosystems resulting from these evaluations will need to be incorporated into management decisions for this subwatershed.

A 2013 HCA field assessment of the main branch of Hannon Creek, as it flows through the Mount Albion Conservation Area, has determined that the watercourse is showing signs of over widening in many locations, but that there is evidence of cold water conditions and many opportunities for improvements to the aquatic habitat.

## TERRESTRIAL

Table HA - 3: Natural Land Cover Statistics

	Forest	Successional	Wetland	Meadow	Historic Wetlands	Environmentally Significant Area	Significant Woodland	City NHS Core Areas	Open Watercourse (km)
km <sup>2</sup>	0.35	0.54	0.05	0.81	0.25	0.51	0.12	0.80	43.89
% of subwatershed area	3.35	5.16	0.48	7.74	2.39	4.88	1.10	7.65	n/a

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

**Table HA - 4: Percent of Total Open Watercourse Length with Riparian Buffer**

% by Width Range					Overall %	
0m < Width < 5m	5m ≤ Width < 15m	15m ≤ Width < 30m	0m < Width < 30m	Width ≥ 30m	Naturally Vegetated	No Buffer
3.51	5.86	5.32	0.00	23.43	38.13	61.87

Natural vegetation covers 1.75km<sup>2</sup> or 16.73 % of the Hannon Creek subwatershed. **Map HA-3** illustrates the natural heritage of the Hannon Creek subwatershed. The current natural land cover statistics for the area are noted within **Table HA-3**.

Based on the digital data available for this analysis, forest cover accounts for 3.35% of this subwatershed, while successional cover is 5.16% of the land base. Meadow habitat accounts for 7.74% of the subwatershed area. The total stream length of Hannon Creek and all of its tributaries is 43.89 km. GIS analyses have determined that 38.13% of the total watercourse length has established riparian vegetation. The percent of watercourse length with riparian buffer, per riparian buffer width range, is outlined in **Table HA-4**.

There are three small wetlands, totaling 0.05km<sup>2</sup>, within this subwatershed. Historical wetlands mapping showed 0.25km<sup>2</sup> of wetlands in this subwatershed before 1967 or before 1982, representing 2.39% of the subwatershed area. Historical information was not recorded for forest or meadow cover. Although, it is known that land use throughout the 20<sup>th</sup> century altered the natural heritage systems within southern Ontario and that 90% of the original upland woodlands were converted to non-forest land uses by 1920 (Larsen et al., 1999).

Hannon Creek is an area of active urbanization. Provincial and municipal legislation exists to ensure that certain natural features are protected from land use changes and activities. Some of the relevant pieces of legislation which are applicable to this subwatershed include the: Conservation Authorities Act, Greenbelt Plan, Hamilton Urban Official Plan, Niagara Escarpment Plan and Provincial Policy Statement. **Tables HA-5 and HA-6** outline the percentage of the subwatershed area that falls within these provincially and municipally legislated areas. **Tables HA-7 and HA-8** outline the percentage of natural features that are outside the provincially and municipally legislated areas.

**Table HA - 5: Subwatershed Area within Provincially Legislated Areas**

Provincially Designated Lands	km2	% area
Greenbelt Designation (Niagara Escarpment Commission)	0.53	5.07
NEP Development Control Area	0.00	0.00
NEP Designated Area	0.53	5.07
HCA Regulated Area	3.88	37.09

**Table HA - 6: Subwatershed Area within Municipally Legislated Areas**

Municipally Designated Lands	km2	% area
Environmentally Significant Area	0.51	4.88
NHS Core Areas	0.12	1.10
Significant Woodland	0.80	7.65

**Table HA - 7: Natural Features Located Outside of Provincially Legislated Areas**

Natural Feature	km2	% area	km
Watercourse			1.57
Forest	0.08	0.76	
Meadow	0.16	1.53	
Successional	0.07	0.67	
Wetland	0.00	0.00	

**Table HA - 8: Natural Features Located Outside of Municipally Legislated Areas**

Natural Feature	km2	% area	km
Watercourse			36.02
Forest	0.16	1.53	
Meadow	0.43	4.11	
Successional	0.19	1.82	
Wetland	0.00	0.29	

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

A portion of one municipally designated environmentally significant area (ESA) falls within the Hannon Creek subwatershed. The Red Hill Escarpment Valley ESA reaches into the northern areas of the subwatershed. Albion Falls is within the Red Hill Escarpment Valley ESA. The waterfall has been classified as an Earth Science Area of Natural and Scientific Interest (ANSI) by the Ontario Ministry of Natural Resources (OMNR).

This natural area is critical habitat and migratory corridor for terrestrial and aquatic species. Biophysical attributes of these areas were assessed in the Hamilton Natural Areas Inventory (NAI) Nature Counts Project, (Dwyer, et al., 2003).

The Red Hill Escarpment Valley ESA encompasses much of the re-entrant valley in the Niagara Escarpment through which Red Hill Creek flows. This ESA is bordered by the urban development of Hamilton and Stoney Creek, to west and east respectively, by industrial and suburban development to the south and by the Lake Ontario shoreline transportation corridor and associated industries to the north. It is traversed by roads, railways, hydro corridors, and sewage mains (Dwyer, et al., 2003).

The significance of the natural features within the ESA, with respect to earth sciences, ecological function, hydrological function, local significance, restoration potential, aesthetic or historical value and educational or research value were itemized in the NAI report, in support of the area's status as an important natural area to be identified for preservation and management. The area was identified as: a distinctive landform, serving as a vital ecological function such as maintaining the hydrologic balance over a widespread area, having plant and animal communities of the area identified as unusual or of high quality locally, having unusually high diversity of biological communities and associated plants and animals due to a variety of geomorphological features, soils, water, sunlight, and associated vegetation and microclimate effects, providing habitat for rare or endangered species, having high aesthetic value and serving as a link between natural areas (Dwyer, et al., 2003).

The 2003 NAI recommended that this area should be protected from development or other impacts; that the continuity of the existing ribbons of natural vegetation along the Red Hill Creek corridor and the Niagara Escarpment corridor should be maintained, particularly the nodal area at the corridor intersection; that the natural area should be enhanced by naturalizing manicured greenspace and maintained stream channels, and by improving water quality and regulating stormwater runoff should be assessed; and that future studies should include the monitoring of significant species populations and communities (Dwyer, et al., 2003).

The area of Mount Albion Conservation Area along the stream corridor is part of the Red Hill Creek Escarpment Valley ESA. The 2013 Ecological Land Classification: Mount Albion Conservation Area report found that the Mount Albion Conservation Area is composed predominantly of fresh – moist mixed meadow, as well as deciduous thickets, hedgerows, meadow marshes, plantations, savannah, woodlands, and constructed systems. There are also small areas of remnant Oak woodland and Sugar Maple forest (HCA c, 2013).

The largest community in the natural area is a fresh mixed meadow which has established in the recently abandoned agricultural fields. The most abundant species are: Canada Goldenrod, Common Wintercress, Reed Canary Grass, Cow vetch, and Rough-fruited Cinquefoil. There are also scattered pockets of Gray Dogwood, Hawthorn and Honeysuckle present (HCA c, 2013).

Mount Albion and other Conservation Authority and City lands contribute to significant meadow cover in the Hannon Creek subwatershed. Meadows are important habitats that support a variety of wildlife which require the specific conditions that meadows provide. It will be important to enhance these habitats and create linkages between them to continue to support these species. HCA is currently developing a Master Plan for the design and management of the Mount Albion Conservation Area.

The Red Hill Creek Escarpment Valley ESA was assessed in the Hamilton Natural Areas Inventory (NAI) Nature Counts Project, 2003. It is recommended that a reassessment of the natural area be completed as part of the ongoing restoration and monitoring program for the Red Hill Valley Parkway project. **Table HA-9** is a summary of the species found in HAMI – 69, to 2012 (Hamilton Natural Heritage Database, 2013).

**Table HA - 9: Summary of HAMI - 69 Red Hill Creek Escarpment Valley ESA**

Animal Type	Total #	Total Native	Total Non Native	% Native	% Non Native
Birds (B)	101	94	7	93.07	6.93
Herptiles (H)	12	12	0	100.00	0.00
Lepidoptera (L)	40	38	2	95.00	5.00
Mammals (M)	18	18	0	100.00	0.00
Odonates (O)	14	14	0	100.00	0.00
Plants (P)	557	379	178	68.04	31.96
TOTAL SPECIES	742	555	187	74.80	25.20

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

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Terrestrial ecological surveys undertaken for the North Glanbrook Industrial Business Park Master Drainage Plan resulted in 151 plant species observed in this area. No species of special concern were observed during the field surveys (TSH, 2010). Seven species observed were considered to be significant at the local level. These include: Awned Sedge, American Hornbeam, Cockspur Hawthorn, River-bank Wild-rye, Silverweed, River Bulrush and Buffaloberry (Dougan and Associates, 2005).

Vegetation cover types were also mapped and analyzed by Dougan and Associates (2005) for the NGIBP Master Drainage Plan. Natural habitats including wetlands (0.48%), natural woodland/forest cover (1.23%), natural thickets (2.18%), and old field/meadow (10.3%) were found to comprise 14.19% of the subwatershed area. Cultural woodland/hedgerows contributed an additional 2.57% of artificial wooded cover in the NGIPB study area (TSH, 2010).

Vegetation communities, determined by Dougan and Associates (2005), identified Reed-canary Grass, Mineral Meadow Marsh, Shallow Water Marsh Dominated by Cattail, Open Aquatic, Dry-Fresh Oak Hardwood Deciduous Forest, Dry-Fresh Sugar Maple-Beech Deciduous Forest Type, Cultural Thickets, Cultural Meadow, Norway Spruce-European Larch Coniferous Plantation Type and Hedgerows within the NGIBP (TSH, 2010).

Twenty-one species of birds were also observed during 2005 field surveys for the Master Drainage Plan, with 55 species observed by Dougan and Associates in the same year. No interior forest specialist species were observed during the 2005 field observations. Nine mammals and four species of amphibians were also observed during the field surveys. The amphibian species observed include: American Toad, Western Chorus Frog, Green Frog and Northern Leopard Frog (TSH, 2010).

The North Glanbrook Industrial Business Park Master Drainage Plan states:

Although none of the natural areas in the study area are very significant in size and the overall natural vegetation cover in the study area is low, habitat of any size has some importance. It should be endeavoured to maintain the existing natural vegetation, and build on it, to enhance the natural cover in the subwatershed” (TSH, 2010).

Current linkages in the NGIBP are limited...The best opportunity to provide and enhance linkages is through enhancement of riparian habitats associated with the main Hannon Creek. These habitats are contiguous with the Red Hill Escarpment Valley ESA with some discontinuities created by roadways. This system extends approximately south as far as Twenty Road” (TSH, 2010).

An east-west linkage opportunity is created by the hydro right-of-way. Currently this area is dominated by meadow habitats with scattered stands of thicket.

Continued evaluations of the North Glanbrook Industrial Business Park, now referred to as the Red Hill Business Park, are planned for 2014. Characterizations and recommendations related to terrestrial ecosystems resulting from these evaluations will need to be incorporated into management decisions for this subwatershed.

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

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All species found within the above-mentioned ESA are noted within Appendix C. The majority of these species are rare or uncommon within the City of Hamilton and where a species has been designated as a species at risk by the OMNR it is indicated in the appendix.

Certain species have been classified by COSEWIC, the Committee on the Status of Endangered Wildlife in Canada and COSSARO the Committee on the Status of Species at Risk in Ontario as being at risk. Each species on the list is given a status depending on the degree of risk: Extinct, Extirpated, Endangered, Threatened and Special Concern.

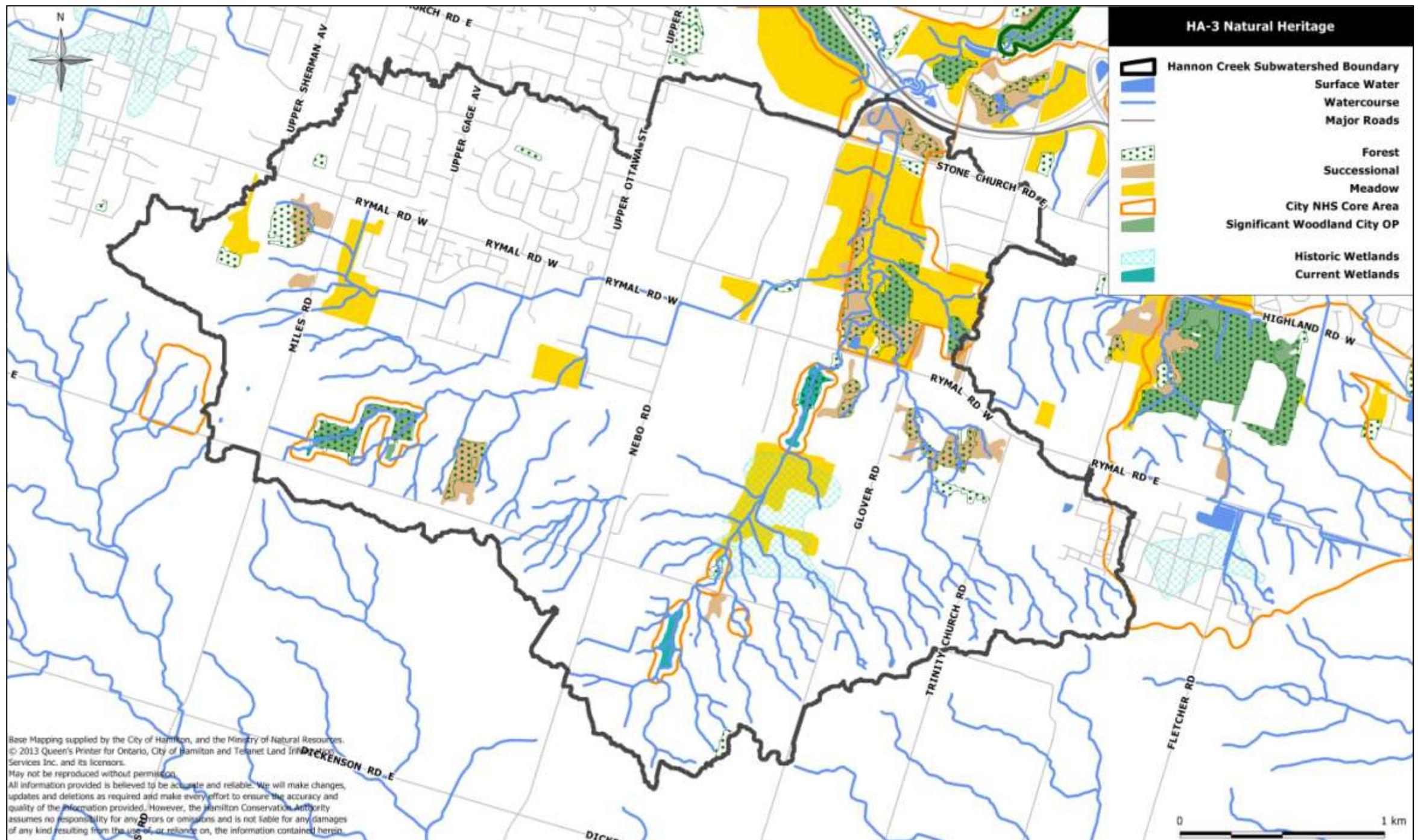
The species listed in **Table HA-10** have been designated by COSEWIC under the Species at Risk Act and COSSARO under the Ontario Endangered Species Act and have been observed in the natural areas in the Hannon Creek subwatershed. The COSEWIC and COSSARO statuses do not always coincide for each species therefore some species will be on more than one list.

It will be important to create awareness and undertake habitat restoration activities related to preserving and restoring these natural areas and associated ecological linkages in order to support these at risk species. Some of these species have recovery strategies in place or in development. Species with recovery strategies are indicated in the list below.

**Table HA - 10: Species at Risk inventoried in HAMI - 69**

Not at Risk	Special Concern	Threatened	Endangered	Extirpated
American Coot	Common Nighthawk	Barn Swallow	Butternut *	Passenger Pigeon
Brown Snake	Eastern Wood-Pewee	Bobolink	Eastern Flowering Dogwood *	
Cooper's Hawk	Eastern Milksnake	Chimney Swift	Yellow-breasted Chat	
Eastern Screech-Owl	Louisiana Waterthrush	Common Nighthawk		
Northern Leopard Frog	Monarch	Eastern Meadowlark		
Red-tailed Hawk	Short-eared Owl	Wood Thrush		
Sedge Wren	Snapping Turtle			
Sharp Shinned Hawk	Yellow-breasted Chat			
Southern Flying Squirrel				
Western Chorus Frog				

\* indicates a recovery strategy is in place.



Map HA - 3: Natural Heritage



## HANNON CREEK SUBWATERSHED CHARACTERIZATION

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### CULTURAL HISTORY

The Hamilton Wentworth County Atlas of 1875 describes the nature and character of the community in and around the Hannon Creek subwatershed as it was during early settlement.

The Township of Glanford lies between the Townships of Ancaster and Binbrook, and is the smallest municipality in the county. It is, however, a capital little township, being thickly settled and containing a great many first class farms. It commenced settling about the same times as its sister townships, and in 1815 contained 50 ratepayers (Page and Smith, 1875).

In 1849 there was only one sawmill in the township. Mount Hope is the only village in Glanford. It is halfway between Hamilton and Caledonia, on the Hamilton and Port Dover Road. There are two churches in the village, belonging to the Church of England and the Wesleyan Methodists, respectively. It is a village of considerable importance and stands in the middle of the township (Page and Smith, 1875).

The history of the Township of Barton is, to a certain extent, associated with the history of the City of Hamilton, as the site of the city originally composed part of the aforesaid township, and the history of the one, as far as early settlements are concerned, is the same as the other. Among the first settlers on the “mountain “ in the Township of Barton were Jacob and William Rymal, William Terryberry, Cornelius and Samuel Ryckman, Lewis and Peter Horning, and the Markle family (Page and Smith, 1875).

William Rymal had, in 1815, 160 acres of cleared lands, and Jacob Rymal had 80. William Terryberry had 168 acres of arable land, lived in a frame house of two stories, and owned three horses and six milch (milk) cows. Samuel had 26 acres of cleared lands, had one horse, two oxen, two milch (milk) cows, and two horned cattle, from two to four years. Cornelius Ryckman had 45 acres of land cleared. Peter Horning was assessed for 5,000 acres of land altogether; only 80 acres of this was cleared. In 1815 Richard Beasley was assessed for 13,350 acres of land, of these, 150 acres were cleared. George Hamilton, after whom the City is called, was assessed for 1,416 acres of land, of which only 141 were cleared (Page and Smith, 1875).

The Hamilton Historical Board adds to this historical record of the area in the City of Hamilton Ward 6 Historical Fact Sheet.

The first railway station on the mountain was built in Ward 6 on Dartnall Road near Rymal Road. It was part of the Hamilton and Lake Erie Railroad, constructed between 1862 and 1878 as Sir Allan MacNab's last financial adventure. He planned to tap the great economic sphere of the Grand River Valley and the American Ports on Lake Erie. The grain storage elevators of the Rymal Station still stand beside the rail trail. Dartnall Road commemorates the Dartnall family who for three generations worked on this section of railway track (Hamilton Historical Board, 2013).

According to 2006 census data, the approximate population of the Hannon Creek subwatershed is 9,875 persons, with a population density of approximately 900 people per square kilometer. The projected population for 2031 is approximately 12,347 persons, with a population density of 1,125 people per square kilometer, resulting in a twenty-five percent population density increase in that time (HHSWP, 2012).

Current land use within the Hannon Creek subwatershed is predominantly classified as Open Space & Miscellaneous (**Table HA-11**). There are industrial, residential and utilities/transportation lands distributed throughout the subwatershed which support the community (**Map HA-4**). Land Use was determined using Oasys primary land use classification (City of Hamilton, 2012). Land use zoning was determined using zoning description within City of Hamilton PED Zoning Boundary mapping (City of Hamilton, 2012) (**Map HA-5**).

For the purposes of comparison, land use zoning designations were categorized and organized into the same land use categories as in **Map HA-4** and **Table HA-11**. **Table HA-12** outlines potential future land use composition based on existing land use zoning designations. **Table HA-16** outlines the scheme used to categorize current zoning designations into current land use categories.

Significant land use changes are planned within this subwatershed. The Red Hill Business Park within the southern and central areas of this subwatershed is planned for development. Additional residential and other supporting land uses are also planned. **Table HA-13** outlines the percentage of the subwatershed area identified for greenfield development. **Table HA-14** outlines the percentage of subwatershed area of different types of natural features within identified greenfield development areas. **Table HA-15** outlines the percentage of subwatershed area of different types of natural features within the Red Hill Business Park area. Areas of potential development are illustrated in the Environmental Considerations mapping in the Catchment Summaries section in the remainder of this document.

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

**Table HA - 11: Land Use Statistics**

Area (km <sup>2</sup> )	Commercial (%)	Industrial (%)	Institutional (%)	Mixed Use (%)	Office (%)	Open Space & Misc. (%)	Residential (%)	Utilities / Transportation (%)	Warehousing / Wholesale / Store (%)	No Data (%)	Impervious Surfacing (%)
10.46	1.15	11.85	0.96	0.03	0.29	46.85	14.05	10.13	1.72	2.58	33.65

**Table HA - 12: Zoning Description Categorized into Land Use Types – Statistics**

Area (km <sup>2</sup> )	Commercial (%)	Industrial (%)	Institutional (%)	Mixed Use (%)	Office (%)	Open Space & Misc. (%)	Residential (%)	Utilities / Transportation (%)	Warehousing / Wholesale / Store (%)	Planned (%)	No Data (%)	Impervious Surfacing (%)
10.46	3.81	43.43	0.56	0.06	n/a	28.57	17.74	n/a	n/a	0.05	5.81	n/a

**Table HA - 13: Percentage of Subwatershed Area Identified for Greenfield Development**

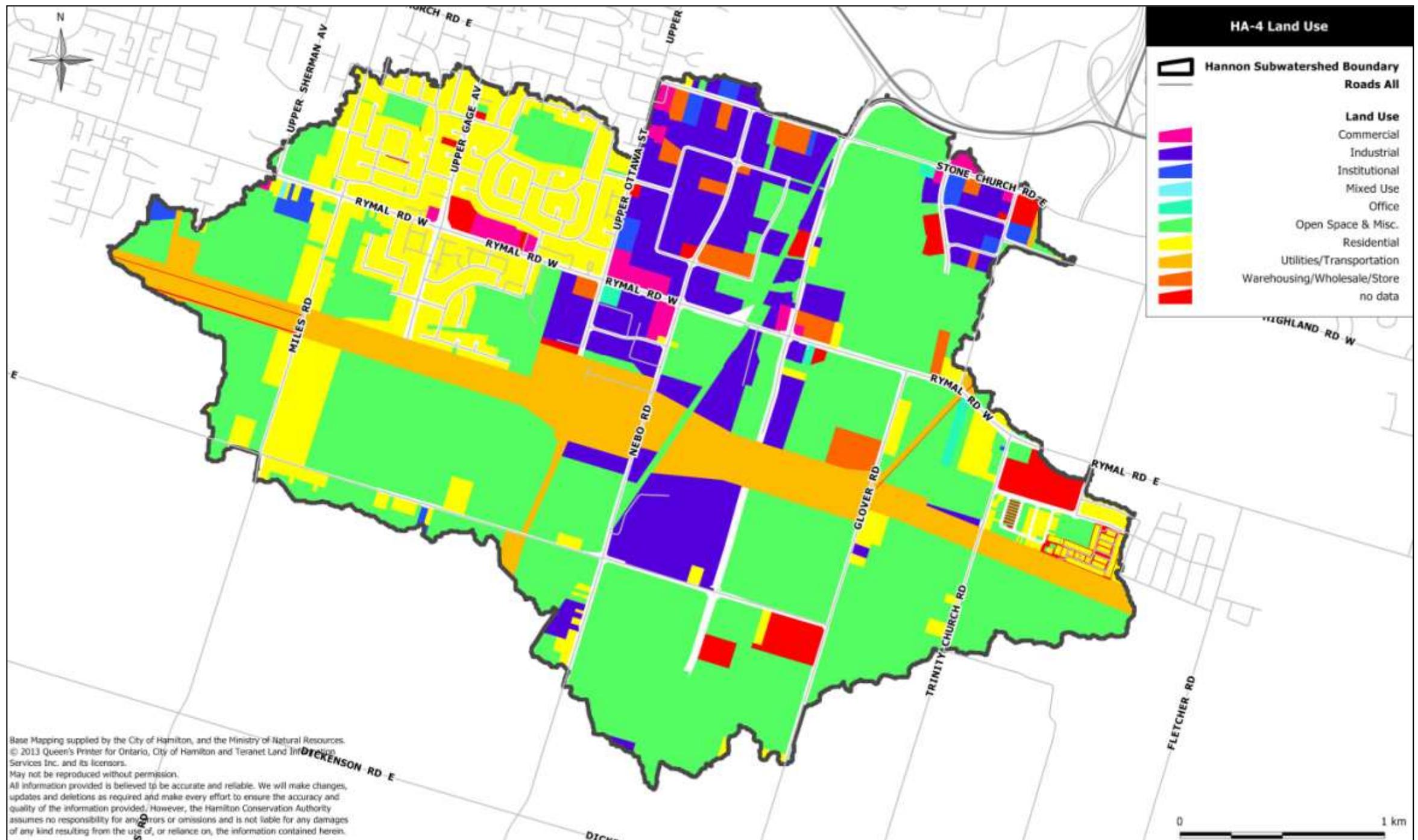
Area Planned for Greenfield Development	km2	% area
Area Planned for Greenfield Development	0.47	4.49

**Table HA - 14: Natural Features within Identified Greenfield Development Areas**

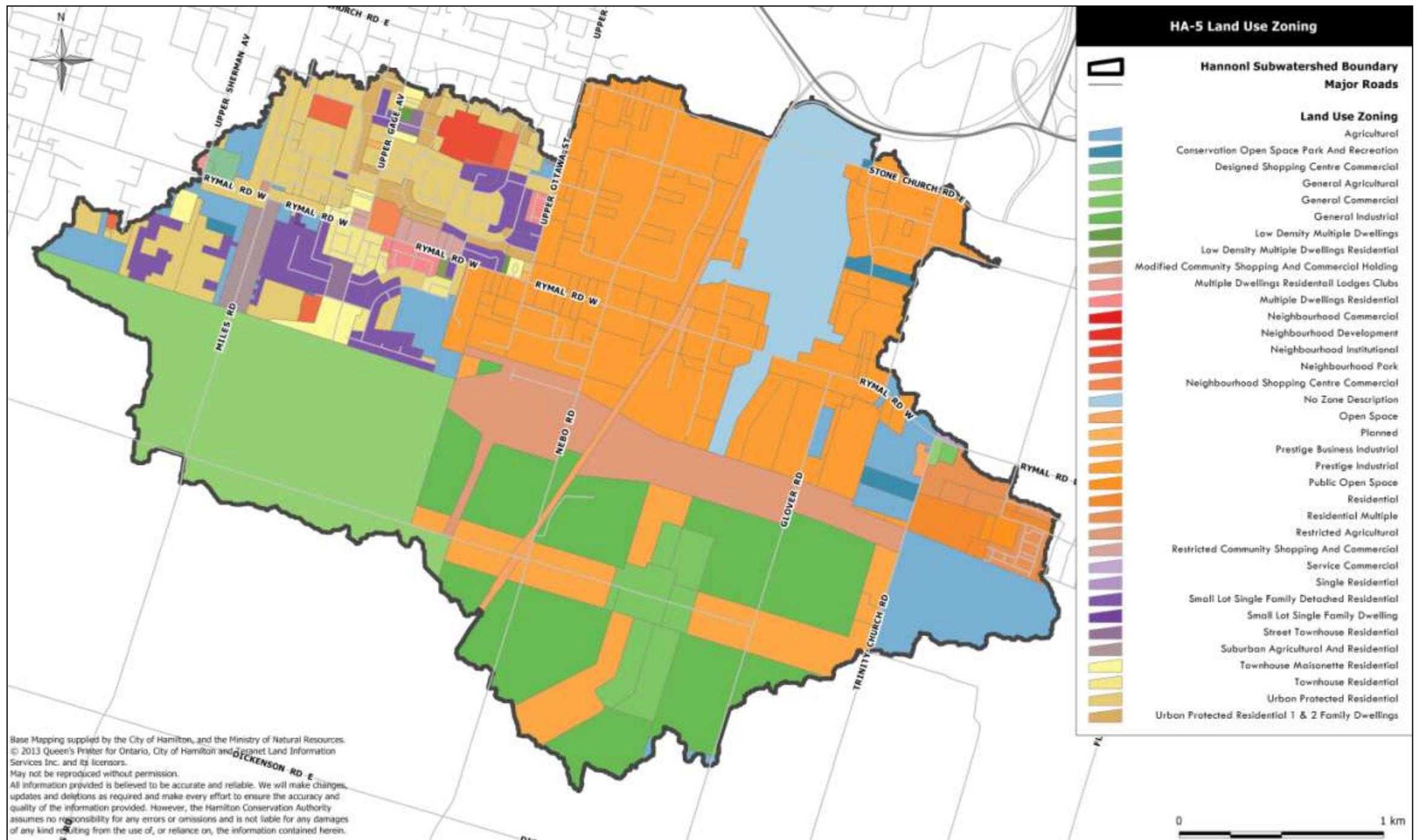
Natural Feature	km2	% area	km
Watercourse			3.00
Wetland	0.00	0.00	
Meadow	0.09	0.86	
Successional	0.03	0.29	
Forest	0.05	0.48	

**Table HA - 15 Natural Features Identified within Red Hill Business Park**

Natural Feature	km2	% area	km
Watercourse			25.27
Wetland	0.02	0.19	
Meadow	0.30	2.87	
Successional	0.13	1.24	
Forest	0.11	1.05	



Map HA - 4: Land Use



Map HA - 5: Land Use Zoning

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

**Table HA - 16: Zoning Description Land Use Categorization Scheme**

Land Use Zoning Description	Land Use Category
Agricultural	Open Space & Misc.
Conservation Open Space Park And Recreation	Open Space & Misc.
Designed Shopping Centre Commercial	Commercial
General Agricultural	Open Space & Misc.
General Commercial	Commercial
General Industrial	Industrial
Low Density Multiple Dwellings	Residential
Low Density Multiple Dwellings Residential	Residential
Modified Community Shopping And Commercial Holding	Commercial
Multiple Dwellings Residential Lodges Clubs	Mixed Use
Multiple Dwellings Residential	Residential
Neighbourhood Commercial	Commercial
Neighbourhood Development	Mixed Use
Neighbourhood Institutional	Institutional
Neighbourhood Park	Open Space & Misc.
Neighbourhood Shopping Centre Commercial	Commercial
No Zone Description	no data
Open Space	Open Space & Misc.
Planned	Planned
Prestige Business Industrial	Industrial
Prestige Industrial	Industrial
Public Open Space	Open Space & Misc.
Residential	Residential
Residential Multiple	Residential
Restricted Agricultural	Open Space & Misc.
Restricted Community Shopping And Commercial	Commercial
Service Commercial	Commercial
Single Residential	Residential
Small Lot Single Family Detached Residential	Residential
Small Lot Single Family Dwelling	Residential
Street Townhouse Residential	Residential
Suburban Agricultural And Residential	Residential
Townhouse Maisonette Residential	Residential
Townhouse Residential	Residential
Urban Protected Residential	Residential
Urban Protected Residential 1 & 2 Family Dwellings	Residential
Urban Protected Residential 1 Or 2 Fam Dwelling	Residential

There are some publicly owned properties in this subwatershed which contain natural features that can be preserved or enhanced to contribute to the natural heritage system in the larger watershed and that can provide education and recreation opportunities for local residents.

**Table HA-17** outlines the number of properties within the subwatershed that are owned or managed by HCA that contain natural features. **Table HA-18** outlines the number of properties within the subwatershed that are owned or managed by the City of Hamilton that contain natural features. **Table HA-19** outlines the percentage of the subwatershed area that is conservation or parkland as well as the length of trail system within the subwatershed. These properties and trail systems are identified on the built infrastructure and natural environment maps for each catchment in the catchment summaries section in the remainder of this document.

The City of Hamilton Recreation and Trails Master Plan Individual Ward Project for Ward 6 states:

The head of the Red Hill Creek Valley is a focal point for the confluence of the Niagara Escarpment, the Red Hill Creek tributaries, the King's Forest, the Lincoln Alexander Parkway and the Red Hill Creek Expressway. In addition, the Bruce Trail, the Escarpment Rail Trail and its extension to Caledonia together with local trails above and below the Escarpment converge on this area. Specific provisions are required to provide for a trail hub and for trail access over the Niagara Escarpment, the Red Hill Creek and the Lincoln Alexander Parkway/Red Hill Creek Expressway.

The older residential neighbourhoods near the Niagara Escarpment exhibit a rectangular organization of streets. Vehicular traffic flows along multiple routes and it is easier to organize a trail system, especially where there are natural features. Newer southern neighbourhoods are designed with interior curvilinear streets which direct through traffic to heavier collector streets which border the exterior and preclude the organization of trails through the interior.

This is further complicated by the absence of natural features and surface drainage along the tributaries of the Red Hill Creek which have been piped from Upper Ottawa Street westwards. Unfortunately, the opportunity to design trails along natural corridors along these streams has been lost.

## HANNON CREEK SUBWATERSHED CHARACTERIZATION

There may be opportunity to develop trails along the lands owned by the City under which these streams have been piped where these are outside street allowances. The corridor from the former Upper Ottawa Street Landfill to T.B. McQuesten Park is one example. Where industrial and residential neighbourhoods are undeveloped, Red Hill Creek tributaries should be maintained as naturalized drainage corridors with potential use for recreational trails (City of Hamilton, 2006).

The City of Hamilton Recreation and Trails Master Plan Individual Ward Projects for Ward 11 states:

An opportunity exists to utilize hydroelectric transmission and hydrocarbon pipeline facilities and corridors, including those that follow the southern limits of Hamilton's Wards 5, 6, 7, and 8 for recreational trail purposes. There is also a north south corridor which connects Hamilton's urban areas to Lake Niapenco and the Grand River downstream of Caledonia roughly parallel to the Rail Trail (City of Hamilton, 2006).

The City believes that properly constructed recreational trails can co-exist within these corridors, subject to obtaining the necessary approvals (i.e. Environmental Assessment Act). Many urban municipalities provide recreational trails within transmission corridors. There do not appear to be comparable examples within rural municipalities and more infrastructure may be required such as gating through agricultural fields. There is, however, no practical reason why trails could not be developed within these corridors (City of Hamilton, 2006).

The East Mountain Trail Loop (EMTL) is one project that fulfills some of the goals of the Recreation and Trails Master Plan. It is a paved/multi-purpose 10 km loop trail. 7km is owned and/or managed by the City of Hamilton and 3km is owned and/or managed by HCA. When completed, the EMTL will connect the Red Hill Valley Trail, Escarpment Rail Trail, Bruce Trail, and Chippewa/Trans Canada Trail to Caledonia. It will also connect Albion Falls, Felker's Falls Conservation Area (CA), Valley Park, Paramount Park, Stoneywood Park, Oak Knoll Park, King's Forest Park, Mount Albion CA, and Eramosa Karst CA. It is also accessible by public transit. The Peter Street Trail segment of the trail was the first accessible trail in Hamilton. The loop also consists of a pedestrian bridge crossing the Lincoln Alexander Parkway. This pedestrian bridge links to the pedestrian bridge crossing the QEW in the lower reaches of the Red Hill watershed, making it possible to use the trail network to walk from Lake Ontario to Caledonia.

The Mount Albion Conservation Area is within the Hannon Creek subwatershed. It will be important to manage these lands to contribute to the natural heritage system in the larger watershed and to provide education and recreation opportunities for local residents. As mentioned previously, HCA is currently developing a Master Plan for the design and management of the Mount Albion Conservation Area.

**Table HA - 17: HCA Owned Properties with Natural Features**

HCA Properties with Natural Features	Number	% of Properties
Total	10	n/a
Properties with Watercourse	5	50.00
Properties with Forest	3	30.00
Properties with Wetland	0	0.00
Properties with Meadow	5	50.00
Properties with Successional	2	20.00

**Table HA - 18: City Owned Properties with Natural Features**

City Properties with Natural Features	Number	% of Properties
Total	32	n/a
Properties with Watercourse	12	37.50
Properties with Forest	5	15.63
Properties with Wetland	1	3.13
Properties with Meadow	5	15.63
Properties with Successional	2	6.25

**Table HA - 19: Recreational Infrastructure**

Feature	km2	% area	km
Existing Trails			10.20
Proposed Trails			5.5
HCA Land	0.450	4.30	
Other 'Parks and Conservation'	0.500	4.78	
Public	1.040	9.94	

# HANNON CREEK SUBWATERSHED CHARACTERIZATION

## STEWARDSHIP

There are 175 properties within this subwatershed that contain natural features; including, forest, wetland, meadow, successional or aquatic habitat (**Table HA-20**). There is potential to for HHWSP to contact landowners with natural features to create awareness regarding best practices for environmental stewardship of natural areas. Through this contact there is also potential to engage landowners in the Watershed Steward Program.

Watershed Stewards are landowners who have agreed to protect and maintain the natural features that fall within their property. In addition to landowners who have natural features on their properties, landowners who do not have natural features on their properties can also act as Watershed Stewards as they can be advocates of stewardship messaging in other capacities. Efforts should be made to solicit participation from residents in this capacity as Urban Watershed Stewards.

The City of Hamilton and HCA are significant land holders of properties with natural features in this subwatershed. Landowner contact should be focused to private properties with natural features throughout the subwatershed.

Stewardship programming should also focus on contacting local residents who do not own or manage properties with natural features, to provide education about urban stewardship opportunities. Due to the large number of residents in this subwatershed, it is recommended that neighbourhood-specific group events, workshops and demonstration sites focused on local environmental opportunities, be used to engage numerous residents at a time.

Environment Canada has provided guidelines for forest, wetland and riparian habitat for subwatersheds and in turn a preliminary analysis has been completed using the guidelines set out by this agency. **Table HA-21** displays the status of the Hannon Creek subwatershed when compared to these Federal guidelines.

This subwatershed does not meet Environment Canada’s How Much Habitat is Enough Guidelines for forest or wetland cover. Efforts should be made to work with landowners and public agencies to preserve existing and creating additional forest cover, with an emphasis being placed on forest patch shape and size. These efforts will work toward meeting targets related to percentages of forest cover to support wildlife populations.

This subwatershed also does not meet the How Much Habitat is Enough guidelines for percentage of stream naturally vegetated. An additional 53kilometers along either side of the stream would have to be buffered with 30m wide buffers, in order to meet this target. Efforts should be made to establish and enhance riparian buffers along watercourses to meet this habitat guideline and prevent sedimentation and runoff contamination within the system.

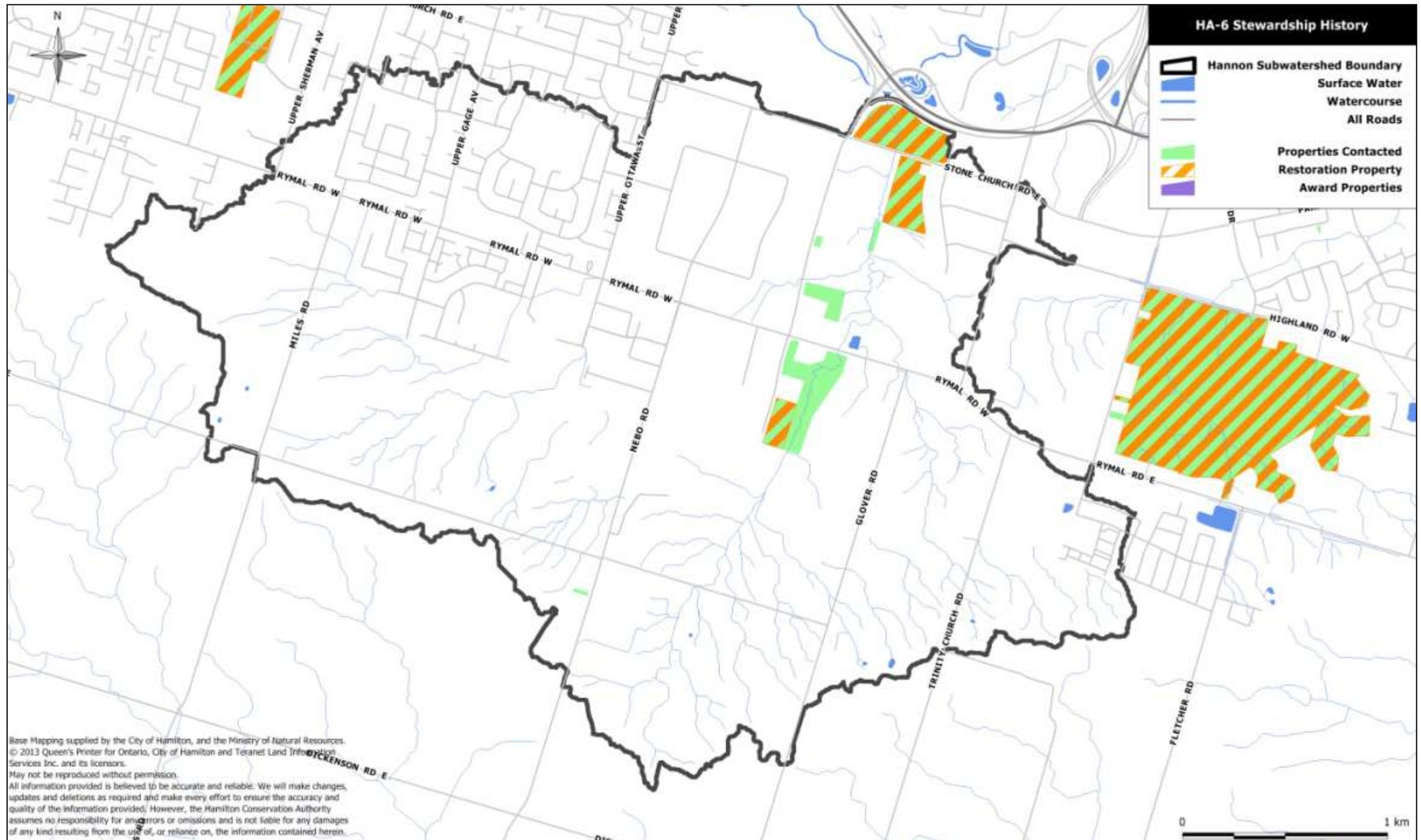
The percentage of impervious surfacing within this subwatershed exceeds the standards recommended by Environment Canada for healthy stream systems. Efforts should be made to implement lot level source control, conveyance control and end of pipe stormwater management practices in new and existing developments.

**Table HA - 20: Stewardship Potential**

Approximate Population	Population Density (persons / km <sup>2</sup> )	Total # of Properties with Forest, Wetland, Meadow or Watercourse
9,875	900	175

**Table HA - 21: Environment Canada’s How Much Habitat is Enough Guidelines**

PARAMETER	% Wetlands	% Stream Naturally Vegetated	Total Suspended Sediments	% Impervious Surfacing	Fish communities	% Forest Cover	Size of largest Forest patch	% Forest Cover 100m & 200m from Forest edge
<b>GUIDELINE</b>	6	75% with 30m buffer on either side	Below 25 mg/L	< 10	Based on historical data / watershed characteristics	30	2km <sup>2</sup> & min 500m wide	10% < 100m from forest edge
<b>SUBWATERSHED STATUS</b>	0.48	23.00	n/a	33.65	cold water	3.35	0.06 km <sup>2</sup>	100m – 0%; 200m – 0%



Map HA - 6: Stewardship History

## STRESSES AND STEWARDSHIP ACTIONS

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### STRESSES AND STEWARDSHIP ACTIONS

There are thirty four types of *stresses* identified as currently impacting, or having the potential to negatively impact, the Red Hill Creek Watershed. Stresses and Stewardship Actions identified for the Spencer Creek Stewardship Action Plans that were likely relevant to the Red Hill Creek Watershed were included in these draft plans for public and stakeholder comment on their relevance to the Red Hill Creek watershed. Stresses that are not applicable to Hannon Creek have been included in this Action Plan to illustrate the cumulative stresses on the Red Hill Creek Watershed.

An inventory count of the number of specific occurrences of each type of stress observed in each catchment basin of this subwatershed is listed in **Table HA- 22**. The most prevalent stresses, or potential stresses, identified in the Hannon Creek subwatershed are utility pipelines crossing watercourses, stormsewer outfalls, development and online ponds. **Table HA-23** outlines *Stewardship Actions* that have been developed to mitigate the impacts of the stresses listed in **Table HA-22**. The Lead Agency as well as Partner Agencies were identified through a desktop exercise and these agencies have not formally assumed any of these responsibilities.

Specific locations of stresses are mapped and inventoried in the subsequent catchment datasheets within the Catchment Summaries section in the remainder of this document. Within the Hannon Creek subwatershed, 62 specific locations where stresses are occurring or have the potential to occur, have been identified. However, this inventory is not exhaustive and therefore there may be stresses occurring within this subwatershed that are not noted within this plan. Implementation of Stewardship Actions should be undertaken on a subwatershed scale to ensure that all occurrences of stresses are mitigated.

The specific occurrences of stresses were identified through public and partner consultation, as well as using geographic information systems analyses, using the best available data; however all should be verified for accuracy before planning for the implementation of related stewardship actions.

It should be noted, there are insufficient riparian buffer stresses identified throughout the subwatershed. Insufficient Riparian Buffers are illustrated on the Environmental Considerations mapping for each catchment in the Catchment Summaries section.

For example, the June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan indicated that “the main branch and tributaries downstream of Rymal Road are exhibiting relatively high rates of erosion. The opportunity exists to enhance

this part of the watercourse and enhance aquatic habitat through stream and riparian enhancement” (TSH, 2010).

The plan also indicated:

The majority of the main branch of Hannon Creek from Rymal Road to the hydro corridor had significant riparian vegetation but is degraded by the current uses, particularly the dog run associated with the animal shelter. A revised management approach to protect the creek and its riparian system should be adopted. This should include the development of vegetated buffers along the watercourse, with restricted access and adding stream crossings, where needed, which would mitigate impacts to the stream (TSH, 2010).

The establishment of a riparian buffer along watercourses where insufficient riparian buffer has been identified should be a focus for stewardship action. The absence or insufficient width of riparian buffers directly relates to the health of the local aquatic ecosystem as it increases the potential for runoff contamination and bank erosion in the creek system. The Hamilton-Halton Watershed Stewardship Program delivers technical and financial assistance programs for the establishment of riparian buffers along watercourses.

Increasing natural cover in the subwatershed will aid in working toward habitat targets as determined by Environment Canada’s How Much Habitat is Enough Guidelines and the City of Hamilton Urban Official Plan and Vision 2020 Natural Heritage Goals. What habitat targets are possible to achieve in this subwatershed, based on current and proposed land use, should be considered when evaluating conditions against recommended habitat targets.

The Mount Albion Conservation Area and adjacent lands are a significant tract of natural area within this subwatershed. Publicly owned lands should be managed for the benefit of local wildlife, including efforts to maintain and improve biodiversity. Restoration opportunities within the Mount Albion Conservation Area include, the installation of sediment traps and channel constrictors, litter cleanups, live staking of stream banks, removal of debris jams, removal of invasive species and the removal of old concrete stream crossing structures and a small rock dam constructed downstream of the pedestrian bridge.

While encouraging the use of local natural areas, it is important to ensure that these areas are not being used beyond their capacity and that the areas are not been used for unintended or disruptive purposes. To prevent encroachment, illegal dumping, camp fires, litter, etc., signage

## STRESSES AND STEWARDSHIP ACTIONS

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and news items on the City and HCA websites should outline rules and etiquette to observe when using these public lands. Contraventions of City or HCA policies related to property use should be reported to the City of Hamilton and HCA for enforcement and management.

The Hannon North catchment is primarily developed with the exception of the Mount Albion Conservation Area and adjacent lands. Much of the lands in the remaining catchments within this subwatershed are currently in agriculture or are planned for development. The potential for stresses associated with land use changes, such as detachment from nature, habitat fragmentation/loss, increased impervious surfaces, invasive species, land maintenance practices, stormwater and runoff contamination from transportation corridors is therefore present throughout the subwatershed.

Sustainable development should be the primary focus for this subwatershed. Low Impact Development practices should be employed to minimize the impacts of development on the natural environment and infrastructure.

Aquatic and terrestrial natural heritage systems are vulnerable in the Hannon East, Hannon South and Hannon North catchments of this subwatershed. Land clearing associated with proposed development in these catchments threatens the continuity and function of these natural systems. Efforts should be made to maintain existing habitat and increase habitat where possible. Meadow habitat is particularly vulnerable to land use changes as there is little legislative protection for this type of habitat. Efforts to preserve and enhance meadow habitat should be a priority.

The June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan suggests that

An east-west linkage opportunity is created by the hydro right of way. Currently this area is dominated by meadow habitats with scattered stands of shrubland. The thicket area between Glover and Trinity Church Roads, identified as core area, is recommended to be included as part of a linkage between the Core Area of the Red Hill Valley ESA and the east-west hydro corridor linkage. The hydro corridor offers the opportunity to provide a linked terrestrial corridor, connecting terrestrial units in the area on a regional basis (TSH, 2010).

Based on field assessments, a stream classification system was developed for this subwatershed as part of the June 2010 NGIBP Master Drainage Plan, to identify the management approach for the streams. The classification system included the identification of streams to be protected and those that could be replaced with a piped drainage system. The

classification is based upon physical characteristics as well as the stream processes from an aquatic, terrestrial, geomorphic, hydrologic and hydrogeologic standpoint (TSH, 2010).

This classification system identified a large portion of headwater streams as “low constraint”, with the possibility for future enclosure or removal. As the watercourse assessments used for this classification system were conducted several years ago, prior to the creation and adoption of new assessment guidelines, agencies should undertake secondary evaluations of “low constraint” streams through regulatory and fisheries review processes as part of the upcoming Hannon Creek Subwatershed Master Drainage and Servicing Study.

Numerous road improvements are required to service development in the Red Hill Business Park (formerly the North Glanbrook Industrial Business Park). For example Dartnall Road is being extended from Rymal Road to Dickenson Road. The City describes the project as:

Dartnall Road is being widened to 4 lanes from Rymal Road to the existing terminus at the hydro corridor. A new 4 lane arterial road from the hydro corridor to Dickenson Road is to be constructed. The location of the extended road followed the same path as a tributary of Hannon Creek and as such, a realignment of the creek along the road is being undertaken. The creek was realigned to the west of the new road location. A natural channel design was used to mimic the natural form of a watercourse. The area has been re-vegetated as part of the restoration work (City of Hamilton, 2013).

The Trinity Church Road extension, Glover Road resurfacing and Upper Mount Albion Road closure are additional changes to the road network required to service development in these areas. It will be important to ensure that disruptions to aquatic and terrestrial natural heritage systems are as minimal as possible throughout the duration of these changes.

Continued evaluations of the North Glanbrook Industrial Business Park, now referred to as the Red Hill Business Park, are planned for 2014. Recommendations related to sustainable development resulting from these evaluations will need to be incorporated into management decisions for this subwatershed.

The Management Strategy for Hannon Creek subwatershed resulting from the June 10 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan, and any subsequent updates thereof, for terrestrial features, stormwater management and stream corridor environmental protection and enhancement (aquatic), and fluvial geomorphic protection should be implemented by appropriate local agencies, with implemented progress reported on through the Healthy Hamilton Watersheds Action Plan Implementation Team.

## STRESSES AND STEWARDSHIP ACTIONS

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Improving water quality in Hannon Creek, toward reaching Provincial Water Quality Objectives, should be a priority. Improving fishery and benthic communities within Hannon Creek, as evaluated against industry standard Indices of Biotic Integrity, should also be a priority.

There is a significant amount of impervious surfacing in this subwatershed. Stormwater and runoff contamination from transportation corridor stresses are directly related to impervious surfacing. Adequate stormwater management (SWM) is important to the health of the local fishery as it can mitigate the potential for erosion and contamination in the creek system. The design and maintenance of stormwater management systems should be a focus for this subwatershed to maintain and improve water quality and quantity, as well as aquatic habitat in this area.

Opportunities to implement a treatment train approach to managing stormwater including source, conveyance and end of pipe systems in new and existing developments should be undertaken throughout this subwatershed to manage flooding, erosion, degraded water quality, and increases in flow volumes to ensure that future maintenance costs are reduced and results in a healthy stream system that is stable over the long-term. Efforts to de-pave unused impervious surfaces should also be undertaken where possible.

Mountain Brow SWM Pond, in particular is currently being considered for improvements. The pond was constructed in 2005, intended to treat the flow generated from the Upper Ottawa subwatershed. It is an off-line facility. Its design allows a portion of storm flows into the facility for treatment while normal base flow by-pass the facility. The pond has been damaged numerous times during storm events due to the high velocities and volume of water acting on the pond banks.

Outreach programming to educate the public on the design and function of their local sewer system should continue to be implemented. Outreach should include where local stormwater flows and how lot level practices such as pouring hazardous waste or sweeping material into the stormsewer can affect water quality in local streams.

Our watersheds will be impacted by climate change. Urbanization further alters a watershed's ability to sustain the impacts of climate change. Increasing and enhancing biodiversity within natural cover (forests, wetlands and meadow/prairies) as well as maintaining watercourses in a

natural state with adequate floodplain storage and meander belt allowances will build resiliency within the natural system to withstand the impacts of a changing climate. Existing and future infrastructure will need to be adaptable to potentially unforeseeable conditions. It will be important to ensure that adequate and innovative stormwater management infrastructure is implemented. Efforts to mitigate the impacts of climate change should continue throughout Hamilton's watersheds, including efforts to reduce carbon emissions through household and industry consumption reduction and alternative transportation initiatives.

The agricultural lands of Hannon Creek subwatershed may stress surface water quantity through increased demand and lower stream flows during the drier portions of summer months and during drought. The stress assessment completed for source protection planning identified Hannon Creek subwatershed as stressed in July and August due to agricultural non-permitted surface water takings with corresponding lower stream flows. Implementing Stewardship Actions related to Water Use will be important throughout this subwatershed.

There are also some on-line ponds in this subwatershed which fragment aquatic habitat by creating physical and thermal barriers to migration. Aquatic wildlife are unable to negotiate these barriers and therefore restoration is necessary to open up additional habitat upstream. Stewardship actions related to these stresses should be implemented to mitigate the thermographic effects of on-line ponds and to eliminate barriers to fish passage. Removal or retrofit of pond retention structures or the installation of by-pass channels and fish ladders are recommended mitigation concepts.

The implementation of stewardship actions associated with utility pipelines identified within this subwatershed should also be a priority. The utility pipelines are categorized as potential stresses for the purpose of this report as no evidence of current adverse impacts on the environment were reported. The implementation team should continue to work to develop relationships with the utility companies to share monitoring data, maintenance schedules and emergency protocols to prevent adverse impacts from occurring.



## STRESSES AND STEWARDSHIP ACTIONS

### CATCHMENT SUMMARIES

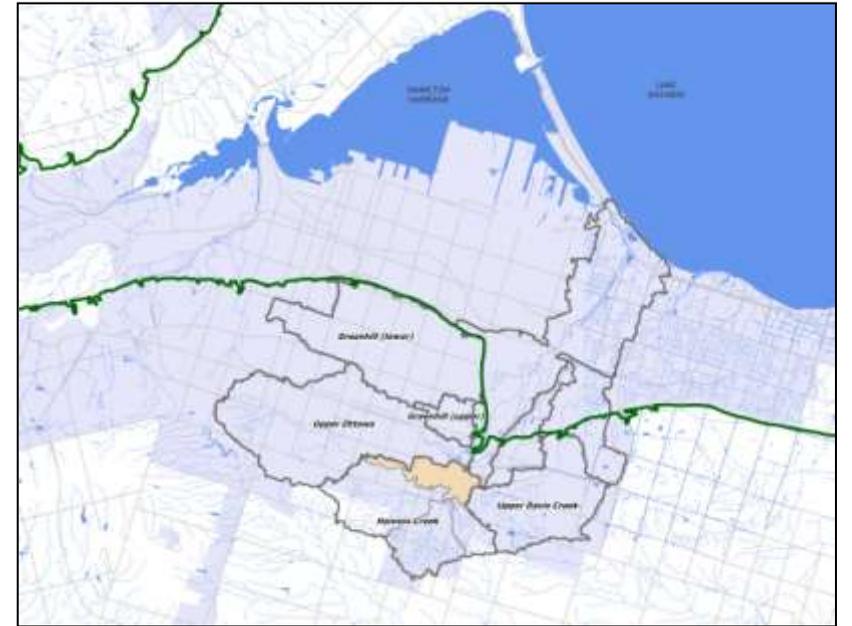
This section of the plan identifies the occurrences of stresses within each catchment of the Hannon Creek subwatershed. A summary of these stresses and an indication of the stewardship actions available to mitigate the impacts of the stresses are outlined in the data sheets following

each catchment map. Where available, ecological monitoring data for each catchment is also outlined following each catchment map. In total, 66 stresses were identified for the Hannon Creek Subwatershed and inventory counts are presented in **Table HA-22**.

**Table HA - 22: Stresses Inventory by Catchment**

STRESS	MAP CODE	NO. IN SUBWATERSHED	CATCHMENT			
			HANNON NORTH	HEADWATERS EAST	HEADWATERS SOUTH	HEADWATERS WEST
Abandoned Groundwater Wells	GW	0				
Buried Stream	BS	0				
Channelization	CH	0				
Debris Jam	DJ	0				
Detachment from Nature	DT	0				
Development	DV	7	2	1	1	3
Encroachment	EN	0				
Erosion	ER	0				
Faulty Septic System	SS	0				
Habitat Fragmentation/Loss	HF	2			2	
Increased Impervious Surface	IS	0				
Insufficient Riparian Buffer	RB	See Catchment Map	See Catchment Map	See Catchment Map	See Catchment Map	See Catchment Map
Intensive uses	IU	0				
Invasive/Introduced Species	IV	0				
Land Maintenance Practices	LM	0				
Landfill Leachate	LL	0				
Litter	LI	0				
Migration Barrier	MB	1		1		
Nutrient Loading	NL	0				
Online Pond	OP	5		1	3	1
Perched Culvert	PC	2				2
Pesticide/Herbicide Use	PS	0				
Plowed Watercourse	PW	0				
Runoff Contamination via Transportation Corridors	TC	0				
Sediment Loading	SL	0				
Site Clearing Prior to Development	SC	0				
Stormsewer Outfall	SO	10	4	1	1	4
Stormwater	SW	0				
Transportation Corridor Expansion	TE	1			1	
Urban Creek System	UC	0				
Utility Pipeline	UP	37		13	7	17
Water Quality	WQ	1	1			
Water Use	WU	0				
Wildlife Collision	WC	0				

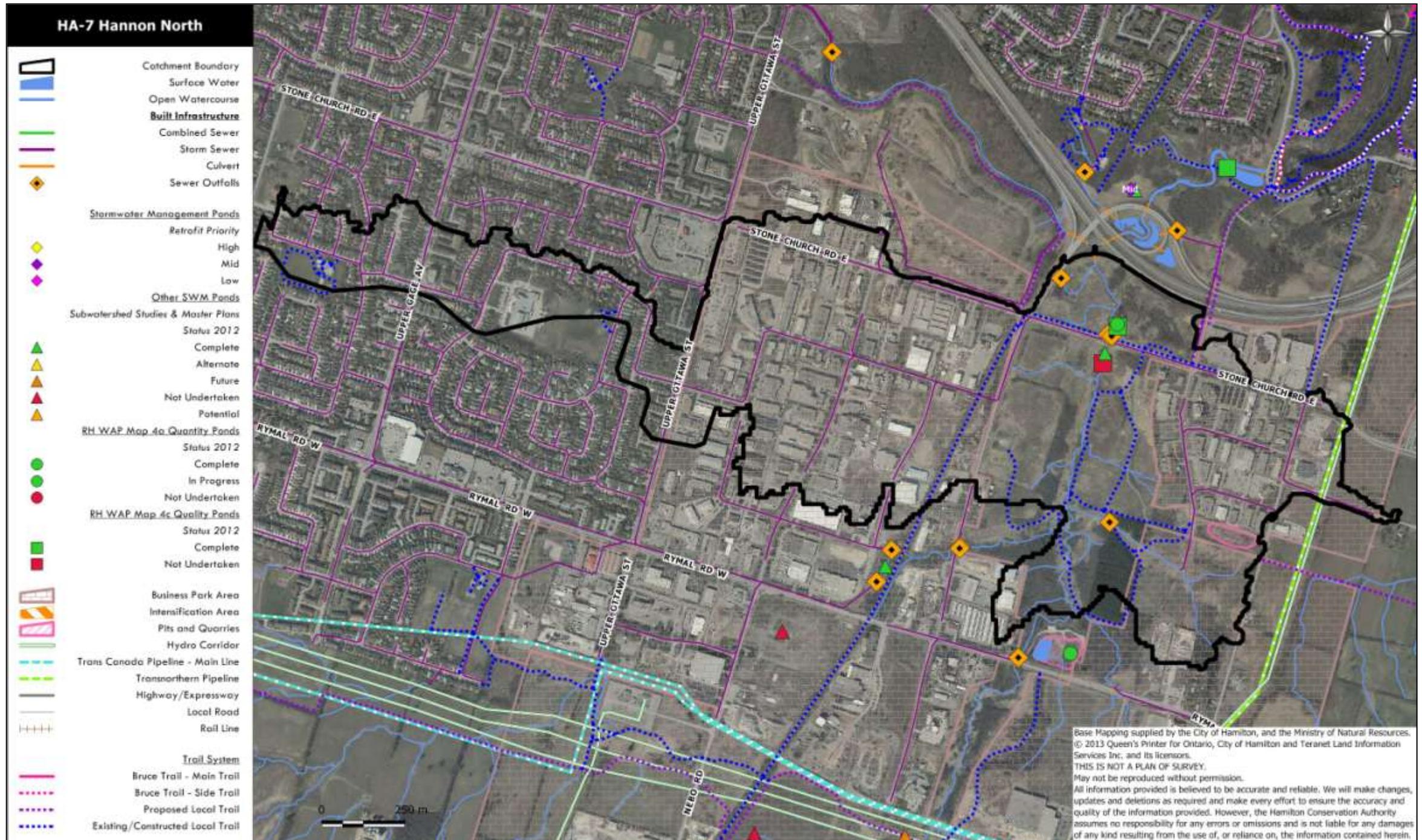




*HANNON NORTH CATCHMENT*

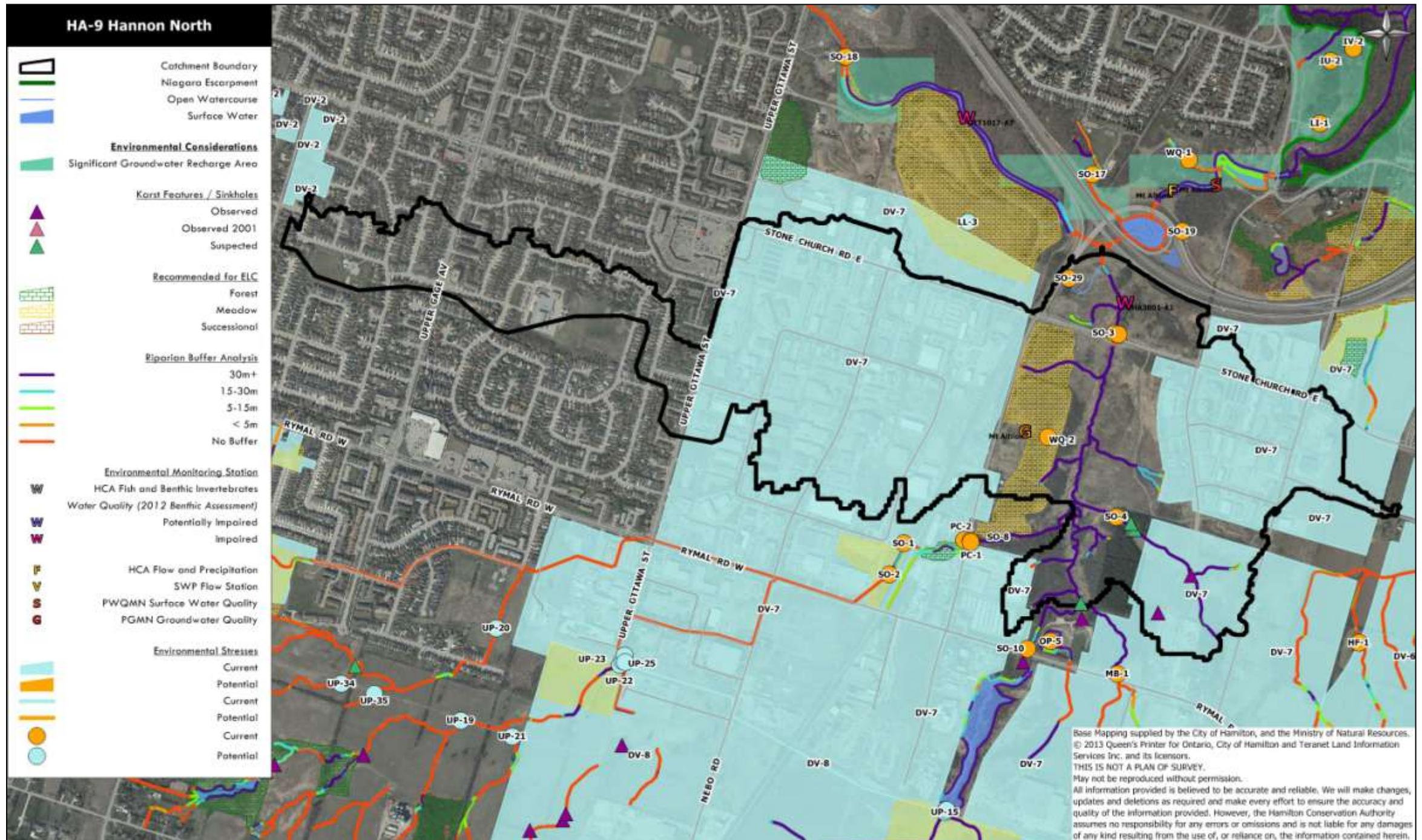
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DATA SHEETS



Map HA - 7: Hannon North Catchment Built Infrastructure





Map HA - 9: Hannon North Catchment Environmental Considerations

# HANNON NORTH CATCHMENT DATA SHEET

**Table HA - 23: Site-specific Stresses Identified in the Hannon North Catchment**

MAP CODE	STRESS NAME	DESCRIPTION	STEWARDSHIP ACTIONS			STRESS TYPE	PUBLIC LAND	PRIVATE LAND	DFO COMP POTENTIAL
			AWARENESS OPPORTUNITY	SPECIAL PROJECT OPPORTUNITY	RESTORATION OPPORTUNITY				
DV-2	Development	Area of potential greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
DV-7	Development	Red Hill Business Park greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
SO-28	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current	<input checked="" type="checkbox"/>		
SO-29	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	
SO-3	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current	<input checked="" type="checkbox"/>		
SO-4	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current	<input checked="" type="checkbox"/>		
WQ-2	Water Quality	Groundwater at Mt. Albion stations (W0000033) has elevated concentrations of chloride, sodium and hardness	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current	<input checked="" type="checkbox"/>		

## Most Recent Environmental Monitoring Data Available for the Hannon North Catchment

### FISHERIES ASSESSMENT

LOCATION	DATE	COMMON NAME	NO. IDENTIFIED	IN-STREAM TEMPERATURE	TEMPERATURE CLASSIFICATION
UHA3001-A1	31-Aug-91	Brook stickleback	3		
UHA3001-A1	8-Oct-91	Brook stickleback	50		
UHA3001-A1	5-Jul-06	Brook stickleback	98		
UHA3001-A1	4-Aug-09	Brook stickleback	17	15.93 °C	
UHA3001-A1	20-Aug-12	Brook stickleback	7		

### BENTHICS ASSESSMENT

LOCATION	DATE	DESCRIPTION
UHA3001-A1	2009	Impaired
UHA3001-A1	2012	Impaired

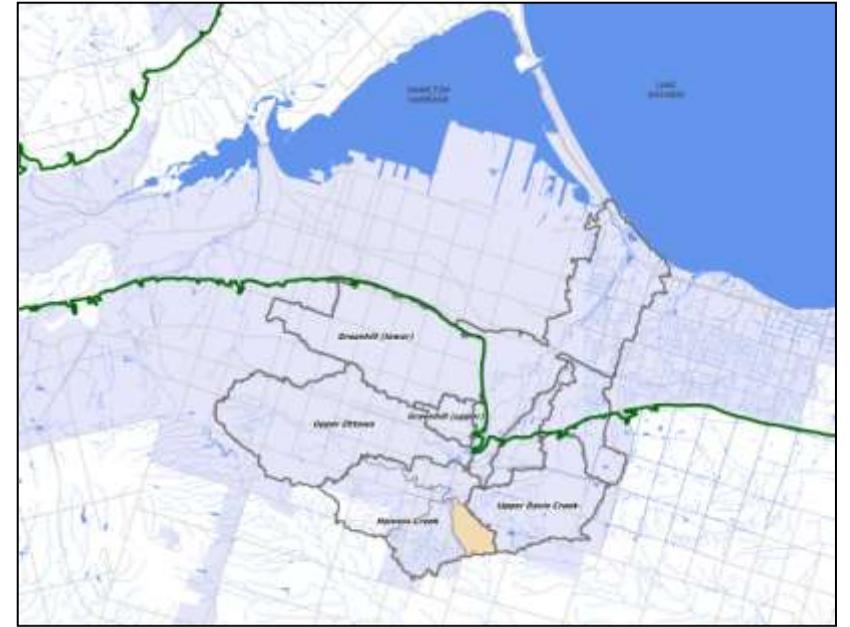
### WATER QUALITY ASSESSMENT

LOCATION	DATE	PARAMETER	SAMPLE RESULTS	UNITS
n/a	n/a	n/a	n/a	n/a

### WATER FLOW ASSESSMENT

LOCATION	DATE	FLOW m <sup>3</sup> /s
n/a	n/a	n/a

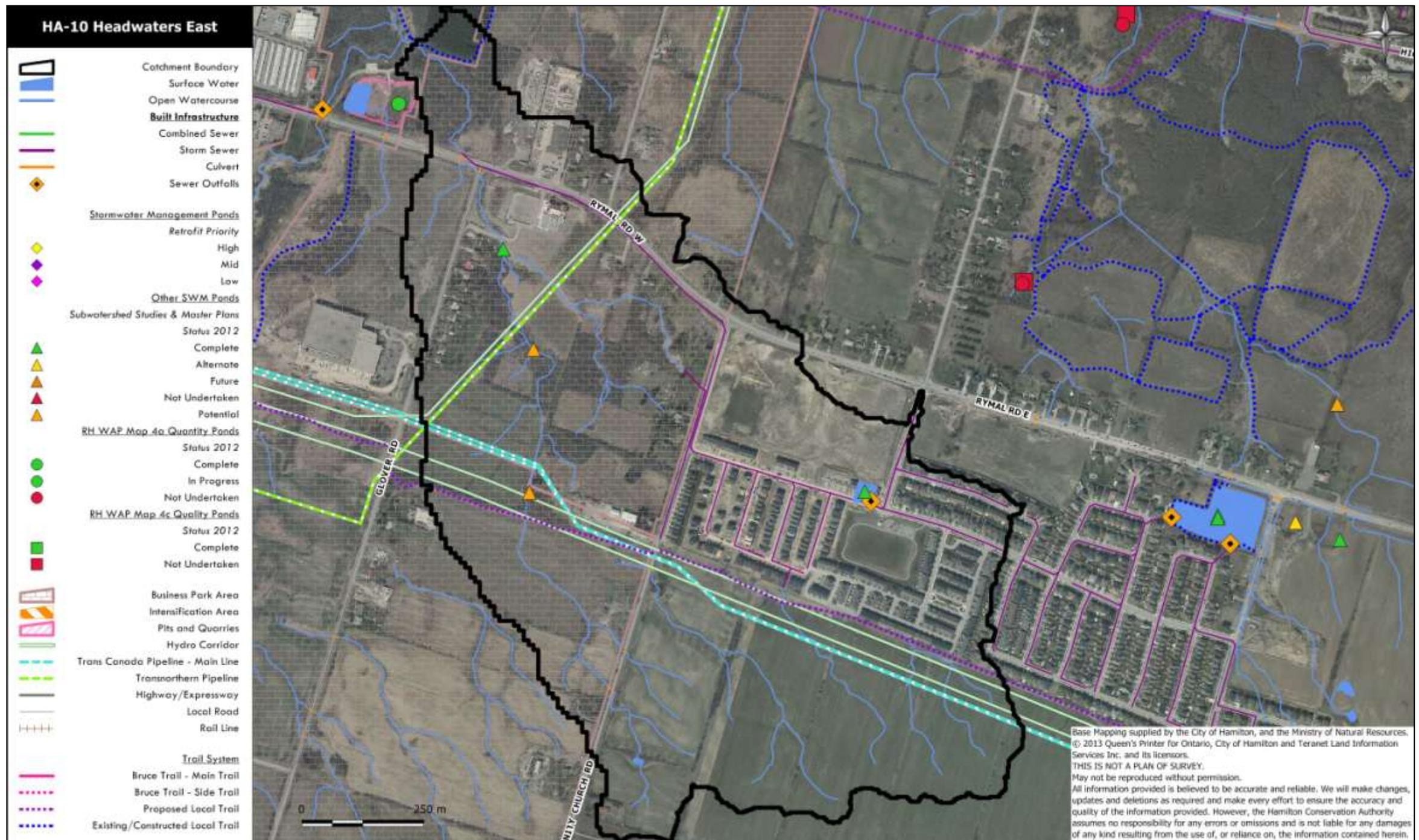




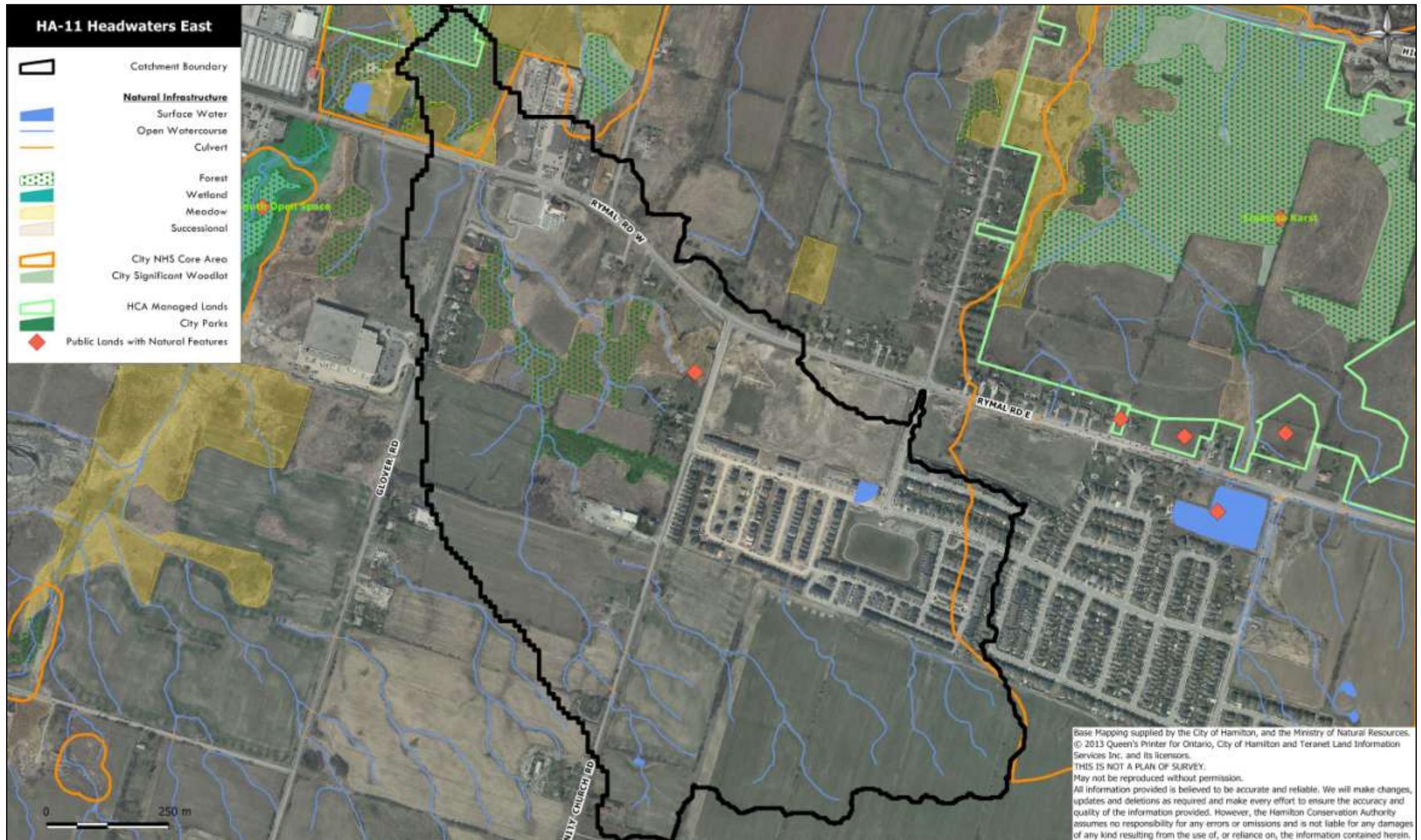
*HEADWATERS EAST CATCHMENT*

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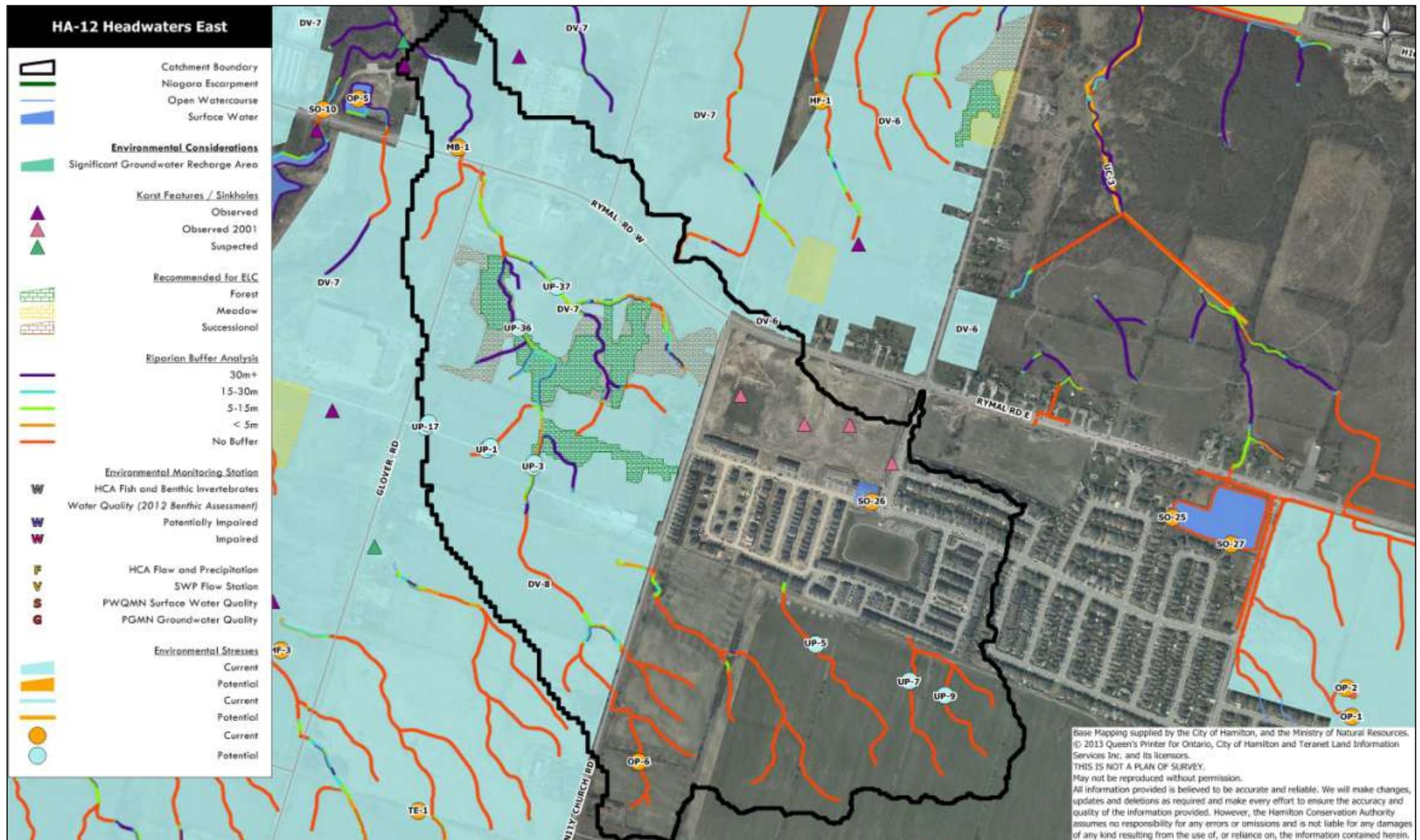
DATA SHEETS



Map HA - 10: Headwaters East Catchment Built Infrastructure



Map HA - 11: Headwaters East Catchment Natural Environment



Map HA - 12: Headwaters East Catchment Environmental Considerations

# HEADWATERS EAST CATCHMENT DATA SHEET

**Table HA - 24: Site-specific Stresses Identified in the Headwaters East Catchment**

MAP CODE	STRESS NAME	DESCRIPTION	STEWARDSHIP ACTIONS			STRESS TYPE	PUBLIC LAND	PRIVATE LAND	DFO COMP POTENTIAL
			AWARENESS OPPORTUNITY	SPECIAL PROJECT OPPORTUNITY	RESTORATION OPPORTUNITY				
DV-7	Development	Red Hill Business Park greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
DV-8	Development	Red Hill Business Park greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
MB-1	Migration Barrier	Manmade structure	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
OP-6	Online Pond	Waterbody Feature Type Online Pond	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SO-26	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	
UP-1	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-10	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-18	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline and Trans Northern Pipeline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-2	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-3	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-36	Utility Pipeline	Pipeline crosses watercourse - Trans Northern Pipeline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-37	Utility Pipeline	Pipeline crosses watercourse - Trans Northern Pipeline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-4	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-5	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-6	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-7	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-8	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-9	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	

## HEADWATERS EAST CATCHMENT DATA SHEET

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### Most Recent Environmental Monitoring Data Available for the Headwaters East Catchment

#### FISHERIES ASSESSMENT

LOCATION	DATE	COMMON NAME	NO. IDENTIFIED	IN-STREAM TEMPERATURE	TEMPERATURE CLASSIFICATION
n/a	n/a	n/a	n/a	n/a	n/a

#### BENTHICS ASSESSMENT

LOCATION	DATE	DESCRIPTION
n/a	n/a	n/a

#### WATER QUALITY ASSESSMENT

LOCATION	DATE	PARAMETER	SAMPLE RESULTS	UNITS
n/a	n/a	n/a	n/a	n/a

#### WATER FLOW ASSESSMENT

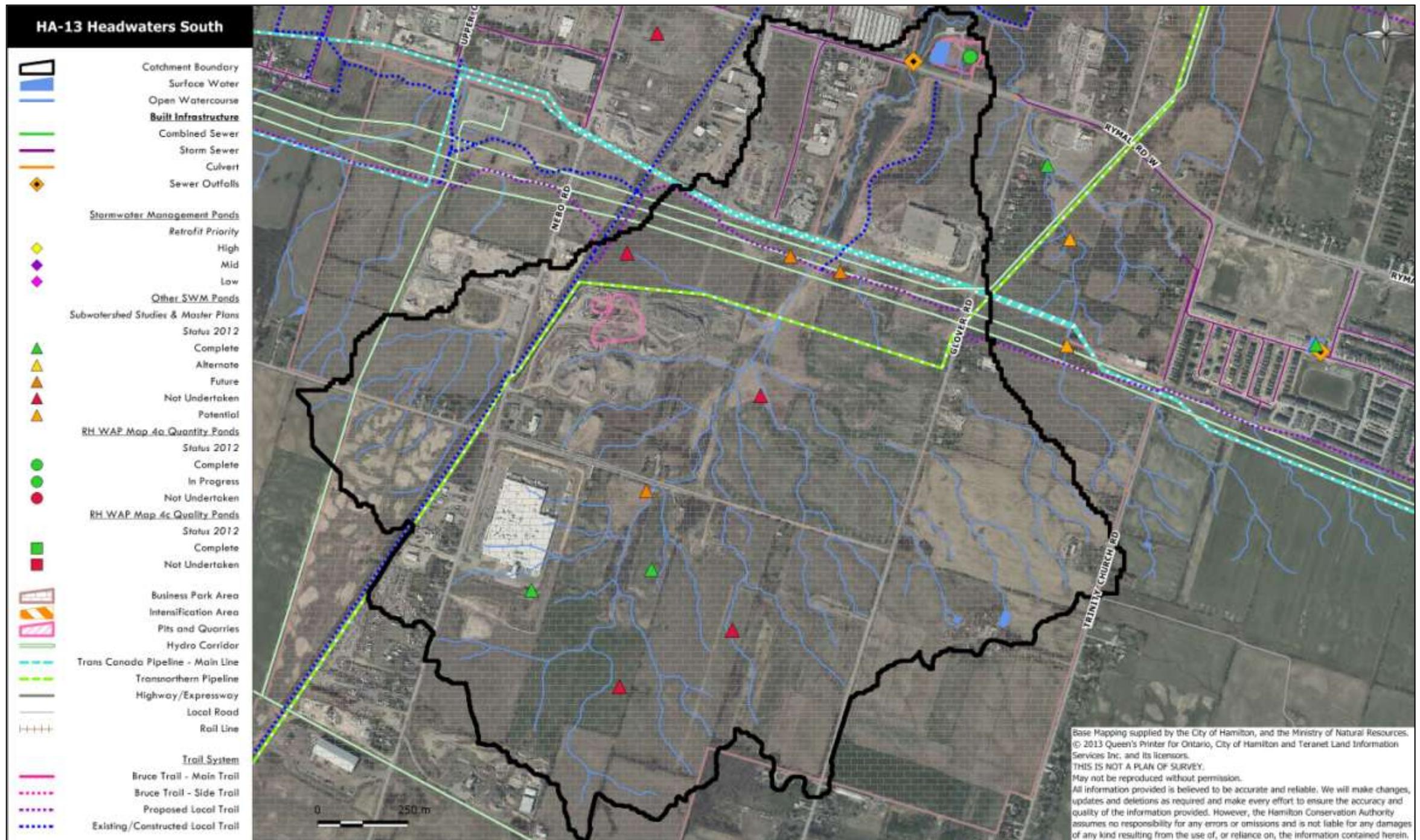
LOCATION	DATE	FLOW m <sup>3</sup> /s
n/a	n/a	n/a



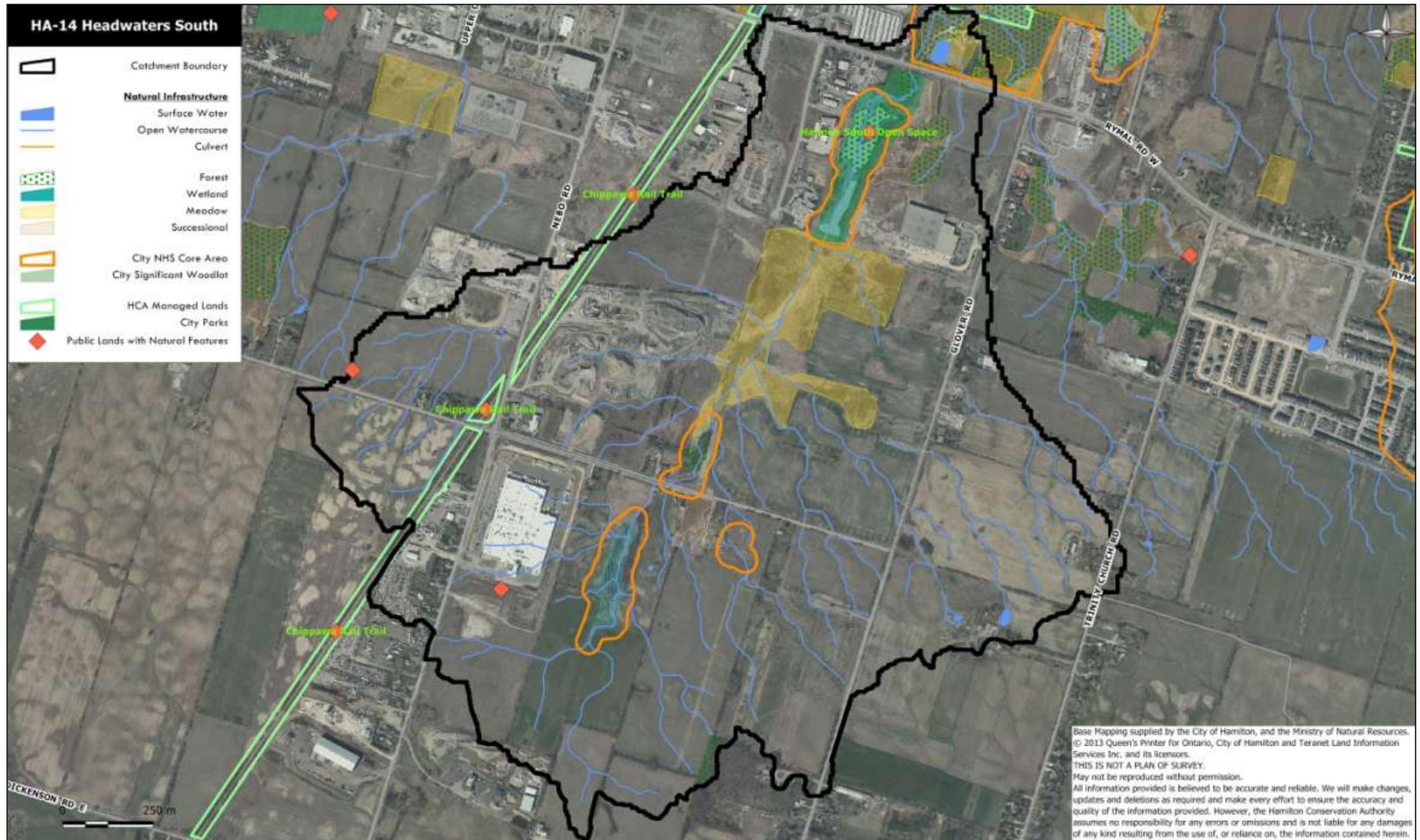
*HEADWATERS SOUTH CATCHMENT*

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DATA SHEETS



Map HA - 13: Headwaters South Catchment Built Infrastructure



Map HA - 14: Headwaters South Catchment Natural Environment



# HEADWATERS SOUTH CATCHMENT DATA SHEET

**Table HA - 25: Site-specific Stresses Identified in the Headwaters South Catchment**

MAP CODE	STRESS NAME	DESCRIPTION	STEWARDSHIP ACTIONS			STRESS TYPE	PUBLIC LAND	PRIVATE LAND	DFO COMP POTENTIAL
			AWARENESS OPPORTUNITY	SPECIAL PROJECT OPPORTUNITY	RESTORATION OPPORTUNITY				
DV-7	Development	Red Hill Business Park greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
DV-8	Development	Red Hill Business Park greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
HF-2	Habitat Fragmentation/Loss	Wetland enhancement - assess appropriateness for habitat nest boxes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	
HF-3	Habitat Fragmentation/Loss	Meadow Habitat Loss - Meadows being planted with tree species, retain public meadows for birds rather than plant with trees.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	
OP-3	Online Pond	Waterbody Feature Type Online Pond	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
OP-4	Online Pond	Waterbody Feature Type Online Pond	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
OP-5	Online Pond	Waterbody Feature Type Online Pond	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Current	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
SO-10	Stormsewer Outfall	Potential for urban runoff contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	
TE-1	Transportation Corridor Expansion	Trinity Church Arterial Corridor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	
UP-11	Utility Pipeline	Pipeline crosses watercourse - Trans Northern Pipeline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-12	Utility Pipeline	Pipeline crosses watercourse - Trans Northern Pipeline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-13	Utility Pipeline	Pipeline crosses watercourse - Trans Northern Pipeline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-14	Utility Pipeline	Pipeline crosses watercourse - Trans Northern Pipeline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-15	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential	<input checked="" type="checkbox"/>		
UP-16	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential	<input checked="" type="checkbox"/>		
UP-17	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline and Trans Northern Pipeline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	

## HEADWATERS SOUTH CATCHMENT DATA SHEET

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### Most Recent Environmental Monitoring Data Available for the Headwaters South Catchment

#### FISHERIES ASSESSMENT

LOCATION	DATE	COMMON NAME	NO. IDENTIFIED	IN-STREAM TEMPERATURE	TEMPERATURE CLASSIFICATION
n/a	n/a	n/a	n/a	n/a	n/a

#### BENTHICS ASSESSMENT

LOCATION	DATE	DESCRIPTION
n/a	n/a	n/a

#### WATER QUALITY ASSESSMENT

LOCATION	DATE	PARAMETER	SAMPLE RESULTS	UNITS
n/a	n/a	n/a	n/a	n/a

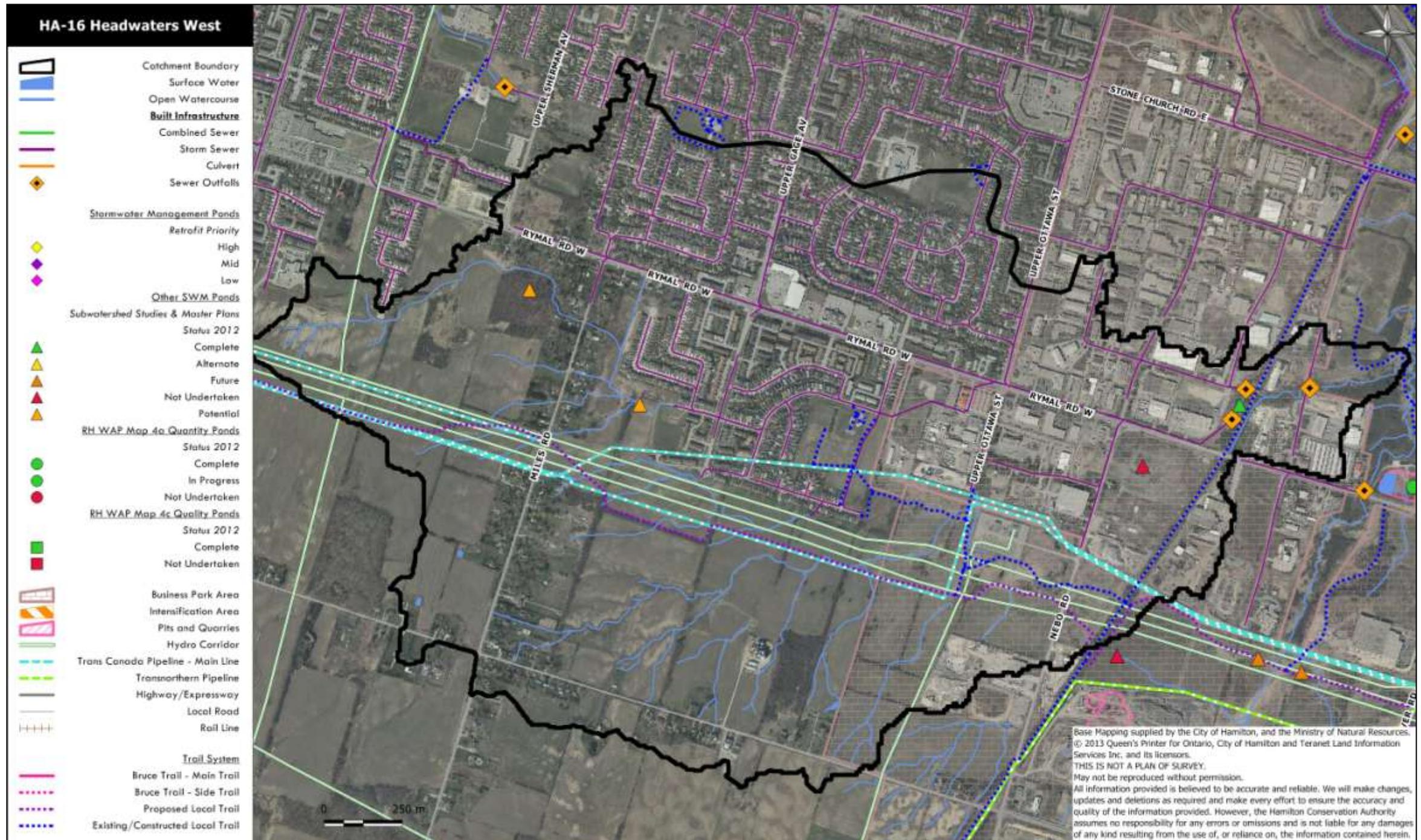
#### WATER FLOW ASSESSMENT

LOCATION	DATE	FLOW m <sup>3</sup> /s
n/a	n/a	n/a

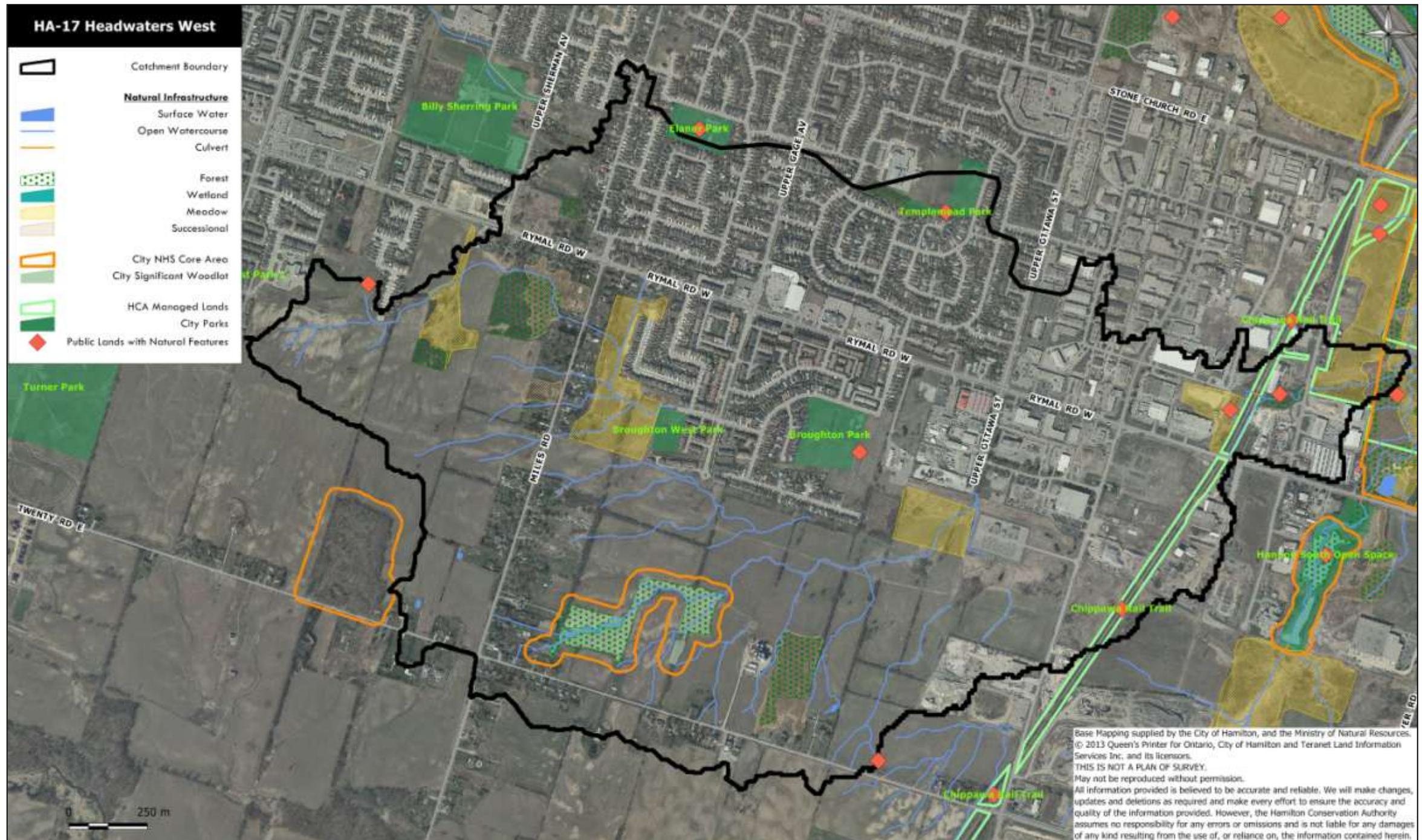


*HEADWATERS WEST CATCHMENT*

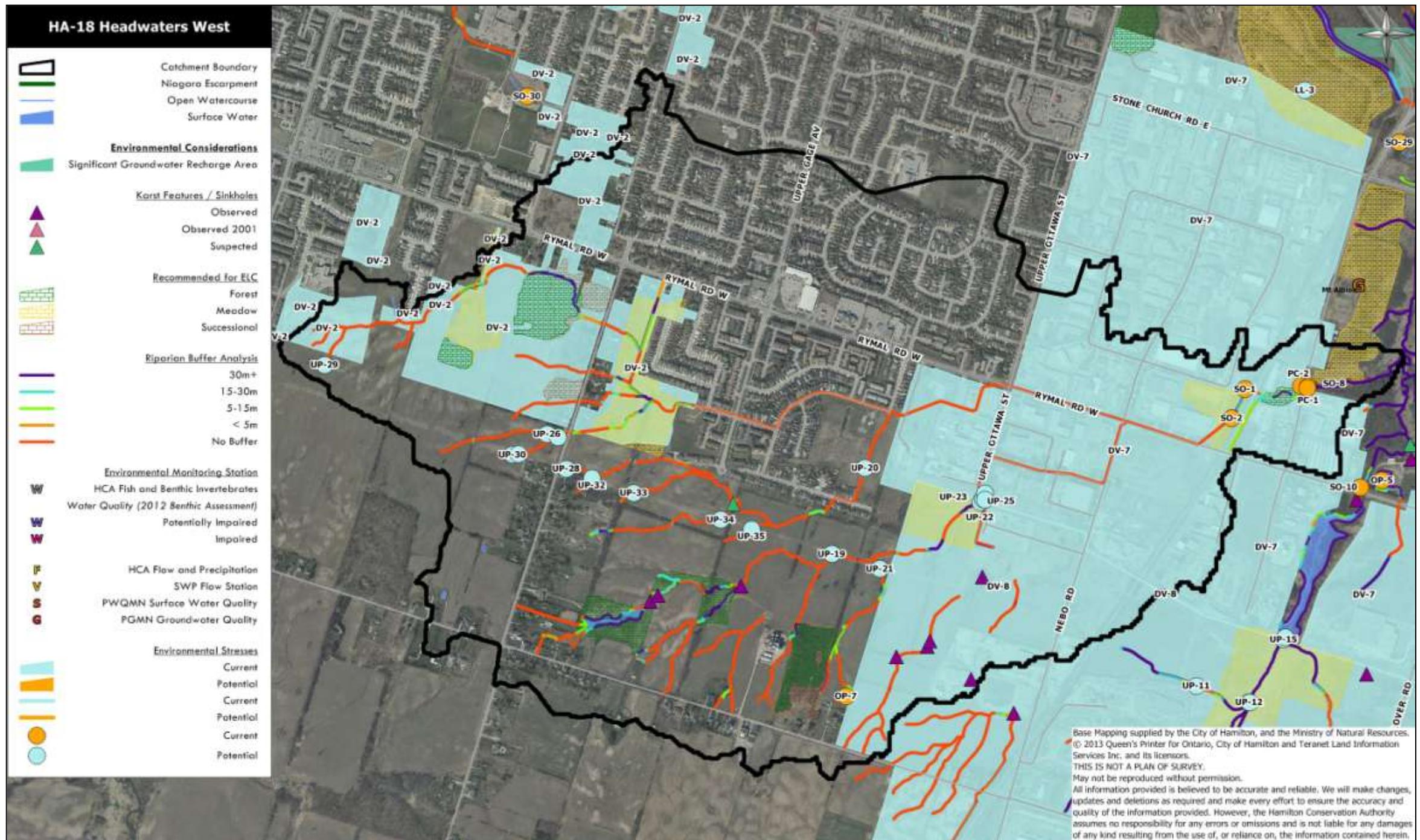
DATA SHEETS



Map HA - 16: Headwaters West Catchment Built Infrastructure



Map HA - 17: Headwaters West Catchment Natural Environment



Map HA - 18: Headwaters West Catchment Environmental Considerations

# HEADWATERS WEST CATCHMENT DATA SHEET

**Table HA - 26: Site-specific Stresses Identified in the Headwaters West Catchment**

MAP CODE	STRESS NAME	DESCRIPTION	STEWARDSHIP ACTIONS			STRESS TYPE	PUBLIC LAND	PRIVATE LAND	DFO COMP POTENTIAL
			AWARENESS OPPORTUNITY	SPECIAL PROJECT OPPORTUNITY	RESTORATION OPPORTUNITY				
DV-2	Development	Area of potential greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
DV-7	Development	Red Hill Business Park greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
DV-8	Development	Red Hill Business Park greenfield development	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potential		<input checked="" type="checkbox"/>	
OP-7	Online Pond	Waterbody Feature Type Online Pond	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PC-1	Perched Culvert	Double Culvert	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PC-2	Perched Culvert	Double Culvert	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
SO-1	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current	<input checked="" type="checkbox"/>		
SO-2	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current	<input checked="" type="checkbox"/>		
SO-8	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	
SO-9	Stormsewer Outfall	Urban runoff and potential for cross connected sanitary sewer contamination	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Current		<input checked="" type="checkbox"/>	
UP-19	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-20	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
UP-21	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-22	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-23	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-24	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-25	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-26	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-27	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-28	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-29	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-30	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-31	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	

## HEADWATERS WEST CATCHMENT DATA SHEET

MAP CODE	STRESS NAME	DESCRIPTION	STEWARDSHIP ACTIONS			STRESS TYPE	PUBLIC LAND	PRIVATE LAND	DFO COMP POTENTIAL
			AWARENESS OPPORTUNITY	SPECIAL PROJECT OPPORTUNITY	RESTORATION OPPORTUNITY				
UP-32	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-33	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-34	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	
UP-35	Utility Pipeline	Pipeline crosses watercourse - Trans Canada Pipeline - Mainline		<input checked="" type="checkbox"/>		Potential		<input checked="" type="checkbox"/>	

### Most Recent Environmental Monitoring Data Available for the Headwaters West Catchment

#### FISHERIES ASSESSMENT

LOCATION	DATE	COMMON NAME	NO. IDENTIFIED	IN-STREAM TEMPERATURE	TEMPERATURE CLASSIFICATION
n/a	n/a	n/a	n/a	n/a	n/a

#### BENTHICS ASSESSMENT

LOCATION	DATE	DESCRIPTION
n/a	n/a	n/a

#### WATER QUALITY ASSESSMENT

LOCATION	DATE	PARAMETER	SAMPLE RESULTS	UNITS
n/a	n/a	n/a	n/a	n/a

#### WATER FLOW ASSESSMENT

LOCATION	DATE	FLOW m <sup>3</sup> /s
n/a	n/a	n/a

## STRESSES AND STEWARDSHIP ACTIONS

**Table HA - 27: Stresses and Stewardship Actions**

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
<b>Abandoned Groundwater Wells</b> <b>Map Code: GW</b>  <b>Definition:</b> <b>Groundwater wells that are no longer in use, often are in a state of disrepair and can be direct conduits for contaminants into groundwater aquifers.</b>	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact promote the importance of decommissioning abandoned groundwater wells to protect drinking water and prevent human and wildlife injury.			CITY SPP	HHWSP / MOE	Agriculture and Agri-Food Canada - Water Wells, Best Management Practices Pg 52
			Work with landowners to decommission abandoned groundwater wells.	CITY SPP	HHWSP / MOE	Ontario Water Resources Act Regulation 903: Water Wells OMAFRA Best Management Practices Series – Water Wells
<b>Buried Streams</b> <b>Map Code: BS</b>  <b>Definition: The structural alteration of a stream channel, involves piping the creek system underground, eliminating aquatic habitat.</b>	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote healthy creeks and the benefits of maintaining our creeks and streams in their natural state.			CITY / HCA WP&E	DFO / FSRT / RAP / WPN	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, FW-4, F-11, F-12, PAA-2 and ULM-2
		Undertake a feasibility and prioritization study for “daylighting” buried streams in each subwatershed.		CITY HW	DFO / HCA / MNR / MTO / RAP	HCA Planning and Regulation Policies and Guidelines Pages 36-41, 55
			Work with the development industry to undertake daylighting projects using bioengineering and natural channel design principles, as recommended by the feasibility and prioritization study.	CITY / HCA WP&E	DFO	Fisheries Act, Section 37 City of Hamilton Stormwater Master Plan Class Environmental Assessment Report Pages 142-158 Evaluation, Classification and Management of Headwater Drainage Features: Interim Guidelines Growth Related Integrated Development Strategy (GRIDS) Urban Hamilton Official Plan State of the Watershed Report 1997 Red Hill Creek Watershed Action Plan First Generation

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
						<p>Plan 1998</p> <p>Red Hill Creek Watershed Action Plan Compendium of Actions (1998)</p> <p>Davis Creek Subwatershed Study</p> <p>June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan</p> <p>Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA</p>
<p><b>Channelization</b> Map Code: CH</p> <p><b>Definition: The structural alteration of a stream channel, usually involves straightening of meanders and increasing gradient which increases velocity and erosion potential.</b></p>	<p>Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media &amp; direct landowner contact to promote healthy creeks and the benefits of maintaining our creeks and streams in their natural state.</p>			<p>CITY / HCA Comm. / HCA WP&amp;E</p>	<p>DFO / FSRT / RAP / WPN</p>	<p>Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, FW-4, F-11, F-12, PAA-2 and ULM-2</p>
		<p>Undertake a feasibility and prioritization study for restoring channelized creeks to those with a natural design.</p>		<p>CITY HW / HCA WP&amp;E</p>	<p>DFO / MNR / RAP</p>	<p>HCA Planning and Regulation Policies and Guidelines Pages 36-41, 55</p>
			<p>Work with landowners downstream of channelized sites to rehabilitate the riparian zone to reduce flow velocities, erosion and sedimentation.</p>	<p>HCA WP&amp;E</p>	<p>CITY / DFO / FSRT</p>	<p>Fisheries Act, Section 37</p>
			<p>Work with landowners to undertake natural channel design projects using bioengineering and natural channel design principles, as recommended by the feasibility and prioritization study.</p>	<p>HCA WP&amp;E</p>	<p>CITY / DFO / FSRT</p>	<p>City of Hamilton Stormwater Master Plan Class Environmental Assessment Report Pages 142-158</p> <p>Growth Related Integrated Development Strategy (GRIDS)</p> <p>State of the Watershed Report 1997</p> <p>Red Hill Creek Watershed Action Plan First Generation Plan 1998</p> <p>Red Hill Creek Watershed</p>

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
						<p>Action Plan Compendium of Actions (1998)</p> <p>Davis Creek Subwatershed Study</p> <p>June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan</p> <p>Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA</p>
<p><b>Debris Jams</b> Map Code: DJ</p> <p><b>Definition: The accumulation of debris within a watercourse that prevents the flow of water.</b></p>	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to create awareness regarding proper debris jam removal so as to not disrupt aquatic habitat.			HCA WP&E	DFO / MNR	<p>Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations FW-4, F-11 and PAA-2</p> <p>Hamilton Harbour Fisheries Management Plan</p> <p>In-stream Barrier Assessment for the Hamilton Harbour AOC.</p>
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to create awareness regarding the importance of debris jam management in flood prevention.			HCA WP&E	CITY / MNR	
		Complete an assessment of creek/in-stream flow barriers that are prone to debris and cause barriers to fish migration, including the prioritization of barriers to be removed.		HCA WP&E	CITY / MNR	
		Incorporate debris jam removal into the City of Hamilton Adopt a Park and Neighbourhood Clean Team Programs.		CITY Op.	BARC / DFO / HCA / MNR	
			Work with landowners to remove debris jams, incorporating proper sediment and erosion control practices throughout the process.	HCA WP&E	BARC / CITY / DFO / FSRT	
<p><b>Detachment from Nature</b> Map Code: DT</p> <p><b>Definition: The condition of people disassociating their existence from</b></p>	Continue to implement the Watershed Steward Award Program; include a 'Neighbourhood-level' component to the program.			HCA WP&E		<p>Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI -1, EPI-2, EPI-3, EPI-5, EPI-6, PAA-1, PAA-2, PAA-3, ULM-7 and ULM-14</p>
	Develop an information package for real estate agents with information for potential homebuyers for living adjacent to natural areas. Offer the information as a training course for the Realtor's Association of Hamilton-Burlington.			HCA WP&E	CITY / RAHB	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
nature.	Develop education and outreach materials linking resident's everyday activities to their impacts on local natural areas to help local residents understand the connection between activities and their impacts i.e. lawn mowing, dumping of yard waste, draining pools, etc.			BARC / CITY Op. / GV / HCA WP&E		Royal Botanical Gardens Back to Nature: Towards a Ontario Strategy for Bringing Children and Nature Together - Event and Workshop Report
	Encourage the formation and activities of "Friends of" groups aimed at protecting and rehabilitating natural features. Invite established ENGO's to liaise with these groups. Centre ENGO liaison events around social events for these groups (i.e. neighbourhood barbeques).			CITY Op. (Outreach) / HCA Lands / HCA WP&E	BARC / BTC / GV	Evergreen Schoolground Greening Resources: Getting Started City of Hamilton Vision 2020 Urban Hamilton Official Plan
	Engage citizen groups to conduct local subwatershed monitoring & reporting projects, including: water quality, base flow, litter hot spots, Ecological Monitoring Assessment Network, Frog Watch, Ice Watch, etc.			BARC / CITY Op. (Outreach) / EH / HCA WP&E	GV	State of the Watershed Report 1997 Red Hill Creek Watershed Action Plan First Generation Plan 1998
	Engage high school students in volunteer opportunities related to environmental programming in order to meet community volunteer hours required for secondary school completion.			BARC / GV	CITY / HCA / HWCDSB / HWDSB	Red Hill Creek Watershed Action Plan Compendium of Actions (1998)
	Erect creek crossing (Watershed Planning Network) & ecological corridor signage along roadways.			CITY Plan.	BARC / GV / HCA / RAP / WPN	
	Help local residents to value natural features by developing a recurring column in a local newspaper which highlights significant natural features in the community, their importance and what local residents can do to assist with their care and management.			HCA Comm. / HNC	BTC / CITY / GV / HCA / RAP	
	Implement education outreach programs for school-aged children and children's groups, including: Yellow Fish Road, Stream of Dreams, Mini Marsh, Envirothon, Children's Water Festival, Eco-House Tours, HNC Junior Naturalists, HCA Junior Conservationists, etc. Include curriculum links in program development.			BARC / CITY HW / GV / HCA Lands	HWCDSB / HWDSB	
	Initiate community-based greening projects/events with watershed partners to deliver messaging to targeted audiences.			GV	BARC / CITY / EDHB / EH / FSRT / HCA	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
	Offer guided hikes with resource interpreters to educate local residents and employees of local businesses on the environmental significance of natural areas in their communities. Include messaging for stewardship of the natural areas. Develop different hikes for children and adults.			HCA Comm. / HNC	HCA	
	Promote existing organizations that currently offer guided hikes through natural areas in the watershed i.e. Hamilton Naturalists Club Wednesday Evening Walks Series.			BTC / HNC	HCA	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote watersheds, watershed characteristics and the ecological significance of natural features.			HCA Comm. / HCA WP&E	BARC / CITY / GV / RAP / WPN	
		Assess barriers to participation in environmental programs to improve program design.		BARC / CITY Op. / GV / HCA Comm.	EH / MAC	
		Assess landowner willingness to participate in and/or support water quality improvement and habitat restoration projects.		HCA Comm.	CITY / HWSC / MAC	
		Encourage municipalities and trail managers to coordinate trail plans that improve access between urban centres and provide links to parks and rural areas.		BTC / CITY Plan. / HCA Lands		
		Undertake a pilot program for local residents to undertake/assist with plant propagation in urban areas to be used in planting projects in neighbourhood natural areas.		HCA WP&E	CITY / HCA	
			Work with citizen groups to undertake restoration projects on public and private lands, including "Friends of" work days, Adopt a Creek, Fishing Clubs, etc.	BARC / CITY Op. / GV / HCA WP&E	BTC	
			Work with schools and school boards to implement the School Grounds Naturally Program; undertaking schoolyard naturalization projects.	HCA WP&E	BARC / CITY / GV / HWCDSB / HWDSB	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
<p><b>Development Map Code: DV</b></p> <p><b>Definition: The process of developing populated settlements including housing and supporting infrastructure.</b></p>	Host annual training sessions for City staff & the development industry to create awareness regarding the incorporation of development related BMPs into planning applications (i.e. pervious pavement, low maintenance lawns, green rooftops, storm water management, road-salt alternatives, snow-piling, erosion & sediment control measures, compliance & enforcement, etc.).			CITY HW / HCA WP&E	BARC / DFO / GV / HHHBA / RAP	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations FW-12, ULM-2, ULM-3, ULM-8, ULM-13 and ULM-14
	Promote the City of Hamilton Low Impact Development Policy for Industrial Lands when completed.			CITY Plan.	BARC / GV / HCA / HHHBA / RAP	Credit Valley Conservation and Toronto and Region Conservation Authority Low Impact Development Stormwater Management Manual
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote the requirements, benefits of and need for intensification and in-fill and brownfield development.			CITY Plan. / HCA WP&E	EH / GV / HHHBA / RAP	HCA Planning and Regulation Policies and Guidelines City of Hamilton Vision 2020
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to provide education about the importance and proper installation of sediment and erosion control through all stages of development, from developer to homeowner.			CITY Plan. / HCA WP&E	EH / GV / HHHBA / RAP	Growth Related Integrated Development Strategy (GRIDS) State of the Watershed Report 1997
	Work with the development industry to develop stewardship guides for new homeowners in all new housing developments adjacent to natural areas and watercourses.			CITY Plan. / HCA WP&E	EH / GV / HHHBA / RAP	Red Hill Creek Watershed Action Plan First Generation Plan 1998
		Review the fish habitat buffer requirements for watercourses in the HCA Planning and Regulations Policy and Guidelines document to a 30m setback, per the third edition of Environment Canada's How Much Habitat Is Enough Guidelines.		HCA WP&E	CITY / HHHBA / RAP	Red Hill Creek Watershed Action Plan Compendium of Actions (1998) Davis Creek Subwatershed Study
		Continue to incorporate downstream assessments of creek conditions, with recommendations for improvement in overall subwatershed studies, conducted as part of new Greenfield development planning.		CITY HW	DFO / HCA	June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan
		Determine the feasibility of adapting the Alternative Land Use Services (ALUS) program for an urban context where landowners receive payments to deliver environmental services; i.e. wildlife and pollinator habitat, improved water quality, clean air and carbon sequestration.			CITY / HCA / MNR	Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
		Develop education and outreach programming around valuing sustainable development.		CITY HW / HCA WP&E	EH / GV / HHHBA	
		Develop policies and guidelines to ensure principles of sustainable development are required in all levels of development, from official plan through to the site plan level.		CITY Plan.	HCA / HHHBA / RAP	
		Encourage the provincial government to amend the building code to include and favour Low Impact Development technologies; e.g. green and white roofs, multilevel parking, interlocking pavement, etc.		CITY Plan. / HCA WP&E	GV / HHHBA	
		Encourage the provincial government to support property tax-based loans i.e. local improvement charges, to assist in funding development and retrofits which incorporate low impact development technologies.		CITY Plan.	HCA / HHHBA	
		Ensure natural feature preservation is incorporated into secondary plan and official plan development.		CITY Plan. / HCA WP&E	HHHBA	
		Implement stewardship and management recommendations resulting from the HCA development permit application review process.		HCA WP&E	CITY / HHHBA	
		Investigate measures for new infrastructure to compensate and/or offset the cost of upgrading existing infrastructure.		CITY HW	HHHBA / MMAH	
		Investigate the need for expiry dates or re-evaluation requirements for preapproved draft plans.		CITY Plan.	HCA / HHHBA / MMAH	
		Revise municipal by-laws regarding development practices and guidelines to facilitate increased use of Low Impact Development technologies.		CITY Plan. / HCA WP&E	GV / HHHBA / MMAH	
		Revise policies to require that development applications contain a certain number/degree of LID's/green infrastructure in order to obtain development and site plan approval. I.e. Minimum number per application.		CITY Plan.	HCA / HHHBA / MMAH	
		Criteria used in the development of the City of Hamilton's Natural Heritage System should be used to identify and value 'potential' natural heritage features and functions in planning for development.		CITY Plan.	GV / HCA / HHHBA / MNR	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
		Work with development industry to initiate a Water Management Task Force to assist in implementing stewardship actions and recommendations from the City of Hamilton Stormwater Master Plan.		CITY HW	GV / HCA / HHHBA / RAP	
		Work with the development industry to create a Low Impact Development demonstration site/house in a new subdivision.		CITY Plan. / HCA WP&E	GV / HHHBA / RAP / MMAH	
		Work with the development industry to determine cost savings and other benefits associated with Low Impact Development, separate from benefits of/to natural areas.		CITY Plan.	GV / HCA / HHHBA / RAP / MAC / MMAH	
			Continue to implement the principles from the Evaluation, Classification and Management of Headwater Drainage Features: Interim Guidelines in development application review.	HCA WP&E	CITY / DFO / HHHBA / MNR	
			Continue to incorporate lot level control Low Impact Development techniques i.e. bioswales, pervious pavement, etc. at the site plan level and as part of subdivision design.	CITY HW / HCA WP&E	GV / HHHBA / MMAH / RAP	
			Continue to require tree protection plans and one to one compensation for the protection or replacement of single/small numbers of trees, based on the City of Hamilton Tree Protection Guidelines.	CITY Plan. / HCA WP&E	HHHBA / MNR	
			Work to implement the Low Impact Development policy for Industrial Lands currently under development by the City of Hamilton.	CITY Plan.	HCA / HHHBA / MMAH / RAP	
			Work to undertake in-stream rehabilitation projects; including those identified in the Stewardship Action Plans as suitable for the DFO Habitat Compensation Program.	HCA WP&E	CITY / DFO / HHHBA / MNR	
<b>Encroachment Map Code: EN</b>	Conduct a direct mailing of an encroachment education brochure to landowners adjacent to Conservation Authority and City owned natural areas.			CITY Op. / HCA Comm. / HCA Lands	BTC / HNC	HCA Planning and Regulation Policies and Guidelines Pages 36-41, 55, 60
<b>Definition: The act of undertaking practices on another person's property, i.e. erecting structures, planting gardens, disposal of waste.</b>	Engage citizen groups to monitor & report areas affected by encroachment that are in need of restoration or that have been restored, to ensure mitigation of encroachment on public lands remains effective & to encourage neighbour-to-neighbour mentoring.			CITY Op. / HCA Comm. / HCA Lands	BARC / BTC / GV / HNC	City of Hamilton Draft Private Tree and Woodland Conservation By-law  City of Hamilton By-law No. 03-117 Illegal Dumping

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
	Install property demarcation posts (with agency logos) at regular intervals along property boundaries to prevent encroachment into natural areas.			CITY Op. / HCA Comm. / HCA Lands	BTC / HNC	
	Provide local residents with information on appropriate species to plant and what types of plants will naturally re-establish to support encroachment remediation projects.			CITY Op. & W. Man (Outreach) / HCA WP&E	BTC / HNC	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to create awareness regarding how encroachment (i.e. dumping yard waste, establishing gardens in natural areas, 'tidying' the forest floor, etc.) negatively impacts habitat.			CITY Op. / HCA Comm. / HCA Lands / HCA WP&E	BARC / BTC / GV / HNC	
	Work with local nurseries & landscaping co.'s to educate / encourage landowners to use native plants.			HCA WP&E	BTC / CITY / GV / HNC	
		Undertake a pilot initiative of a three warnings rule for enforcement where, if after three warnings, encroachment has not been remediated then a fine is issued.		CITY Op. / HCA Lands	BTC / GV / HNC	
		Undertake an orthophotography interpretation analysis to determine how many properties are encroaching into natural areas and how much natural feature is lost to encroachment.		CITY Op. / HCA Lands	MNR / MAC	
			Utilize enforcement of the City of Hamilton Litter, Yard Waste and Property Maintenance by-law No. 10-118 to prevent and remediate encroachment into natural areas.	CITY Op. / HCA Lands /	BTC / GV	
			Work with citizen groups to prioritize and remove encroaching material on public and private lands, including "Friends of" work days, Adopt a Creek, Fishing Clubs, Stewardship Rangers, etc.	CITY Op. / HCA Lands / HCA WP&E	BARC / GV / HNC	
<b>Erosion</b> <b>Map Code: ER</b>  <b>Definition: The process of soil being scoured or washed away by flowing</b>	Conduct a direct mailing to landowners where erosion has been identified through the City of Hamilton GRIDS Plan and City-wide erosion assessment to engage landowners in restoration work.			CITY HW	DFO / HCA	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, FW-4, ULM-2 and ULM-3  HCA Planning and Regulation
	Create demonstration sites on public lands that highlight streambank stabilization and natural channel design projects.			CITY / HCA Lands	BARC / DFO / GV	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
water.	Host training sessions for City staff and development industry to create awareness regarding BMPs & importance of properly maintained erosion / sediment control measures & enforcement.			HCA WP&E	CITY / DFO / MMAH / RAP	Policies and Guidelines Pages 68-69  Fisheries Act, Section 35
	Utilize enforcement scheme to enforce appropriate erosion control measures on development sites, including: seeding, avoiding steep slopes, etc.			HCA WP&E	CITY / DFO / GV / RAP	City of Hamilton Stormwater Master Plan Class Environmental Assessment Report Pages 142, 159-160
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote healthy creeks and the importance of riparian buffers.			HCA WP&E	BARC / CITY / DFO / GV / HHHBA / RAP	Erosion and Sediment Control Guidelines for Urban Construction
		Undertake a field study of stream morphology, determining erosion hotspots & associated causes.		HCA WP&E	CITY / DFO / RAP	OMAFRA Best Management Practices Series – No-Till Making It Work
			Enhance urban creeks through the restoration of creek buffers, establishing native vegetation, naturalizing eroded areas, installing habitat features, removing invasive species, etc. i.e. Upper Davis Creek through Valley Park.	CITY Op. / HCA WP&E	BARC / GV	Growth Related Integrated Development Strategy (GRIDS)
			Work to undertake erosion rehabilitation projects as identified in the City-wide Erosion Study; combine hard and soft bank protection for erosion sites. Ex. Lower Davis project.	CITY HW	DFO / HCA	State of the Watershed Report 1997
			Work with City staff to install permeable conveyance systems (infiltration trenches) where suitable along roadsides as an alternative to the conventional ditch system.	CITY Op. & W. Man (Roads) / HCA WP&E	DFO / MTO / RAP	Red Hill Creek Watershed Action Plan First Generation Plan 1998
			Work with private landowners to undertake bank stabilization and erosion rehabilitation projects using bioengineering design principles; combine hard and soft bank protection for erosion sites. Ex. Lower Davis project.	HCA WP&E	BARC / DFO / FSRT / OSCIA	Red Hill Creek Watershed Action Plan Compendium of Actions (1998)  Davis Creek Subwatershed Study  June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan  Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS	
<b>Habitat Fragmentation</b> <b>Map Code: HF</b>  <b>Definition:</b> <b>Disruption of large continuous tracts of habitat.</b>	Create demonstration sites on public lands that highlight various types of terrestrial and aquatic habitat restoration projects.			HCA Comm. / HCA Lands / HCA WP&E	CITY / DFO / DU / FSRT / HNC / MNR	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, FW-2, FW-4, FW-12, PAA-1 and ULM-2	
	Encourage landowners to complete management plans for the natural features of their properties and to sustainably manage those features through the implementation of BMP's.			HCA WP&E	CITY / HNC / MNR	HCA Planning and Regulation Policies and Guidelines Pages 53-59	
	Encourage urban ecosystem restoration practices on public and private properties, including promoting the importance of creating and preserving meadow and prairie habitats.			CITY Op. / HCA Lands / HCA WP&E	HNC / MNR	City of Hamilton Draft Private Tree and Woodland Conservation By-law	
	Promote the City of Hamilton Street Tree Planting Program and its importance in contributing to the natural heritage system.			CITY Op.	HCA / HNC / MNR	Cootes to Escarpment Park System – A Conservation and Land Management Strategy	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to create awareness regarding the Niagara Escarpment Plan and Greenbelt Plans and the importance of preserving these areas with an emphasis on the importance of healthy ecosystems, habitat and habitat connectivity.			CITY Plan. / HCA WP&E	CC / DU / HNC / MMAH / MNR / NEC / OMAFRA	Nature Counts – City of Hamilton Natural Areas inventory 2003  City of Hamilton Natural Areas Acquisition Fund  Dundas Valley 50 Year Vision	
		Communicate and coordinate with adjacent Conservation Authorities regarding goals and objectives for natural heritage.			HCA WP&E	CITY / MNR	Hamilton Harbour Fisheries Management Plan
		Continue to complete ecological surveys (using acceptable protocols) to ensure species at risk habitat or rare ecological areas are not disrupted.			CITY Plan. / HCA WP&E	HNC / MNR	OMAFRA Best Management Practices Series – Farm Forestry and Habitat Management
		Continue to implement the City of Hamilton Naturalization Pilot project in local parks.			CITY Op.	HCA / HNC	OMAFRA Best Management Practices Series – Fish and Wildlife Habitat Management
		Determine the potential for ecosystem restoration on cemetery grounds/memorial gardens i.e. prairie/meadow habitat			CITY Op.	EH / HCA / HNC	City of Hamilton Vision 2020
		Develop How Much Habitat is Enough habitat targets for each subwatershed.			HCA WP&E	CITY / CC / DFO / HNC / MNR	Growth Related Integrated Development Strategy (GRIDS)
	Investigate the suitability of stormwater management ponds for wildlife habitat, i.e. basking logs, nesting sites, etc.			HCA WP&E	CITY / DFO / EH / MNR	Urban Hamilton Official Plan	
	Map fisheries information throughout each subwatershed to identify areas at risk and prioritize areas for remediation.			HCA WP&E	CITY / DFO / EH / MNR	State of the Watershed	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
		Protect and enhance natural corridors through parks and public lands by ensuring that naturalization and habitat creation are incorporated into master planning.		CITY Plan. / HCA Lands / HCA WP&E	BTC / HNC / MNR	Report 1997 Red Hill Creek Watershed Action Plan First Generation Plan 1998
		Strengthen the City of Hamilton Forest Conservation By-law to be more similar to a private tree by-law (that applies to single/small numbers of trees as well as woodlots) – Ex. Private tree by-laws for Ancaster and portions of Dundas and Stoney Creek.		CITY Plan.	HCA / MMAH / MNR	Red Hill Creek Watershed Action Plan Compendium of Actions (1998) Red Hill Valley Project Ecosystem Restoration Program
		Continue to work with the aggregate industry when planning new/expanded pit and quarry operations to minimize impacts on the adjacent natural features.		HCA WP&E	CITY / MNR	Davis Creek Subwatershed Study
			Implement the recommendations outlined in the City of Hamilton Urban Official Plan and Nature Counts 2 Project Hamilton Natural Areas Inventory relating to preserving and enhancing natural heritage systems.	CITY Op. / HCA Lands / HCA WP&E	BTC / HNC / MNR	June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan
			Manage public lands, identified in the Stewardship Action Plans as 'public lands having natural features', for wildlife habitat, including planting native species and managing for invasive species.	CITY Op. / HCA Lands	BTC / HNC / MNR	Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
			Work to acquire lands that enhance and further the continuity of the natural heritage system through the City of Hamilton Natural Areas Acquisition Fund, Hamilton Conservation Authority Land Acquisition Strategy and Head of the Lake Land Trust (Hamilton Naturalists Club).	CITY Plan. / HCA Lands / HNC	BTC / MNR / MMAH	
			Work to maintain existing and improve habitat cover toward meeting the subwatershed and watershed habitat targets as outlined in the How Much Habitat is Enough guidelines as well as the City of Hamilton Official Plan targets for forest cover. The targets identified in the City's Official Plan are based on Environment Canada's 2004 Framework for Guiding Habitat Restoration in Great Lakes Areas of Concern.	CITY Plan. / HCA WP&E	HNC / MNR	
			Work to maintain prairie and meadow habitat for ground nesting and pollinator species.	CITY Plan. / HCA WP&E	HNC / MNR	
			Work with landowners to build and install bird, bat and waterfowl nest boxes, where suitable.	HCA WP&E	CITY / HNC / MNR	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
			Work with landowners to undertake habitat creation and enhancement projects which enhance core habitat by infilling areas within or linking existing forested areas, where forested habitat is suitable.	HCA WP&E	FSRT / MNR	
			Work with the aggregate industry to restore decommissioned pits and quarries into natural habitat through the Management of Abandoned Aggregate Properties Program.	CITY Plan. / HCA WP&E	MNR	
			Work with the school boards to implement the School Grounds Naturally program to create habitat restoration (meadow, prairie forest, etc.) demonstration sites on school grounds.	HCA WP&E	CITY / HNC / HWCDSB / HWDSB	
			Work with utility companies to implement integrated vegetation management practices along utility corridors.	CITY Plan. / HCA WP&E	HNC / MNR	
<b>Increased Impervious Surfacing</b> <b>Map Code: IS</b>  <b>Definition: The decreased potential for rainwater infiltration into the soil as a result of increased paved/impermeable surfacing.</b>	Create demonstration sites that highlight development related BMP's and Low Impact Development technologies; e.g. permeable pavement, green roofs, rain gardens, on-site wastewater treatment, etc.			CITY Plan. / HCA WP&E	GV / HHHBA	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, FW-4 and ULM-2
	Host training sessions for HCA and City staff, members of the development industry and consultants to promote the incorporation of development related BMP's into planning applications; e.g. permeable pavement, green roofs, rain gardens, on-site wastewater treatment, etc.			CITY Plan. / HCA WP&E	GV / HHHBA / RAP / MMAH	HCA Planning and Regulation Policies and Guidelines Pages 40, 55, 60  City of Hamilton Stormwater Master Plan Class Environmental Assessment Report Pages 43, 145-150,162-163  City of Hamilton Natural Heritage Strategy
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote the Green Venture de-paving project at St. Augustine School as a demonstration site for impervious surfacing remediation.			GV	BARC / CITY / HCA / RAP / HWCDSB	Dundas Valley 50 Year Vision  Cootes to Escarpment Park System – A Conservation and Land Management Strategy
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote the implementation of development related BMP's and Low Impact Development technologies when undertaking home renovations.			GV	CITY / HCA / HHHBA / RAP	Towards Full Cost Recovery: Best Practices in Cost Recovery for Municipal Water and Wastewater Services  Growth Related Integrated
		Investigate the potential to implement a stormwater credit and rebate program (i.e. City of Kitchener Stormwater Credit Program) for impervious surfaces to offset the cost of stormwater infrastructure and to compensate rehabilitation efforts associated with stormwater infrastructure.			CITY Plan.	HCA / HHHBA / RAP

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
		Undertake a GIS analysis to determine the percentage of impervious surface per land use type in each subwatershed to better understand sources of impervious surfaces to facilitate better distribution of land use types when planning for future land use.		CITY Plan.	HCA / RAP	Development Strategy (GRIDS) Urban Hamilton Official Plan
			Reduce stormwater runoff and enhance groundwater recharge by requiring as condition for development application approval, the inclusion of measures that will capture and enhance the infiltration of stormwater runoff; Maximize infiltration by ensuring that pervious areas remaining are supported by suitable geologic conditions, as determined through subwatershed studies.	CITY Dev. Eng. / HCA WP&E	HHHBA	State of the Watershed Report 1997 Red Hill Creek Watershed Action Plan First Generation Plan 1998 Red Hill Creek Watershed Action Plan Compendium of Actions (1998) Davis Creek Subwatershed Study June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
<b>Insufficient Riparian Buffer</b> <b>Map Code: RB</b>  <b>Definition:</b> <b>Disruption of large continuous tracts of habitat along watercourses.</b>	Conduct direct mailings to property owners identified through the 2009 GIS analysis, as having insufficient riparian buffers, promoting funding and technical assistance available for establishing riparian buffers.			HCA WP&E	CITY / OSCIA	
	Create riparian buffer demonstration sites in high traffic locations. i.e. golf courses, municipal parks, schools, etc.			CITY Op. / HCA Lands	BARC / GV / HWCDSB / HWDSC	
	Notify local residents of intent to naturalize/establish riparian buffers along watercourses on public lands (i.e. parks) prior to naturalization commencing, explaining the purpose of riparian buffers.			CITY Op. / HCA Comm. / HCA Lands	BARC / EH / GV	
	Promote the Environmental Farm Plan Program and associated Cost Sharing Programs for the implementation of BMP projects.			HCA WP&E	CITY / OMAFRA / OSCIA	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote healthy streams and the establishment of larger riparian buffers.			HCA WP&E	CITY / OMAFRA / OSCIA	
			Work with landowners to naturalize and plant riparian buffers along reaches of watercourses identified in the 2009 riparian analysis as not having a buffer that meets the How Much Habitat is Enough guideline of 30m riparian buffer width.	HCA WP&E	BARC / CITY / FSRT / GV / OSCIA	
<b>Intensive Uses</b> <b>Map Code: IU</b>  <b>Definition: Activities occurring in natural areas which degrade the natural features of the area.</b>	Add "tread lightly" messaging to partner recreation oriented websites.			CITY Op. / HCA Op.	BTC / HNC	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations FW-8, PAA-1, PAA-2 and PAA-3
	Encourage the formation and activities of "Friends of" groups aimed at protecting and rehabilitating natural features.			CITY Op. / HCA Op. / HCA WP&E	BARC / BTC / EH / FOTEK / FSRT / GV	The Conservation Lands of Ontario – Three Year Business Plan
	Erect interpretive signage explaining the environmental significance of natural areas and promoting user "etiquette" for the area.			CITY L.A.S. / HCA Lands	BTC / HNC	A Joint Outdoor Tourism Marketing Strategy
	Help local residents to value green space by developing a recurring column in a local newspaper which highlights significant natural features in the community, their importance and what local residents can do to assist with their care and maintenance.			HCA Comm. / HNC	CITY / EH	Niagara Escarpment Access Enhancement Plan
	Install deterrent mechanisms along trails and in off trail areas known to be degraded by trespassing, such as no trespassing signage.			CITY Op. / HCA Lands	BTC / HNC	Dundas Valley 50 Year Vision Strategy
	Offer guided hikes with resource interpreters to educate the local residents on the environmental significance of natural areas in their communities. Include messaging for stewardship of the natural areas. Develop different hikes designed for children and adults.			HCA Comm.	FOTEK / IBTC / HNC	Cootes to Escarpment Conservation & Land Management Strategy
	Promote the City of Hamilton Adopt-a-Park and Neighbourhood Clean Team Programs.			CITY Op.	BARC / HCA	Urban Hamilton Official Plan
	Work with special interest groups to steward natural areas, tailoring activities to each group's interests i.e. Mountain Biking groups to design and maintain sustainable trails. Maintain regular/semi-regular contact with each group.			CITY Op. / HCA Lands / HCA Op.	FOTEK / IBTC	Red Hill Creek Watershed Action Plan First Generation Plan 1998
	Develop marketing strategies for sensitive lands that focus on sustainable use.			CITY L.A.S. / HCA Op.	BTC / HNC	Red Hill Creek Watershed Action Plan Compendium of Actions (1998)  Davis Creek Subwatershed Study  June 2010 Final Hannon

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
		Monitor Category A and B waterfalls on public lands for signs of intensive use.		CITY L.A.S. / HCA Lands	BTC	Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan
		Refer to the Niagara Escarpment Access Enhancement Plan and Niagara Escarpment Parks and Open Space System Planning Manual to design infrastructure for high traffic areas to guide users along approved trails.		CITY L.A.S. / HCA Lands	BTC	Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
		When undertaking master planning exercises, refer to the Ontario Trails Guidelines and Best Practices for the Design, Construction and Maintenance of Sustainable Trails.		CITY L.A.S. / HCA Lands	BTC	
			Host annual clean up days for natural areas identified as having excessive amounts of litter.	CITY Op. / HCA Op.	BARC / IBTC / GV	
			Rotationally restrict access to degraded areas to allow for the regeneration of vegetation.	CITY Op. / HCA Op.	IBTC	
			Utilize enforcement scheme, including increased patrols, signage and fines, to deter dumping garbage, campfires, tree cutting, etc. in natural areas on public lands.	CITY Op. / HCA Op.	BTC / IBTC / FOTEK	
			When conducting maintenance of existing trails, refer to the Ontario Trails Guidelines and Best Practices for the Design, Construction and Maintenance of Sustainable Trails.	CITY Op. / HCA Op.	BTC / IBTC	
<b>Invasive/Introduced Species</b> <b>Map Code: IV</b>  <b>Definition: The establishment / proliferation of exotic species that have no natural control measures which compete with native species for resources and degrade the ecosystem.</b>	Host training sessions for City staff, landscapers, consultants and nurseries to create awareness regarding the detrimental effects of invasive species and to encourage the use of native species.			CITY Plan. / HCA WP&E	HNC / MNR / OIPC	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendation FW-5
	Host training sessions on the identification and management of invasive species as well as landscaping with native species for the landscaping industry through Landscape Ontario; include information about the spread of invasive species by contractor vehicles.			CITY Plan. / HCA WP&E	HNC / MNR / OIPC	Action Plan for Addressing Terrestrial Invasive Species within the Great Lakes Basin  HCA Planning and Regulation Policies and Guidelines Pages 53-56, 70-71
	Host workshops for landowners adjacent to natural areas to provide training on how to identify and manage invasive species, as well as alternatives to invasive species for planting.			CITY Op. / HCA WP&E	HNC / MNR / OIPC	Invasive Alien Plant Species Found in the Carolinian Zone – Inventory and Management Options for rare Charitable

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media, community events, demonstration signage & direct landowner contact to create awareness regarding the importance of controlling invasive species and planting native species.			CITY Op. / HCA Comm.	HNC / MNR / OIPC	Research Reserve Mistaken Identity – Invasive Plants and their native look-alikes.
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media, community events, demonstration signage & direct landowner contact to provide education about invasive insects i.e. Emerald Ash Borer. Include information on how to identify the insects and indicators of specific species presence. Also include contact information for agencies for reporting observations.			CITY Op. / HCA WP&E	HNC / MNR	City of Hamilton Natural Heritage Strategy Dundas Valley 50 Year Vision Cootes to Escarpment Park System – A Conservation and Land Management Strategy City of Hamilton Vision 2020
	Work with nurseries to deliver the Grow Me Instead program, highlighting native species alternatives for commonly used non-native ornamental species.			CITY Op. / HCA WP&E	HNC / MNR / OIPC	Urban Hamilton Official Plan State of the Watershed Report 1997
		Continue to review development application landscape plans against the most up to date landscape plan guidelines to ensure that no invasive plants are included on properties near or adjacent to natural areas.		CITY Plan. / HCA WP&E	HHHBA / MNR / OIPC	Red Hill Creek Watershed Action Plan First Generation Plan 1998
		Contribute local data to the Early Detection and Distribution Mapping System for Invasive Species in Ontario as adapted by the Ontario Ministry of Natural Resources, Canada-Ontario Invasive Species Centre and OFAH/MNR Invading Species Awareness Program.		CITY Plan. / HCA WP&E	MNR / OIPC	Red Hill Creek Watershed Action Plan Compendium of Actions (1998) Red Hill Valley Project Ecosystem Restoration Program
		Develop a volunteer program to map invasive species on public lands; include the use of smart phones for georeferencing and/or photographing the invasive species.		CITY Plan. / HCA WP&E	MNR / OIPC	Davis Creek Subwatershed Study
		Develop an 'Adopt a' program for managing invasive species hot spots or add invasive species management to the City of Hamilton Adopt-a-Park Program.		CITY Op. / HCA WP&E	MNR / OIPC	June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan
		Develop an Invasive Species Management Program which includes monitoring sites and management for specific species; include a prioritization scheme for the management of invasive species on public lands.		CITY Op. / HCA WP&E	HNC / MNR / OIPC	Mewburn and Sheldon Neighbourhoods Master

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
		Implement the recommendations in the City of Hamilton Urban Official Plan and Nature Counts 2 Project Hamilton Natural Areas Inventory relating to preserving and enhancing biodiversity.		CITY Op. / HCA WP&E	MNR / OIPC	Servicing Plan Class EA
		Review the City of Hamilton Street Tree Planting Program Available Species List to ensure that suitable species are incorporated into the natural heritage system; recommend native, non-invasive alternatives.		CITY Op.	HCA MNR / OIPC	
		Revise the City of Hamilton Litter, Yard Waste and Property Maintenance by-law No. 10-118 to include language regarding the prevention of the introduction of invasive species onto private properties.		CITY Op.	HCA / HNC	
			Manage public lands for wildlife habitat, including management of invasive species to preserve and enhance biodiversity.	CITY Op. / HCA WP&E	BTC / FOTEK / IBTC / HNC / MNR / OIPC	
			Work with community volunteers to undertake stewardship events to manage invasive species on private and public lands.	CITY Op. / HCA WP&E	BTC / FOTEK / IBTC / HNC / MNR / OIPC	
			Work with landowners to control invasive species and to plant native species on private lands.	HCA WP&E	CITY / GV	
<b>Land Maintenance Practices</b> <b>Map Code: LM</b>  <b>Definition: Land maintenance practices which unnecessarily degrade wildlife habitat.</b>		Continue to work with utility companies to develop low impact land maintenance practices policies to be implemented throughout utility corridors.		CITY Plan. / HCA WP&E	MNR	
		Determine suitability for incorporating the installation of alternative roadside vegetation, such as MTO roadside prairie and wildlife shrub corridors, into existing maintenance plans.		CITY Op.	HCA / MTO	
		Implement the Hydro One Integrated Land Management protocol on utility corridors that pass through HCA lands and lands regulated by HCA.		HCA Lands / HCA Op. / HCA WP&E	CITY / MNR	
		Work with the City to develop guidelines for using native plant species for revegetation projects along roadsides.		CITY Op.	HCA / MNR / MTO	
			Work to naturalize infrequently used areas of municipal parks (Adopt a Park) and Conservation Areas.	CITY Op. / HCA Lands / HCA Op.	BARC / HNC	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
			Work with the City to ensure roadside maintenance is not done in excess of access standards.	CITY Op.	HCA / MTO	
<b>Landfill Leachate</b> <b>Map Code: LL</b>  <b>Definition: Rainwater filtering down through the landfill materials with the potential to contaminate groundwater aquifers.</b>		Monitor existing surface and groundwater sampling programs to ensure that surface and groundwater contamination is not occurring as a result of landfill leachate.		CITY HW / HCA WP&E	EH / MOE / RAP	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendation ULM-12  HCA Planning and Regulation Policies and Guidelines Page 60  State of the Watershed Report 1997  Red Hill Creek Watershed Action Plan First Generation Plan 1998  Red Hill Creek Watershed Action Plan Compendium of Actions (1998)
<b>Litter</b> <b>Map Code: LI</b>  <b>Definition: The act of illegally disposing of waste into public/natural areas.</b>	Implement the 'Pack it in – Pack it out" waste disposal policy at strategic City parks and Conservation Authority lands.			CITY Op. / HCA Op.	MMAH	City of Hamilton By-law No. 10-118 Litter, Yard Waste and Property Maintenance  City of Hamilton Vision 2020  State of the Watershed Report 1997  Red Hill Creek Watershed Action Plan First Generation Plan 1998  Red Hill Creek Watershed Action Plan Compendium of Actions (1998)
	Promote not overfilling recycling bins (i.e. crushing cans to reduce the volume of recyclables) so as to reduce the occurrence of materials falling or being blown out of bins at the roadside.			CITY Op. (Outreach)	EDHB / GV	
	Promote the City of Hamilton's Team Up to Clean Up, Adopt a Park, and Neighbourhood Clean Team programs to assist community-minded residents to undertake litter clean-up projects.			CITY Op. (Outreach)	BARC / GV /	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media, community events, demonstration signage & direct landowner contact to create awareness regarding the prevention and clean-up of litter.			CITY Op. / HCA Op.	BARC / EDHB / EH / GV	
	Work to develop an Adopt a Park / "Friends of" Program for Conservation Authority lands.			HCA Lands / HCA Op.	CITY / FOTEK	
		Undertake a pilot project to determine the effectiveness and feasibility of replacing all current recycle bins with ones with lids.			CITY Op. (Outreach)	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
		Undertake an inventory of illegal dumping sites throughout each subwatershed. Prioritize sites for the installation of deterrent mechanisms and the implementation of the Clean City Strategy Components.		CITY Op. / HCA Op.	MMAH	
			Work to replace all current recycle bins in public areas with ones that have lids.	CITY Op. / HCA Op.	GV / MMAH	
			Work with local residents to host litter clean up events, such as the Great Canadian Shoreline Clean-Up, on public lands; including City parks and Conservation Authority lands.	CITY Op. / HCA Op.	BARC / GV	
<b>Migration Barrier</b> <b>Map Code: MB</b>  <b>Definition: Any infrastructure that precludes the passage of wildlife into upstream habitat or the upper reaches of natural corridors.</b>	Erect wildlife crossing signage where known migration corridors cross roadways and trails.			CITY Plan. / HCA WP&E	BARC / HNC / RAP / WPN	In-stream Barrier Assessment for the Hamilton Harbour AOC.
			Work to retrofit infrastructure, as appropriate, that precludes the passage of wildlife into upstream habitat or other reaches of natural corridors. Possible retrofit options include: underpasses, fish ladders, by-pass channels, etc.	CITY Plan. / HCA WP&E	FSRT / RAP	Hamilton Harbour Fisheries Management Plan State of the Watershed Report 1997  Red Hill Creek Watershed Action Plan First Generation Plan 1998  Red Hill Creek Watershed Action Plan Compendium of Actions (1998)  Davis Creek Subwatershed Study  June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan  Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
<b>Nutrient Loading</b> <b>Map Code: NL</b>  <b>Definition: Excessive</b>	Create demonstration sites on public lands that highlight nutrient management BMP projects, including fertilizer free lawns, gardens and natural areas.			CITY Op. / GV / HCA WP&E	BARC / MOE / OSICA / RAP	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, FW-9, RM-4, RM-7, WQ-1d

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
nutrients being inputted into a watercourse.	Host a training workshop for local golf course practitioners to discuss BMP's for golf course management, including Audubon Cooperative Sanctuary Program certification standards.			HCA WP&E	CITY / GV / MOE / RAP / RCGA	and ULM-2  Nutrient Management Act 2002, O. Reg 267/03
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote alternatives to lawn fertilizer to reduce phosphorous in urban areas.			GV / HCA WP&E	BARC / EH / MOE / RAP	Fisheries Act, Section 34  HCA Planning and Regulation Policies and Guidelines Page 72
		Develop a fertilizer use by-law under the Fertilizer Act, limiting the use of fertilizer for non essential purposes.		CITY Plan.	BARC / EH / HCA / MOE / RAP	Ministry of the Environment Water Management Policies and Guidelines – Provincial Water Quality Objectives Appendix A
		Develop a plan to reduce nutrient levels to meet Provincial Water Quality Objectives as determined by the land use dependent nutrient level monitoring program.		HCA WP&E	BARC / EH / MOE / RAP	OMAFRA Best Management Practices Series – Nutrient Management Planning  OMAFRA Best Management Practices Series – Manure Management
		Develop a subwatershed-based total phosphorous target for surface water based on the PWQO recommendation of 30µg/L for control of excessive plant growth, 20µg/L for control of Nuisance concentrations of algae or 10µg/L for high level protection against aesthetic deterioration, to measure progress toward reaching Harbour RAP targets for total phosphorous.		HCA WP&E	BARC / EH / MOE / RAP	State of the Watershed Report 1997
		Encourage the provincial government to develop a policy to ban the use of phosphorous in fertilizer for cosmetic use.		GV	CITY / EH / HCA / MNR / MOE / RAP	Red Hill Creek Watershed Action Plan First Generation Plan 1998
		Establish a nutrient level monitoring program with strategic sampling sites that are land use dependent, to identify specific sources of nutrient loading.		HCA WP&E	BARC / EH / MOE / RAP	Red Hill Creek Watershed Action Plan Compendium of Actions (1998)
		Model phosphorus loading in the subwatersheds and compare against RAP objectives		HCA WP&E	CITY / EH / MOE / RAP	Davis Creek Subwatershed Study  June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan  Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
			Work with landowners to reduce nutrient loading by implementing agricultural and urban BMP's related to nutrient management, including fertilizer use and pet waste management.	GV / HCA WP&E	BARC / CITY / MOE / OMAFRA / OSCIA	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
<b>On-line Ponds</b> <b>Map Code: OP</b>  <b>Definition: An in-stream structure designed to impound stream flow; leads to increased in-stream temperatures downstream and is often a barrier to fish migration.</b>	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote healthy streams and pond retrofit options.			HCA WP&E	CITY / DFO	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, FW-1, FW-4 and ULM-2
			Work with landowners to restore or retrofit on-line ponds.	HCA WP&E	CITY / DFO / MNR	Fisheries Act, Section 37  HCA Planning and Regulation Policies and Guidelines Page 63  In-stream Barrier Assessment for the Hamilton Harbour AOC  Davis Creek Subwatershed Study  June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan  Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
<b>Perched Culverts</b> <b>Map Code: PC</b>  <b>Definition: In-stream culverts that when improperly designed / installed, create barriers to water flow and fish migration.</b>	Host training sessions for HCA and City staff and contractors to promote the proper design and installation of culverts.			CITY Op. / HCA WP&E	DFO / MNR	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote healthy streams and create awareness regarding the detrimental effects of perched and closed bottom culverts.			HCA WP&E	CITY / DFO / MNR	
		Undertake an inventory of perched and closed bottom culverts throughout each subwatershed. Prioritize culverts for mitigation or replacement.			CITY Op.	DFO / HCA / MNR

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
			Work with landowners to remove/retrofit perched and closed bottom culverts; begin with those prioritized in the Barrier Mitigation Plan of the In-stream Barrier Assessment for the Hamilton Harbour AOC.	HCA WP&E	CITY / DFO / MNR	
<b>Pesticide/Herbicide Use</b> <b>Map Code: PS</b>  <b>Definition: The application of pesticides/herbicides to control perceived pests/weeds.</b>	Create demonstration sites on public lands that highlight pesticide/herbicide free lawns, gardens, natural areas, crops, etc.			CITY Op. / GV / HCA Lands	MOE	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-4, EPI-6, TSSR-6 and ULM-2  Fisheries Act, Section 34  City of Hamilton By -Law No. 07-282  Pesticides Act Ontario Regulation 63/09  OMAFRA Best Management Practices Series – integrated Pest Management  OMAFRA Best Management Practices Series – Pesticide Storage, Handling and Application
	Host a training workshop for local golf course practitioners to discuss BMP's for golf course management, including Audubon Cooperative Sanctuary Program certification standards and the Ministry of the Environment Gold Course IPM Accreditation.			HCA WP&E	CITY / GV / MOE / RAP / RCGA	
	Promote Municipal and Provincial Pesticide By-Laws.			CITY Op. / GV	MNR / MOE	
	Promote the Ministry of the Environment 'Add It Up Program – Going Pesticide Free' Program			GV	MNR / MOE	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to create awareness regarding the detrimental effects of pesticides and herbicides and to promote alternatives to traditional methods.			GV	CITY / HCA / MOE	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote Integrated Pest Management principles, Natural Tips for Healthy Lawns and Gardens and alternative turf management techniques.			CITY Op.	GV / HCA / MOE	
				GV / HCA WP&E	CITY / MOE	
<b>Plowed Watercourse</b> <b>Map Code: PW</b>  <b>Definition: Headwater swales or small watercourses that are worked for agricultural production.</b>	Conduct a direct mailing to landowners where plowed watercourses have been identified to promote technical and financial assistance available for BMP projects related to agricultural drainage.			HCA WP&E / OSCIA	DFO	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, ULM-2, ULM-3 and ULM-4  Fisheries Act, Section 37  City of Hamilton Stormwater Master Plan Class Environmental Assessment Report Pages 44, 145-150  OMAFRA Best Management
	Create and link to existing OMAFRA demonstration sites that highlight BMP's that promote agricultural land drainage practices; e.g. grassed waterways, Water and Sediment Control Basins, etc.			HCA WP&E / OSCIA	DFO / OMAFRA	
	Promote the Environmental Farm Plan Program and associated Cost Sharing Programs for the implementation of BMP projects.			HCA WP&E / OMAFRA / OSCIA	DFO	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote drainage related BMP's; e.g. Water and Sediment Control Basins and grassed waterways.			HCA WP&E / OMAFRA / OSCIA	DFO	Practices Series – Soil Management  Red Hill Creek Watershed Action Plan First Generation Plan 1998	
			Work with landowners to install effective agricultural land drainage; e.g. grassed waterways, Water and Sediment Control Basins, etc.	HCA WP&E / OMAFRA / OSCIA	DFO	Red Hill Creek Watershed Action Plan Compendium of Actions (1998)  Davis Creek Subwatershed Study  June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan  Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA	
<b>Runoff Contamination via Transportation Corridors</b> <b>Map Code: TC</b>  <b>Definition: Contamination resulting from stormwater runoff from major arterial roadways; often associated with the application of salts for de-icing and the residual precipitate created by automobile exhaust.</b>	Host training sessions for City Staff and Contractors using the Ministry of the Environment Snow Disposal and De-icing Operations in Ontario Guidelines.			CITY Op. (Roads)	MOE / MTO / RAP	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendation ULM-5b	
	Liaise with City staff to promote road salt alternatives, alternative application methods and recommended snow removal practices. E.g. City of Guelph liquid application prior to inclement weather.			CITY Op. (Roads) / HCA WP&E	DFO / MOE / MTO / RAP	Fisheries Act, Section 34  City of Hamilton 2003 Road Salt Management Plan	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote the use of sidewalk salt alternatives.			CITY Op. / GV	DFO / MOE / RAP	Municipalities of Wellington County – 2005 Salt Management Plan	
		Investigate using the Region of Waterloo Smart About Salt Council as a model to develop a Smart About Salt Program in Hamilton.			CITY Op. (Outreach)	GV / MOE / MTO / RAP	Red Hill Creek Watershed Action Plan First Generation Plan 1998
		Support planning for alternative and sustainable transportation strategies including Light Rail Transit.			CITY Plan.	HHHBA / MTO	Red Hill Creek Watershed Action Plan Compendium of Actions (1998)
		Undertake a study to determine the most effective method of snow and ice removal and snow storage that will reduce contamination of watercourses and groundwater.			CITY Op.	DFO / MOE / MTO / RAP	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
			Implement improved snow removal methods as recommended by the study to determine the most effective method of snow and ice removal and snow storage that will reduce contamination of watercourses and groundwater.	CITY Op.	MTO	
			Install vegetated filter strips along medians and roadsides and riparian buffers along watercourses.	CITY Op.	HCA / MTO	
<b>Sediment Loading</b> <b>Map Code: SL</b>  <b>Definition: Organic and inorganic material that is entrained by the flow of water and is deposited in a creek system.</b>	Develop educational material for local residents to understand the purpose and need for erosion and sediment control, how it relates to the community as a whole and how they can be involved in its implementation i.e. who to contact if sediment is observed coming from a property.			CITY HW / EH	DFO / HCA / HHHBA / MOE / RAP	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, FW9, RM-4, ULM-2, ULM-3, ULM-5 and WQ-1d
	Promote new techniques for sediment and erosion control, i.e. compost filter socks. Include information that alternatives to silt fence can be cost effective and easy to maintain.			CITY HW / HCA WP&E	HHHBA / RAP	Fisheries Act, Sections 34 and 36
	Promote the Erosion and Sediment Control Guidelines for Urban Construction, 2006.			CITY HW / HCA WP&E	DFO / EH / HHHBA / RAP	Erosion and Sediment Control Guidelines for Urban Construction
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote healthy streams and BMP's related to preventing sedimentation.			HCA WP&E	DFO / FSRT / MNR / RAP	City of Hamilton By-law for Prohibiting and Regulating the Alteration of Property Grades, the Placing or Dumping of Fill, and the Removal of Topsoil
		Develop a total suspended solids target based on the PWQO turbidity recommendation of between 5-50 FTU (Formazin Turbidity Units)		CITY HW / HCA WP&E	DFO / MOE / RAP	OMAFRA Best Management Practices Series – No-Till Making it Work
			Continue to monitor and enforce the proper installation and maintenance of sediment and erosion control measures on construction sites.	HCA WP&E	CITY / DFO / HHHBA MOE	Ministry of the Environment Stormwater Management Design Guidelines
			Work to achieve and maintain the total suspended solids target developed based on the PWQO turbidity recommendation of between 5-50 FTU (Formazin Turbidity Units)	HCA WP&E	CITY / DFO / MOE / RAP	State of the Watershed Report 1997
			Work to mitigate non point sediment sources identified in the 2009 Draft Identifying Non Point Sediment Sources for Priority Remediation Report completed by the Watershed Planning Network.	HCA WP&E	CITY / DFO / MOE / RAP	Red Hill Creek Watershed Action Plan Compendium of Actions (1998)
			Work with contractors to ensure that site clearing prior to development is phased as the project progresses to reduce the area and length of time bare soil is exposed.	HCA WP&E	CITY / DFO / HHHBA MNR	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
			Work with landowners to reduce sediment loading by implementing BMP projects; e.g. streambank stabilization, riparian buffers, natural channel design, etc.	HCA WP&E	BARC / CITY / DFO / FSRT	
			Work with the development industry to implement the Erosion and Sediment Control Guidelines for Urban Construction, 2006.	HCA WP&E	CITY / DFO / HHHBA / MNR	
<b>Septic Systems</b> <b>Map Code: SS</b>  <b>Definition:</b> <b>Malfunctioning and unmaintained septic systems; including plugged distribution tiles, infrequent tank pumping, etc. lead to untreated sewage contaminating ground and surface water.</b>	Install interpretive signage on public lands, where septic systems are in use, that illustrate properly functioning septic systems.			CITY SPP / CITY Op. / HCA Comm. / HCA Lands	MOE / RAP	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendation WQ-d1
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote the proper maintenance of existing septic systems.			CITY SPP / HHWSP	BARC / HHSWP / MOE	City of Hamilton's Greensville Community Subwatershed Study
		Develop a financial assistance loan-based program for upgrading or replacing faulty septic systems.		CITY Plan.	HCA / HHSWP / MOE / RAP	Ontario New Home Warranty Program – A New Homeowner's Guide to Septic Systems
						State of the Watershed Report 1997
			Work with landowners to properly maintain their septic systems or upgrade or decommission faulty or unused septic systems.	CITY SPP / HHWSP	BARC / HHSWP / MOE	Davis Creek Subwatershed Study
<b>Site Clearing Prior to Development</b> <b>Map Code: SC</b>  <b>Definition: The act of removing or excavating the vegetation and</b>	Host training sessions for City staff, development industry and consultants to promote City standards and guidelines related to site preparation prior to development.			CITY Plan. / HCA WP&E	DFO / HHHBA / MNR / RAP	June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan
	Promote City of Hamilton By-Law No. 03-126 Prohibiting and Regulating the Alteration of Property Grades, the Placing or Dumping of Fill, and the Removal of Topsoil.			CITY Plan.	DFO / HCA / HHHBA / MNR / RAP	Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
						Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations ULM-3, ULM-4
						HCA Planning and Regulation Policies and Guidelines

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
<p>topsoil from a site prior to construction works.</p>		<p>Review City of Hamilton By-Law No. 03-126 to determine if it addresses the requested education and outreach policy of the Source Protection Plan and guidance of the MOE.</p>		CITY SPP	MOE / HHSWP	<p>Pages 50-62, 68-69</p> <p>City of Hamilton Draft Private Tree and Woodland Conservation By-Law</p>
		<p>Strengthen the City of Hamilton Forest Conservation By-law to be more similar to a private tree by-law (that applies to single/small numbers of trees as well as woodlots) – Ex. Private tree by-laws for Ancaster and portions of Dundas and Stoney Creek.</p>		CITY Plan.	HCA / HNC / MNR	<p>City of Hamilton By -Law No. 03-126 Site Alteration By-Law</p> <p>Erosion and Sediment Control Guidelines for Urban Construction</p>
			<p>Work with contractors to ensure that only necessary areas of development sites are cleared prior to development to eliminate the unnecessary destruction of habitat.</p>	CITY Plan. / HCA WP&E	DFO / HHHBA / MNR / RAP	<p>City of Hamilton By-law for Prohibiting and Regulating the Alteration of Property Grades, the Placing or Dumping of Fill, and the Removal of Topsoil</p> <p>Growth Related Integrated Development Strategy (GRIDS)</p> <p>Red Hill Creek Watershed Action Plan First Generation Plan 1998</p> <p>Red Hill Creek Watershed Action Plan Compendium of Actions (1998)</p> <p>Davis Creek Subwatershed Study</p> <p>June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan</p> <p>Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA</p>

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
<b>Storm Sewer Outfalls</b> <b>Map Code: SO</b>  <b>Definition: The point where a sewer system discharges into a watercourse.</b>	Implement the Stream of Dreams and Yellow Fish Road Programs with local schools, scouting and girl guide groups and other children's groups, to create awareness regarding stormwater input & the impacts of CSO and stormsewer outfalls on stream systems.			BARC	CITY / EH / GV / HCA / HMCDSB / HWDSB / RAP	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations RM-4, RM-7, ULM -6, ULM-9 and ULM-11  Fisheries Act, Section 34  City of Hamilton Stormwater Master Plan Class Environmental Assessment Report Pages 43, 138, 158-159  State of the Watershed Report 1997  Red Hill Creek Watershed Action Plan First Generation Plan 1998  Davis Creek Subwatershed Study  June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan  Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
	Promote EcoHouse as a demonstration site for Rain Gardens.			GV	BARC / CITY / EH / HCA / HHHBA / RAP	
	Promote the City of Hamilton Public Works Stormwater Pollution Solutions for Urban and Rural Residents Outreach Program.			CITY HW	BARC / EH / GV / HCA / HHHBA / RAP	
	Promote the downspout disconnection and rain barrel programs, including demonstration sites at EcoHouse.			GV	BARC / CITY / EH / HCA / HHHBA / RAP	
	Promote the Municipal Sewer-Use By-law No. 04-150 as amended by By-Law No. 06-228.			CITY HW	BARC / EH / GV / HCA / RAP	
		Conduct water quality testing at outfalls pre and post mitigation to support mitigation measures.		CITY HW	BARC / EH / GV / HCA / MOE / RAP	
		Conduct water quality testing at storm sewer outfalls to support the study to investigate cross connections of the sanitary sewer with the storm sewer system, Sewer Use Bylaw enforcement, & restoration efforts.		CITY HW	BARC / EH / GV / HCA / MOE / RAP	
		Investigate the potential for undertaking cross connection corrections/retrofits with scheduled road improvements.		CITY HW	HCA / RAP	
		Reduce stormwater load to meet the MOE volumetric target of a 90% overflow capture rate for combined sewer systems		CITY HW	BARC / EH / GV / HCA / MOE / RAP	
		Undertake a water quality study evaluating water quality and temperature at a representative sampling of storm sewers to prioritize sewersheds to target for education outreach and remediation.		CITY HW / HCA / WP&E	BARC / DFO / EH / GV / MOE / RAP	
		Undertake a risk analysis of the potential for old and/or degraded sewer lines to contaminate groundwater.		CITY HW	HCA / MOE / RAP	
		Work toward achieving the final net loading targets for CSO's outlined in the RAP.		CITY HW	BARC / EH / GV / HCA /	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
					MOE / RAP	
		Work with Green Venture to develop the RAIN Stormwater Mitigation Program.		GV	BARC / CITY / EH / HCA / HHHBA / RAP	
			Continue to implement the Catch the Rain Rain Barrel and Downspout Disconnection Program to assist with installing rain barrels and disconnecting downspouts.	CITY HW / GV	BARC / EH / HCA / RAP	
			Continue to rehabilitate eroded or undermined stormsewer outfalls to incorporate erosion control measures such as plunge pools, rip rap, tree planting, etc.	CITY HW	DFO / HCA / RAP	
			During re-development incorporate bottom or post treatment train options at existing outfalls for natural infiltration; i.e. lot level, vegetated swales, etc.	CITY HW / HCA WP&E	HHHBA / MOE / RAP	
			Work to implement the recommendations in the water quality study evaluating water quality and temperature at a representative sampling of storm sewers to prioritize sewersheds to target for education outreach and remediation.	CITY HW / HCA WP&E	BARC / DFO / EH / GV / MOE / RAP	
			Work with landowners to establish riparian buffers and/or erosion protection downstream of storm sewer outfalls; e.g. plunge pools, rip rap, tree planting, etc.	HCA WP&E	BARC / CITY / DFO / FSRT / GV	
<b>Stormwater</b> <b>Map Code: SW</b>  <b>Definition: Water that flows overland from rainfall during or after a storm event or as a result of snowmelt</b>	Implement the Stream of Dreams and Yellow Fish Road Programs with local schools, scout, girl guides and other children's groups, to create awareness regarding stormwater input & the impacts of CSO and stormsewer outfalls on stream systems.			BARC	CITY / EH / GV / HCA / HMCDSB / HWDSB / RAP	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations ULM -6, ULM-9, ULM-11 and ULM-14
	Promote City of Hamilton and Green Venture Programs to prevent the overloading of stormwater infrastructure; including the Wise Water Use Program, Protective Plumbing Program, Rates and Leaks Detection Program and High Household Water Consumption Program.			CITY HW / GV	BARC / EH / HCA / RAP	HCA Planning and Regulation Policies and Guidelines Pages 74-77  Fisheries Act, Section 34
	Promote the use of constructed wetland technology and Low Impact Development technology in the design of stormwater management facilities.			CITY HW / HCA WP&E	DFO / HHHBA / MOE / RAP	City of Hamilton Stormwater Master Plan Class Environmental Assessment Report Pages 38-44, 93-97, 122-125, 158-162
	Support Sewer-Use Bylaw enforcement (By-law No. 04-150 as amended by By-Law No. 06-228).			CITY HW	BARC / DFO / EH / GV / HCA / MOE / RAP	Towards Full Cost Recovery: Best Practices in Cost

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
	Utilize stormwater management ponds along recreation trails as demonstration sites to educate the public about stormwater contamination of local waterbodies and negative impacts to wildlife. Include information on sources of contaminants.			CITY HW / GV	BARC / EH / HCA / RAP	Recovery for Municipal Water and Wastewater Services
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to educate the public about Hamilton's sanitary and storm sewer system; i.e. how it functions, where their water goes, etc.			CITY HW / GV	BARC / EH / HCA / RAP	Growth Related Integrated Development Strategy (GRIDS) State of the Watershed Report 1997
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to educate the public on the impacts of climate change as well as adaptation and mitigation measures to be implemented.			CITY HW / HCA / WP&E	BARC / EH / GV / RAP	Red Hill Creek Watershed Action Plan First Generation Plan 1998 Red Hill Creek Watershed Action Plan Compendium of Actions (1998)
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote stormwater management BMP's including: disconnected downspouts, roof gardens, rain barrels, biofilters, permeable pavement, rain gardens, etc.			CITY HW / GV	BARC / EH / HCA / RAP	Davis Creek Subwatershed Study June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan
		Adapt the Slow it. Spread It Sink It. A Homeowner's Guide to Using Rain as a Resource for Hamilton residents.		CITY HW / HCA / WP&E	BARC / EH / GV / HHHBA / MOE / RAP	Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
		Automate the decision making process for operators for combined sewer overflow events.		CITY HW	MOE / RAP	
		Conduct water quality testing at CSO outfalls pre and post mitigation to support mitigation measures.		CITY HW	BARC / EH / GV / HCA / MOE / RAP	
		Determine the suitability of Limeridge Mall as a green building demonstration site, including lot level stormwater management features, permeable paving, green roofs, upgraded infrastructure, grey water system, etc.		CITY HW / HCA / WP&E	BARC / EH / GV / HHHBA / MOE / RAP	
		Develop a system to ensure sufficient capital and operating funds to install and maintain stormwater management infrastructure.		CITY HW	MMAH / RAP	
		Evaluate opportunities for implementing full cost recovery and life cycle asset management for water and wastewater services.		CITY HW	MMAH / RAP	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
		Offer financial incentives and/or grant programs to replace driveways and decks with permeable pavement, interlocking brick, etc.		CITY HW	BARC / EH / GV / HHHBA / MOE / RAP	
		Outline the operational requirements for existing stormwater management infrastructure.		CITY HW	HCA / HHHBA / EH / MOE / RAP	
		Undertake a study to determine the percentage of landowners with connected downspouts.		CITY HW / GV	MAC	
		Undertake water quality monitoring in stormwater management ponds.		CITY HW	EH / HCA / MAC	
		Work with development industry to develop a premium 'Efficiency Package' for new homes that include LEED principles, LID technologies, Energy Star appliances, water conservation fixtures, etc. per the results of the Durham Region Pilot Project.		CITY Plan. / HCA WP&E	BARC / GV / HHHBA	
		Work with insurance companies to develop a cost-sharing grant program to support the implementation of lot level stormwater controls on private properties. i.e. retrofit impervious surfaces, install rain gardens, etc.		CITY Dev. Eng. / HCA WP&E	BARC / GV / HHHBA	
		Revise stormwater management policy to include Low Impact Development as a component of the treatment train approach to stormwater management.		CITY Dev. Eng. / HCA WP&E	DFO / MNR / MOE / RAP	
		Undertake an inventory of oil and grit separators installed within the each subwatershed implement an awareness program to ensure that they are maintained regularly and working as designed.		CITY HW	HCA	
			Implement recommendations from the City of Hamilton Stormwater Master Plan.	CITY HW	BARC / GV / HCA / HHHBA / RAP	
			Implement the City of Hamilton Low Impact Development Policy for Industrial Lands when completed.	CITY Dev. Eng.	BARC / GV / HCA / HHHBA / RAP	
			Retrofit existing dry stormwater management ponds to wet ponds where beneficial to water quality, aquatic habitat and erosion control.	CITY HW	HCA / RAP	
			Retrofit outlet structures to decrease the velocity of stormwater as it flows into the creek system.	CITY HW	GV / HCA	
			Work to ensure adequate stormwater management in in-fill developments.	CITY Dev. Eng.	HCA / HHHBA / RAP	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
			Work to ensure adequate stormwater management in new developments in headwaters areas, including: over controlling, planning and advanced design of LID, SWM ponds that maintain and control water within subdivision footprint, treatment devices i.e. oil and grit separators, and maintenance.	CITY Dev. Eng.	HCA / HHHBA / RAP	
			Work with landowners to install lot level stormwater controls i.e. disconnect downspouts, retrofit impervious surfaces, install rain barrels and rain gardens, etc.	CITY HW / GV	BARC / HCA	
<b>Transportation Corridor Expansion</b> <b>Map Code: TE</b>  <b>Definition: The process by which new roads are built or existing roads are widened.</b>	Host training sessions for City staff, development industry and consultants to promote BMP's and new environmental technologies relating to transportation corridors; e.g. permeable pavement, wildlife under/overpasses, vegetated filter medians and rights of way, light coloured aggregate in hot mix, etc.			CITY HW	HCA / HHHBA / MNR / MTO	HCA Planning and Regulation Policies and Guidelines Pages 50-62, 68-69
		When planning for major road works, design transportation corridors using new technologies for environmental solutions.		CITY HW	HCA / HHHBA / MNR / MTO	Ontario Provincial Standards for Roads and Public Works
			When repairing roads, utilize new technologies for road maintenance that are proven to have environmental benefits.	CITY Op.	HCA / HHHBA / MNR / MTO	Erosion and Sediment Control Guidelines for Urban Construction  Growth Related Integrated Development Strategy (GRIDS)  Urban Hamilton Official Plan  State of the Watershed Report 1997  Red Hill Creek Watershed Action Plan First Generation Plan 1998  Red Hill Creek Watershed Action Plan Compendium of Actions (1998)  Davis Creek Subwatershed Study  June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan  Mewburn and Sheldon

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
						Neighbourhoods Master Servicing Plan Class EA
<b>Urban Creek System</b> <b>Map Code: UC</b>  <b>Definition: A creek system within an urbanized environment which may be altered or impacted by the surrounding land use.</b>	Engage local residents in Stream of Dreams and Adopt a Creek programs along reaches of creek that pass through new and existing residential developments (i.e. creek blocks).			BARC	CITY / EH / GV / HCA / RAP	State of the Watershed Report 1997
		Develop a pilot information package for one street or part of a neighbourhood related to the health of a local watercourse. Aim for one or two neighbourhood champions to promote 'big picture' ideas about preserving and maintaining the natural environment for the community.		HCA WP&E	BARC / CITY / EH / GV / RAP	Red Hill Creek Watershed Action Plan First Generation Plan 1998  Red Hill Creek Watershed Action Plan Compendium of Actions (1998)
			Enhance urban creeks through the restoration of creek buffers, establishing native vegetation, naturalizing eroded areas, installing habitat features, removing invasive species, etc. i.e. Upper Davis Creek through Valley Park.	HCA WP&E	BARC / CITY / GV	Davis Creek Subwatershed Study
			Undertake riparian and in-stream rehabilitation works on reaches of creek in urban areas to enhance/improve hydrologic function and aquatic habitat.	CITY HW / HCA WP&E	BARC / GV	June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan  Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
<b>Utility Pipeline</b> <b>Map Code: UP</b>  <b>Definition: Oil and gas conveyance systems.</b>		Continue to work with individual utility companies to review emergency protocols for identification of issues, reporting protocols and emergency contacts.		CITY Plan. / HCA WP&E	MOE	
		Develop an HCA emergency protocol for identification of issues, reporting protocols and emergency contacts.		HCA WP&E	CITY / MOE	
<b>Water Quality</b> <b>Map Code: WQ</b>  <b>Definition: Maintenance of water resources at an appropriate quality for its identified use.</b>	Install signage indicating that water in watercourses may be contaminated; include a phone number or hotline to report concerns on the signage.			CITY Op.	EH / MOE / RAP	State of the Watershed Report 1997
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to educate the public about the impacts of pharmaceuticals on wildlife and promote free disposal programs at pharmacies and municipal transfer stations.			CITY HW	DFO / HCA / MAC / RAP	Red Hill Creek Watershed Action Plan First Generation Plan 1998  Red Hill Creek Watershed Action Plan Compendium of Actions (1998)

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote driveway sealer alternatives that do not contain coal tar.			EH	CITY / DFO / HCA / MAC / RAP	Davis Creek Subwatershed Study
		Consider adapting the Conservation Halton Fisheries Index of Biotic Integrity for HCA to measure the health of the local fishery.		HCA WP&E	DFO / MAC / MNR / RAP	June 2010 Final Hannon Creek Subwatershed – North Glanbrook Industrial Business Park Master Drainage Plan
		Determine if pharmaceuticals as a result of cross connections or dumping are currently being investigated through the Environment Canada Pharmaceuticals and Personal Care Products Surveillance Network.		CITY HW	DFO / HCA / MAC / RAP	Mewburn and Sheldon Neighbourhoods Master Servicing Plan Class EA
		Determine the impacts of pools & drainage of chlorinated and salt water on local watercourses and aquatic wildlife.		CITY HW / HCA WP&E	DFO / MAC / MOE / MNR / RAP	
		Investigate the impacts of water quality in stormwater management ponds on wildlife to determine if ponds are suitable habitat and to provide management recommendations based on findings.		CITY HW / HCA WP&E	DFO / EC / MAC / MOE / MNR / RAP	
		Link water quality monitoring to fishery health to determine the cause of, and prevent future fish kills.		CITY HW / HCA WP&E	DFO / MAC / MOE / MNR / RAP	
		Prioritize sewersheds for retrofit of cross connections.		CITY HW	DFO / HCA / MAC / MOE / RAP	
		Assess the monitoring network for various programs including: surface water and groundwater quality and quantity for PWQMN, PGMN, Ontario Low Water Response Program and local programs; weather and longer term climate data to understand deficiencies and plan for improvement.		HCA Eng. / CITY HW	MOE / MNR / MAC	
			Maintain and enhance stormwater management ponds as identified and prioritized in the City of Hamilton Inventory of stormwater management ponds.	CITY HW	DFO / HCA / MAC / MOE / RAP	
			Work to maintain existing water quality and improve water quality toward improving benthic communities, as determined using the Hilsenhoff Index of Biotic Integrity.	CITY HW / HCA WP&E	BARC / DFO / GV / MAC / MOE / MNR / RAP	
			Work to maintain existing water quality and improve water quality toward improving the health of the overall fishery, as determined using the Conservation Halton Fisheries Index of Biotic Integrity.	CITY HW / HCA WP&E	BARC / DFO / GV / MAC / MOE / MNR / RAP	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
			Work to maintain or improve groundwater quality to meet the Ontario Drinking Water Quality Standards and the Provincial Water Quality Objective for total phosphorous.	CITY HW / HCA WP&E	BARC / DFO / GV / MAC / MOE / MNR / RAP	
			Work to maintain existing water quality and improve water quality toward meeting the Provincial Water Quality Objectives as determined for the Provincial Water Quality Monitoring Program.	CITY HW / HCA WP&E	BARC / DFO / GV / MAC / MOE / MNR / RAP	
<b>Water Use</b> <b>Map Code: WU</b>  <b>Definition: The extraction, use and disposal of surface and groundwater.</b>	Encourage landowners with water taking needs to establish an Irrigation Advisory Committee to schedule takings alternately.			HCA WP&E	GV / HHSWP / MOE / MNR / OMAFRA / OSCIA	Hamilton Harbour Remedial Action Plan Stage 2 Update: Recommendations EPI-6, ULM-2 and ULM-12  Ontario Water Resources Act O. Reg. 387/04  OMAFRA Best Management Practices Series – Irrigation Management
	Encourage landowners with water taking permits to implement water conservation measures/infrastructure.			HCA WP&E	GV / HHSWP / MOE / MNR / OMAFRA / OSCIA	
	Host open houses when experiencing Level 1 low water conditions to address landowner concerns and promote recommended reductions in rates and volumes of takings.			HCA WP&E	GV / HHSWP / MOE / MNR / OMAFRA / OSCIA	
	Promote City of Hamilton and Green Venture Programs for water conservation; including the Wise Water Use Program, Protective Plumbing Program, Rates and Leaks Detection Program and High Household Water Consumption Program.			CITY HW / GV	BARC / HCA / HHSWP / MOE / MNR / RAP	
	Promote the Ministry of Natural Resources Low Water Response Program.			HCA WP&E / MNR	GV / HHSWP / MOE / OMAFRA / OSCIA	
	Promote the use of greywater systems i.e. for lawn care rather than treated/potable water.			CITY HW / GV	BARC / HCA / HHSWP / MOE / MNR / RAP	

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote decreasing water use in combined sewer areas resulting in less wastewater to be treated at the Woodward Treatment Plant and therefore less cost for treatment and greater available capacity to reduce the potential for emergency by-passes. Also include messaging explaining reasons for rate increases despite usage decreases.			CITY HW / GV	BARC / HCA / HHSWP / MOE / MNR / RAP	
	Utilize workshops, information sessions, literature, websites, public service announcements, interpretive signage, social media & direct landowner contact to promote water conservation programs and techniques.			CITY HW / GV	BARC / HCA / HHSWP / MOE / MNR / RAP	
		Develop a low flow toilet rebate program. Include a return system for existing toilets to be recycled (crushed to make "poticrete" an aggregate mix containing 20 percent toilets that can be used in sidewalk construction).		CITY HW / GV	BARC / HCA / HHSWP / MOE / MNR / RAP	
		Develop monitoring program to assess impacts of surface water takings on creek systems and aquatic wildlife during periods of low water, include recommendations for reducing impacts.		HCA WP&E	DFO / HHSWP / MNR / MOE / OMARFRA / OSCIA	
		Investigate the use of block rates for water services.		CITY HW	HCA / HHSWP / MMAH / RAP	
		Upon receipt of new Permit to Take Water applications, evaluate the taking against active permits in the area to determine the potential stress level related to multiple users on a given system.		HCA WP&E	HHSWP / MOE / MNR	
			Work with landowners to implement water conservation techniques.	CITY HW / GV / HCA WP&E	BARC / HHSWP / MOE / OMAFRA / OSCIA	
			Work with landowners who have groundwater taking systems to decommission unused wells in accordance with the Ontario Water Resources Act.	CITY HW / HCA WP&E	HHSWP / MOE / OSCIA	
<b>Wildlife Collisions Map Code: WC</b>	Erect additional wildlife caution signage that is species specific, along roadways at known points of frequent collisions.			CITY Op. (Roads)	HCA / HNC / MNR / MTO	British Columbia Wildlife Collision Prevention Program Report

## STRESSES AND STEWARDSHIP ACTIONS

STRESSES	AWARENESS OPPORTUNITIES	SPECIAL PROJECT OPPORTUNITIES	RESTORATION OPPORTUNITIES	LEAD AGENCY	PARTNER AGENCIES	RELATED DOCUMENTS
<b>Definition:</b> <b>Incidences where animals are struck by vehicles or where animals collide with buildings, often occurring with buildings with large windows.</b>	Utilize literature, websites, public service announcements, interpretive signage & direct landowner contact to create awareness regarding managing human-wildlife conflicts.			CITY Op. (Roads) / HCA Comm. / HCA WP&E	HNC / MNR / MTO	City of Ottawa Wildlife/Vehicle Collision Prevention Program
		Evaluate the effectiveness of the MTO roadside prairie and wildlife shrub corridor projects in preventing wildlife collisions.		CITY Op.	HCA / MNR / MTO	
		When planning major road works, consider the incorporation of wildlife over/underpasses, avoiding known migratory corridors and other wildlife accommodations in the design.		CITY HW	HCA / HNC / MNR / MTO	
			Produce and distribute window decals for large windows of homes and high rise buildings to prevent bird collisions.	CITY Bldg. Serv. / HCA WP&E	HNC / MNR	
			Reduce the use of road salt or consider alternatives that do not attract wildlife.	CITY Op. (Roads)	MOE / MNR / MTO / RAP	

## STRESSES AND STEWARDSHIP ACTIONS

**Table HA - 28: Partner Agency Acronym**

BARC	Bay Area Restoration Council	HCA Lands	Hamilton Conservation Authority - Land Management
BTC	Bruce Trail Conservancy	HCA Op.	Hamilton Conservation Authority - Customer Service & Operations
CC	Carolinian Canada	HHHBA	Hamilton-Halton Home Builders Association
CITY	City of Hamilton	HHSWP	Halton Hamilton Source Water Protection
CITY Bldg. Serv.	City of Hamilton - Building Services	HHWSP	Hamilton-Halton Watershed Stewardship Program
CITY Dev. Eng.	City of Hamilton - Development Engineering	HIEA	Hamilton Industrial Environmental Association
CITY HW	City of Hamilton - Hamilton Water	HNC	Hamilton Naturalists Club
CITY L.A.S.	City of Hamilton - Landscape Architectural Services	HWCDSB	Hamilton Wentworth Catholic District School Board
CITY Op.	City of Hamilton - Operations - General	HWDSB	Hamilton Wentworth District School Board
CITY Op. (Outreach)	City of Hamilton - Operations - Outreach	IBTC	Iroquoia Bruce Trail Club
CITY Op. (Roads)	City of Hamilton - Operations - Roads	MAC	McMaster University
CITY Plan.	City of Hamilton - Planning	MMAH	Ministry of Municipal Affairs and Housing
CITY SPP	City of Hamilton – Source Protection Planning	MNR	Ministry of Natural Resources
DFO	Department of Fisheries and Oceans	MOE	Ministry of the Environment
DU	Ducks Unlimited	MTO	Ministry of Transportation
EDHB	Earth Day Hamilton-Burlington	OIPC	Ontario Invasive Plant Council
EH	Environment Hamilton	OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
FOTEK	Friends of the Eramosa Karst	OSCIA	Ontario Soil and Crop Improvement Association
FSRT	Field and Stream Rescue Team	RAP	Hamilton Harbour Remedial Action Plan
GV	Green Venture	RBG	Royal Botanical Gardens
HCA	Hamilton Conservation Authority	TU	Trout Unlimited
HCA Comm.	Hamilton Conservation Authority - Communications	WPN	Watershed Planning Network
HCA WP&E	Hamilton Conservation Authority – Watershed Planning & Engineering		