Cycling Master Plan Review and Update

Hamilton

CITY OF HAMILTON
TRANSPORTATION MASTER PLAN
REVIEW AND UPDATE

Cycling Master Plan Review and Update

1.0 Introduction

The purpose of this review is to provide an overview and identify revisions to Hamilton's Cycling Master Plan (CMP): *Shifting Gears* approved by Council in 2009. This current update is a component of the city-wide Transportation Master Plan (TMP) review and update. The 2009 CMP was well received by the community, therefore the direction and extent of the network established in 2009 has been determined to still be relevant, with appropriate enhancements and refinements. Some milestones from the CMP include:

- 2010-2016: Added approximately 85 km (lane km) of bicycle lanes to the existing network
- Expansion of the multi-use trail network to support cycling includes trails over Highway 403, the Queen Elizabeth Way (QEW), the Lincoln Alexander Parkway (LINC) and along the Upper Red Hill Valley Parkway
- 2012 and 2016: Received recognition as being a Silver-rated Bicycle-Friendly Community
- 2014: Leader in developing cycle tracks in Ontario (e.g. Cannon Street)
- A decreasing trend in cycling collision rates
- Since 2010, 325 bicycle racks (approximately 700 spaces) installed within the street right-of-way (ROW)
- All libraries, community, and recreation centres have bicycle racks

Figure 1 Cover of Hamilton's Cycling Master Plan: Shifting Gears (2009)

The CMP continues to have a broad spectrum of considerations including:

- Cycling audience (e.g. age, skill level and gender)
- Cycling purpose (e.g. commuter/utilitarian or recreational)
- Cycling network density (i.e. ideal maximum separation of parallel facilities is two km in urban areas)
- All-season considerations
- Health and safety

In June 2016, Council received an update of the City of Hamilton Recreational Trails Master Plan (RTMP), including the development of approximately 87 km of new trails. This update provides critical input to the cycling network in the city as connectivity of the cycling network is a product of both on-street and multi-use trail (off-street) facilities.

This CMP review and update includes the following elements:

- Network
- Cycling facility types
- Assessment/measuring
- Maintenance
- Supporting programs (e.g. bicycle parking, bicycle share, education, promotion, etc.)
- Implementation

Community consultation for cycling was embedded in the general consultation for the broader TMP review and update, as well as through the Hamilton Cycling Advisory Committee. The information herein this document provides justification for the enhancement and expansion of cycling infrastructure in the city.

The Vision of the TMP review and update is to provide a comprehensive and attainable transportation blueprint for Hamilton as a whole that balances all modes of transportation to become a healthier city. The success of the plan will be based on specific, measurable, achievable, relevant and programmed results. The ultimate goals are to:

- Reduce dependence on single occupant vehicles;
- Promote accessibility;
- Improve options for walking, cycling and transit; and
- Maintain and improve the efficiency of goods movement.

2.0 Background/Context

Hamilton is part of the Greater Golden Horseshoe, which is one of the fastest growing regions in North America. By 2041, this area is forecast to grow to 13.5 million people and 6.3 million jobs. Although the allocation of growth has not been approved by Council, the Province estimates that Hamilton will have a population of 780,000 and 350,000 jobs by 2041 (Growth Plan, 2017). The magnitude and pace of this growth

necessitates a plan for building healthy and safe communities, a sustainable and balanced transportation system, and maintaining and improving overall quality of life.

Several Provincial planning documents have been developed that provide guidance and direction on growth in the Province in conjunction with a supportive transportation system to sustainably accommodate this new growth and improve health and the environment. Themes such as intensification, complete communities, and complete streets are prevalent. These documents include but are not limited to:

- Places to Grow (2017)
- Regional Transportation Plan (RTP), The Big Move (2008; review and update currently underway)
- Improving Health by Design in the Greater Toronto-Hamilton Area (2014)
- #CycleON Provincial Cycling Strategy (2015)
- #CycleON Action Plan 2.0 (2018)
- Ontario's Climate Change Strategy (2016)

The desire to provide a connected and balanced multi-modal and sustainable approach to transportation systems planning is fundamental among the supporting Provincial directions and policies. The provision of a safe active transportation network in Hamilton is consistent with the direction provided by the Province.

The Province places high value on concentrating the focus on moving people through active transportation and transit, while less priority is given to moving single-occupancy vehicles. This is specifically identified by a hierarchy of modes within the Places to Grow updated policies. Cycling plays a vital role in supporting intensification policies and transit mode share by supporting first and last mile trips. Cycling is also recognized by the Province to benefit the environment by contributing to the action plan to combat climate change as well as being an important part of building healthier communities by providing a built environment that supports healthier modes of transportation.

In addition to Provincial guidance, the City has also identified through several strategic policy documents the important role of cycling in how the City manages growth and evolves in the future including but not limited to: the City's Strategic Plan, Official Plan, TMP, CMP, Recreational Trails Master Plan, various Neighbourhood Transportation Management Plans and more recently through its' recommitment to the Hamilton Strategic Road Safety Program and investigation into the Vision Zero initiative.

3.0 Cycling Network

In order to support the City's Transportation vision and goals, a suitable cycling network should be pursued to provide reasonable connectivity for people of various skill levels rather than cycling infrastructure on all streets (that may always be achievable).

The three general roadway classifications are:

Local neighbourhood streets are typically suitable for all types of cyclists with no special accommodation for cyclists because auto traffic is typically low volume and low speed. A special facility design called a "Bicycle Boulevard" typically relies on local streets to create well-defined cycling routes through the city.

Collector streets can have varying auto traffic volumes so some segments of these streets are suitable for bicycle lanes to provide good network connectivity and access.

Arterial streets are typically not comfortable for many cyclists without bicycle lanes; thus without bicycle lanes, cyclists of most skill levels will choose to avoid arterials as much as possible (i.e. only ride them for short segments to access a property or to connect to preferred alternatives). Approximately 50% of arterials in the urban area are planned to have bicycle lanes, cycle tracks, or separated multi-use recreational trails to achieve a reasonable connectivity.

The TMP review and update is integrating a Complete-Livable-Better Streets (CLB Streets) policy consistent with the City's Strategic Plan, Urban and Rural Official Plans, and various Provincial Policies. This is an approach to ROW design (inclusive of streets) that balances the needs of all uses and users regardless of age, ability, income or mode of transportation, in an equitable manner. It is an approach that recognizes that no one-size fits all solution is appropriate for ROW design as different streets can have different priorities through the process of routine accommodation.

Seven street typologies have been identified with additional design guidance, consistent with the existing roadway classifications identified in the Official Plan. The typology system is intended to better meet the context sensitive nature of Hamilton's road network, while also promoting the development of complete communities by responding to and supporting adjacent land uses, natural heritage, built form and public health. Hamilton is composed of a wide range of urban, suburban, rural settlement area and rural contexts.

Table 1 below provides an overview of potential cycling treatments within each street typology, which is consistent with existing policies and best practices to characterize the variety of conditions found in Hamilton. These typologies are not intended to replace the functional classification of streets (e.g. Major Arterial, Minor Arterial, Local). Rather, they are intended to be layered on top of a street's functional classification. More details relating to CLB streets are provided in the Complete-Livable-Better Streets Policy and Framework.

Table 1 Overview of Potential Cycling Treatments within each Complete-Livable-Better (CLB) Streets Typology

CLB Street Typology	Potential Cycling Accommodation
Urban Avenues	Dedicated cycling facility (e.g. bicycle lane, cycle track, multi-use recreational trail)
Transitioning Avenues	Dedicated cycling facility (e.g. bicycle lane, cycle track, multi-use recreational trail)
Main Streets	Dedicated cycling facility (e.g. bicycle lane)
Connectors	Dedicated cycling facility (e.g. multi-use recreational trail, cycle track, bicycle lane)
Neighbourhood Streets	Shared on-road facility (e.g. range of bicycle boulevard treatments)
Rural Roads (including industrial roads)	Paved shoulder for cycling or multi-use recreational trails
Rural Settlement Areas	Dedicated cycling facility (e.g. bicycle lane, shared on-road facility or multi-use recreational trail)

The 2009 CMP identified a cycling network of approximately 1,000 centreline km of routes, including bicycle lanes and paths, a network of expanded multi-use trails, paved shoulders (primarily in rural areas), and shared on-street routes (e.g. bicycle boulevards/signed routes). This cycling network is consistent with the City's rapid transit network and also feeds into the broader Provincial cycling network led by the Ministry of Transportation (currently in draft form) and a commuter cycling network that is part of the Metrolinx Regional Transportation Plan update. The City has also been working with the Hamilton-Burlington Trails Council to connect a Regional Greenway Network Concept linking urban and rural areas through a system of on- and off-road routes. Table 2 summarizes the 2009 cycling network and implementation between 2009 and 2017 by linear facility type.

Table 2 Summary of 2009 Existing Cycling Network and Implementation between 2009-2017 (by Linear Facility Type)*

	2009 Existing (km)	2009-2017 Implemented (km)	% Increase 2009-2017	% of 2009 Full Network Complete
On-Road				
Bicycle Lanes	52	44	84.6%	34%
Paved Shoulders	9	2.5	27.8%	5%
Signed Routes	90.5	72	79.6%	153%
Off-Road				
Multi-Use Recreational Trails	132	16	12.1%	69%
Total	**283.5**	**134.5**		

**Notes:*

- *Values for multi-use trails and paved shoulders include roadways under MTO jurisdiction*
- *All distances represent centreline kilometers. For bicycle lanes, paved shoulders and signed routes, centreline kilometers were approximated by dividing total lane kilometers by two*
- *Values are rounded*
- *Bicycle Lanes include Bicycle Paths*
- *Full Network means 2009 Planned plus existing network*
- *Percent completion of 2009 Signed Routes network is greater than 100% due to the Greenbelt Route which was not envisioned as part of the 2009 network*

Continuity of the cycling network was identified as a critical goal in 2009 based on community input. Although the City has made progress in increasing network continuity since 2009, feedback continues to be received from residents asking for improved connectivity where the cycling network is fragmented. In 2009, there was a minimal network of uninterrupted cycling infrastructure; by the end of 2016, two networks of uninterrupted cycling infrastructure are apparent: 1) in the Downtown and West Hamilton areas, and 2) across the southern portion of the Mountain and Upper Stoney Creek (through the Saltfleet Highlands).

In addition to continuity, the other primary considerations in the planning of the City's primary cycling network are:

- Safety
- Demand/major generators
- Cost

- Property constraints
- Project coordination

Community input relating to this update includes additional links to add to the planned network. The feedback received reaffirms the decision to continue to focus on the 2009 planned network, including Niagara Escarpment (Escarpment) crossings. Any newly developed areas also need to identify a cycling network that links to the existing network, requiring an update to the plan. The TMP review and update is designed to be the blueprint and the context used when those updates are made to ensure they reflect the latest policy guidelines, technologies and incorporates the latest understanding of the full integrated transportation system and local community priorities.

In addition to newly developed areas, the City continues to recognize that bicycle lanes beyond those identified in the CMP could be created, whether through street reconstruction or traffic calming. These projects would be deemed secondary to the task of completing the primary network. Appendix A shows a map of the ultimate cycling network as planned in this update.

The 2009 CMP determined a priority ranking of projects (272 links of various lengths), which is a sound approach and continued as part of this update. These projects were separated into urban (223) and rural (49) projects. The methodology to create this priority ranking was set based on combining justification (positive values) and constraints (negative values).

The justification component included:

- Continuity/connectivity of the route to other bicycle network facilities in the immediate area
- Safety/collision history of the route (involving cyclists), and
- Demand for the route – based on proximity to major facilities, community feedback, and City planning documents.

Constraints included capital costs to create the recommended infrastructure and property acquisition costs.

Table 3 below provides a schematic of the prioritization methodology, consistent with the methodology of the 2009 CMP. This methodology is aligned with the three desired outcomes of the TMP review and update. For example, connectivity and costs relate to a Sustainable and Balanced Transportation System. Safety corresponds with Healthy and Safe Communities. Proximity to origins and destinations relates to Economic Prosperity and Growth.

Table 3 Prioritization Methodology for Individual Cycling Link Alternatives

Desire Criteria				Constraint Criteria	
Continuity	***Safety***	***Demand (two factors)***		***Cost***	***Additional Property Required?***
Connect missing link?	**Collisions (10 years) per km**	**Close to major O/D?**	**PIC feedback & existing City plans**	**Construction cost estimate**	**Property total**
Yes = 5 No = 0	Rate normalized to a value range of 0 to 30	Yes = 5 No = 0	in City documents = 4 HCyC/Orange = 3 Green = 2 Yellow = 1	Est. TOTAL Est. per km	Yes = 5 No = 0
Maximum value is 30 (factored)	Maximum value is 30	Maximum value is 40 (factored)		Factored with cost	Factored with cost
Higher value, a priority	Higher value, a priority	Higher value, a priority		Higher value, lower priority	Higher value, lower priority
Maximum value 100				Less sum of constraint value	

This update also includes prioritization based on the ranking developed in 2009 combined with suitable connectivity opportunities. The full updated list of ranked projects is included in Appendix B. Appendix C summarizes considerations for route modifications. This information is intended for consideration when cycling infrastructure is planned to be rehabilitated or modified. Appendix C is not an exhaustive list of projects, and does not include all design considerations and alternatives.

The 2017 updated preferred cycling network identifies a total of approximately 554 km of planned routes (centreline distance). In terms of the planned network distribution of facility types, on-road routes represent 85% of the planned network, while off-road routes represent 15%. Both are important elements to provide integrated seamless connections. Table 4 provides a summary of the existing (2017), planned (2017 CMP review and update) and total cycling network by facility type.

Table 4 Distribution of Existing (2017), Planned and Total Cycling Network (by Facility Type)*

	2017 Existing Network (km)	2017 Planned Network (km)	Total Network (Existing + Planned) (km)	% of Total Network (Existing + Planned)
On-Road				
Bicycle Lanes	96	227.2	323.2	33%
Paved Shoulders*	11.5	195.1	204.2	21%
Signed Routes	162.5	48.6	211.1	22%
Off Road				
Multi-Use Recreational Trail*	148	82.7	230.7	24%
Total	**418**	**553.7**	**969.3**	**100%**

**Notes:*

- *Values for multi-use trails and paved shoulders include roadways under MTO jurisdiction*
- *All distances represent centreline kilometers. For bicycle lanes, paved shoulders and signed routes, centreline kilometers were approximated by dividing total lane kilometers by two*
- *Values are rounded*
- *Bicycle Lanes include Bicycle Paths*
- *The planned network does not include facilities on unbuilt roads or future developments*

One notable safety consideration relates to motor traffic operations on the Sherman Access in relation to cycling accommodations. This mountain access operates along a narrow platform in many segments along the face of the Escarpment, with a single lane in each direction during most times of the day. Up-bound cyclists ride the Escarpment at a very slow speed, since there are very limited opportunities for motorists to pass slower moving cyclists. This can result in motorist frustration, aggressive and unsafe behaviours. Therefore, it is not suitable for cycling traffic up-bound until a wider paved shoulder can be constructed in specific segments.

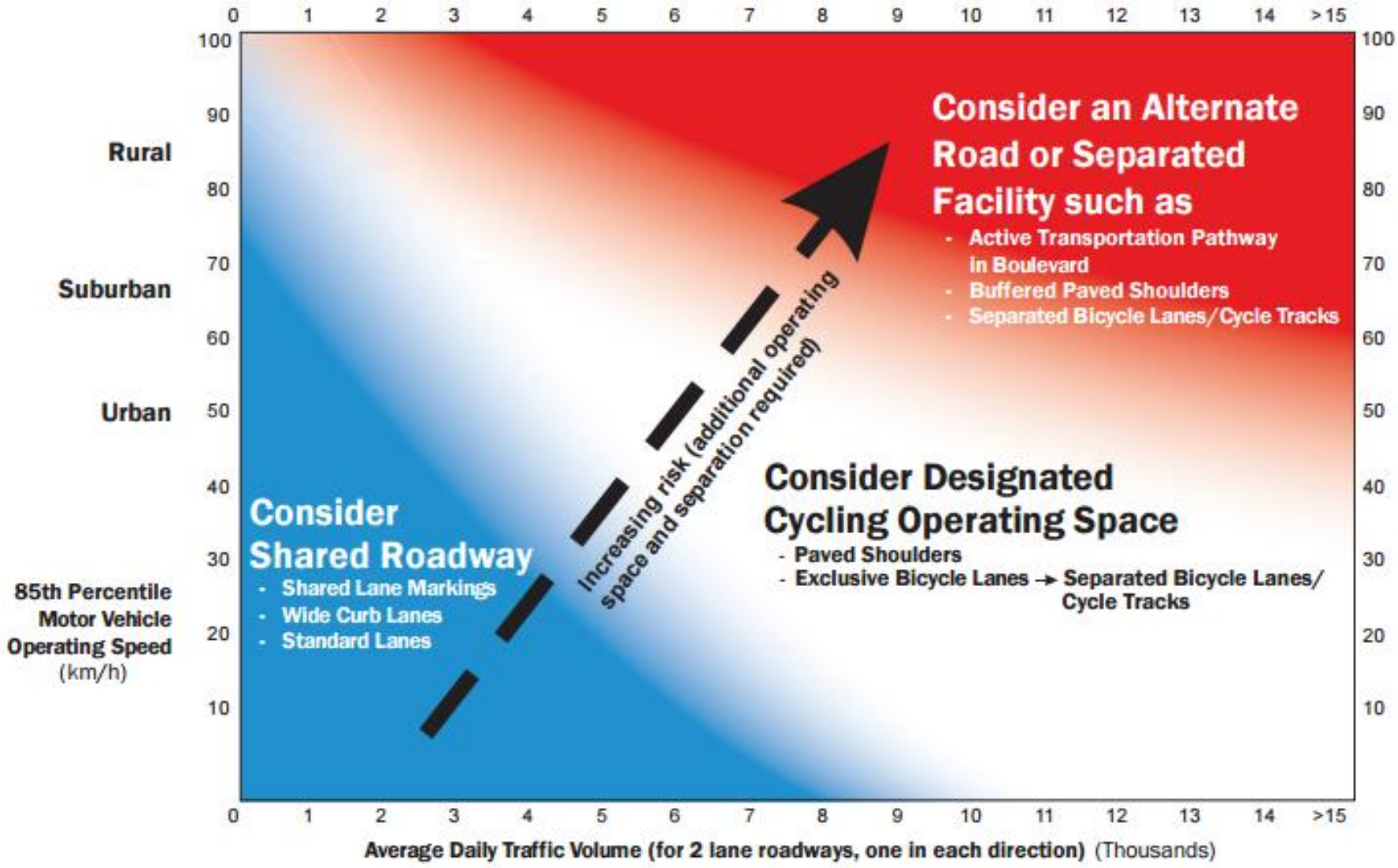
Until such time that a wider platform is implemented, the up-bound lane of the Sherman Access will be signed to restrict cycling up-bound. The Sherman Access & Cut are not identified in the Cycling Master Plan because it would be ranked as a very low priority. Many other Escarpment crossings are identified to be higher priorities. The nearby Wentworth stairs are included in the Cycling Master Plan for improved cycling accommodations, ranked #201.

4.0 Facility Types

There are various types of facilities to provide mobility for cyclists. This section provides an overview of many of these facilities through a Hamilton lens. Since 2009 there have been a few documents that have helped to refine the design of cycling facilities in Ontario and are applied to the Hamilton context. These documents include Ontario Traffic Manual (OTM) Book 18 (2013) in Ontario, TAC's Bikeway Traffic Control Guidelines for Canada (2012), and TAC's Traffic Signal Guidelines for Bicycles (2014).

Figure 2 below, from OTM Book 18, serves as a tool to help determine which facility type is most suitable for various roadways by relating traffic speeds and auto volumes.

Figure 2 Desirable Bicycle Facility Pre-Selection Nomograph (Ontario Traffic Manual Book 18)



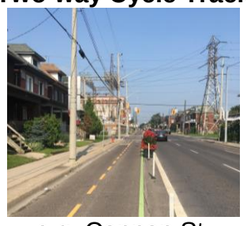
4.1 Linear Facilities

The following are descriptions of the various linear cycling facility types.

<table>
<tr><th>Reserved Bicycle lanes</th><th>Multi-use Recreational Trails</th><th>Bike Paths</th><th>Paved Shoulders</th><th>Bicycle Boulevards (or Neighbourhood Greenways)</th><th>Alleyways</th></tr>
<tr>
<td>Reserved bicycle lanes designate a portion of the roadway for the exclusive use of cyclists through signing and pavement markings. OTM Book 18 (2013) and TAC's Bikeway Traffic Control Guidelines for Canada (2012) are primary design resources. Enhanced forms of bicycle lanes exist including buffered bicycle lanes (paint and sometimes visual barriers), cycle tracks (various types of barriers), and protected bicycle lanes (physical barriers). Installation of enhanced forms will be accompanied by a staff report. The images below are examples of enhanced bicycle lanes.

The City aims to avoid the application of a two-way cycle track along one side of a two-way street for motor traffic. Such a design increases potential conflict points at intersections as well as creates concerns if there are frequent driveways.

Buffered Bicycle lane
 
e.g. York Blvd.

Two-way Cycle Track
 
e.g. Cannon St.

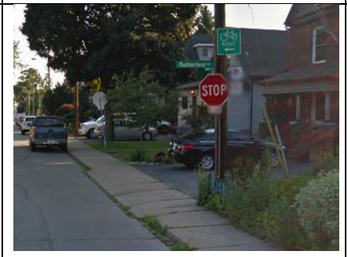
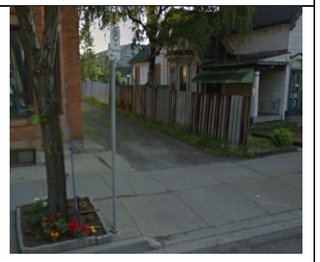
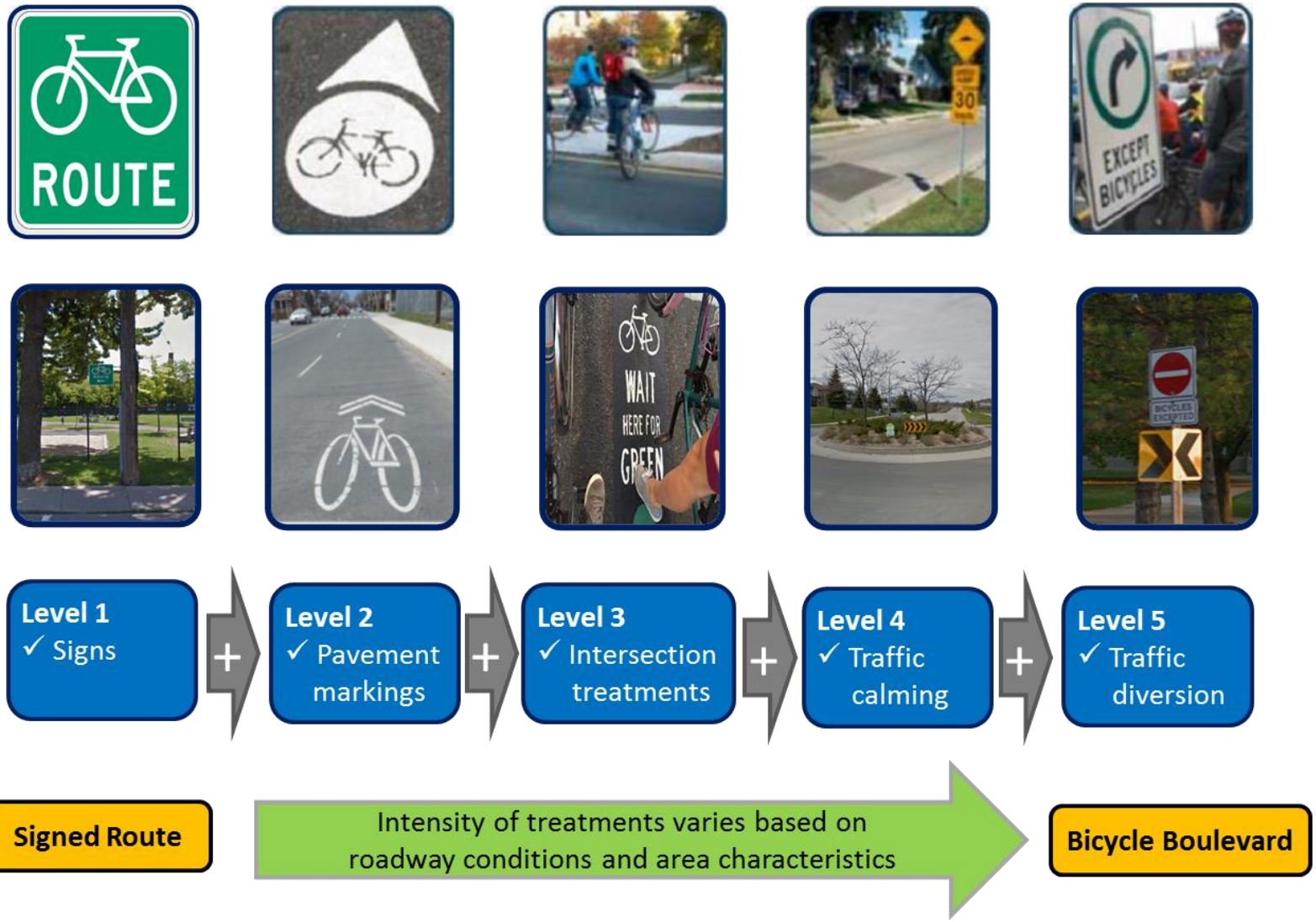
Protected Bicycle lane
 
e.g. Herkimer St.</td>
<td>A multi-use trail is a paved or packed loose-material trail that is physically separated from vehicular traffic by an open space or barrier. Multi-use trails are typically shared by pedestrians and other non-motorized uses. An asphalt surface is desirable for cyclists.</td>
<td>Bike paths are visually very similar to multi-use recreational trails, but are for the exclusive use of cyclists, typically because a dedicated pedestrian facility (typically a sidewalk) is adjacent. Separation between a bike path and a sidewalk is recommended in the form of a landscaped strip to clearly define the uses.</td>
<td>Paved shoulders are part of the continuous paved platform of a roadway, but are separated from the motor vehicle lane by a solid painted edgeline. The paved shoulder is similar in operation to a reserved bicycle lane, but no bicycle stencils exist. The primary determinant for a paved shoulder, instead of a bicycle lane, is the absence of a separate pedestrian facility; thus the paved shoulder is shared by cyclists and pedestrians. Occasional cycling wayfinding signage may be considered. A paved shoulder is typically designated as a cycling facility only if it is wider than 1.2m.</td>
<td>Bicycle Boulevards or Neighbourhood Greenways are slow-speed, low-volume streets where walking or bicycling are sometimes/ often given priority. Five levels of this type of treatment are identified in Figure 3. Designing streets in this manner reduces automobile speeds and cut-through traffic; provides safer bicycling and walking links; and makes residential streets calmer and quieter. Design elements can include signs, pavement markings, and bicycle-friendly speed humps. Motor vehicle access may be restricted.</td>
<td>Alleyways were considered as a possible option for resolving "pinch points" in the cycling network, but no such routes are included in the primary cycling network. Alleyways are not regarded as ideal links in the network since they typically have poor sightlines at street intersections, thus a safety concerns and maintenance issues.</td>
</tr>
<tr>
<td></td>
<td> 
e.g. Cootes Drive</td>
<td> 
e.g. Main Street West</td>
<td> 
e.g. Olympic Drive</td>
<td> 
e.g. Rutherford Avenue</td>
<td> 
e.g. Alleyway near Cannon Street</td>
</tr>
</table>

Figure 3 Levels of Bicycle Boulevards (Neighbourhood Greenways)

The design elements are illustrated but not limited by the examples below.



Source: North End Traffic Management Plan Implementation, Bicycle Boulevard Design Brief, IBI Group

4.2 Non-linear Facilities

Below are descriptions of various non-linear facility types.

Sharrows: Sharrows are a relatively new pavement marking device. Hamilton first installed sharrows in 2010. They are installed with caution because overuse could result in a broad community expectation to install sharrows to mark shared usage on many streets. Hamilton favours the limited use of sharrows only at transition points where facility type changes or lane width changes, or with unique geometrics (e.g., hills in rural areas), or as a short connector between defined cycling facilities to provide continuity or in conjunction with the range of bicycle boulevard treatments.

Signals: Traffic signals heads with bicycle icons were first installed in Hamilton in 2016 following the MTO approval of the device. Previous to 2016, Hamilton had a number of signal heads exclusively for cyclists due to unique geometrics (approximately 10 intersections). Hamilton is transitioning to video detection of approaches at signalized intersections that require activation. Video detection of cyclists is part of this technological development. Some video detection has been installed and it is expected to evolve to be the most common form of detection. As video detection becomes more common, the need for other forms of detection will rarely be required for bicycles as the video will be configured to detect all traffic. Where loops or other means of detection are employed, stencils are marked on the approach to indicate to cyclists where to position a bicycle for maximum detection.

Crossrides: Crossrides are recognized cycling crossings by the MTO, with their distinctive “elephant’s feet” markings. Hamilton will continue to implement this new form of crossing where appropriate.

Bike Boxes: Hamilton has implemented various forms of bike boxes since the City’s first installation to better accommodate left turning cyclists in 2011. A modified version has been designed to accommodate right turns in unique situations (e.g. Hunter St). Two-stage turning boxes have also been implemented at select intersections along the Cannon Cycle Track and at unique trail connections (e.g. Pipeline Trail). In Hamilton, bike boxes are typically designed with green pavement to create greater visibility to all road users.

Roundabouts: At single-lane roundabouts (lower volume), cyclists are expected to merge with vehicular traffic and ride through the roundabout single file. At multi-lane roundabouts (higher volume), the configuration typically provides two options for cyclists:

1) A separate route outside the roundabout (behind the curb) for less-skilled cyclists
2) Ride through the roundabout merged with vehicular traffic.

Speed Humps: The City receives complaints from some cyclists regarding speed hump implementation; but it is recognized that a speed hump is a minimal inconvenience for cyclists. If a speed hump does not extend into the adjacent bicycle lane, some drivers would swerve into the bicycle lane to minimize the impact of the speed hump; and this practice is not acceptable. Installing bollards to prevent autos from swerving would create a significant road maintenance issue for both sweeping and snow clearing. The design of speed humps aims to minimize the side-slope of the speed hump near the curb face (maintaining suitable drainage), to maximize a suitable approach width in the bicycle lane for bicycle traffic.

Catch Basin Grates: A cycling-friendly grate design has been the standard in Hamilton since approximately 2008. Holes in the grate are rectangular, approximately 5 cm x 10 cm. Where feasible, catch basin inlets are provided to provide a clear path for cyclists on the roadway.

Stairs with Bicycle Trough: The City has a practice to construct stairs which are part of multi-use trails or bicycle routes with a trough for bicycles. Such stairs work best for cyclists when the stairs have less steep slopes and troughs are on both sides of the stairs. A textured surface in the trough is suggested to maintain braking control of a bicycle traveling down stairways.

Trailhead Entryways (e.g. Gates, bollards): Bollards provide a visible impediment to auto traffic where multi-use trails intersect streets. Hamilton recognizes various designs and the design continues to evolve. Suitable barriers include stationary bollards, drop-down bollards, boulders (armour stone), and P-gates. Performance criteria include high visibility at all times and suitable all-season operations for Parks & Cemeteries maintenance staff. Chains are avoided. Drop-down bollards can be problematic with ice build-up and a risk to trail users if left open. Chains spanning gateways are difficult to see, thus a risk for trail users.

Wayfinding (e.g. Signs): Wayfinding is a signing approach to provide road users with positive guidance to destinations “at a glance” without having to stop. It is another element of the cycling network that will be enhanced through continued integration of various City initiatives. The Urban Renewal division of Planning and Economic Development Department led a City-wide way-finding strategy to standardize and create unified look and character of way-finding signs for local residents and tourists that reflects a positive image for the City. To enhance and expand this established system, the application of route branding for bicycle boulevards (neighbourhood greenways) using street name blades will be explored.

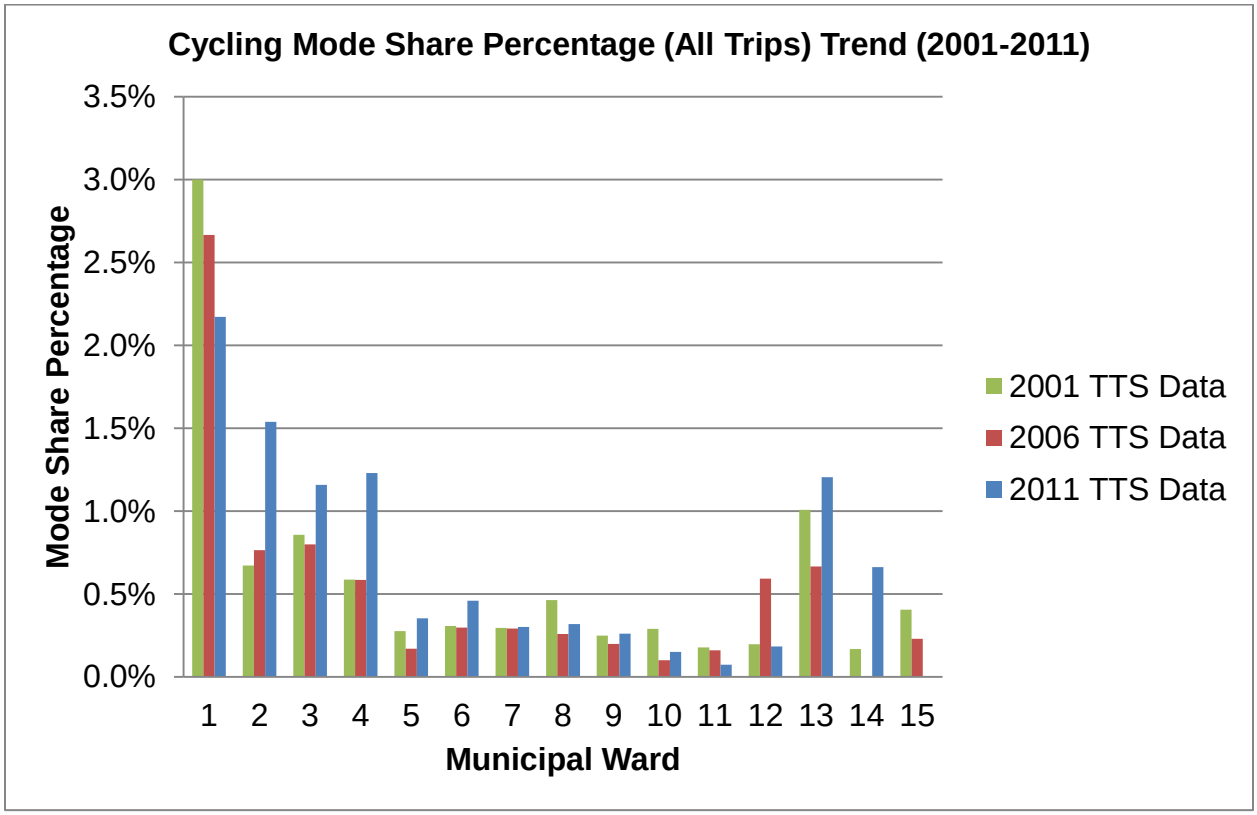
5.0 Monitoring/Assessing

Until 2018, the focus of creating cycling infrastructure has been to provide safer, defined facilities to encourage cycling as a mode of transport. No expectation or requirement of ridership/volume has been stated. It has been suggested that future updates may analyze ridership data to review the location of existing bicycle lanes. The TMP (2007) identifies that active transportation trips (walking and cycling combined) are envisioned to increase from 6% in 2001 to 15% in the long term (by 2031 and beyond). The cycling component has the potential to represent one-quarter of this value, thus a value of about 3.5% by 2031 (city-wide). Refer to the TMP review and update for further information about aspirational targets and monitoring.

5.1 Ridership

Figure 4 below shows how existing cycling activity varies across the city by ward. Transportation Tomorrow Survey (TTS) data generally suggests an increase in cycling mode share over the past 10 years (2001-2011); but the overall mode share remains below 3% in all wards. This data is only collected once every five years, and the most recent survey data (2016) is currently being analyzed, so data over the past five years is not reflected in the graph. The TTS data is not collected during the winter season.

Figure 4 Historical Cycling Mode Share Trend (by Ward)



Source: Transportation Tomorrow Survey (2011)

Proximity to the Downtown area and McMaster University appears to influence cycling mode share. It is suggested that certain factors contribute to higher cycling mode share including but not limited to: population density, higher concentration of short-distance trips, auto ownership, and limited access to convenient and low-cost parking. Additional factors that may increase cycling rates include access to a bike share, targeted cycling promotion to elementary students, as well as the provision of end-of-trip facilities such as showers, changing facilities and long-term bicycle parking.

The City recognizes that cycling is a more attractive mode option for shorter trips (i.e. five (5) km or less). Over one-third (~35%) of all commuter trips are 5 km or less. Cycling represents 2.3% of the mode share for this distance range and 0.9% of all trips (regardless of trip length). Based on 2011 TTS data (as presented in Table 5) for home-based work trips (i.e. commuter trips), two Wards have a commuter cycling mode share of 3% or more for shorter trips (< 5 km). These are Ward 1 and Ward 2. In addition, the use of Hamilton's public bike share system (SoBi Hamilton) data confirms that cycling trips are used mostly for trips ≤ 5 km and is documented in a later part of this section.

Table 5 Commuter Cycling Mode Share for trips ≤ 5km (Home-Based Work Trips) by Ward

Ward	Cycling Mode Share
Ward 1	7.3%
Ward 2	3.5%
Ward 3	2.1%
Ward 4	1.7%
Ward 5	1.4%
Ward 6	0.4%
Ward 7	1.5%
Ward 8	1.7%
Ward 9	2.6%
Ward 10	0.8%
Ward 11	0.0%
Ward 12	0.0%
Ward 13	2.1%
Ward 14	0.0%
Ward 15	0.0%
City-wide	2.3%

Source: Transportation Tomorrow Survey (2011)

The City has been collecting significant active transportation (AT) data since 2011 and plans to continue this practice. Historically, pedestrian count data was regularly

collected at signalized intersections, but rarely along linear facilities such as trails. Bicycle ridership volumes also exist prior to 2011, but the data collected was minimal. Since 2011, the AT Benchmarking Program has collected data at approximately 200 off-road locations, plus over 55 on-road locations and has recently expanded the program to include permanent count locations, to track activity trends. The data is collected with a methodology that recognizes that the four (4) seasons may impact AT trip volumes. The program also identified five (5) major screenlines to monitor AT trips, which include:

- The Niagara Escarpment
- Hwy 403
- Lincoln Alexander Parkway (LINC)
- Red Hill Valley Parkway (RHVP)
- Bay St/West 5th (west side)

The data collected shows that there is a correlation between AT activity and weather conditions, and that the most significant influence on AT activity is precipitation. Temperature is a secondary influence, not primary. The data also describes time-of-day usage, and some multi-use trails and bicycle lanes are indicating that commuter peak traffic periods are developing along some facilities. The following facilities demonstrate the strongest commuter trip activity:

- Cootes Drive Multi-use Recreational Trail
- Hamilton-Brantford Rail Trail (crossing Hwy 403)
- LINC bridge (connecting to Cornelius Park)
- Many on-street bicycle lanes (e.g. Cannon St, Hunter St, and King St crossing Hwy 403)

Figure 5 shows sample pedestrian and cycling activity on a multi-use trail and Figure 6 shows sample cycling activity on the Cannon Cycle Track.

Figure 5 Sample Data Showing Trips in Hourly Increments on a Multi-use Recreational Trail (June 2-9, 2016)

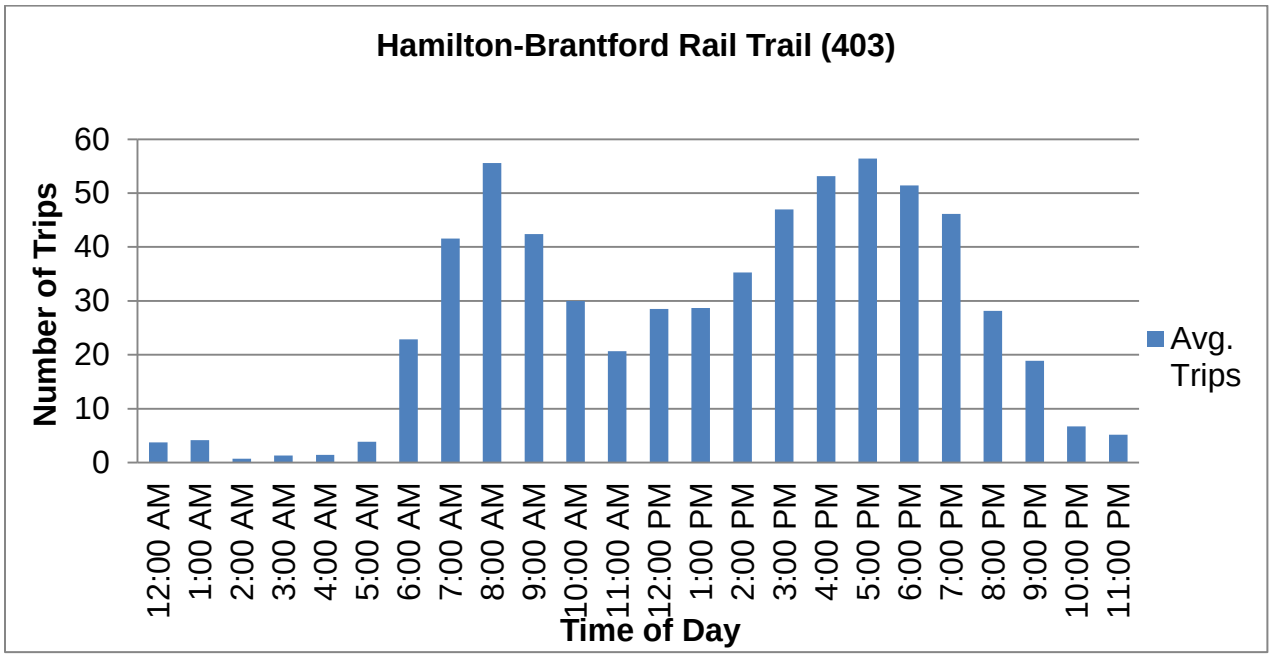
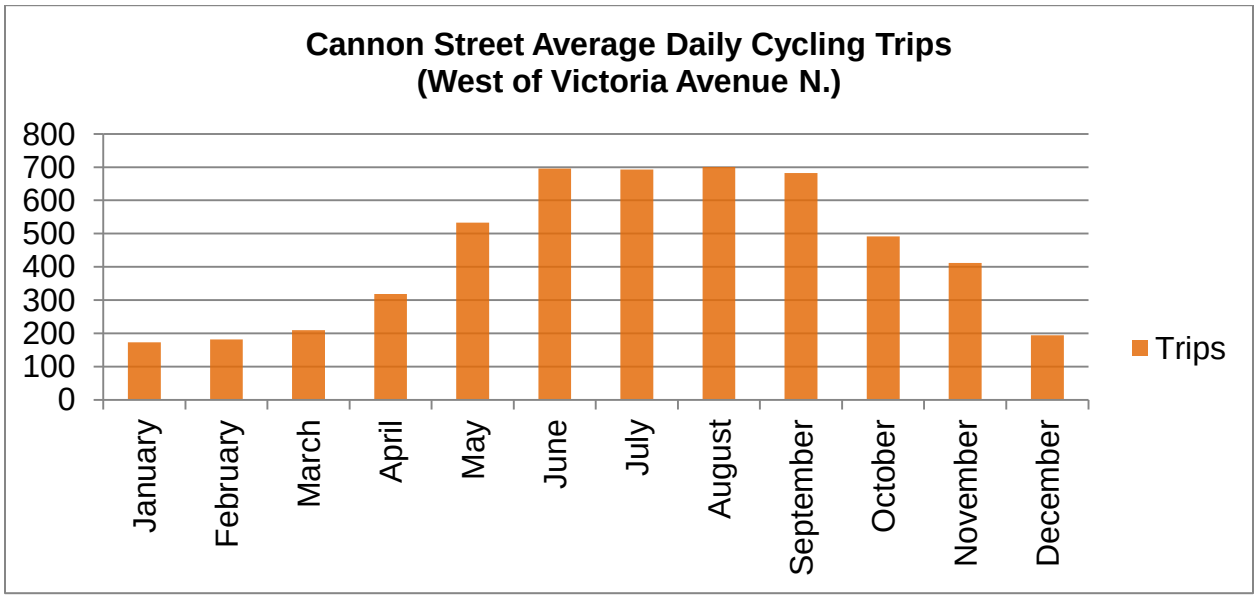


Figure 6 Cannon Street Cycle Track Ridership (January – December 2016)



* Count data summary inclusive from January 19 to December 31, 2016.

A future innovation that is in development is a more comprehensive description of cycling ridership data using a methodology that integrates count data at specific static screenline locations (as described previously) with data generated by Hamilton's public bike share system. This opportunity for more diverse data collection is provided by the GPS technology embedded in the public bike share system, which continually tracks the

location of each bicycle geographically. The combination of these two data sources will provide a better understanding of where bicycles travel and help formulate and validate hypotheses (e.g. Cyclists tend to prefer travel on local streets and avoid larger volumes of auto traffic). More information about the program is available at www.hamilton.ca/ATcounts.

Thus far, the data from Hamilton's public bike share system data validates the TTS data trend and the hypothesis that cycling trips are generally used for short distance trips. According to this data, provided in Table 6, the average trip distance of each ride is approximately two kilometres.

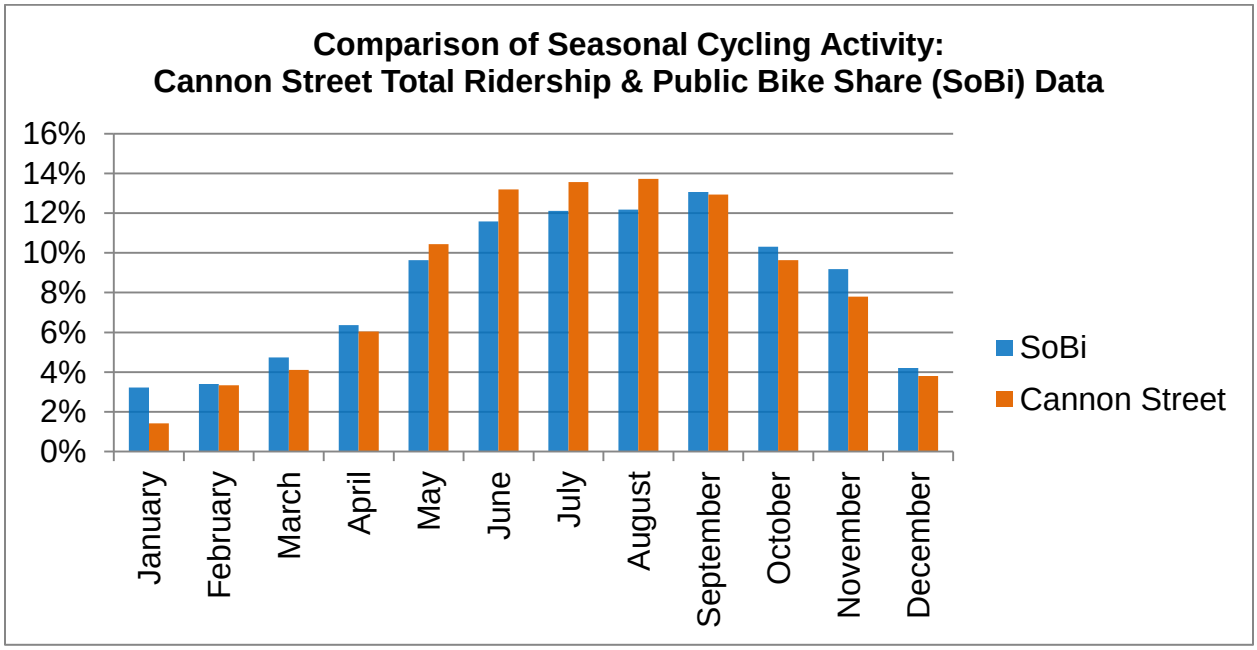
Table 6 Summary of Hamilton's Public Bike Share System Ridership Data

Year	Days of Operation	Trips	Distance (km)	Trips per day	km per day	km per trip
2015[1]	349	218,628	445,881.9	626.4	1277.6	2.04
2016	366	316,172	632,801.5	863.9	1729.0	2.00
Total	**715**	**534,800**	**1,078,683.4**	**748.0**	**1,508.7**	**2.02**

In addition to trip distances, the public bike share data also aligns with the seasonal data being collected by the City. Figure 7 compares the percentage of overall cycling activity in 2016 (by month) of the entire public bike share system ridership with the cycling activity captured at a static location on the Cannon Street cycle track (west of Victoria Street). The data indicates that similar seasonal trends are occurring.

[1] Represents data from January 17, 2015 to December 31, 2015 (Winter Testing Period extended from January 17, 2015 to March 20, 2015. System officially launched on March 21, 2015).

Figure 7 Comparison of Seasonal Cycling Trends in 2016



The public bike share metrics can also create heat maps that illustrate the routing patterns associated with the seasons. A snapshot of activity for January and July, 2016 is illustrated in Figure 8.

Figure 8 Hamilton Public Bike Share (SoBi) System Heat Map (Seasonal Use Comparison)

Wednesday, January 6, 2016
Total trips: 453
Maximum Temp: 3.6 °C Precipitation Accumulation: 0 mm

Wednesday July 6, 2016
Total Trips: 1284
Maximum Temp: 32.3 °C Precipitation Accumulation: 0 mm

The data being collected also provides opportunities for follow-up observational surveys regarding cyclist behaviours and experience/opinion surveys. This information can assist with the programming for education, enforcement, and engineering activities relating to cycling.

5.2 Cycling Safety

Collision data is another major component of monitoring cycling activity. Collision rates can be quantified in various ways (e.g. as compared to the city population or as compared to the estimated total annual number of cycling trips). Cycling collisions compared to total cycling trips (or total cycling km travelled) is most descriptive, but also the most challenging comparison for which to collect base data (total cycling activity must be estimated). For purposes of this review it is quantified as follows:

$$\frac{\text{Average Annual Reported Collisions}^{2}}{\text{Annual Cycling Trips}^{3}}$$

Accordingly, one reported collision occurs per 15,465 cycling trips or 6.47 collisions per 100,000 cycling trips.

Some highlights include:

- Intersections continue to be the most dangerous element of any cycling trip; 63% of all reported collisions occur at intersections
- The total number of reported collisions involving cyclists has increased slightly from an average of 155 per year (1998-2007) to 160 per year (2011-2015) at the same time as cycling ridership is increasing; the collision rate is therefore relatively stable. It is also recognized that the reporting of collisions may be an inconsistent practice.
- The annual average cycling fatality frequency has decreased from an average of 1.2 per year (1998-2007) to 0.6 per year (2011-2015) even as cycling ridership increases; therefore a trend in the direction of Vision Zero.
- The City also monitors reported “dooring”. Between 2011 and 2015, the annual average “dooring” occurrence was 3.4 such collisions per year being reported

The City is committed to improving roadway safety in a comprehensive way through the Hamilton Strategic Road Safety Program, the Hamilton Strategic Road Safety Committee, and the Vision Zero initiative.

[2] Based on 5-year period (2010-2015)
[3] Annualized Trips based on 2011 TTS data

Vision Zero is a new program initiated by various levels of government in a number of countries with a target of zero fatalities and zero serious injuries on roadways. The City of Hamilton is currently in the process of undertaking a comprehensive review of Vision Zero and preparing a Vision Zero Action plan for the City of Hamilton based on a motion that was passed by Council in 2016 to investigate a "Comprehensive Plan to Improve Road Safety".

The Hamilton Strategic Road Safety Committee was re-established in 2014 with a vision to make roadways throughout the City of Hamilton the safest throughout North America and to address safety for ALL road users, including vulnerable road users such as seniors, children, pedestrians, and cyclists and to reinvest Red Light Camera (RLC) revenue into safety initiatives in the community.

5.2.1 Safety in Numbers

The safety of vulnerable road users such as pedestrians and cyclists is important to the City of Hamilton. Academic research regarding the safety of pedestrians and cyclists emerged as the *Safety in Numbers Theory.* This theory states that with increased numbers of cyclists and pedestrians on the road these vulnerable road users will feel safer and more secure on streets.

The theory states that the behaviour of motorists controls the likelihood of collisions with persons walking or bicycling, because it is unlikely that pedestrians and cyclists are become more cautious in large numbers. With an increased awareness due to the presence of pedestrians and cyclists, motorists adjust their behaviour thus decreasing the likelihood and number of collisions by:

- Decreasing speed;
- Checking blind spots; and
- Making eye contact.

Further, research has identified that policies supporting walking and cycling also appears to improve cyclist and pedestrian safety[4].

6.0 Maintenance

Cycling facility maintenance includes both summer and winter operations, for on-street facilities and multi-use recreational trails. On-street facilities are maintained by Road Operations, and trails are maintained by Parks & Cemeteries (City staff) and the Hamilton Conservation Authority. Multi-use trails and bike paths in the street ROW "behind" the curb are individually assigned for maintenance to either Road Operations or Parks & Cemeteries, depending on each facility's details.

[4] P L Jacobsen. (2003). Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury Prevention*. *9*(3), 205-209.

Hamilton's Parks and Cemeteries Maintenance Section maintains the multi-use trail network across the city, including winter maintenance (e.g. snow ploughing, salting, etc.), on a select portion of the network, specifically:

- The Breezeway (the length of Beach Boulevard)
- Cootes Drive Trail
- Desjardins Trail/Waterfront Trail (Princess Point to HMCS Haida)
- Escarpment Rail Trail (Corktown Park to Wentworth Street)
- Glenside Trail
- Hamilton Brantford Rail Trail (paved portions)
- Mountain Brow Trail (Wentworth Stairs to Mohawk Sports Park)
- Valley Inn Trail
- Short portions of neighbourhood connectors and multi-use trails within parks throughout the city.

The City's multi-use recreational trail winter maintenance standard is to remove snow on this select network within 24 hours, and to salt as required.

The Hamilton Conservation Authority maintains one paved multi-use recreational trail in all seasons, the Breezeway (through Confederation Beach Park).

Road Operations maintains on-street cycling infrastructure. This typically represents all infrastructure within any road ROW. The standard for maintenance is to sweep as required in summer, and in winter maintain to the standard of the street classification of the street.

Conventional bicycle lanes adjacent to curb-face sidewalks (represents approximately one-quarter of the cycling network) create an exception to this maintenance standard. In such segments, sidewalks shall not be buried with any windrow of snow. Snow must therefore be piled in the bicycle lane, compromising the rideable width of the bicycle lane (this situation is avoided when there is a suitably wide boulevard between the curb and sidewalk clear-way to store snow). Road crews take follow-up measures after all streets have been cleared to groom such bicycle lanes using additional salting and ploughing to minimize the width of bicycle lanes obstructed by snow and ice. Also, street sweeping of bicycle lanes is conducted in winter months to reduce grit as too much grit in bicycle lanes creates a slipping hazard. This practice is based on a three-year pilot, which was conducted in 2012-2015 to experiment with innovative ways to provide winter maintenance of conventional bicycle lanes to determine the level of service required and cost impacts; while avoiding the significant cost of removing (loading and hauling) snow away.

Higher-order bicycle lane projects (e.g. Cannon Cycle Track and Herkimer bicycle lane) create unique maintenance requirements relating to street sweeping, winter maintenance, and waste collection. As such projects are developed, maintenance cost

estimates and operational impacts will be determined and included in the budget process to convey to Council associated cost implications.

Conventional bicycle lanes adjacent to curb-face sidewalks and higher-order bicycle lanes constitute approximately 60 km of the total bicycle lane network (33%) thus the estimated cost of special cycling maintenance is $80,000. Future Road Operations budgets are planned to include $100,000 annually to fund this maintenance. If this maintenance practice exceeds this value in future years, the City could plan to either pursue an increased budget for these maintenance costs, or alternatively a select network for such maintenance could be determined based on busiest cycling routes and connectivity (to avoid a cost increase). This strategy will be reviewed in conjunction with revised Provincial Maintenance Standards that are currently being developed.

The maintenance of other aspects of on-street bicycle lanes is combined with general street maintenance costs (e.g. pothole/asphalt repairs, catch basin repairs, and graffiti removal).

Cycling infrastructure also generates maintenance for Traffic Operations, such as remarking stencils on asphalt and replacing signage and signals. These costs have been tracked for the past few years and are approximately $15,000 annually. This cost is recognized to increase as the cycling network expands and as existing cycling infrastructure ages. This cost is planned to be itemized in the City's Operating budget annually.

7.0 Supporting Programs

The following subsections summarize some of the supporting programs that help to make cycling a viable mode of travel. More information is outlined as part of the Sustainable Mobility Implementation (Transportation Demand Management) Paper.

7.1 Cycling Education/Promotion

Various cycling education and promotion activities are coordinated through the Sustainable Mobility Program within the Transportation Planning Section. These activities include but are not limited to the educational and promotional programs identified below:

- Hamilton Strategic Road Safety Committee
- Healthy and Safe Communities - Public Health Services (Health Promotion, Injury Prevention, Chronic Disease Prevention, Healthy Kids Community Challenge) and Culture and Recreation programming
- Public Works - Traffic Operations & Engineering
- Planning and Economic Development - Transportation Planning and Tourism
- Hamilton Police Service
- Hamilton Cycling Committee

- External organizations delivering cycling education and training in coordination with City staff (e.g., New Hope Community Bikes, CanBike, Share the Road)

7.2 Bicycle Parking

Bicycle parking, an essential end-of-trip facility, is provided by the City of Hamilton in many areas of the City including within the street ROW, parks, recreation and community centres, libraries, bus stops and higher-order transit stops.

Bicycle parking installations are managed by several Sections:

- Transportation Planning - street ROW including local transit stops
- Parks & Cemeteries - green spaces
- Facilities & Recreation - community centres
- Hamilton Street Railway (HSR) - higher-order transit stops
- Hamilton Public Library - libraries

Recent highlights of the City's bicycle parking program include:

- Bicycle parking requirements were incorporated into the Transit Oriented Corridor Zoning By-law (Wards 1 to 4) (October 2016).
- Bicycle parking requirements were incorporated into the draft Commercial and Mixed-Use Zoning By-law (Zones C1, C2, C3, C4, C5, C5a). As part of this draft, motor vehicle parking spaces may also be reduced with the provision of sufficient bicycle parking.
- Development of a Bicycle Parking Strategy that describes the City's implementation strategy (described in more detail in Appendix D). This document is continually reviewed and updated to serve as an overview of tasks and responsibilities.
- In 2015, the City conducted a bicycle parking audit to evaluate the location, quantity and quality of existing bicycle parking within road ROW, and to identify potential opportunities for addition bicycle parking.
- The development of a new online bicycle parking request form.

In addition, Hamilton's Smart Commute Program has a bicycle rack seed program for schools. This program provides funding assistance to elementary schools that purchase bicycle racks. To be eligible, schools must have completed a School Travel Plan. On private property and at post-secondary institutions, bicycle racks are provided by business and property owners.

7.3 Public Bike Share

Hamilton's public bike share system, SoBi Hamilton, was launched on March 20, 2015 following a winter testing period from January of March of the same year. Since then, the system has been widely embraced as an integral and exciting part of Hamilton's transportation system and cultural landscape. The system utilizes smart-bike technology developed by Social Bicycles Inc. and the innovative design gives users greater

flexibility than traditional dock-based systems. Hamilton's public bike share system spans across approximately thirty-five (35) square km with 750 bikes and 115 hubs. The system is largely used for commuting by Hamilton residents, and is an excellent solution for first/last mile connectivity to transit. It is operated by a local non-profit organization, Hamilton Bike Share Inc.

As of June 12, 2017 there are over 14,000 active users, and since the launch of the system 16,393 people used the system at least once. In a recent survey, public bike share riders reported that since the system launched they are driving less, replacing vehicle trips with public bike share trips, and often utilizing public bike share to connect with local and regional transit. Over 60% of users indicated that before using the system they cycled once a month or less, which means that most public bike share users are not regular cyclists. In addition to positive reception by residents and visitors to Hamilton, the Hamilton's public bike share system is unique in that it boasts gender equity amongst its riders. Unlike the gender inequity of general cycling statistics, the Hamilton's public bike share system is split 50/50 between men and women riders.

Another accomplishment has been the creation and successful implementation of the Everyone Rides Initiative (ERI) Pre-Pilot Project, SoBi Hamilton's program that works to remove barriers to the system for people with low incomes. SoBi Hamilton has partnered with social service agencies to distribute up to 250 subsidized memberships to people living below the poverty line. In addition to the subsidized passes, the program offers education workshops on how to use the system, and cycling safety and confidence.

7.4 Transit Connectivity

With an emphasis on moving people and connecting multiple modes together, the City and Province have been successful in integrating cycling and transit. The entire HSR fleet is equipped with a two-bike capacity bike rack on the front of each bus (approximately 250 buses in 2016 and increasing). All GO Transit service in Hamilton accommodates bicycles by providing both parking facilities and means to transport a bicycle. GO buses have a two-bike capacity and GO trains permit the transport of bikes except during peak periods on weekdays.

In the 2009 CMP, special accommodation of reduced fares for cyclists using the HSR to climb the Escarpment was investigated and declined. Issues identified included capacity concerns, schedule adherence, and the forced aligning of cyclists at the top of the Escarpment. Following further interest in this initiative, the Mountain Climber Pilot Program was launched on May 29, 2017. This pilot provides free rides for cyclists looking to use the HSR to get up and/or down James Mountain Road. Staff will monitor the existing pilot and evaluate future expansion options.

8.0 Implementation

Cycling infrastructure is designed and constructed by various means within Public Works and/or Planning & Economic Development, within the City of Hamilton. Linear cycling infrastructure includes multi-use trails, bicycle lanes, bicycle paths, paved shoulders, sharrows, and signed on-street routes.

The Transportation Planning Section is responsible for managing the implementation schedule of on-road cycling projects, and scheduling decisions are based on cycling project rankings and opportunities of coordination with other projects. The priority ranking of cycling projects is identified in Appendix B. The priority ranking helps to identify projects annually, primarily as stand-alone projects.

The TMP review and update identifies an implementation approach that supports opportunities for external funding sources or “state-of-readiness”. Opportunities exist to identify cycling connections to the regional cycling network identified in the RTP (Big Move), cycling infrastructure within MTO infrastructure, or connections to the regional transit system that could be considered for funding. Developing annual or short-term (e.g. three to five-year) priority plans will help implement the preferred cycling network. Continued pursuit of funding opportunities should continue to be coordinated for both stand-alone projects and within the scope of other requests for funding on City projects.

Cycling projects are funded and implemented in various ways as a coordinated effort of various City staff. Table 7 identifies the cost and type of implementation associated with that type. In general, there are five main “streams” through which projects are achieved, which are described below.

Table 7 Proposed Future Cycling Network (by Implementation Type)

	Implementation Type	Length (km)	% of Network	Cost	% Cost of Network
URBAN	Road Construction[1]	83.8	28.4%	$10,954,292	35.0%
	Multi-use Recreational Trails[2]	39.4	13.3%	$7,526,304	24.0%
	Development[3]	40.6	13.7%	$2,248,135	7.2%
	Stand-alone Projects[3]	123.3	41.7%	$3,644,688	11.6%
	Special Projects[4]	8.4	2.9%	$6,934,100	22.1%
	Subtotal	**295.6**	*100.0%*	**$31,307,519**	*100.0%*
RURAL	Road Construction[1]	195.7	75.8%	$30,801,288	96.0%
	Multi-use Recreational Trails[2]	31.3	12.1%	$1,137,274	3.5%
	Development[3]	-	-	-	-
	Stand-alone Projects[3]	31.2	12.1%	$147,657	0.5%
	Special Projects[4]	-	-	-	-
	Subtotal	**258.1**	*100.0%*	**$32,086,219**	*100.0%*
	Total	**553.7**		**$63,393,738**	

[1] Scope of work/cost within future road construction projects

[2] Represents 50% share of cost relating to cycling

[3] Cost associated with signal heads, pavement markings and signs

[4] Includes projects that require structures (e.g. bridges), MTO projects and some multi-use recreational trails.

**Notes:*

- *All distances are based on centreline kilometers and are rounded to the nearest kilometer*
- *Values for multi-use trails and paved shoulders include roadways under MTO jurisdiction*
- *Values are rounded*
- *In a few instances, project cost and/or distances are not included and will be determined at the design stage*
- *Does not include facilities on unbuilt roads or future developments*

Road construction (reconstruction or resurfacing) projects are an opportunity to create cycling infrastructure as part of significant road works. These projects may include building a wider asphalt platform to add bicycle lanes, but there are other scenarios as new asphalt is an opportunity to modify pavement markings to implement road rechannelizations; or construction could include multi-use trails, etc. Road

construction projects are financed individually and the cycling component of any project is itemized as part of the project scope.

Multi-use recreational trails within the ROW are an integral part of the cycling master plan to create a well-connected cycling network across Hamilton for both recreational and commuter cyclists. Multi-use trails outside of the street ROW can provide key linkages and are typically programmed for design and construction by the Landscape Architectural Services Section. Such projects are financed individually as trail projects in the capital budget. Multi-use trails that are constructed within the street ROW are typically included within the scope of road construction projects.

Development projects can include new streets with cycling infrastructure (e.g. bicycle lanes and new trails). Such infrastructure is constructed as part of new subdivisions, typically planned through new neighbourhood design; expanding the cycling network beyond what is identified in the Master Plan. These projects are financed as individual projects, with a portion of their funding typically from Development Charges.

Stand-alone projects are projects that can be accomplished primarily with pavement markings and/or signage, thus minimal concrete or asphalt work is required. These projects typically involve modified pavement markings to create bicycle lanes or they may be projects with minimal impact on the traffic operations within the ROW (e.g. a multi-use trail along the side of a street). Such infrastructure projects are opportunities to complete critical missing gaps in the cycling network or they may have synergy with larger adjacent construction projects of streets or trails. Stand-alone projects are typically financed through the Cycling Capital Budget (annual block funding).

Special projects such as pedestrian-bicycle specific structures (e.g. bridges, tunnels) are required to overcome barriers such as natural features (e.g. water courses, topography) or safety concerns (e.g. rail lines, highways). These types of facilities are expensive and often require partnerships to cost share implementation.

List of Appendices

Appendix A: Map of 2018 Planned Cycling Network

Appendix B: Cycling Project Priority List

Appendix C: Spot Modification in Coordinated Works

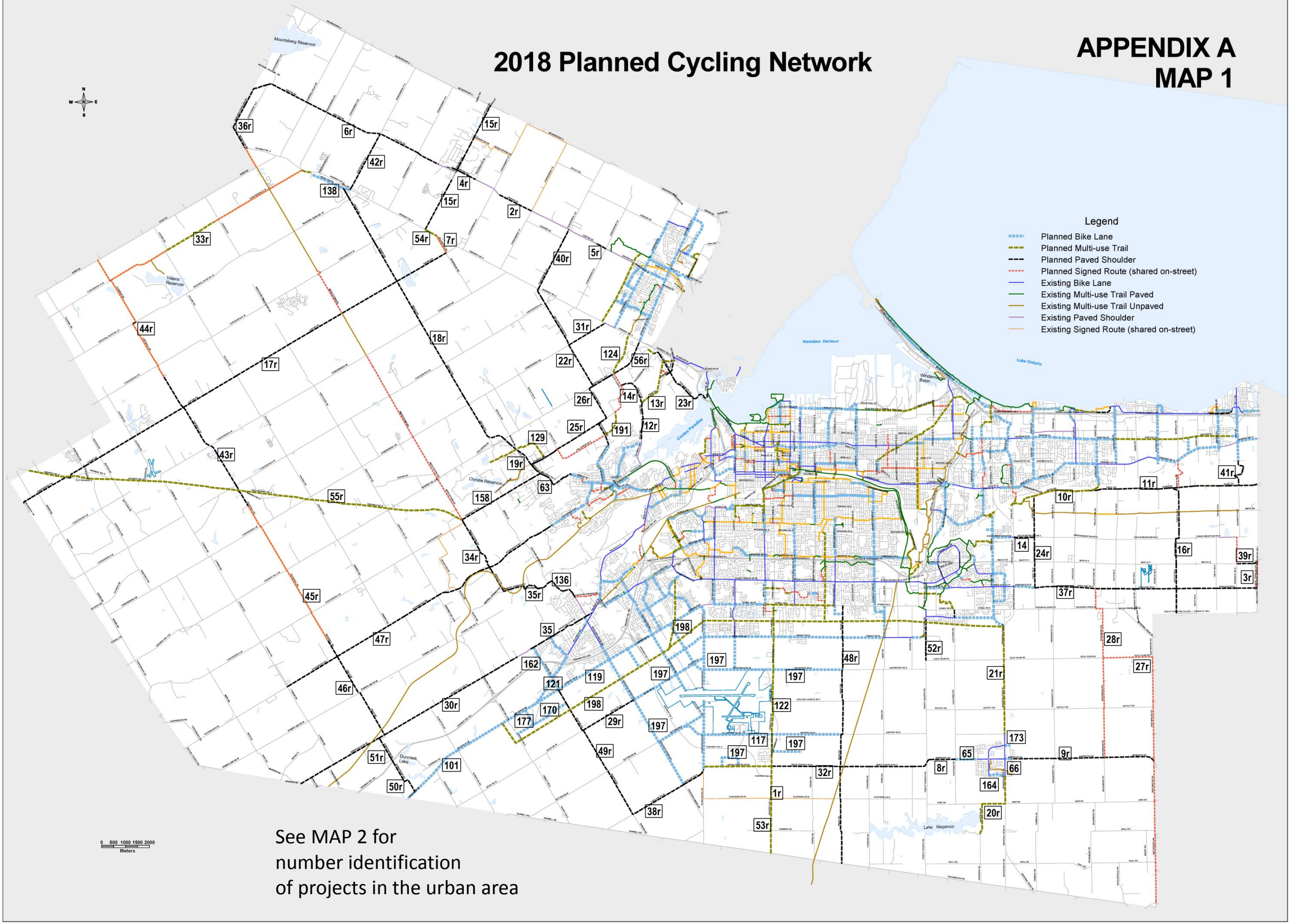
Appendix D: Bicycle Parking Strategy

Appendix A: Map of 2017 Planned Cycling Network

A

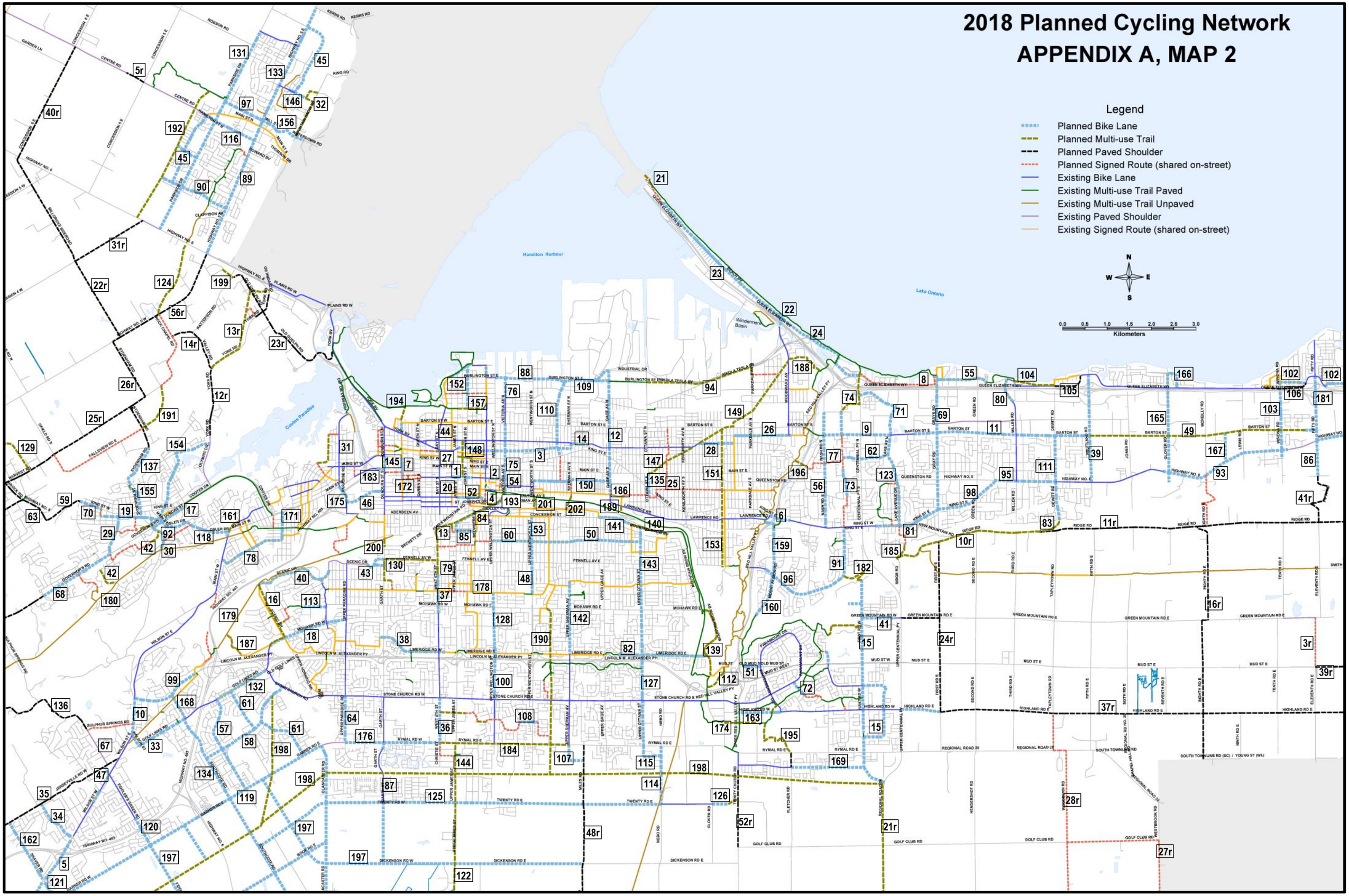
2018 Planned Cycling Network

APPENDIX A
MAP 1



See MAP 2 for
number identification
of projects in the urban area

2018 Planned Cycling Network
APPENDIX A, MAP 2



Appendix B: Cycling Project Priority List

B

APPENDIX B

Proposed Cycling Network Projects

BL = Bike Lane
MurT = Multi-use Recreational Trail
PS = Paved Shoulder
osp = On-street Parking
TWLTL = Two-way Left-turn Lane
= Completed

Urban Streets

Ward	Priority Ranking	Street	from	to	Length (m)	Design Concept	2017 Cost Estimate
2	1	**Hunter**	MacNab	Catharine	470	BL w road diet & osp review - 2way BL	$ 57,678
2	2	**Hunter**	Liberty	Claremont Access	230	2way BL w road diet & osp review (west of Well.) & street widening (east of Well.)	$ 23,071
2 & 3	3	**Wilson**	James	Sherman	2550	BL w road diet - depending on Cannon pilot	$ 60,000
2	4	**Ferguson**	Hunter	Charlton	200	bike path north of tunnel & shared on-street - signed southerly	$ 1,730
12	5	**Wilson in Ancaster**	Meadowbrook	Hwy 52	3777	BL w reconstruction	$ 65,355
4 & 5	6	**King over RHVP**	Lawrence	Pottruff	500	BL on existing/road diet & some construction	$ 20,187
1	7	**Locke**	King	Hunter	1275	BL w road diet, contraflow lane north of Main	$ 5,912
5	8	**Confederation Beach Park Rd**	Centennial Pkwy	Grays Rd gate	1975	shared on-street - signed	$ 5,768
5	9	**Barton**	RHVP	Lake	1610	BL w reconstruction or MurT S side	$ 173,035
12	10	**Wilson in Ancaster**	Rousseaux	Halson	850	BL w reconstruction	$ 14,708
5 & 10	11	**Barton**	Brockley	Fruitland	3950	BL on existing or MurT	$ 91,132
3	12	**Gage**	Industrial	Lawrence	2960	BL w road diet - LTL - parking 1 side	$ 85,364
2,7 & 8	13	**Claremont Access**	Hunter	West 5th @ Fennell	3500	MurT on Ns w road diet & 7 side MurTs	$ 2,422,494
3	14	**Cannon**	Sherman	Lottridge	420	BL w road diet - osp Ns OR changeable direction ctr lane	$ 12,199
9 & 11	15	**First Rd W/ Whitedeer/ Terryberry & Picardy/ Highbury**	Glover Mtn Rd/ Ridgeview Dr	Rymal/ Bellagio	4075	BL on existing or w development	$ 35,256
8 & 12	16	**MurT Scenic-Mohawk**	Chedoke RT	Old Mohawk Rd	1500	MurT 4.0m paved - incl Aterno connection	$ 346,071
13	17	**Dundas St**	Main	Cootes	680	BL on existing	$ 11,766
8 & 12	18	**Mohawk**	Old Mohawk	Upp Paradise	1830	BL w reconstruction	$ 34,607
13	19	**Hatt**	Peel	Main	930	BL on existing	$ 21,456
2	20	**Bay**	Main	Aberdeen	865	BL w road diet and reduce osp	$ 19,957
5	21	**MurT Beach Strip**	at Lift Bridge		250	devize MurT crossing on lake-side of bridge	TBD
5	22	**Beach Blvd**	under QEW		240	BL w road diet	$ 5,537
5	23	**Beach Blvd**	lift bridge	Van Wagner's	4250	BL on existing	$ 69,214
5	24	**Van Wagner's**	Beach Blvd	Centennial Pkwy	2500	BL w reconstruction	$ 57,678
3 & 4	25	**Montclair/ Central/ Graham/ Frederick**			3800	shared on-street - signed	$ 13,843
4	26	**Melvin**	Strathhearne/ Shelby	RHV MurT	1900	BL w road diet - parking 1 side Parkdale to Woodward, other section BL on existing	$ 43,836

2	27	**Bay**	Cannon	Main	625	BL w road diet & MurT to Napier	$	73,259
4	28	**Britania**	Cannon	Walter	840	BL on existing	$	16,473
13	29	**Creighton/ Market**	Hatt/ King	Governor's	950	BL on existing	$	18,457
13	30	**Ogilvie/ Old Ancaster**	Hatt/ King	Hamilton-Brantford RT	800	BL on existing	$	10,036
1	31	**Longwood**	Franklin	King	725	BL on existing - eliminate osp	$	12,545
15	32	**Mountain Brow in Waterdown**	Mill	Burke to King Rd	1200	MurT w development	$	10,382
12	33	**Golf Links/ Halson**	Wilson	Southcote	1190	BL on existing - narrow lanes	$	20,591
12	34	**Meadowbrook**			1000	BL on existing	$	12,000
12 & 14	35	**Jerseyville**	Shaver	Wilson	2850	BL w reconstruction	$	49,315
8	36	**W 5th**	Stone Church	Rymal	1000	BL w reconstruction	$	17,304
8	37	**W 5th**	Mohawk Coll. Access	Marlowe	1130	BL on existing - narrow curb lanes	$	52,141
8	38	**Limeridge**	Garth/ Bonaventure	W5th/ Hawkridge	1370	BL on existing	$	39,510
10 & 11	39	**Fruitland**	North Service	Hwy 8	2425	BL/MurT w development	$	41,961
8	40	**Scenic**	Chedoke RT	Upp Paradise	2270	BL on existing - construct sidewalk along brow	$	19,640
9 & 11	41	**Green Mtn**	First Rd W	First Rd E	1500	BL w development	$	216,294
13	42	**MurTs Walnut Grove & Sanctuary Park**	at Walnut Grove/ Ogilvie	at Highland Park Dr	400	MurT 4.0m pave (both)	$	70,000
8	43	**Scenic/ Denlow**	Upp Paradise	Garth	950	BL on existing - construct sidewalk along street	$	8,219
2	44	**Bay**	Stuart	Cannon	633	BL w road diet & eliminate osp N of Barton	$	14,604
15	45	**Waterdown local streets**				BL w development	$	57,678
1	46	**Frid/Chatham**	Longwood	Dundurn	1000	BL w development	$	4,326
12	47	**Fiddler's Green**	Jerseyville	Wilson	250	BL on existing	$	4,326
7	48	**Upp Wentworth**	Fennell	E 24th	1030	BL on existing	$	29,704
11	49	**Barton**	Fruitland	Fifty	5110	MurT 4.0+ m pave	$	165,053
6	50	**Queensdale**	Upp Sherman	Upp Ottawa	1560	BL & 1 side parking	$	26,994
6 & 9	51	**Old Mud**	Mt Albion MurT	Winterberry	400	BL on existing - modify osp	$	6,921
2	52	**Charlton/ John**	James	Ferguson & St Joseph's Dr	800	BL and 1 auto each dir - review osp	$	62,193
7	53	**Upp Wentworth**	Concession	Fennell	1030	BL on existing	$	29,704
2	54	**West Ave**	Hunter/ Claremont	Young	360	shared on-street - signed & 2way full length	$	2,307
5 & 10	55	**Frances**	Grays	east of Green Rd	1150	BL w construction (incl. sidewalk)	$	115,357
5	56	**Nash**	Bancroft	King	2580	BL w road diet - parking 1 side or TWLTL where required	$	74,405
12	57	**Kitty Murray**			2260	BL on existing	$	39,106
12	58	**Stonehenge**			2460	BL on existing	$	42,567
13 & 14	59	**Hwy 8**	Bond	Hillcrest	1100	PS upbound w reconsruction, PS both sides E of rail bridge	$	750,000
7	60	**Queensdale**	Upp Wellington	Upp Sherman	1680	BL & 1 side parking	$	29,070
12	61	**Meadowlands/ Raymond**	Golf Links	Garner	2100	BL on existing	$	36,000
5	62	**Delawana**	Kenora	Lake	1020	BL on existing	$	6,575
14	63	**Hwy 8**	Brock	Hillcrest	600	PS widen asphalt	$	80,000
8	64	**Upp Paradise**	Stone Church	Rymal	1070	BL on existing - narrow TWLTL	$	30,858
11	65	**Binbrook Rd**	Fletcher	Royal Winter	940	BL w development	$	16,265
11	66	**Binbrook Rd**	Reg Rd 56	Southbrook	280	BL w development	$	4,845
12	67	**Lovers Lane**	Sulpher Springs	Jerseyville	900	BL on existing, review ped need	$	15,573

13	68	**Governor's**	Binkley	Creighton	4920	BL w widening, possible cycle track in urban	$	482,422
5,9 & 10	69	**Grays/ Gray**	Confederation Park gate	King	3000	BL w road diet & TWLTL	$	86,518
13	70	**King in Dundas**	Bond	Peel	800	BL on existing, reduce osp to 1 side	$	23,071
5	71	**Warrington/ South Service/ Lake**	Centennial Pkwy	Delawana	2050	BL w construction, road diet, review osp	$	57,678
9	72	**Marston**	Paramount	Gordon Drummond	400	BL on existing	$	10,000
5	73	**Kenora/ Greenford/ Owen**	Bancroft	King	2600	BL w reconstruction/existing & shared/signed	$	126,893
5	74	**Centennial Pkwy**	North Service	GO station/ Kenora	1200	MurT w MTO bridge rehab and new GO station	$	115,357
3	75	**Victoria**	Barton	Main	1035	BL w road diet - BL NB only, E side S of Cannon; 2way N of Cannon	$	29,849
3	76	**Victoria**	Burlington	Ferrie	464	BL w road diet & 2-way conversion	$	13,381
5	77	**Kentley**	Eugene	Kenora	400	shared on-street - signed	$	2,769
1	78	**Whitney**	Main	Emerson	1500	BL on existing, remove osp w attn to commercial area	$	34,607
8	79	**W 5th**	Fennell	Mohawk Coll. Access	325	MurT 4.0m - west side	$	20,908
10	80	**Millen**	Shoreview	Millen/ Seaman	500	BL on existing	$	23,071
9	81	**King in Stoney Creek**	Battlefield/ Elm	Gray	742	BL w road diet	$	11,536
6	82	**Limeridge**	Birchview	Mtn Brow	1975	BL on existing	$	51,911
10	83	**Dewitt**	Dundee	Ridge	500	BL on existing - narrow lane - 2-way for bikes	$	8,652
2 & 7	84	**Claremont Access**	Inverness	Main	1600	downbound BL on existing shoulder & road diet in segments	$	36,914
7	85	**Inverness**	Upp James	Belvidere	435	BL on existing	$	8,000
11	86	**Fifty**	South Service	Cokers	1600	BL w development	$	27,686
8 & 11	87	**Garth**	Rymal	Twenty	1400	BL on existing	$	24,225
2 & 3	88	**Burlington St/ Ferguson**	Ferguson/ Dock Service Rd	Sherman	1880	BL w road diet Ferguson to Victoria, narrow lanes easterly	$	77,289
15	89	**Dundas St in Waterdown**	Hwy 6	Hamilton St	2750	BL on existing	$	95,169
15	90	**Hollybush**	Parkside	Dundas St	1100	BL on existing	$	11,536
5	91	**Greenhill**	Summercrest	King	1200	BL w road diet - parking 1 side, no TWLTL	$	34,607
13	92	**Governor's**	Ogilvie	Main	240	BL w widening	$	31,838
11	93	**Queenston/ Hwy 8**	Glover	Winona/ Niagara border	3800	BL w widening	$	504,109
4	94	**Burlington St/ Parkdale**	Ottawa	Parkdale to Glow	2300	MurT 3.0m pave S side - instead of sidewalk	$	155,155
10	95	**Queenston/ Hwy 8**	King	Dewitt	1370	BL as paved blvd	$	181,745
5	96	**Greenhill**	Harrisford	Summercrest	1940	BL w road diet - parking 1 side, no TWLTL	$	55,948
15	97	**Mill in Waterdown**	Parkside	Dundas St	950	BL on existing	$	16,438
10	98	**King in Stoney Creek**	Gray	Queenston/ Hwy 8	1510	BL w road diet - BL & TWLTL	$	57,678
12	99	**Rousseaux/ Mohawk**	Wilson	Filman	1600	BL w some widenings & sidewalks	$	166,114
7	100	**Upp Wellington**	Limeridge	Stone Church	1030	BL w reconstruction	$	136,640
12	101	**Wilson in Ancaster**	Hwy 52	Brant border	5300	BL w road diet - BL & TWLTL	$	106,993
11	102	**Baseline/ Lockport**	Winona Rd	Niagara border	1150	BL on existing	$	17,304
11	103	**Winona**	Lido/ shore	Peachtree	1965	BL w development	$	34,001
10	104	**MurT Cherry Beach**	Millen	Dewitt	910	MurT 4.0m pave	$	173,035
10	105	**North Service Rd**	Dewitt	Lakeview	730	BL w development	$	11,536
11	106	**North Service Rd**	Bellavista	Baseline	980	BL w development	$	17,304
7	107	**Upp Sherman**	Stone Church	Rymal to Miles	1000	BL w reconstruction & w development southerly	$	132,660

7	108	**Emperor**	Brigade	Acadia	435	BL on existing - review osp	$	11,536
3	109	**Burlington/ Industrial**	Sherman	Gage	860	BL/ cycle track w road diet	$	73,238
3	110	**Birch/ Holton**	Burlington St	Cannon/ King/ Delaware	1400	BL w road diet & 2-way conversion, 1 block contraflow on Holton, modify osp	$	23,071
10	111	**Dewitt**	Barton	Dundee	900	BL on existing	$	15,573
6	112	**MurT Karst Escarpment Loop**	Arbour	Pritchard/ Mud	650	MurT 4.0m pave	$	100,000
8	113	**Chedmac**	Southridge	Rice	530	BL on existing	$	17,304
6 & 11	114	**Nebo**	Rymal	Twenty	1300	BL w widening	$	112,473
6	115	**Kilbride**	Upp Ottawa	Nebo	380	BL w development	$	6,575
15	116	**Hamilton in Waterdown**	Centre/Main	Hwy 5/Dundas	1000	BL narrow lanes and modest concrete works	$	46,143
11	117	**Airport Rd**	airport access	Upp James	1400	BL w reconstruction	$	185,725
1 & 13	118	**Osler/ Main**	Hatt/ King	Main + 125m of Main	2000	BL on existing - narrow curb lanes	$	65,000
12	119	**Garner**	Wilson	Glancaster	7800	BL w reconstruction	$	1,034,751
12	120	**Fiddler's Green**	Amberly	Garner	680	BL on existing	$	15,689
12	121	**Shaver**	Wilson	Garner	520	BL on existing	$	8,998
11	122	**Upp James**	Twenty	Airport/ Mt Hope	4050	MurT on Ws	$	852,631
5 & 9	123	**Lake**	Delawana	King	1625	BL w road diet N of Queenston, w reconstruction S of Queenston	$	215,573
15	124	**MurT Borer's Creek**	Hwy 6	Hwy 5/ Rock Chapel	1700	MurT 4.0m pave	$	175,000
11	125	**Twenty**	Glancaster	Nebo	7535	BL w widening	$	1,216,899
11	126	**Twenty**	Glover	Trinity Church	600	BL & MurT w development	$	115,357
6	127	**Upp Ottawa**	Mohawk	Kilbride	3285	BL w widening	$	811,449
7	128	**Upp Wellington**	South Bend	Limeridge	1355	BL w widening	$	320,432
14	129	**MurT Christie-Tews**	Christie C.A.	Harvest	2750	MurT 4.0m	$	300,000
8	130	**Fennell/ Garth**	Garth/ W 18th	W 5th	1200	MurT on S side of Fennell	$	283,778
15	131	**Parkside**	Hwy 6	Avonsyde	6010	BL w widening	$	1,143,936
12	132	**Golf Links**	Kitty Murray	Stone Church	1290	BL w widening	$	565,479
15	133	**Dundas St/ Hwy 5**	Hamilton St	Burlington border	3290	BL w reconstruction	$	436,453
12	134	**Southcote**	Golf Links	Garner	2100	BL w widening	$	278,587
3 & 4	135	**Ottawa**	Main	Lawrence	700	BL w road diet, review osp	$	20,000
12	136	**Sulphur Springs**	Mineral Springs Rd	Lovers Lane	1450	PS widen asphalt	$	234,174
13 & 15	137	**Sydenham bridge**	Crowley	Romar	1000	BL on existing, narrow downbound	$	30,000
14	138	**Freelton Rd**	Hwy 6	Brock to Hwy 6	1600	BL w widening	$	212,257
6	139	**MurT Mountain Brow East Mtn**	Mohawk	Arbour	1810	MurT 4.0m pave along brow	$	276,655
6	140	**MurT Mountain Brow East Mtn**	Rendell	Oakcrest	810	MurT 4.0m pave along brow & possible bridge	$	1,153,568
6	141	**Mountain Brow/ Concession St**	Mountain Park Ave	Rendell	770	BL on existing	$	11,536
6 & 7	142	**Upp Sherman**	Macassa	Limeridge	1650	BL w road diet or reconstruction	$	371,161
6	143	**Upp Ottawa**	Mtn Brow	Mohawk	1875	BL w reconstruction	$	421,773
7,8 & 11	144	**Upp James/ Christie**	Rymal	Twenty	800	MurT on Ws	$	145,350
1	145	**Dundurn**	Head St/ King	Main	270	BL/ Bike Path Ws w reconstruction	$	116,799
15	146	**Burke**	McKnight	Mtn Brow Rd	364	BL w development	$	6,298
4	147	**MurT Pipeline 1860**	Ottawa	Barton	2400	MurT 4.0m pave	$	576,784
2	148	**Hughson/ King William**	Cannon	Hunter	1115	Active Transport priority - local access for autos	$	100,000

4	149	**MurT Pipeline 1860**	Strathearne	Woodward	2200	MurT 4.0m pave - incl. 3-4 blocks along Barton	$	3,460,705
3	150	**Delaware/ Maplewood**	Wentworth	Gage	1715	BL on existing - modify osp	$	28,839
4	151	**MurT Strathearne/ Cochrane**	Barton	Lawrence	1900	MurT 4.0m pave	$	526,027
2	152	**Guise/ John**	Bay	Strachan	1500	BL on existing	$	30,000
5	153	**MurT Strathearne/ Cochrane**	Lawrence	Greenhill	1150	MurT 4.0m pave	$	318,385
13	154	**York Rd**	Main	Olympic	2150	BL on existing - modify osp	$	57,678
13	155	**Queen/ Sydenham/ Memorial Sqr**	Livingstone	King/ Hatt	800	BL on existing, eliminate osp & stair/ bike trough	$	14,000
15	156	**Mill St/ Waterdown Rd**	Dundas St	Burlington border	875	Active Transport priority N of Mtn Brow Rd, BL w widening S of Mtn Brow Rd	$	95,890
2	157	**MurT CN**	James	Ferguson	660	MurT 4.0m pave	$	249,171
14	158	**Hwy 8**	Middletown	Brock	3800	PS or MurT	$	558,904
5	159	**Mount Albion**	Lawrence	Greenhill	1000	BL on existing - narrow curb lanes	$	23,071
5	160	**Mount Albion**	Greenhill	Glen Castle	1000	BL w road diet or MurT/ cycle track	$	23,071
1	161	**MurT Sanders**	Osler/ Main	West Park	200	MurT 4.0m pave	$	76,712
12 & 14	162	**Shaver**	Jerseyville	Wilson	1500	BL w widening	$	242,249
9	163	**Highland**	Upp Red Hill	Winterberry	940	BL w development	$	17,304
11	164	**Windwood**	Bradley	Reg Rd 56	700	BL w development	$	12,112
11	165	**Glover**	Watercrest	Hwy 8	1800	BL w development	$	31,146
11	166	**Watercrest**			475	BL on existing	$	8,219
11	167	**SCUBE N-S collector**	Barton	Hwy 8	650	BL w development	$	11,536
12	168	**NcNiven**	Mohawk	Golf Links	620	BL w widening	$	46,489
11	169	**Bellagio/ Dalgleish**	Fletcher	Reg Rd 56	2400	BL w development	$	41,528
12	170	**Cormorant**			2700	BL w development	$	77,866
1	171	**Emerson**	Main	Whitney	650	BL on existing - modify osp	$	11,536
1	172	**Hunter/ Canada/ Jackson**	Dundurn	Queen	900	shared on-street - signed	$	7,787
11	173	**Maggie Johnson**			235	BL on existing	$	4,066
6 & 9	174	**MurT Karst Escarpment Loop**	Pritchard	Upp Mt Albion/ Winterberry	700	MurT 4.0m pave	$	230,714
1	175	**Longwood**	Main	Aberdeen	700	BL /cycle track w construction/ new bridge	$	230,714
8	176	**Rymal**	Glancaster	W5th	2700	Bike Path w reconstruction	$	358,183
12	177	**Tradewind**			700	BL w development	$	12,112
6,7 & 8	178	**Bendamere/ South Bend/ Macassa/ Ninth/ Broker**			8000	shared on-street - signed - spot improvements	$	23,071
12	179	**MurT Chedoke RT**	Hwy 403	Dundurn	4680	MurT - pave existing 3.0m gravel and replace stairs with ramp at Hwy 403	$	1,100,000
1 & 8	180	**MurT Hamilton-Brantford RT**	Bridlewood Dr	Ewen	4000	MurT - pave existing 3.0m gravel	$	300,000
11	181	**Fifty**	North Service	South Service	650	BL w reconstruction - MTO	$	11,247
5 & 9	182	**MurT First Rd W**	Greenhill to Bruce Trail to Glover Mtn Rd	First Rd W	750	MurT 4.0m pave	$	201,153
1	183	**Main**	Frid	Dundurn/ Jackson	300	BL or devise 2-way/ MurT	$	115,357
7 & 8	184	**Rymal Rd**	West 5th	Upp Sherman	2900	Bike Path w reconstruction	$	173,035
9	185	**MurT Mtn Ave**	Mountain Ave/ Lake Ave	Ridge Rd/ Devil's Punch Bowl	420	MurT 4.0m pave	$	3,634
3	186	**MurT Gage Park**	Cumberland	Montclair/ Maple	590	MurT 6.0m pave	$	245,018
12	187	**MurT Iroquoia Heights to Old Mohawk**	Chedoke RT	Old Mohawk Rd	850	MurT 4.0m pave	$	235,328

4	188	**MurT Museum of Steam & Tech link (Globe Park)**	Woodward	Red Hill Valley Trail	750	MurT 4.0m pave	$ 152,271
3	189	**MurT Gage Park to Escarpment Rail Trail**			390	MurT 4.0m pave	$ 507,570
7	190	**MurT Limeridge-McQueston**	Mohawk Rd	S of Rymal	3800	MurT 4.0m pave & bridge	$ 3,460,705
15	191	**MurT Fallsview**	Sydenham	Rock Chapel Rd	1400	MurT 4.0m pave	$ 258,652
15	192	**North Waterdown Dr**	Hwy 6	Joe Sams MurT	3200	MurT 4.0m pave	$ 200,000
2	193	**MurT Claremont to Escarpment Rail Trail**	Claremont	Corktown Park	1000	MurT 3.0m pave switchback on slope	TBD
1	194	**MurT Locke bridge & Locke St**	Waterfront Trail	Locke/ York Blvd	1133	6.0 m platform & BL S of Barton, modify osp	$ 2,307,137
9	195	**MurT Eramosa Karst & Fletcher**	Highland	Rymal/ Bellagio	1200	MurT 4.0m pave & BL S of Rymal	funding by others
4 & 5	196	**MurT RHV bridge**	Armstrong	Eugene	250	MurT 4.0m pave	$ 1,153,568
11 & 12	197	**AEGD (Airport Employment Growth Development)**	AEGD development			BL w development	TBD
6,7,8, 11 & 12	198	**MurT South Transmission Lines**	Wilson/ Hwy 52	Stonehenge and Reg Rd 56			separate approval
13 & 15	199	**Innovation stairs**	Innovation Dr	Old Guelph Rd		stairs w bike trough	separate approval
1 & 8	200	**Dundurn stairs**				stairs exist - develop retrofrit for bikes	separate approval
3 & 7	201	**Wentworth stairs**				stairs exist - develop retrofrit for bikes	separate approval
3 & 7	202	**Henderson lift**	at Sherman			incline lift - separate EA required	separate approval
						TOTAL ESTIMATED URBAN COST	**$ 38,604,731**

Notes:

Short segments of shared on-street signed routes are not listed above but are identified in Appendix A.
For most multi-use trail projects above, the cycling portionof the total cost would be 50% of the above value
All lengths above are centreline lengths

BL = Bike Lane
MurT = Multi-use Recreational Trail
PS = Paved Shoulder
osp = On-street Parking
TWLTL = Two-way Left-turn Lane

Rural Roads

Ward	Priority Ranking	Road	from	to	Length (m)	Design Concept	2017 Cost Estimate
11	1r	**Chippewa Rd @ Hwy 6**			20	resolve crossing for Greenbelt Route	$ 92,285
15	2r	**Centre**	Concession 8 E	Concession 7 E	1800	PS widen asphalt	$ 259,553
11	3r	**East Townline**	Mud	Highland	1100	shared on-street - signed	$ 9,517
15	4r	**Centre**	Warren/ Carlisle Rd	Progreston	775	PS widen asphalt	$ 111,752
15	5r	**Centre**	Grinstone Creek	Concession 5 E	450	PS widen asphalt	$ 64,888
15	6r	**Centre**	Puslinch Townline	Woodend	8630	PS widen asphalt	$ 1,244,412
14	7r	**Edgewood**	Safari	Hwy 6	900	shared on-street - signed	$ 7,787
11	8r	**Binbrook Rd**	Trinity Church	Fletcher	1260	PS widen asphalt	$ 181,687
11	9r	**Binbrook Rd**	Southbrook	Niagara border	6100	PS widen asphalt	$ 879,596
9,10 & 11	10r	**Ridge Rd**	Devil Punch Bowl	Dewitt	2910	MurT 4.0m pave	$ 576,784
10 & 11	11r	**Ridge Rd**	Dewitt	Niagara border	7000	PS widen asphalt	$ 1,241,528
13	12r	**York Rd**	Olympic	Valley Rd	1700	PS w reconstruction or 2-way cycle track on W side	$ 323,576
13	13r	**MurT York Rd & York Rd at Old Guelph**	Valley Rd	Hwy 6 interchange	2500	MurT 4.0m pave & 600m of PS on York Rd	$ 576,784
13 & 15	14r	**Valley Rd**	Rock Chapel	York Rd	1400	PS widen asphalt	$ 230,714
15	15r	**Carlisle Rd**	Hwy 6	Burlington border	5850	PS widen asphalt	$ 843,547
11	16r	**Eighth Rd E**	Ridge Rd	Niagara border	4420	PS w dev or reconstruction	$ 637,347
14	17r	**Safari**	Waterloo border	Edgewood	19700	PS widen asphalt	$ 3,124,729
14	18r	**Brock**	Freelton Rd	Hwy 5	12600	PS widen asphalt	$ 1,816,870
14	19r	**Brock**	Hwy 5	Hwy 8	2120	PS widen asphalt	$ 305,696
11	20r	**MurT Reg Rd 56 S/ Kirk**	Southbrook	Binbrook Cons Area	3000	MurT 3.0+ m pave	$ 576,784
11	21r	**MurT Reg Rd 56 N**	Dalgleish	Cemetery	4600	MurT 3.0+ m pave	$ 2,307,137
15	22r	**Millgrove**	Hwy 6	Hwy 5	4400	PS widen asphalt	$ 634,463
13	23r	**Old Guelph Rd**	Paterson	York Blvd	3525	PS w dev or reconstruction	$ 670,944
9 & 11	24r	**First Rd E**	Ridge Rd	Highland	3750	PS w dev or reconstruction	$ 540,735
14 & 15	25r	**Harvest**	Brock	Sydenham	3280	PS widen asphalt	$ 472,963
15	26r	**Sydenham**	Hwy 5	Sydenham bridge (Romar)	2830	PS widen asphalt	$ 408,075
11	27r	**Westbrook & Golf Club**	Woodburn/ Golf Club Rd	York St (Niagara)	10234	shared on-street - signed	$ 11,536
11	28r	**Tapleytown Rd/ Hwy 20/ Woodburn Rd**	Highland	Binbrook Rd	7200	shared on-street - signed & PS on Hwy 20	$ 11,536
12	29r	**Book**	Shaver	Fiddler's Green	2475	PS widen asphalt	$ 356,885
14	30r	**Jerseyville**	Brant border	Paddy Green/ private rd	10175	PS widen asphalt	$ 1,467,195
15	31r	**Concession 4 W**	Millgrove Sdrd	Hwy 6	1775	PS widen asphalt	$ 255,948
11	32r	**White Church**	Glancaster	Trinity Church	10500	PS widen asphalt & MurT W of Upp James	$ 1,514,059

14	33r	**MurT Valens CA**	Valens Rd	Lennon	2250	MurT 3.0m	$	807,498
13 & 14	34r	**Middletown/ Binkley**	Hwy 8	Mineral Springs	3500	PS & pave road in segment	$	444,124
12 & 14	35r	**Mineral Springs**	Binkley	Sulphur Springs	2250	PS widen asphalt	$	350,396
15	36r	**Maddaugh Road/ Puslinch Town Line Road**	Centre	Highway 6	2800	PS widen asphalt	$	403,749
9 & 11	37r	**Highland**	Upp Centennial	Niagara border	9200	PS w reconstruction	$	1,326,604
12	38r	**Carluke**	Shaver	Glancaster	3500	PS widen asphalt	$	504,686
11	39r	**Mud**	Eleventh	Niagara border	850	PS widen asphalt	$	122,567
15	40r	**Concession 6 E**	Hwy 6	Centre Rd	2750	PS widen asphalt	$	396,539
11	41r	**Fifty**	Cokers	Ridge	1750	PS widen asphalt	$	448,450
15	42r	**Concession 11 E**	Hwy 6	Centre Rd	2600	PS widen asphalt	$	299,928
14	43r	**Kirkwall/ Woodhill**	N of Safari Rd	N of Concession 4 W	6900	PS widen asphalt	$	994,953
14	44r	**Foreman/ Kirkwall**	Gore Rd	N of Safari Rd	6200	shared on-street - signed	$	9,229
14	45r	**Woodhill**	N of Concession 4 W	N of Governor's	5500	shared on-street - signed	$	5,768
14	46r	**Woodhill/ Field**	N of Governor's	Jerseyville	4575	PS widen asphalt	$	659,697
14	47r	**Governor's**	Lynden	Binkley	7100	PS widen asphalt	$	819,034
6,7 & 11	48r	**Miles**	Rymal	Haldibrook	10700	PS widen asphalt	$	1,542,898
12	49r	**Shaver**	Garner	Carluke	6000	PS w dev or reconstruction	$	865,176
12	50r	**Sunny Ridge**	Hwy 403	Wilson	1300	PS widen asphalt	$	187,455
14	51r	**Sunny Ridge**	Jerseyville	Hwy 403	1200	PS widen asphalt	$	173,035
6 & 11	52r	**Trinity Church**	Pinehill	Golf Club	1650	PS widen asphalt	$	214,131
11	53r	**Upp James**	Airport Rd/ Mt Hope	Haldibrook	4900	MurT 3.0+ m pave	$	890,266
14	54r	**Hwy 6**	Edgewood	Carlisle Rd	600	MurT 3.0+ m pave	MTO jurisdiction	
14	55r	**Hwy 8**	Cambridge border	Middletown	18000	MurT 3.0+ m pave	MTO jurisdiction	
15	56r	**Hwy 5/ Dundas St**	Sydenham	Hwy 6	3010	PS widen asphalt	MTO jurisdiction	
						TOTAL ESTIMATED RURAL COST	$	33,223,493

Notes:
Short segments of shared on-street signed routes are not listed above but are identified in Appendix A.
For most multi-use trail projects above, the cycling portionof the total cost would be 50% of the above value
All lengths above are centreline lengths

Appendix C: Spot Modifications in Coordinated Works

APPENDIX C

Spot Modifications in Coordinated Works

Ward	Street	Segment	Description
1	Breadalbane St/ Dundurn St (#145)	York Blvd to King St	LRT development may shift this north-south route westerly to Breadalbane. Detailed design would require connections at York Blvd. Maintain the Head/Hunt connection with possible signal (to be further reviewed) and two-way bike path along the west side of the street southerly to Main St.
1 & 2	York Blvd	Dundurn St to Hess St	LRT development may modify this east-west route, but it is proposed to continue to be accommodated in the York Blvd r.o.w.
1 & 13	Hamilton-Brantford Rail Trail	Old Ancaster Rd to Ewen Rd	Pave the trail, 4m wide.
1, 8, & 12	Chedoke Radial Trail	Hwy 403 to Dundurn St	Pave the trail, 4m wide.
2	Napier St (#118)	Queen St to Bay St	Improve eastbound crossing of Queen St, define a two-way route between Caroline St and Bay St.
2 & 3	Cannon St	Catharine St to Sherman Ave	Modifications (possible lane restriction for auto traffic) at minor streets along the south side of the cycle track.
2 & 3	Wilson St (#3)	James St to Sherman Ave	Plan for bike lane opportunities on Wilson St if the Cannon Cycle Track is not confirmed after the three-year pilot concludes (2014 - 2017).
2 & 7	Jolley Cut		Possible conversion of the upbound bike lane into a two-way facility to connect to the planned Claremont Access multi-use trail.
3	Sanford Ave	Barton St to Delaware Ave	Investigate the possibility of a two-way cycle track with LRT design and potential two-way conversion.
3	Montclair Ave (#25)	Gage Park connections easterly	Montclair Ave or Maple Ave as an alternate connection to Gage Park via Ottawa St (#135) to both the Pipeline 1860 Trail (#147) and the Escarpment Rail Trail connector (#189).
3 & 4	Lawrence Rd	Gage Ave to Kenilworth Ave	Possible two-way cycle track on south side & sidewalk on north side.
5	Beach Strip Lift Bridge (#21)		A coordinated project with the Federal Government and the City of Burlington has been considered to create a contiguous lake-side multi-use trail crossing of the canal, including an approach ramp on the Hamilton side. An alternate consideration is an on-road solution that could be closed when bridge capacity is needed for QEW bypass traffic.

Ward	Street	Segment	Description
5 & 6	Red Hill Valley Trail	Pritchard Falls to Mount Albion Trail	Enhance this segment with pavement/ asphalt and less-steep grades
6	Upper Ottawa St (#127)	LINC to Stone Church Rd	Consider both on-street bike lanes for continuity and a multi-use trail to connect McQuesten Trail to Stone Church Rd, crossing Upper Ottawa at Redbury St.
6, 7 & 8	Bendamere Ave	To Broker Dr	Add bicycle boulevard elements and new signal at Upper James and South Bend.
6, 7 & 8	Limeridge Rd	At interchanges	Enhance cycling connections through existing traffic signals.
6, 7 & 8	Stone Church Rd		Consider a painted buffer on this arterial street.
9	First Rd W/ Highbury Dr/ Picardy Dr	South of Mud St	Create a continuous bike lanes on existing where possible.
10	Millen Rd	Over QEW	Complete bike lane connection.
10 & 11	North Service Rd	various segments	Consider a painted buffer as the street is an arterial/ collector.
12	Chedoke Radial Trail (#187)	Iroquoia Heights Conservation Area	Consider an alternate connection between rail trail and Bluebell Cres.
13	Governor's Rd (#68)	Bridlewood Drive to Creighton Rd	Consider a two-way cycle track or bike path on the south side.
13	Sydenham St/ Queen St (#137 & #155)	Livingstone Dr to Alma St/ Victoria St	Investigate the option of a Queen St connection including new stair and bike trough to Livingstone Dr using existing City easement, and address downbound cycling speeds.
13	Old Guelph Rd (#23r)	York Rd to York Blvd	Instead of paved shoulders along the narrow and sloped roadway, explore a road closure in the vicinity of the CN railway crossing to significantly reduce the volume of motor traffic. The street would then be suitable as a shared facility instead of requiring paved shoulders, and would continue to provide full access between the various RBG gardens.
15	Hwy 5 crossings (#56r)	at Sydenham Rd at Rock Chapel Rd	Provide protected crossings at these two intersections
15	Borer's Creek Trail	Hwy 6 underpass to Chudleigh St	Pave the trail, 4m wide.
15	Mill St (#156)	Union St to Mountain Brow Rd	Consider restrictive lane operations or Bicycle Boulevard devices to further encourage through motor traffic to use the new Burke St/ Waterdown Rd connection.

Appendix D: Bike Parking Strategy

Appendix D

City of Hamilton Bicycle Parking Strategy

1.0 Introduction

1.1 Background

The City of Hamilton provides cycling infrastructure throughout the City including off-road multi-use paths, on-street dedicated bike lanes, on-street signed bike routes and bike parking facilities to serve the needs of recreational and commuter cyclists. The City of Hamilton's Cycling Master Plan, *Shifting Gears,* considers bike parking as an essential component of the cycling network. The availability of safe and convenient bike parking facilities is an important factor in increasing the uptake of this sustainable and healthy mode of transportation.

The City of Hamilton's Transportation Planning Section manages and installs bicycle parking within the City's right-of-way. Other City departments are responsible for managing bicycle parking in other public locations, such as at parks and community centres. For the purposes of this document, the focus is on bicycle parking within the right-of-way.

This document provides an overview of the City of Hamilton's right-of-way bicycle parking strategy. Detailed design guidelines are beyond the scope of this document, and are included in an internal design guideline document.

1.2 Objectives

The objectives of this Bike Parking Strategy are to:

- Provide background information about bicycle parking including the main types of bike parking, important considerations for locating bicycle parking, and more.
- Provide guidance on the identification of existing bike parking facilities.
- Provide guidance on the identification, planning, installation and maintenance of new bike parking facilities to improve the end-of-trip experience for cyclists.

2.0 Bike Parking Facilities

Bike parking facilities (or bike racks) are infrastructure built for safely and securely storing bicycles. Bike parking facilities are found across the City at a variety of locations. In general, bicycle parking facilities should be located in areas where there are significant trip generators. High-density residential areas, business districts, offices, educational institutions, community centres and public spaces are examples of trip generators. When safe and accessible parking facilities are readily accessible, cyclists are more likely to travel by bicycle.

Bike parking is often categorized by the duration of intended use: short-term and long-term. Short-term bike parking is often used by customers and visitors for relatively short

periods of time (up to several hours). Long-term bike parking is typically used by employees and tenants for periods of time lasting more than several hours. It is important to consider these two groups of bike parking facilities independently because of the different needs of the users. For example, convenience and proximity to destination may be a priority for users of short-term bicycle parking, while users of long-term parking may prefer a sheltered method of storage.

Different types of bike parking, outlined in more detail in the following sections, are designed to meet different needs. It is important to consider these needs when selecting the most appropriate type of bike parking infrastructure to install.

2.1 Short-Term Bicycle Parking

Short-term bike parking is intended to be used for less than several hours at a time. Such facilities are located near shopping areas, recreation centres and parks. Short-term bicycle parking includes:

Boulevard Parking: Facilities located on street boulevards, which is City right-of-way, either between sidewalks and buildings or sidewalks and roads, are one of the most common types of short-term bike parking. These facilities are most commonly found in areas with high retail and service amenities, such as Business Improvement Areas (BIAs).

On-Street Parking: Often referred to as bike corrals, on-street bike parking includes on-street facilities where there is limited space on nearby boulevards and sidewalks. These facilities are usually surrounded by a curb or bollards to provide a buffer between cyclists and motor vehicles. On-street parking is located on City right-of-way.

City Assets: This includes facilities that are located at or near City offices, libraries, arenas, pools, and community centres. Facilities within City parks and along City trails are also included. New City assets are now required to include bike parking as part of the building design process.

Schools: The City is not responsible for the installation and maintenance of bicycle parking facilities on elementary, secondary or post-secondary school properties. However, there is a bike parking grant program for schools through the Smart Commute Program. Schools can apply for a one-time grant of up to $600 for bike parking so long as they are have or are in the process of developing a School Travel Plan and agree to the terms and conditions of the grant.

2.2 Long-Term Bicycle Parking

Long-term and monitored bike parking is intended to be used for more than several hours at a time. These facilities are often located near workplaces, schools and transportation hubs, and are typically monitored. Long-term bicycle parking includes:

Sheltered: This type of bike parking is commonly found at post-secondary institutions and major transportation loading and access hubs. Sheltered parking is accessible to everyone, and provides shelter from the elements. Sheltered bike parking is often provided and maintained by the property owner.

Secure Parking: This type of bike parking is most often found near workplaces, post-secondary institutions, and at major transportation loading and access hubs. Access to this type of parking is limited to registered users only, providing a higher level of security. Further, most secure facilities are also sheltered from the elements.

Event Parking: Event parking, commonly referred to as valet bike parking, is a method of securely storing a large number of bikes at a special event or venue. The infrastructure is generally temporary and can be set up on a variety of land uses. Having convenient and safe bike parking facilities at events and venues provides attendees piece of mind about the safety of their bicycle and the ease of finding a parking space.

3.0 Identification of Existing and Potential Bike Parking Facilities

3.1 Existing Bike Parking

In 2015, the City of Hamilton conducted a city-wide bike parking audit to identify and collect data about all existing bike parking infrastructure within the City right-of-way. The following information was collected about existing bike parking facilities: location, type of rack, condition, capacity, nearby attractions and amenities, and compliance with City design guidelines. Results from the audit are being used to identify gaps in the current bike parking network. Further, a living inventory of all existing bike parking facilities is in the process of being developed to help inform future infrastructure maintenance and improvements. In total, over 900 existing racks were inventoried through the bike parking audit, with a total capacity for over 4,000 bikes.

The identification of existing bicycle parking on private property has not been formalized. Generally this information is kept by the respective property owners or maintenance teams. It is recommended that property owners or managers keep track of this information, especially for the purpose of regular maintenance.

3.2 Potential Bike Parking

The presence of easily accessible and convenient bicycle parking is an important factor in promoting cycling as a form of transportation, so it is necessary to continuously grow and develop this network.

To improve the provision of bicycle parking at high demand locations (also known as trip generators) that are not within the City's right-of-way, the City of Hamilton is actively engaging the development community to integrate Transportation Demand Management (TDM) measures such as bicycle parking into development applications. The Transportation Demand Management Land Development Guidelines (available at

www.hamilton.ca/develop-property/policies-guidelines/transportation-demand-management-land-development-guidelines) were created as a tool for developers and City staff to include TDM initiatives into new development, redevelopment and existing buildings through the development approval process. This document also provides recommended bicycle parking rates for different land uses. To promote the incorporation of bicycle parking into existing buildings that are not within the City's right-of-way, resources are available to help property owners and managers identify vendors and properly locate the racks.

Potential sites for new bike parking within the City's right-of-way are identified through the bike parking audit and community requests, summarized in the following sections.

3.3 Bike Parking Audit

In addition inventorying all existing bike parking, potential locations for new bike parking were identified as part of the bike parking audit. This was based on on-site anecdotal evidence of insufficient parking (e.g. the absence of bike parking at major destinations and points of attraction, overflowing bicycle racks and bicycles locked to fences or other objects that obstruct pedestrian or vehicular traffic).

3.4 Community Requests

In order to obtain community input about bike parking facilities within Hamilton, the City has developed a bike rack request process. Community members who would like to request the installation of a new rack on City right-of-way can complete and submit a simple rack request form found on the City website (www.hamilton.ca/streets-transportation/biking-cyclists/cycling-in-city). When a request is received, City staff review the request to ensure that the location is on City right-of-way and that the installation would not obstruct other modes of transportation. If the location is approved and funding is available, the requested infrastructure is installed. This process generally takes between 8-12 weeks, depending on the location.

In 2016, Cycle Hamilton, a member-supported coalition of individuals, communities, and organizations that works together to promote a healthy, safe, and sustainable cycling culture in Hamilton, conducted interactive community engagement around bicycle parking. Cycle Hamilton collected feedback from community members regarding bicycle parking recommendations by bringing a map of the City to various community events. In total, nearly 100 locations were recommended for additional bicycle parking through this process. These recommendations are currently being investigated for feasibility.

4.0 Prioritization of Bike Parking Installations

The City's bicycle program includes the provision of bicycle parking infrastructure, maintenance of the bicycle parking database (existing and requested infrastructure), improving and upgrading existing facilities as required, and the formalization of policies and procedures related to bike parking facilities within municipal documents.

In order to most effectively and efficiently implement these installations, prioritization is crucial. The following factors are considered when prioritizing bike parking facility projects:

- Expected need, impact and reach of project
- Cost of project and availability of funding
- Timeframe
- Required coordination and agreements with other organizations
- Potential planning constraints

The following City locations have been identified as priorities for biking parking installations:

- **Business Improvement Areas (BIAs)**: Business Improvement Areas (BIA) represent a group of property and business owners within a defined geographic area who collectively develop, promote and protect the commercial viability of the area. There are 13 BIAs within the City of Hamilton.
- **Major Destinations**: These are points of interest and destinations such as galleries, transit hubs, museums, parks, etc.
- **HSR Stops**: bike parking at transit stops improves multi-modal access.
- **Trail connections**: having bicycle parking at trail connections is important for facilitating multi-modal access. For example, recreational trail users may wish to cycle to a trail and park their bike while they go hiking or jogging.

5.0 Bike Parking Maintenance

Bike parking maintenance is an important consideration in the provision of bicycle parking facilities. It is recommended that all facilities be visited at least once every two years in order to identify and rectify issues including:

- Rusting
- Superficial damage (scuffs and vandalism)
- Damaged components
- Loose or broken bolts

A regular maintenance program requires an up to date inventory of all existing facilities. It is recommended that the location (GPS coordinate and nearest intersection), type of rack, capacity and current status of the rack be documented. This is currently being developed for facilities on City right-of-way through the bike parking audit.

As part of the maintenance program, it is recommended that racks be sanded and painted with Tremclad (or a similar type of paint) if rusting or surficial damage is observed. Loose or damaged bolts should be replaced immediately for the safety of users and the security of the bicycles. Bike parking maintenance is generally the responsibility of the party that funded for the installation unless other arrangements are made.