

Walk Cycle WATERLOO REGION

February 2014



Helping to shape the future of walking and cycling in Waterloo Region





FOREWORD EXECUTIVE SUMMARY PART 1: WALK CYCLE WATERLOO REGION PART 2: GREEN CHAPTER DESIGN GUIDE





FOREWORD

It is my great pleasure to introduce the Region of Waterloo's Active Transportation Master Plan entitled "*Walk Cycle Waterloo Region*", a comprehensive travel strategy for pedestrians and cyclists in our community.

Waterloo Region is a vibrant global community that is experiencing unprecedented investment, growth and change. Already the fourth largest community in Ontario and the tenth largest in Canada, Waterloo Region continues to grow and prosper. In recent years, we have seen a series of significant economic, environmental and social changes in our community. We often refer to these changes as "big shifts". *Walk Cycle Waterloo Region* will be another important element of our "Big Shift Toolbox", which can be found at <u>www.regionofwaterloo.ca/bigshift</u>, and supports many of these changes.

With our population expected to reach 729,000 by 2031, we have committed ourselves to ensuring our growth is both compact and largely concentrated in existing built-up areas. This means that our roads and transit systems must function well, and that we also offer other quality choices for pedestrians, cyclists and people with disabilities. *Walk Cycle Waterloo Region* is a very important part of achieving this diverse transportation system.

It is important to note that we are already achieving significant progress in making it easier to get around our community. *Walk Cycle Waterloo Region Region* is part of our larger *Regional Transportation Master Plan*, which was approved in 2010, and includes substantial investment in transit and roads as well. Survey results suggest that over 90,000 people are regular walkers, and over 10,000 people are regular cyclists in our region. New cycling lanes are being built, and new pedestrian safety and accessibility features are being installed on a regular basis. Regional roads now include over 300 kilometers of cycling facilities, and we hope to more than double that amount over the next 10 years. *Walk Cycle Waterloo Region* will help us continue to build safe, efficient and uninterrupted Region-wide travel systems through wise investment decisions.

The creation of a comprehensive plan like this cannot happen without the dedicated effort of so many members of our community, and our sincere thanks to all who have offered their ideas and energy. The ongoing collaboration with all of our Area Municipalities has also been critical, as we all work to coordinate our travel systems. These collective efforts will again lead to shared successes.

Realizing the vision of *Walk Cycle Waterloo Region* is expected to evolve over a number of years, and will require financial commitments from a variety of sources. Over the course of 2014 and 2015, we will focus on developing a detailed financial strategy that can support the realization of this plan.

I hope you find *Walk Cycle Waterloo Region* to be an exciting and forward-looking initiative that enhances our transportation system and supports our broader community vision for years to come. Our thanks to everyone who is helping to make this strategy a reality, and we welcome your comments.

All the best,



EXECUTIVE SUMMARY

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EX 1 THE VISION AND GOAL FOR WALKING AND CYCLING

Walk Cycle Waterloo Region is the Region of Waterloo's plan for making it easier to walk and cycle in our community. By promoting and integrating active forms of transportation, Walk Cycle Waterloo Region will help to achieve the Region's "Vision for a Sustainable and Liveable Waterloo Region" articulated in part by these excerpt from the Regional Official Plan:

"[to be] an **inclusive, thriving, and sustainable** community committed to maintaining harmony between rural and urban areas and fostering opportunities for current and future generations"

and

"[to] plan and manage **integrated, accessible and safe** multi-modal transportation systems that provide transportation choice, and promote **sustainability**, a **healthy** population and the effective movement of goods"

The Regional Transportation Master Plan (RTMP, 2010) was based on population and employment in Waterloo Region increasing to 729,000 and 366,000 respectively by 2031. This significant growth is planned to be accommodated through growth that is both compact and largely concentrated in existing built-up areas. Getting around by using active modes is a large part of the transportation solution planned in the RTMP. In fact, one recent study shows that in one of our densest areas we are already achieving nearly a 20% share of trips by active modes at some times.

The Region has committed to ensuring that the health and social benefits of an active lifestyle direct transportation planning and design decisions. Generally, priority for travellers will be given in the following order: walking, cycling, public transit, carpooling and other smart commuting strategies, and then driving alone (single occupant vehicles). However, this priority order and can be influenced by the local context of a particular project. For example, highways are typically designed for motor vehicles first as walking and cycling is not permitted.

In the Regional Transportation Master Plan, the Region has set a goal for how many trips should be made by walking and cycling to meet its vision. This goal was developed to complement the transit mode share in the RTMP and minimize the road expansion requirements over the next 20 years.

Current mode share for walking and cycling for PM peak hour trips in the Region is **7.8%**



The target mode share for walking and cycling for PM peak hour trips in the Region is **12% by 2031**

Walk Cycle Waterloo Region looks at the people who live, work, study and play in the Region and considers where there is the potential for them to choose walking and cycling for short trips. The walking and cycling networks and supportive policies developed in this plan are designed to



encourage cycling and walking in our communities. This plan contains five action plans and new policy directions that were developed through consultation with the following stakeholders:

- Project, Technical and Consultant Teams consisting of Regional staff and Councillors, Area Municipal staff and consultants
- Stakeholders including the Active Transportation Advisory Committee (ATAC) and Grand River Accessibility Advisory Committee (GRAAC)
- Members of the public through three Public Consultation Centres with combined attendance in excess of 360 people

EX 2 NETWORK ACTION PLAN

One of the most effective strategies for the Region of Waterloo to achieve its walking and cycling mode share goals is to encourage more active transportation in the Region by providing a safe, comfortable and convenient network of facilities. The primary aim of the network recommended as part of this plan is to connect the tri-cities and rural communities within the townships by providing accessible routes for pedestrians and cyclists.

The existing Regional Walking Network includes 365 km of sidewalks along one or both sides of Regional Roads. The existing Regional Cycling Network is made up of 117 km of dedicated bike lanes and 453 km of improved rural roads. There are 17 km of existing boulevard multi-use trails along Regional roads that are included in both the walking and the cycling networks.

The recommended Regional Walking and Cycling Networks were developed considering:

- A comprehensive review of the upcoming transportation projects in the Transportation Capital Program.
- The need to improve connections for pedestrians and cyclists.
- Other master plans in the region
- Physical barriers.
- Parallel options for constrained corridors.
- Potential demand and need (i.e. identifying areas where there is good potential for active transportation trips, but minimal facilities or missing connections).

The Recommended Walking and Cycling Networks include four areas for implementation:

- The **Transportation Capital Program (TCP)** action area is intended to identify the walking and cycling facilities that could be included as part of the other transportation projects in the 10-year Transportation Capital Program. This action area takes advantage of the opportunity to build the Recommended Walking and Cycling Network in conjunction with on-going transportation projects already planned by the Region over the next 10 years. It is the primary mechanism by which active transportation facilities have been built in the past and will continue to significantly expand the active transportation area is \$69.9 M. However, the 2013 TCP includes \$42.5 M in funding for active transportation tasks leaving \$27.5M to be added.
- The **Gaps / Infill** action area starts with an analysis of the gaps remaining in the network that are not addressed by the TCP action area. It outlines which walking and cycling facilities are recommended within Regional corridors that are not included in the current 10-year TCP.



This action area aims to build these standalone active transportation facilities in order to create a connected network within a reasonable timeframe of approximately 10 years. It would piece together the isolated facilities implemented through the Transportation Capital Program action area. The total estimated cost of active transportation facilities in this action area is \$20.4 M (with an additional \$35.5 M in the long term).

- The **Fix-It List** consists of additional localized or "spot" improvements that fine-tune existing or planned facilities, but which do not alter the overall network: for example, upgrades to intersections, improvements to interchange ramp crossings or curb cuts to improve transitions between trails and bike lanes. These enhancements would further encourage walking and cycling by improving the safety, comfort and convenience of existing and future users. It is recommended that the Region pursue these Fix-It List projects on an ongoing basis with an annual budget of \$80,000. This amount is sufficient to cover a number of smaller projects, such as several crossing improvements, or a larger project over 2 years, such as interchange enhancements.
- **Special Study Areas:** These areas are large, iconic, challenging or require unique solutions. Identified over the course of developing the ATMP these special projects require further study or special funding to complete. \$6.5 M worth of projects are planned in the ten year network while \$7.5 M are planned for the beyond ten year timeframe.

The facilities included in these four action areas were developed in concert with existing area municipal plans. Both existing and planned area municipal facilities were considered to ensure increase connectivity in the network and to provide alternatives for areas where regional facilities could not be provided.

Maps of the recommended Walking and Cycling Network are provided in **Appendix 4–A** and **Appendix 4–B**. The total estimated cost to implement the complete recommended Regional Walking and Cycling Network along with 10 years of funding for the Fix-it list and Strategic Signage is \$141.0 M (2012 Dollars).



EX 3 STRATEGIC SIGNAGE ACTION PLAN

The Strategic Signage Action Plan contains guidelines for way-finding signs for the trail and cycling network, including way-finding on trails, on-street cycling facility signage, signing regional routes, regional destination signing and linkage signs. The primary signs proposed for way-finding on trails and on-road cycling routes are illustrated below.



Note: Signs shown are not to scale; refer to Walk Cycle Waterloo Region **Chapter 5: Strategic Signage Action Plan** for dimensions and additional details

Two options for destination signs are recommended to be tested; these are discussed in detail in **Section 5.7**. These destination signs include key elements such as walking and cycling symbols, distances and travel times. Once tested, the preferred sign option would become the recommended design.

Trail, on-road cycling facility, regional route identification and direction signs, linkage signs and destination signs are intended to be combined to reflect a coherent and integrated way-finding sign system for users of the active transportation network.

Additional guidelines on supplementary signs, materials and installation are provided in this Action Plan.

It is recommended that the Region of Waterloo and Area Municipalities apply the signage guidelines to their specific projects and plans, and that the Region of Waterloo co-ordinate the implementation of the signage strategy with Area Municipalities to ensure that clarity and consistency is achieved to benefit the users. Area Municipalities are supportive of this integrated signage approach. The implementation and co-ordination would become the responsibility of the Transportation Engineering Division within Transportation and Environmental Services.

Other elements may be added to the signage system such as trailhead signage and maps, regulatory or warning signs (for example prohibition of motorized vehicles, stop signs, steep grade vii



ahead, etc.), tourism information, cultural and heritage interpretation and public art. These additional components would enhance, supplement or provide information that is separate from the primary way-finding components. Agencies and Area Municipalities are encouraged to exchange and co-ordinate guidelines on these additional elements.

The way-finding signage strategy for the cycling and trail network is recommended to be implemented in two ways:

 For each new facility added to the network, add the way-finding and destination signs at the time of construction. The cost for the signs should be incorporated into the overall cost to implement the n



incorporated into the overall cost to implement the new facility within the Transportation Capital Program.

2. For the existing network, a sign plan can be developed for specific corridors and destinations, or for a broader part of the network in collaboration with the Area Municipalities. It can be implemented on an incremental basis with annual funding recommended in the amount of \$40,000. This would allow for the Region of Waterloo to install about 50 to 100 signs annually, equivalent to signing generally one existing route that traverses an Area Municipality. This cost would be coordinated through the Transportation Capital Program.

EX 4 WINTER NETWORK ACTION PLAN

Poor weather conditions can make travel by walking or cycling more difficult, in particular when active transportation corridors are not maintained during these times. In order for active transportation to be a good choice for residents in this Region during all seasons, it is important that government agencies make an effort to mitigate adverse weather conditions. The impacts of weather on walking and cycling are relatively under-researched areas. However, a commitment to winter maintenance of active transportation facilities is needed if the Region of Waterloo is to achieve their goal of more walking and cycling trips by making them year-round transportation choices.

The Winter Network Action Plan identifies a portion of the existing Walking and Cycling Network where year round maintenance should be a priority. The cycling corridors to be maintained over the winter aim to address the more popular commuter routes, especially for university / college students since they are more likely to cycle over the winter months. The pedestrian corridors to be designated high-priority for winter maintenance focus on serving busy retail corridors as well as higher-order transit. The plan goes on to identify a number of maintenance practices that could be used to improve winter conditions along this core network. Finally, it recommends that a pilot project be initiated to test enhanced maintenance practices to determine if winter maintenance can be accomplished and measureable improvements made in an efficient and cost-effective manner. This pilot project would consider a small section of the winter network and would be run during the 2014-2015 winter season.

EX 5 BEHAVIOURAL SHIFT ACTION PLAN

The Region of Waterloo supports programs, such as Travelwise, that encourage a behaviour change toward active transportation with the goal of reducing personal car use and encouraging human-powered travel.



Active transportation behavioural change strategies have the ability to benefit the Region of Waterloo by:

- Providing metrics to showcase changes in travel choice while establishing environmental impacts, quantifiable data and value in the community.
- Connecting pedestrians and cyclists to other sustainable modes by developing facilities and services, and by encouraging the use of these modes through education and marketing campaigns.
- Repositioning active transportation in the minds of Waterloo residents as convenient, accessible and safe.

The Behavioural Shift Action Plan identifies actions designed to achieve long-term behaviour change, provide measurable results and encourage social norming.

EX 6 PERFORMANCE MONITORING ACTION PLAN

Decision-makers need tangible tools to support policy implementation — to move from ideas to execution. A useful performance measurement process monitors progress, evaluates deficiencies and strengths and reports on actions. Reporting is a key aspect of performance measurement, since the knowledge resulting from monitoring and analysis is only useful if decision makers and stakeholders are aware of it. Reports presenting information in a way that effectively communicates successes and ongoing challenges can capture the attention of community groups and the media, helping to raise public awareness of results achieved and the need for continued action.

The Active Transportation Performance Monitoring Action Plan recommends indicators to measure progress, an expanded data collection program and reporting. Key performance objectives and indicators for Walk Cycle Waterloo Region (ATMP) along with additional details such as sample period, location for data collection, source of data and sample frequency are provided in this action plan.

Several new data collection initiatives are suggested to support performance monitoring needs. Many of these initiatives dovetail well with existing programs and others support other areas of this plan, For example, the **Behavioural Shift Action Plan**. Automated bicycle counters such as those shown below are a key part of this action plan.





EX 7 DELIVERING THE PLAN

Four phases of activity are recommended for implementing the Regional Walking and Cycling Network. These four phases are:

- 1. Short Term: All projects that fall within the first five years of the TCP and the highest priority infill projects.
- 2. Medium Term: All projects that fall within the second five years of the TCP and the next highest priority infill projects.
- 3. Long Term: Includes projects that are not financially feasible on their own and need to wait for a road project to complete, projects on roads that have recently been (re)constructed, and upcoming projects where there is no opportunity to incorporate AT elements.
- 4. As development occurs: There are several projects, including some that overlap with TCP projects, which are not needed in the short term as there is no local demand. In these cases care should be taken to ensure that AT facilities can be added easily in the long term as development occurs.

The projects that are included in the first two phases are considered part of the "ten year network". Those that fall in the last two phases are considered as part of the "beyond ten year network". This status as a "long term" project reflects the current expectation of opportunity to implement, not the preferred timeline. A long term project is not of no importance to the network. If any opportunity to implement a long term project presents itself it should be taken.

The ten year network is recommended to be delivered through the Transportation Capital Program (TCP) as follows:

- Update the TCP to include the active transportation facilities in the TCP action area, resulting in potential additional expenditures of \$27.5 M over the current expenditure of \$42.5 M on active transportation facilities in the TCP.
- Integrate the active transportation facilities in the Gaps / Infill action area into the TCP with a
 potential expenditure of \$20.4 M
- Adjust phasing of projects in all four phases on an ongoing basis to take advantage of any
 opportunity to implement AT infrastructure
- Include a potential annual budget of \$120,000 in the TCP for the implementation of the Fix-it List and the Strategic Signage Action Plan for signing existing cycling facilities and trails.



Exhibit 9.3 summarizes all costs discussed above and is reproduced below.



February, 2014

	Ten Year	Beyond Ten	Overview
2013 TCP (\$893.2M)	\$27.5M	not yet planned	Existing: \$42.5M (4.8%) Total: \$69.9M (7.8%)
Gaps / Infill	\$20.4M	\$35.5M	Total Infill: \$55.9M
Special Study Areas	\$6.5M	\$7.5M	Total Special: \$14.0M
Fix-it List and Signage	\$1.2M	to be determined	Fix-it List: \$80K/year Signage: \$40K/year
Overall Network	\$55.5M	\$43.0M Long Term Total: \$141.0 ear Total RDC: \$ te Breakdown: Tax: \$2	Existing TCP: \$42.5M M 25.6M 9.9M



EX 8 POLICY UPDATES

UPDATES TO THE SIDEWALK POLICY

The Municipal Act assigns the responsibility for the construction and maintenance of sidewalks in the boulevard along Regional roads to the lower tier municipalities unless other agreements are made. In the Region of Waterloo, the Area Municipalities maintain sidewalks and multi-use trails along Regional Roads and the Region's policy for sidewalks addresses cost-sharing policies between the Region and Area Municipalities for these facilities.

The ATMP recommends a general update to this sidewalk policy. Beyond minor editorial changes there are two key points that differ from the previous policy:

- The Region does not currently cover the full construction cost of a new boulevard multi-use trail. The change being recommended would see the full capital cost of a multi-use trail along a Regional Road covered by the Region in the same manner as sidewalks are currently funded.
- The design of sidewalks and multi-use trails currently follows the general requirements of the Area Municipality within which they are constructed. Under the updated policy, these facilities would be built to Regional standards along Regional roads.

CYCLING MASTER PLAN POLICY UPDATES

The Cycling Master Plan (CMP) approved in 2004 included nine policies for the Region of Waterloo to pursue. These policies were reviewed and updated to fit within the Walk Cycle Waterloo Region plan. Some highlights of the policy updates are:

- This plan recognizes that bicycles on the road are considered vehicles under the Highway Traffic Act. Walk Cycle Water Region is based on the principle of attracting and encouraging a variety of cyclist types from the "interested, but concerned group", to the "enthused and confident" and the "strong and experienced". As such, design strategies must expand beyond the provision of conventional travel lanes and intersection treatments for all vehicles, and recognize the need for treatments that improve on the comfort, convenience and safety of cyclists.
- The Walking and Cycling Network Action Plan includes a Fix-It List designed to address localized improvements that are not addressed specifically through implementation of the recommended network. It is intended to address, through an annual program, localized hazards, issues or problems that require physical or operational repairs.

New Recommended Policies

Other issues raised by the Project Team during the Walk Cycle Waterloo Region study requiring policy direction are: e-bike use on trails, conflicts on multi-use trails, trip planning for active transportation modes and pilot projects to test new design ideas. This plan includes policies to:

- Review and co-ordinate updating of area municipal by-laws, as required, pertaining to permitted users of the Walking and Cycling Network, having regard to Provincial regulations on e-bikes and other new vehicles. The by-laws should reflect and complement the existing MTO regulations on new "active transportation vehicles".
- Determine strategies to address conflicts along trails arising from use approaching capacity when the trails cannot be upgraded (widened), placing priority on those multi-use trails that form part of the Recommended Walking and Cycling Network.
- Develop a region-wide walking and cycling map separate from the GRT Transit Route Map that can illustrate the variety of facilities available for active transportation and recreation, promote services available in the Region for cyclists and pedestrians and incorporate basic safety and promotional messages.



EX 9 PART 2: GREEN CHAPTER DESIGN GUIDE

The Region of Waterloo is committed to implementing accessible pedestrian facilities that meet the regulations of the Accessibility for Ontarians with Disabilities Act, and advance best practices to make walking convenient. Walk Cycle Waterloo Region **Part 2: Green Chapter Design Guide** outlines some of the practices that can be used to meet basic pedestrian needs, such as sidewalk width, accessibility requirements and convenient crossings. Land use types, densities and building form, landscaping and other elements will influence the pedestrian trip. It is important for the Region of Waterloo and Area Municipalities to consider these broader elements that influence the walking trip as future policies and programs are developed and implemented.

A cycling network made up of a variety of different types of cycling facilities suitable for different users (experienced, confident and casual cyclists) and fitting local context is necessary to achieve more trips by bicycle. Different types of cycling facilities are recommended for rural and urban Regional road classifications based on whether or not shared space, separate space or segregated space for cyclists will create a safe, comfortable and convenient ride. Descriptions of the types of cycling facilities and general design criteria are presented in **Part 2: Green Chapter Design Guide**.

Together, these two aspects of the design guide provide planning and design guidance for creating safe, convenient and comfortable space for pedestrians, cyclists, and other active transportation modes along Regional roads throughout the Region of Waterloo. For practices that are new to the Region of Waterloo, it is recommended that consideration be given to the experience of other jurisdictions around the world and to risk management. If a practice is found to be appropriate, the Region of Waterloo should implement a pilot project. The pilot would be monitored and followed by an analysis to determine if continued use of the practice is justified. For those practices that differ from those regulated by Ontario's Highway Traffic Act or are prohibited by the Act, the Region of Waterloo can pursue a "pilot project" under the Act to research, test or evaluate those matters as has been done in other jurisdictions.

EX 10 WALKING AND CYCLING FORWARD

Walk Cycle Waterloo Region, the Region of Waterloo's plan for making it easier to walk and bike in our community, requires shifting transportation priorities in order to achieve an integrated and connected walking and cycling network.

The Walking and Cycling Network is complemented by a suite of actions to encourage, promote and educate the public about positive walking and cycling behaviour. In addition, minor revisions to existing sidewalk and cycling policies, along with new policy directions would continue to build a strong foundation for decision-making at the Region. A somewhat expanded data collection program would help measure indicators of success for an annual performance monitoring report. Finally, best practices in pedestrian and cycling facility design are introduced to help make walking and cycling safer, more convenient and comfortable. These transportation improvements that can benefit all road users are needed in order to address the perception of safety and comfort so that residents and visitors to the region who are interested in walking and cycling but concerned about safety are encouraged to try it as a viable option to get to where they need to go.



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1 INTRODUCTION

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1.1 WHAT IS ACTIVE TRANSPORTATION?

Active transportation is any form of human powered transportation. It includes walking, cycling, using a wheelchair, in-line skating, skateboarding or any other mode of transportation that involves physical activity.

For the purposes of this Active Transportation Master Plan the focus will be on pedestrians and cyclists, hence the name "Walk Cycle Waterloo Region".

Throughout this plan the term pedestrian includes walkers, joggers or runners, wheelchair users or any other person using a mobility assistive device. The term cyclist includes all types of cyclists on all types of bicycles. And, while not addressed specifically, the goal of this plan is to improve conditions for other active travellers such as in-line skaters or skateboarders by providing high quality walking and cycling networks.

1.2 WHY ACTIVE TRANSPORTATION?

People are active for many different reasons. They may choose to be active for reasons of health, to engage socially, to protect the environment, or to make a purposeful (or utilitarian) trip.

Physical activity is associated with a 31% reduction in the risk of premature death by any cause¹. The estimated total health care costs in Canada related to physical inactivity were \$6.8 billion in 2009².

The NEWPATH study recently conducted by Public Health found that 61% of those responding report that they would prefer to walk or bike rather than drive whenever possible. However, 86% of people report that they need a car to do many of the things they like to do. This disparity may be due to the infrastructure that currently exists in our neighbourhoods. About 72% of respondents indicated they would prefer to live in a neighborhood that has more space for walking and biking, even if this means less space for cars while only 32% of respondents indicated that their current neighborhood is like this.

People tend to choose how they will make a trip based on a variety of factors. These factors tend to follow one of three trends: safety, comfort and convenience. By providing a safe comfortable and convenient active transportation network the Region can make the choice to walk or cycle an easy one.

With our population expected to exceed 725,000 by 2031, we have committed ourselves to ensuring our growth is both compact and largely concentrated in existing built-up areas. Offering quality choices for pedestrians, cyclists and people with disabilities means that our roads and transit systems will function well as we continue to grow.

¹ Warburton D, Charlesworth S, Ivey A, Nettlefold L, Bredin S. (2010). A systematic review of the evidence for Canada's Physical Activity Guidelines for Adults. International Journal of Behavioral Nutrition and Physical Activity, 7:39) (http://www.ijbnpa.org/content/7/1/39)

² Janssen I. (2012). Health care costs of physical inactivity in Canadian Adults. Applied Physiology and Nutrition Metabolism, 37. Doi:10.1139/H2012-061



1.3 THE REGIONAL TRANSPORTATION MASTER PLAN

Walk Cycle Waterloo is an Active Transportation Master Plan (ATMP) for the Region of Waterloo. This plan addresses one of the key actions recommended as part of the Regional Transportation Master Plan (RTMP):

• Update the Cycling Master Plan and develop a Pedestrian Master Plan to create an Active Transportation Plan.

The RTMP plans for the transportation needs of the region until 2031 by employing a strategy that focuses on three key areas:

- Building a Rapid Transit system and enhancing conventional transit service.
- Increasing the number of people who choose to walk and cycle.
- Constructing strategic road projects to serve growing automobile traffic.

Each of these three key areas focuses on a different mode of transportation (transit, active, private automobile). The RTMP plans for each of these modes to be used in different proportions. These proportions are known as "mode shares" and represent the percentage of people using each of these three primary modes to get around in a typical afternoon.

A 2006 survey estimated that 7.8% of people travelling in a typical afternoon were walking or cycling. The RTMP has a goal of increasing this active mode share to 12% by 2031. This "12% mode share" target is mentioned throughout Walk Cycle Waterloo Region as the driving goal for this plan.

1.4 THE VISION

Walk Cycle Waterloo Region is the Region of Waterloo's plan for making it easier to walk and cycle in our community. By promoting and integrating active forms of transportation, Walk Cycle Waterloo Region will help to achieve the Region's "Vision for a Sustainable and Liveable Waterloo Region" articulated in part by these excerpt from the Regional Official Plan:

"[to be] an **inclusive, thriving, and sustainable** community committed to maintaining harmony between rural and urban areas and fostering opportunities for current and future generations"

and

"[to] plan and manage **integrated**, **accessible and safe** multi-modal transportation systems that provide transportation choice, and promote **sustainability**, a **healthy** population and the effective movement of goods"

Creating a more walkable and bike-friendly environment fits with this vision for the community and transportation system to be inclusive, thriving, sustainable, integrated, accessible, safe and healthy. The Regional Transportation Master Plan already sets the framework for the plan:



- **Optimize the Transportation System:** Make the most of what exists: preserve and maximize the use of facilities and services avoid or defer the need for new infrastructure that does not support the other goals.
- **Promote Transportation Choice:** Provide and maintain a transportation system that offers competitive choices for moving people and goods in an integrated and seamless manner while minimizing single occupancy vehicles trips.
- **Foster a Strong Economy:** Provide a transportation system that supports the retention of existing businesses and attraction of sustainable economic activity.
- **Support Sustainable Development:** Propose and maintain a transportation system that supports sustainable growth in both urban and rural areas and reduces transportation contributions to climate change.

The Regional Growth Management Strategy is a long-term strategic framework which identifies where, when, and how future residential and employment growth will be accommodated. With our population expected to exceed 725,000 by 2031, we have committed ourselves to ensuring our growth is both compact and largely concentrated in existing built-up areas. To provide greater transportation choice, the Regional Growth Management Strategy included a recommendation that:

The Regional Official Plan be amended to build on the directions of the RGMS, the Transportation Master Plan, and the Cycling Master Plan to establish policies which facilitate the increased use of transit and cycling facilities, and pedestrian movement through the development approval process

The Region has committed to ensuring that the health and social benefits of an active lifestyle inform transportation planning and design decisions. Generally, priority for travellers will be given in the following order: walking, cycling, public transit, carpooling and other smart commuting strategies, and then driving alone (single occupant vehicles). However, local context will influence transportation design.

1.5 THE GOAL

The current mode share for walking and cycling, the percent of PM peak hour trips made by walking and cycling, in the Region is 7.8%. In the Regional Transportation Master Plan, the Region has set a target to reach a 12% mode share for walking and cycling by 2031.

To move from 8% to 12% active mode share by 2031.

The 12% mode share target is based on complementing the transit mode share in the RTMP and minimizing the road expansion requirements over the next 20 years.



1.6 WHO IS THE PLAN FOR?

Walking is the number one reason why people living in the Region of Waterloo believe they drive less now compared to ten years ago. In addition, the 2006 Participation and Activity Limitation Survey found that over one in seven people in Ontario reported having an activity limitation. This rate increased with age (more than half the population 75 and older).

Filling in missing links in a walking network, making road crossings more convenient, and creating accessible pedestrian facilities would make it more convenient and enjoyable for people to take short trips by walking.

Research³ has shown that a majority of people would choose to cycle more if they could take a route that felt safe, comfortable and convenient. To encourage more trips by bicycle, it is important to provide cycling facilities that are attractive to the segment of the population that is interested in cycling but concerned about safety.⁴

Walk Cycle Waterloo Region looks at the people who live, work, study and play in the Region and considers where there is the potential for them to choose walking and cycling for short trips. The walking and cycling networks and supportive policies developed in this plan are designed to encourage cycling and walking in our communities.

1.7 THE PLAN

Walk Cycle Waterloo Region was developed through a study process that involved Regional staff and Councillors, Area Municipal staff, stakeholders and members of the public. It is through their combined efforts that a comprehensive and feasible plan is recommended. The **Study Process and Consultation** is summarized in Chapter 2. Additional information on consultation is provided under separate cover.

Chapter 3 Active Mode Facilities: Considerations and Criteria introduces the elements that make up the Walking and Cycling Network. Additional design guidance and references for providing active transportation facilities along Regional roads are provided in **Part 2: Green Chapter Design Guide**. It is intended to supplement existing design guidelines such as *The Blue Book* and the *Context Sensitive Regional Transportation Corridor Design Guidelines*.

Walk Cycle Waterloo Region has five Action Plans intended to help the Region of Waterloo achieve the vision and goal of increasing the mode share for walking and cycling:

• Chapter 4: **Network Action Plan** — This Action Plan demonstrates how delivery of the Recommended Walking and Cycling network could be coordinated with the current 10-year Transportation Capital Program (TCP). It also includes Gap / Infill projects to complete the Walking and Cycling Network that are not currently associated with transportation projects in the Transportation Capital Program. In addition, a Fix-It List of local issues and barriers that

³ Dill, Jennifer, "Bicycling for transportation and health: the role of infrastructure." Journal of Public Health Policy, 2009, pp. S-95-S110. Meghan Winters and Kay Teschke, "Route preferences among adults in the near market for bicycling: findings of the cycling in cities study." American Journal of Health Promotion, Sep-Oct 2012, 25(1), pp. 40-7. Winters, Machan, Michael Praver, Elegandre M, Setter and Kay Teschke, "Puilt anvironment influences on healthy transportation."

Winters, Meghan, Michael Brauer, Eleanor M. Setton and Kay Teschke, "Built environment influences on healthy transportation choices: bicycling versus driving." Journal of Urban Health, December 2012, 87 (6): pp. 969-993. Jennifer Dill and Nathan McNeil, "Four types of cyclists? Testing a typology to better understand bicycle behaviour and potential."

⁴ Jennifer Dill and Nathan McNeil, "Four types of cyclists? Testing a typology to better understand bicy Portland State University, Working Paper, August 10, 2012. Geller, R. "Four Types of Cyclists," Portland Bureau of Transportation, Portland, OR, 2006, http://www.portlandoregon.gov/transportation/article/264746, Accessed June 23, 2012.



need to be addressed is recommended. It lists localized improvement projects that would contribute to an increased number of trips made by walking and cycling. Special Study Areas are also indentified to highlight projects that require further consideration.

- Chapter 5: **Strategic Signage Action Plan** This Action Plan considers way-finding and Regional destination signage for pedestrians and cyclists. It was developed in collaboration with an Area Municipal working group.
- Chapter 6: Winter Network Action Plan This Action Plan provides recommendations to update current snow clearing practices in order to enable walking and cycling all year round.
- Chapter 7: Behavioural Shift Action Plan This Action Plan provides a review of current walking and cycling programs and suggests several strategies to improve behaviour and education programming.
- Chapter 8: **Performance Monitoring Action Plan** This Action Plan lays out the strategies to measure success, refine efforts and report progress to decision-makers and the public.

While the estimated costs of the recommended walking and cycling network are identified in Chapter 9: **Delivering the Plan** funding the plan is not addressed. Financing the plan is a challenge that will be addressed over the course of 2014 through the development of an ATMP implementation plan. This plan, which would be subject to council approval, would identify a range of financing options and recommend a plan to fund the ATMP costs.

The Region of Waterloo currently has approved policies on sidewalks, cycling and multi-modal transportation in various documents. These policies are reviewed in **Chapter 10: Additional Policy Direction**, some are updated and new policies are recommended where needed.

The final chapter (Chapter 11) provides a **Summary of Recommendations** from Walk Cycle Waterloo Region compiled into one section.



2 STUDY PROCESS AND CONSULTATION

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2.1 ABOUT THE PLAN

The Active Transportation Master Plan is divided into two main parts. Part 1: Walk Cycle Waterloo Region contains the main body of the plan and includes the following action plans:

- Network Action Plan (Chapter 4)
- Strategic Signage Action Plan (Chapter 5)
- Winter Network Action Plan (Chapter 6)
- Behavioural Shift Action Plan (Chapter 7)
- Performance Monitoring Action Plan (Chapter 8)

Each action plan is intended to be a standalone reference for the topic area covered; action plans can be read with minimal reference to the remainder of the Walk Cycle Waterloo Plan.

Chapter 9 discusses how the Region will approach **Delivering the Plan**. The total costs and phasing are outlined. An ATMP Implementation Plan is recommended to determine how the funding requirements of the plan will be met.

Other policy directions that do not fall into the listed action plans are discussed separately in **Chapter 10: Additional Policy Direction**.

Recommendations from each action plan are summarized in Chapter 11: **Summary of Recommendations**.

Chapter 3 provides a brief synopsis of the recommended pedestrian and cycling facility design considerations and criteria. However, **Part 2: Green Chapter Design Guide** is intended present design ideas in practice or to be considered by Regional staff in the implementation of the Regional Walking and Cycling Network. **Part 2: Green Chapter Design Guide** is separate from the main plan for two reasons: one, it will serve as a quick reference for facility design; and two, it will be updated more by staff as best practices and industry standards evolve as opposed to formal amendments approved by Regional Council.

2.2 STUDY PROCESS

The Active Transportation Master Plan Study was initiated in August 2011. The study process initially proposed nine action plans to be developed under the direction of a Technical Team and a Project Team, with input from the public, Region and Area Municipal staff and community stakeholders. Consultation with the public and stakeholders was an integral part of preparing the plan. **Exhibit 2.1** shows the project timeline and consultation strategy. The Project Team and Technical Teams as well as the consultation events are described in the following sections.

Over the course of the study, the proposed nine action plans evolved into the Walk Cycle Waterloo Region Plan with five action plans. As part of this evolution the Walking and Cycling Network Action Plan combined three of the original action plans into one: the Transportation Capital Program Action Plan, the Gaps / Infill Action Plan, and the "Fix-It" List Action Plan (previously the Local Projects of Regional Significance).





Exhibit 2.1: The Active Transportation Master Plan Study Process

2.2.1 THE TECHNICAL TEAM

The Technical Team was comprised of staff from various Regional departments identified to provide technical guidance to the development of the plan and to have responsibility for the implementation of, and thus the outcomes of the study. The members included staff from the following divisions: Transportation Planning, Design & Construction, Transportation Engineering and Operations & Maintenance. Key Area Municipal staff representatives from the project team were also invited to join the Technical Team.

There were three meetings with the Technical Team over the course of the study in January, May and July of 2012. Meetings focused on understanding the Transportation Capital Plan and currently planned active transportation facilities, developing the methodologies to identify infill and gaps as



well as local projects of regional significance and regional destinations, and preparing for the inhouse professional development workshops. The Technical Team played an integral role in advising the study team about funding mechanisms, current winter maintenance practices, the feasibility of pilot projects, and providing feedback to the active transportation design guidelines and signage strategy.

2.2.2 THE PROJECT TEAM

The Project Team included two Regional Councillors, Jane Mitchell and Geoff Lorentz, representatives from the Area Municipalities, and staff from broader Regional departments and divisions of interest such as Public Health and Communications.

Each of the seven area municipalities was invited to participate on the project team and was circulated on project team correspondence. Cambridge, Kitchener, Waterloo and Woolwich regularly attended the project team meetings.

The role of the Project Team was to direct the study process. The Project Team gave direction regarding the visions, goals and objectives for the study and the public consultation strategy. All background data were provided by the Project Team. The Project Team was consulted for input into all action plans, including the development of the Walking and Cycling Network, Strategic Signage, Behavioural Shift Programming, the Winter Network and Performance Monitoring.

There were seven Project Team meetings: in August, October and December, 2011; in April, August and October 2012; and in September 2013.

2.2.3 THE CONSULTANT TEAM

The Region of Waterloo retained IBI Group with Nelson Nygaard and UrbanTrans to undertake the study. They undertook the technical analyses, led many of the study meetings, drafted the ATMP document and facilitated the consultation events in co-operation with Regional staff.

2.3 PUBLIC CONSULTATION

2.3.1 PUBLIC CONSULTATION CENTRE NUMBER 1

The first series of public consultation centres (PCCs) was held in early November 2011 in Cambridge, Kitchener and Waterloo. The purpose of the first PCCs was to introduce the project. An open house and workshop format were used as a forum to update the public about the current status of active transportation planning in the Region of Waterloo including existing vision, objectives, policies and planning practices. Displays summarized the study purpose, current policies and maps of the existing network and planned walking and cycling facilities in Area Municipal plans. This information was reiterated to attendees in a short presentation from the study team followed by a group discussion in a "world café" format. Over 150 people attended the first PCCs.

The "world café" portion of the PCCs consisted of asking the attendees to discuss five key questions directly related to the development of the Walk Cycle Waterloo Region Plan; those questions are listed in **Exhibit 2.2**. In addition, comment sheets were available at the PCCs and on the project website <u>walkcyclewr.regionofwaterloo.ca</u>, where all PCC material was posted.



Exhibit 2.2: World Café Discussion Workshop



Outcomes from the first PCC were summarized in a newsletter to the public. The workshop material (i.e. presentation and question sheets) and newsletter are provided under separate cover.

2.3.2 PUBLIC CONSULTATION CENTRE NUMBER 2

The purpose of the second public consultation centre (PCC) was to provide an update on the progress of the study including a draft active transportation network, and to solicit more input to feed into developing the remainder of the plan. It was held on Monday, June 5, 2012 at the University Of Waterloo School Of Pharmacy. This event was co-hosted with the first PCC for the King • Victoria Multi-Model Transportation Hub Study as well as the kickoff event for the Commuter Challenge, sponsored by Sustainable Waterloo Region



and the City of Kitchener. Each hosting party provided an update on their respective projects, which was then followed by guest speaker, Hans Moor of the Dutch Embassy and President of Citizens for Safe Cycling, Ottawa.

Over 120 people attended the second PCC. Displays showed draft maps of the walking and cycling network along with a preliminary "Fix-It" List, and ideas for way-finding signage. Feedback was solicited about missing links in the network, other potential "Fix-It" locations and priorities in the network. Comment forms were distributed to the public. All PCC materials were posted on the project website <u>walkcyclewr.regionofwaterloo.ca</u>, including an information booklet and video



presentation that summarized progress to date. All PCC materials are provided under separate cover.

2.3.3 PUBLIC CONSULTATION CENTRE NUMBER 3

The third series of public consultation centres was held in November 2012 with events in Cambridge, Kitchener and Waterloo. The purpose of the third public consultation centres (PCCs) was to present the draft report for Walk Cycle Waterloo Region. The PCCs were held in a drop-in format between 4:00 p.m. and 8:00 p.m. Displays for each section of the draft ATMP and maps were available for review along with an information booklet summarizing the study recommendations and a comment form. Feedback on the draft recommendations was solicited in three ways: by talking with the project team at the PCCs, through the comment form available at the PCCs and on the study web site, and through an on-line survey. Several pointed questions were asked about specific sections of the draft as well as open format questions to capture any other comments.

Five key trends were identified from the feedback and are as follows:

- 1. Complete the network, fill the gaps and fix problem areas.
- 2. Provide the funding to get these projects built as soon as possible.
- 3. Build segregated cycling facilities.
- 4. Improve winter maintenance of sidewalks, trails and cycling facilities; winter maintenance needs to be done on par with roads or better and sidewalk clearing should be done by the Area Municipality.
- 5. Educate (programs and school curriculum).

Approximately 120 people attended the third round of public consultation meetings.

2.3.4 PUBLIC INPUT MEETING

A Public Information Meeting of the Regional Planning and Works Committee was held on October 24, 2013. Feedback from that meeting included concerns about cycling facility and sidewalk width, desire to see more off-road cycling facilities, walking and cycling mode shares that are not aggressive enough, lack of illumination and winter maintenance for active transportation and desire to improve roundabouts for cyclists. Changes have been made in the ATMP to clarify many issues of the issues identified. Other issues will be addressed during the development of the Implementation Plan or through other Regional departments.

2.3.5 COMMENTS FALLING OUTSIDE REGIONAL JURISDICTION

Throughout the public consultation process a wide variety of comments were received that fell outside the jurisdiction of the Region. Some examples of this are:

- Comments related to municipal facilities.
- Comments related to maintenance of sidewalks and trails.
- Road crossings or connections over municipal or provincial infrastructure.

While not specifically addressed within Walk Cycle Waterloo Region these challenges continue to be addressed elsewhere:

- Ongoing discussion and collaboration with Area Municipalities on active transportation infrastructure and connectivity
- Continuing discussions on sidewalk and trail ownership and maintenance
- Future collaboration through the recommended Winter Maintenance pilot project



 Cooperation with Area Municipalities and the Ministry of Transportation of Ontario (MTO) to provide active transportation infrastructure and promote best practices in design.

2.4 STAKEHOLDER CONSULTATION

2.4.1 ACTIVE TRANSPORTATION ADVISORY COMMITTEE

The Active Transportation Advisory Committee (ATAC) is an advisory committee of Regional Council through the Commissioner of Planning, Housing & Community Services to the Planning and Works Committee. The role of the ATAC is to assist the Region in developing new active transportation policies, strategies and programs including the Walk Cycle Waterloo Region Plan. The ATAC consists of twelve appointed members, which includes two Regional Councillors.

Members of the project team met with the ATAC on April 18, 2012; the committee was provided with the opportunity to advise the project team regarding: the winter network, the Trans Canada Trail, barriers to active transportation throughout the Region, education for all road users, way-finding and bike parking. The barriers identified during this meeting were particularly helpful in initiating the Fix-It List.

2.4.2 PROFESSIONAL DEVELOPMENT WORKSHOPS

Two professional development workshops were held for the project team and stakeholders on best practices for designing pedestrian and cycling facilities. Both workshops were hosted by the Region, featuring speakers Norma Moores, P.Eng., IBI Group and Michael Moule, P.E., Nelson \ Nygaard; both speakers are instructors for the Smart Growth America's Complete Streets Workshops.

The pedestrian facilities workshop was held on March 22, 2012 and consisted of a presentation and walking tour in downtown Kitchener in the morning, followed by a seminar in the afternoon. An overview of the Ontarians with Disabilities Act, Accessibility for Ontarians with Disabilities Act and associated built environment standards was presented, along with best practices in countermeasures for pedestrian crossing crashes, and accessible sidewalks and curb ramps.

The cycling facilities workshop was held on April 18, 2012 and consisted of a presentation and cycling tour from downtown Kitchener to the University of Waterloo



in the morning, followed by a seminar in the afternoon. Best practices were presented on bikeway design for arterial roads, both conventional and innovative.



2.4.3 GRAND RIVER ACCESSIBILITY ADVISORY COMMITTEE

Regional staff met with representatives of the Grand River Accessibility Advisory Committee (GRAAC) in December 2012. Staff also provided access to the complete draft plan and specifically highlighted the pedestrian components of the plan for review and comment. As a result of this meeting, several clarifications and small design changes have been incorporated into the plan.

2.5 AGENCY AND AREA MUNICIPAL CONSULTATION AND COLLABORATION

In general, the agency and Area Municipalities were consulted through the Project Team and the Technical Team. Outlined below are several other meetings where other Regional departments and Area Municipalities were consulted over the course of the study.

2.5.1 ACTIVE TRANSPORTATION REVIEW DESIGN AND CONSTRUCTION STAFF MEETING

Key Regional staff met on May 17, 2012 to discuss and review in detail the Region of Waterloo's practice on paving the shoulder of rural roads and the width required to accommodate cyclists, and to consider selection criteria for cycling facilities on urban Regional roads.

2.5.2 AREA MUNICIPAL WALKING AND CYCLING PLANS

As the recommended network was developed, Area Municipal networks and plans were considered to ensure a well connected network throughout the region. These plans included:

- City of Cambridge Trails Master Plan
- City of Cambridge Bikeway Network Master Plan
- City of Kitchener Multi-use Pathways and Trails Master Plan
- City of Kitchener Cycling Master Plan
- City of Waterloo Transportation Master Plan

2.5.3 NETWORK REVIEW MEETINGS

A series of meetings were held in July 2012 with staff from each of the Area Municipalities to gain their input on the draft Walking and Cycling Networks. Their feedback was incorporated prior to the Project Team endorsing the networks for presentation at the last PCCs.

These meetings built on the work completed to incorporate and consider all Area Municipal facilities in the design of the overall recommended walking and cycling networks. The Region will continue to collaborate with the Area Municipalities to create a seamless walking and cycling experience throughout the region.

2.5.4 SIGNAGE STRATEGY MEETINGS

A Working Group initiated by the City of Waterloo with representation from the Region of Waterloo, and Cities of Cambridge, Kitchener and Waterloo worked on developing a system of way-finding and tourism-related signage for trails in the region. Members of the ATMP project team met with this group on two occasions to gain their input on the proposed way-finding signage strategy as part of the Walk Cycle Waterloo Region plan. The results of these meetings are incorporated in the Strategic Signage Action Plan.



3 ACTIVE MODE FACILITIES: CONSIDERATIONS AND CRITERIA

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February, 2014

3.1 WALKING: A REASON TO DRIVE LESS

Expansion of the walking network in the Region of Waterloo is one action required to meet the Region of Waterloo's goal of increasing walking to 9.0% of all trips during the PM peak hour by 2031. The goal varies in the urban municipalities of Cambridge, Kitchener and Waterloo (to 8.0%, 9.2% and 10.7%, respectively). In the rural municipalities (North Dumfries, Wellesley, Wilmot and Woolwich), the walking mode share goal is 4.7%.

Walking is the number one reason why people believe they drive less now compared to ten years ago, as indicated by a survey conducted in 2007 shown in **Exhibit 3.1**.



Exhibit 3.1: Reasons for Driving Less⁵

In addition, the 2006 Participation and Activity Limitation Survey found that over one in seven people in Ontario reported having an activity limitation. Over the next 20 years, that number will rise as the population ages. The Accessibility for Ontarians with Disabilities Act (AODA) is intended to create a province where every person who lives or visits can participate fully. This includes creating accessible public rights-of-way for pedestrians with mobility, visual, hearing and cognitive impairments. Accessible pedestrian facilities in the Region of Waterloo's would help to remove transportation barriers for a significant portion of the population.

⁵ Ipsos Reid, "Region of Waterloo Transportation Master Plan Public Opinion Survey Final Report", 2008



3.2 ACCESSIBLE AND CONVENIENT PEDESTRIAN FACILITIES

Throughout this document the term pedestrian is used. This term is meant to be interpreted broadly and include those with mobility assistive devices including, but not limited to, wheelchairs and mobility scooters.

The Region of Waterloo has included pedestrian facilities in two key documents that influence the planning and design of Regional roads:

- *Context Sensitive Regional Transportation Corridor Design Guidelines*, Region of Waterloo, Final Report, June 2010
- *The Blue Book*: Region of Waterloo Draft Transportation Engineering Practice, Region of Waterloo, (updated regularly)

The above guides contain numerous guidelines and practices that benefit pedestrians. Part 2: Green Chapter Design Guide presents additional practices that address some of the finer details of creating accessible and convenient pedestrian facilities. Some of these can be considered for implementation in the Region of Waterloo based on the experience in other Ontario jurisdictions, while others may require pilot projects that research, test and evaluate their benefits in the Region of Waterloo. These best practices and initiatives include:

- Additional design criteria for accessible sidewalks based on Ontario's Design of Public Spaces Standards (Accessibility Standards for the Built Environment, O. Reg. 413/12, s. 6).
- Options for providing continuous, accessible sidewalks through driveways that take into consideration sidewalk width, boulevard width, curb height and available right-of-way.
- Accessible street crossings including curb ramps to bring the sidewalk to street level, and hazard indicators built into the walking surface to warn the visually impaired of entering a roadway.
- The placement of crosswalks within an intersection to balance crosswalk length, setback and curb ramp placement.
- Accessible pedestrian signal (APS) technologies that supplement conventional traffic control signals to assist pedestrians with visual impairments in crossing the road.
- Countermeasures and initiatives to create safe, convenient and easy to use pedestrian crossings of Regional roads at signalized intersections and non-signalized locations.

The *Context Sensitive Regional Transportation Corridor Design Guidelines* provide guidelines for sidewalk width based on corridor classification. The preferred widths range from 1.8m to 2.5m. Generally sidewalk widths should be increased where higher pedestrian activity is expected. The minimum width of 1.5m should only be used in tightly constrained or very low use areas and should never be curb-faced.

The Region of Waterloo should continue to be committed to implementing accessible pedestrian facilities that meet the regulations of the AODA, and advance best practices to make walking safe, comfortable and convenient.



3.3 CHARACTERISTICS OF PEDESTRIAN TRAVEL

Pedestrians differ from other modes of travel, presenting both opportunities and challenges:

- **Pedestrian travel is very "portable"** they can transition to other modes of travel with relative ease. They don't need, for example, storage facilities such as parking areas before they are able to change modes.
- Walking trips are short the majority of walking trips are less than 2.5 km in length; at an average walking speed of 4.3 km/h (1.2m/s), a 20 minute walk covers 1.4 km.
- Pedestrians generally seek the most direct route to destinations since walking trips are short and travel speeds much slower than other modes of transportation, barriers and indirect routes can be a significant deterrent to walking. Even out-of-the-way travel to use a crosswalk in order to get to a destination on the other side of a street can tempt crossing where crosswalks (and thus the right-of-way) are not provided. However, Ensuring that facilities are directly aligned with each other as they cross roads is also important as the visually impaired often use cues such as ramp direction or curb alignment to assist with positioning for street crossings.
- Pedestrians can travel many places that do not require formalized routes Compared to automobiles, transit and bicycles that require roads, or pathways for the later, pedestrians can and often do use short cuts or informal routes, alleyways, public plazas, routes through buildings or across private yards to get to their destination. However, this does not always apply to those with mobility impairments who rely on the standard design and cues of formalized facilities. Care must be taken to ensure that accessibility is not sacrificed to directness.
- Pedestrian travel tends to be more geographically contained in some areas compared to others In Waterloo Region, for example, large numbers of pedestrian trips are more likely to occur in business districts than along a suburban multi-use trail. The density, mix and proximity of land-uses within a walkable distance greatly influence the potential for walking trips.
- **Pedestrian travel is "organic"** the many unique origins and destinations of pedestrian trips with different formal and informal routes available between them result in a more organic, less organized, form of travel.
- Pedestrians are sensitive to the environment in which they walk they will, to a greater degree than other modes of transportation, enjoy the aesthetics, experience the weather, be distressed by noise levels or concerned over lighting, fear for their personal safety, communicate with greater ease with others and socialize as they walk. A journey by walking heightens ones awareness of the micro-environment around them.
- **Pedestrians have a wider range of abilities** This includes their physical abilities to balance and coordinate their movements with or without mobility aids; their cognitive abilities to interact with others, their environment and to way-find; and their abilities to see, hear and thus interpret or react to what is going on around them.

These unique aspects of pedestrian travel influence network planning and design. Short trip lengths, and the organic form of travel, imply that the location, frequency and convenience of crossings of corridors are as important as the corridors themselves. The wide range of abilities requires understanding of the elements that create an accessible corridor and easy to understand crossings. Their sensitivity to their surroundings requires providing more than just infrastructure that allows for travel, but an environment that is inclusive and appealing.

Walk Cycle Waterloo Region Part 2: Green Chapter Design Guide outlines some of the practices used to meet basic pedestrian needs, such as sidewalk width, accessibility requirements and convenient crossings. Land use types, densities and building form, landscaping and other elements will influence the pedestrian trip. The Region of Waterloo is encouraged to consider these broader elements that influence the walking trip as the Walking Network is implemented.


3.4 CYCLING NETWORK: A TRANSPORTATION PRIORITY

Expansion of the cycling network in the Region of Waterloo is one action required to meet the Region of Waterloo's goal of increasing cycling to 3.0% of all trips during the PM peak hour by 2031. This target varies in Cambridge, Kitchener and Waterloo to 1.9%, 2.7% and 4.5%, respectively. In rural areas, the target is 1.4%. The majority of residents agree with this effort, as indicated by a survey conducted in 2007 shown in **Exhibit 3.2**.



Exhibit 3.2: Priorities for Improvements; Cycling Results⁶

3.5 CHARACTERISTICS THAT GUIDE FACILITY DESIGN

The inclusive community that is envisioned by the RTMP must be designed to accommodate people of all types and abilities. Similar to the design of roadways for motorists, the design of active transportation facilities requires an understanding of the space occupied by the users when in motion and the buffer space required to ensure comfort and allow reaction time in response to other users. The operating space, buffer space, length and operating speed for various users are illustrated in **Exhibit 3.3**.

⁶ Ipsos Reid, "Region of Waterloo Transportation Master Plan Public Opinion Survey Final Report", 2008





Exhibit 3.3: Design Characteristics of Active Transportation Users

3.6 TYPES OF CYCLISTS

Numerous surveys have found that the number one reason people do not cycle as a mode of transportation is because of their fear of sharing the roadway with automobiles. This has been documented and reported in transportation literature across the United States, Canada and Europe. Addressing concerns about personal safety, interaction with motorized vehicular traffic and comfort is the key to creating a region where cycling is recognized as both a viable mode of transportation and a recreational activity.

Generally, cyclists can be divided into four categories based on their comfort level while riding on a roadway with traffic as outlined below and illustrated in **Exhibit 3.4**.



► •	7	2000.0	<u>†</u>		1
Strong & Experienced Will ride regardless of facilities. Trip distance is not an issue.	Enthused & Confident Comfortable in traffic with appropriate facili- ties. Prefer shorter trip distances.		Interested but Concerned Not comfortable in mixed traf- fic. Not attracted by bike lanes on busy streets. Will ride in low-traffic, low-speed conditions (boulevards.		No Way, No How Not interested in cycling at all.
<1%		7%	off-street).	60%	33%

Exhibit 3.4: Types of Transportation Cyclists by Proportion of Population⁷

Some communities are using these cyclist types to describe the potential for people to choose cycling as a mode of transportation or recreational activity. It is important to note that the lines between these categories are blurry. People across this spectrum may use a bicycle for recreation; but the goal here is to describe groups of people as they relate to purposeful trips.

- The **Strong and the Experienced** less than 0.5 percent of the population will ride regardless of the roadway conditions.
- The **Enthused and Confident** about 7 percent of the population is comprised of people attracted to cycling by the significant advances a city has made developing its bikeway network and supporting infrastructure. They may be comfortable sharing the roadway with motorists, but they prefer to do so operating in their own facilities. They are attracted to riding because of streets that have been redesigned to make them work for bicycling. They appreciate bicycle lanes and bicycle boulevards (local traffic-calmed streets).
- The Interested but Concerned approximately 60% of the population is curious about cycling. They are hearing messages from a wide variety of sources about how easy it is to ride a bicycle, and about the need for people to lead more active lives. They like riding a bicycle, remembering back to their youth, or to the ride they took last summer on a local trail, and they would like to ride more. But, they are afraid to ride. They don't like cars speeding down their streets. They get nervous thinking about what would happen to them on a bicycle when a driver runs a red light, or guns their cars around them, or passes too closely and too fast. Very few of these people regularly ride —less than 0.5 percent will ride through their neighbourhoods to the local park or coffee shop, but will not venture out onto arterial roads to the major commercial and employment destinations they frequent. They would ride if they felt safer on the roadways if cars were slower and less frequent, and if there were more quiet streets with few cars and paths without cars at all.
- **No Way No How** about one-third of the population is not interested in cycling at all, for reasons of topography, inability, or simply a complete lack of interest.

The separation between these four broad groups is not generally as clear-cut as described above. There is quite a bit of blurring between the "enthused," the "interested," and those not at all interested. However, it is a reasonable way to understand a city's existing and potential cyclists.

⁷ Adapted from Roger Geller, Bicycle Coordinator, Portland Office of Transportation, Four Types of Cyclists, http://www.portlandoregon.gov/transportation/44597?a=237507 (accessed July 2012), reflected in the 2008 Ipsos Reid, "Region of Waterloo Transportation Master Plan Public Opinion Survey Final Report"

The Region of Waterloo should focus on providing cycling facilities that serve the majority of residents and visitors to make cycling safe, comfortable and convenient.

3.7 CYCLING FACILITIES SELECTION

The types of bikeways suitable for different routes or corridors are foremost influenced by the speed and volume of motor vehicle traffic that affects the safety and comfort of cyclists. Although there is no formula for matching bikeways with roadways, selection criteria have been developed in many of the design guidelines. In addition, one must consider the local context including: types of users in the corridor and for the bikeway, the presence of on-street parking, intersection and driveway spacing and use, width of adjacent lanes, sight lines, topography, adjacent development function and form, environmental impacts, costs, maintenance, connecting bikeways and safety.

3.7.1 THE ROLE OF INFRASTRUCTURE IN CREATING A CYCLING CULTURE

Numerous research efforts have been undertaken to understand the role of cycling infrastructure in creating a positive cycling culture, where using a bicycle for daily trips is considered normal, and cycling trips make up a significant portion of all trips. One such study⁸ of Portland, Oregon, a city with a network of bike lanes, paths and bicycle boulevards (local traffic-calmed streets), concluded that:

- A network of different types of infrastructure appears necessary to attract new people to bicycling. For people concerned with safety and avoiding traffic, a well-connected network of bicycle boulevards, that is local traffic-calmed streets, may be more effective than adding bike lanes on major streets with high volumes of motor vehicle traffic.
- The role of bike lanes should not be dismissed in planning for a bicycle-friendly community. A disproportionate share of the bicycling occurs on streets with bike lanes, indicating their value to bicyclists. These facilities may provide important links in the network, connecting neighborhoods when low-volume streets cannot.

Buehler and Pucher⁹ analyzed the variation in bike commuting in 90 large American cities, with a focus on assessing the influence of bike paths and lanes on levels of cycling. The study confirmed that cities with a greater supply of bike paths (typically multi-use, not just for cyclists, in most of the cities studied) and lanes have significantly higher bike commute rates—even when controlling for land use, climate, socioeconomic factors, gasoline prices, public transport supply, and cycling safety. Both off-street paths and on-street lanes have a similar positive association with bike commute rates in U.S. cities.

⁸ Jennifer Dill, Bicycling for Transportation and Health: The Role of Infrastructure, Journal of Public Health Policy 2009, 30, S95–S110 r 2009 Palgrave Macmillan 0197-5897/09 http://www.palgrave-journals.com/jphp/journal/v30/nS1/full/jphp200856a.html (accessed July 2012)

⁹ Ralph Buehler and John Pucher, Cycling to work in 90 large American cities: new evidence on the role of bike paths and lanes, 6 July 2011 Springer Science+Business Media, LLC, July 2011 http://policy.rutgers.edu/faculty/pucher/ (accessed July 2012)



The Joint GPS Cycling Study data¹⁰ show cycling facility use by 400 existing cyclists in the Region of Waterloo as follows and illustrated on **Exhibit 3.5**:

- High to very high use on the Iron Horse Trail and sections of the Spur Line Trail
- High to very high use on shorter sections of Regional roads where no cycling facilities exist to access major destinations such as King Street in Uptown Waterloo and in Downtown Kitchener, and on Queen Street
- Moderate use on longer sections of Regional roads where no cycling facilities exist such as King Street / Coronation Boulevard in Cambridge, King Street and Ottawa Street in Kitchener, and Northfield Road, Lancaster Road, Weber Street, and King Street in Waterloo
- Moderate use on longer sections of Regional roads with bike lanes such as Parkhill Road in Cambridge, and Westmount Road, Columbia Street and Bridge Street in Waterloo.

Note that there were fewer trips recorded in Cambridge, perhaps due to the lack of cyclists living in Cambridge volunteering for the study, and there are fewer bike lanes on Regional roads in more central, less suburban, areas of Kitchener. These factors may affect the use of some routes over others.

The Region of Waterloo's Draft Transportation Engineering Practice, Section 20.5 (2009) provides information on counts of cyclists undertaken in October 2008 in 30 locations. Over 2,000 cyclists were counted. This data showed:

- Where there were boulevard multi-use trails (on Westmount and Fischer-Hallman), none of the cyclists used the trail.
- Where bike lanes are provided, more cyclists are on the road, compared to the sidewalk with this number decreasing slightly as the AADT increases.
- The volume of cyclists on a corridor appears to be related to the destination, not the type of cycling facility.

A cycling network should function well for existing cyclists, encourage casual cyclists to take more trips by bicycle, and attract new cyclists. New cyclists may become casual users or, ultimately, frequent, experienced users of the network. Cycling facility preferences among the variety of experienced and casual cyclists, youth, adult and senior cyclists, and non-cyclists will vary.

¹⁰ Joint GPS Cycling Study, Region of Waterloo and University of Waterloo (Jeff Casello and Kyrylo Rewa), GPS data for over 4,000 cycling trips recorded by 400 volunteers over two-week periods in spring, summer and fall 2010, and winter 2011



Exhibit 3.5: Where People Cycle





In order to reach the Regional Transportation Master Plan target of 12% of trips by active transportation, a cycling network made up of a variety of different types of cycling facilities suitable for different users (experienced, confident and casual cyclists) and fitting local context is necessary.

For example:

- Separate or segregated space, such as bike lanes, segregated bike lanes or boulevard multiuse trails are needed along arterial roads where sharing the roadway is uncomfortable for many cyclists.
- Segregated bike lanes, with higher capital and maintenance costs, are appropriate where there will likely be a higher number of existing and potential cyclists in an area with many destinations.
- Boulevard multi-use trails are to be avoided where the likely volume of pedestrians and cyclists may result in conflicts between these users, or where frequent driveways and side-streets degrade the safety and quality of the cycling trip.
- Removing on-street parking in a commercial area, or mature, healthy street trees to provide cycling facilities would likely be difficult to build support for while current cycling levels are low and cycling is viewed by the public as a second class activity. Street trees also provide shade which enhances the cycling facility and removal of trees may be counterproductive.
- Providing cycling facilities as part of a transformative project, such as major streetscape or rapid transit implementation, can focus support on the many elements of the plan, instead of a single trade-off decision over the cycling facility.
- Marking shared-use lanes can legitimize the use of arterial roads by cyclists in higher volume, lower speed environments where sidewalk riding is discouraged but the road is too narrow to provide separate or segregated space.
- Where appropriate create bi-directional facilities on one side of the road, particularly if the environment on one side of the street lends itself to higher quality facilities such as the presence of shade trees, greater separation from vehicle traffic or fewer driveways.

3.7.2 REGIONAL ROAD CLASSIFICATION

The *Context Sensitive Regional Transportation Corridor Design Guidelines* (CDG), June 2010, identifies six classes of urban roadways that may accommodate cycling. A 2013 update to the corridor design guidelines states that the need for facilities on all road types should reference the ATMP and that widths of facilities are as follows:

- **Community Connector** preferred width of 1.5m and a minimum of 1.25m
- **Neighbourhood Connector: Avenue** (note that the majority of Regional roads in urban areas are this classification) preferred width of 1.5m and a minimum of 1.25m
- Rural Connector preferred width of 1.5m and a minimum of 1.25m
- Neighbourhood Connector: Main Street preferred width of 1.25m
- **Residential Connector** preferred width of 1.25m
- Rural Village: Main Street preferred width of 1.25m

These widths are measured to the edge of the asphalt pavement and assume that the bike lane is adjacent a standard curb and gutter. Many guidelines actually measure the width of a bike lane to the face of the curb rather than the edge of the pavement. When comparing to standards with this approach the 0.3m gutter width should be added to the widths above.

The CDG also states that "The width of the cycling lane should be considered in conjunction with the width of the adjacent travel land and if there is no gutter present, a wider bike lane should be considered." This point should be interpreted to mean that in cases where a bicycle lane can not



take advantage of the width in an adjacent 0.3m gutter it should be wider than the preferred width mentioned above. The additional width should be roughly the 0.3m that the gutter provides. For example a 1.5m bike lane should be used on streets where a 1.25m bike lane is preferred but no gutter is adjacent the bike lane. Similarly a 1.8m bike lane would be preferred on a higher speed road with no gutter (however off road facilities are typically recommended in this scenario).

3.7.3 SELECTING SUITABLE CYCLING FACILITIES

A range of cycling facilities can be applied in various contexts, providing varying levels of separation from motorists and pedestrians. In North America, bikeway planning and design guides have lacked guidance on determining the most appropriate type of facility for a particular location. Planning and engineering judgement are critical elements in selecting cycling facilities within individual corridors.

Outside of North America, where segregated bike lanes or cycle tracks have been implemented for decades along with shared streets, advisory bike lanes and bike lanes, design guidelines have included graphs or tables to assist in bikeway selection. The Austroads Guide¹¹ notes that:

A key message [of the selection guide] is that the separation of cyclists from motor vehicles is not always required on local and collector roads that have traffic volumes less than 5,000 vehicles per day and speeds less than 40 km/h. In these circumstances, it is considered appropriate that adult cyclists may share the road with motor vehicles and younger cyclists may use the footpath where this is supported by appropriate road rules.

However, where space permits, it is still important to consider the provision of a separated bicycle facility such as a bicycle lane or a shared-use path. Road authorities should aim to comply with this guidance, particularly in greenfield situations, but the outcome may not always be optimal in retro-fit situations. In addition, note that experienced road cyclists are unlikely to use off-road facilities with low design speeds, even on routes where the road carries high volume, high speed traffic. On-road bicycle lanes or suitable road shoulders may still be required in addition to off-road facilities.

Consistent use of treatments and application of cycling facilities, however, allows users to anticipate whether they would feel comfortable riding on a particular corridor, and plan their trips accordingly. Although a consistent cross-section is generally desirable throughout a corridor, types of cycle facilities and their design along segments of the corridor may vary based on local context as long as the facilities are seamlessly integrated. Sound planning and engineering judgement in the choice and the design of the facility must be based on the type of user, the type of roadway, level of separation desirable between motorists and cyclists, as illustrated in Exhibit 3.6, along with a consideration for the local context.

The different types of cycling facilities recommended for rural and urban Regional roads are illustrated in Exhibit 3.7. Additional descriptions of the types of cycling facilities and general design criteria are presented Part 2: Green Chapter Design Guide along with a selected bibliography of planning and design guidelines.

¹¹ Cycling Aspects of Austroads Guide, Austroads Publication No. AP-G88/11, Austroads Ltd, March 2011, https://www.onlinepublications.austroads.com.au/items/AP-G88-11 (accessed July 2012)



Exhibit 3.6: Basic Considerations in Cycling Facility Selection



Initial Cycling Facility Selection

Regional and Area Municipal plans, community input and local context are to be used to refine facility recommendations for any particular corridor. In some Regional corridors, it may be desirable to construct cycling facilities to improve (i.e., lessen) interaction between cyclists and motorists than those recommended in the Walk Cycle Waterloo Region Plan to enhance the quality of the cycling trip and user comfort. Or, the minimum cycling facility width may be required where the right-of-way is narrow and where utilities, street trees, or other elements conflict with the preferred width and are too costly to modify. Separate or segregated space for cyclists on Regional roads is generally desirable due to the higher volume and speed of traffic. Shared space is only applicable on Regional roads in lower speed environments such as downtown districts. Suburban settings may accommodate shared-use with pedestrians on multi-use trails where user volumes are lower; not warranting the higher cost of providing segregated on-road cycling facilities and sidewalks. Segregated bike lanes are more desirable where moderate to high use is anticipated that justifies the additional cost of segregation and maintenance.

The "General Suitability of Cycling Facilities by Regional Road Classification" table should be used to inform the facility selection process on Regional Roads.



Exhibit 3.7: General Suitability of Cycling Facilities by Regional Road Classification



Segregated Space		
ed Bike Lane	Boulevard Multi-use Trail	
tion: delineators, median, ole, semi-mountable or Locate adjacent travel street parking, in	Suitable for back-lotted, suburban corridors with few driveways and side- street intersections. Locate on one or both sides of road	
70 km/h	≤70 km/h	
2.0 m wide bike lane passing within the lane ion width varies	Minimum 3.0 m to 4.0 m (preferred) wide trail Minimum 0.6 m wide separation to back of curb of roadway: 1.0 m preferred	
prevent motorists from on cyclists' space reatments required to icts at intersections and s to turn left to / from d side-street is low (< 1 per 300 m) regated bike lanes on o-way streets are not d (on one-way street are intenance effort or ay be required	 Cyclists share with pedestrians and other modes of active transportation Intersection crossing treatments required to mitigate conflicts at intersections and permit cyclists to cross without dismounting in crosswalks Recommended where the density of driveways and side-street intersections is low (< 1 per 300 m) Additional maintenance effort required compared to narrower sidewalks 	



4 NETWORK ACTION PLAN

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4.1 INTRODUCTION

The Region aims to reach a 9% mode share for walking and 3% mode share for cycling for PM peak hour trips by 2031. One of the most effective strategies to achieve this is to encourage more walking and cycling in the Region by providing a safe, comfortable and convenient network of facilities:

- **Safe:** In the case of active transportation, there is safety in numbers and numbers in safety. Building an environment perceived as safe for walking and cycling will encourage people to do it more often. More people cycling and walking results in a reduction in incidences and associated injuries or fatalities.¹² Together with best practices in design that promote safe walking and cycling practices, the network can reduce the ratio of injuries and fatalities to walking and cycling activity.
- **Comfortable:** An effort to create a comfortable environment is also needed for people who may be interested in walking and cycling. Comfort must be viewed from the perspective of users of all abilities and ages and includes considerations such as the provision of shade and user amenities.
- **Convenient:** People tend to choose walking and cycling when it is relatively more convenient than or as convenient as other options. Convenience is partly achieved by building comprehensive walking and cycling facilities and ensuring these facilities are well connected and link directly to destinations in the Region, making them more convenient, if possible, than the network and facilities for other modes. Convenient, safe and comfortable access and roadway crossings are as much a part of the network as the facilities themselves.

This section of Walk Cycle Waterloo Region describes the recommend walking and cycling network for the Region to implement over time. The primary aim of the network is to connect the tri-cities and rural communities within the townships by providing accessible routes for pedestrians and cyclists. The network is designed to not only accommodate the existing built environment, but also future land use and development patterns.

Some roads have not been identified with a specific facility as part of the walking or cycling network. However, when the opportunity arises, all regional roads should be considered for improving the walking and cycling network and environment. This may include the provision of facilities not identified, improving crossings or connections to adjacent facilities, providing active mode amenities, or any other context sensitive solution.

The Walking and Cycling Network Action Plan consists of the following two components:

- Development of the Walking and Cycling Network the approach taken in developing the walking and cycling network for the Region.
- Recommended Walking and Cycling Network the four elements or action areas that make up the network: the Transportation Capital Program, Gaps / Infill, the Fix-It List, and the Special Study Areas.

12 Jacobsen, P.L., "Safety in numbers: more walkers and bicyclists, safer walking and bicycling", Injury Prevention, 2003, 9: 205-209.

4.2 DEVELOPMENT OF THE WALKING AND CYCLING NETWORK

4.2.1 APPROACH AND RATIONALE

A traditional approach to developing an active transportation network involves starting with the existing conditions and building out the network towards key destinations, such as transit and mobility hubs, major institutions, and regional shopping centres. Other considerations, such as physical barriers and demand for active transportation, are also factored into the decision of where network links should be established and which type of facilities should be built. Once a conceptual network is developed, the details regarding how to build the network are determined.

The Recommended Walking and Cycling Network detailed in this report was instead developed through a less conventional "Follow the Pavers" approach; this approach starts with implementing active transportation facilities on roadways that are already planned to be resurfaced, reconstructed, widened or newly constructed. In the Region of Waterloo, the Transportation Capital Program (TCP) is the delivery mechanism for new and upgraded transportation facilities and, in this approach, building and expanding the active transportation network. Taking advantage of the efficiencies of implementing cycling and walking facilities in the planning, design and construction of these larger road projects is a prudent approach. Adding pedestrian or cycling facilities to a major roadway reconstruction project accounts for as little as a 2% to 5% increase in the overall project costs. Most importantly, it is through the TCP that the majority of the cycling facilities have been implemented since the Region of Waterloo's first cycling master plan was approved in 1994.¹³

The development of the Recommended Walking and Cycling Network revolves around four action areas:

- The **Transportation Capital Program** action area is intended to confirm the walking and cycling facilities that can be included as part of the other transportation projects in the TCP. This action area takes advantage of the opportunity to build the Recommended Walking and Cycling Network in conjunction with on-going transportation projects already planned by the Region over the next 10 years. It is the primary mechanism by which active transportation facilities have been built in the past and will continue to significantly expand the active transportation network in the future.
- The **Gaps** / Infill action area starts with an analysis of the gaps remaining in the network that are not addressed by the TCP. It outlines which walking and cycling facilities are recommended within Regional corridors that are not included in the current 10-year TCP. This action area aims to build these standalone active transportation facilities in order to create a connected network within a reasonable timeframe of approximately 10 years. It would piece together the isolated facilities implemented through the Transportation Capital Program action area.
- The **Fix-It List** consists of additional localized or "spot" improvements that fine-tune existing or planned facilities, but which do not alter the overall network: for example, upgrades to intersections, improvements to interchange ramp crossings or curb cuts to improve transitions between trails and bike lanes. This list focuses on other network enhancements that would further encourage walking and cycling by improving the safety, comfort and convenience of existing and future users.
- **Special Study Areas:** These areas are large, iconic, challenging or require unique solutions. Identified over the course of developing the ATMP these special projects require further study or special funding to complete.

¹³ The Plan was later updated and approved in 2004.

All four action areas together comprise the **Recommended Regional Walking and Cycling Network Action Plan**.

4.2.2 EXISTING REGIONAL NETWORK AND AREA MUNICIPAL PLANS

The existing Regional Sidewalk Network is 365 linear km, which comprises primarily sidewalks along one or both sides of Regional Roads. The existing Regional Cycling Network is 570 linear km. Both pedestrians and cyclists can take advantage of 17 linear km of boulevard multi-use trails along Regional roads. **Exhibit 4.1** shows the breakdown of each network by facility type.

Facility	Length of Facility	
Sidewalks along Regional roads (linear km on each side of the street)	365 km	
Subtotal: Sidewalk Network	365 km	
Boulevard Multi-Use Trail (linear km on each side of the street)	17 km	
Subtotal: Trails Network	17 km	
Bike lane	117 km	
Rural bike lane (typically 1.5 m wide)	247 km	
1.0m paved edge	206 km	
Subtotal: Cycling Network	570km	

Exhibit 4.1: Existing Regional Walking and Cycling Network

Maps illustrating the existing regional walking and cycling facilities are provided in **Exhibit 4.2** and **Exhibit 4.3**.¹⁴ Existing and planned cycling facilities that follow roadways under other jurisdictions are indicated on the map. These local facilities comprise the networks from the City of Cambridge's Bikeway Network Plan (2008) and Cambridge Trails Master Plan (2010), the City of Kitchener's Cycling Master Plan for the 21st Century (2010) and Multi-use Pathways and Trails Master Plan (2012), and the City of Waterloo's bikeways and trails network identified in their Transportation Master Plan (2011). The Townships of North Dumfries, Wellesley, Wilmot and Woolwich are supportive of efforts to encourage more walking and cycling, though none have prepared a trail or cycling master plan to date. The Township of Wilmot is in the process of preparing a trails master plan¹⁵. Please refer to these original documents for details and information on the types of facilities.

A number of Regional roads have 1.0 m paved edges with no curb in rural areas; local cycling clubs frequent the rural roads in the region. North Dumfries has a number of hiking trails in Conservation Areas and Agreement Forests, plus the multi-use Cambridge to Paris Rail Trail. Woolwich has eleven trails totalling more than 80 km, while Wilmot promotes the 104 km Avon Trail for hiking between St. Mary's and Conestogo. The 45 km-long Kissing Bridge Trail traverses Woolwich and Wellesley. Lastly, the Trans Canada Trail crosses through all of the Townships except Wilmot. In rural areas, cycling is generally not permitted on off-road portions of the Trans Canada Trail.

¹⁴ Note that existing sidewalks and boulevard multi-use trails are shown only along Regional rights-of-way to highlight the regional network. Similarly, for the cycling network map, facility type for bikeways is shown only along regional roadways.

¹⁵ The Corporation of the Township of Wilmot. Wilmot Trails. See http://www.wilmot.ca/departments-development-details.php?Wilmot-Trails-4













4.2.3 THE TRANSPORTATION CAPITAL PROGRAM

The Region of Waterloo plans for the long-term management of its transportation assets and the upgrading and expansion of its roadway network through the Transportation Capital Program (TCP). The TCP is a forecast of the annual capital expenditure on transportation projects over a 10-year period, which is updated annually as Regional Council approves the expenditures and associated revenues.

TCP projects are grouped into two categories: the Road System Rehabilitation Program (Base Program) and the Transportation Capital System Expansion Program (Expansion Program).¹⁶

4.2.3.1 EXPENDITURES AND REVENUE

The 2013-2022 Base Program is forecast to be approximately \$423.4 M, with a varying annual expenditure of \$26.7 M to \$54.7 M. The Expansion Program is roughly the same size, with a 10-year forecast of approximately \$469.7 M, for which the varying annual expenditure is \$25.3 M to \$75.1 M. Note that these costs reflect the total value of the Transportation Capital Program, not just those cost associated with pedestrian and cycling facilities.

Cycling facilities and sidewalks that are part of projects in the Base Program are funded from the Development Charges Reserve Fund (generally 15.5% of the costs), the Cycling Facility Reserve Fund (\$603,000 annually), and the remainder is funded by the Roads Rehabilitation Reserve Fund. Generally, the costs of walking and cycling facilities included in projects in the Expansion Program are funded 100% by the Development Charge Reserve Fund; for some projects, that portion is less than 100% and the remaining costs are funded by the Capital Program Levy Reserve Fund.

Revenues for these funds come from property and gas taxes except for the Development Charges Reserve Fund, which is financed by developers.

4.2.3.2 TRANSPORTATION CAPITAL PROGRAM REVIEW

Each TCP project comprises a list of TCP tasks and each of these tasks identifies the inclusion of sidewalk or generic cycling facility construction. This information was supplemented with comments from the Region of Waterloo's Design & Construction staff. As well, project managers confirmed the active transportation components of the TCP projects, including details on the type of facility that was planned or designed. Given the large number of projects (over 200), several iterations of consultation were conducted to review the project information and highlight where there are known challenges in providing walking and cycling facilities.

Based on this information, the Technical Team reviewed the TCP in order to confirm which active transportation (AT) facilities were already being planned or considered for projects in the 2012 TCP. The projects in the TCP Base Program that provide opportunities to construct walking and/or cycling facilities include: infill sidewalk facilities, reconstruction and major rehabilitation, rural resurfacing, and urban resurfacing. For the Expansion Program, the review included growth-related intersection improvements, road system expansion and road widening projects.

The review resulted in an updated database of TCP projects from 2012 to 2021 and their related AT tasks, including details regarding the type and extent¹⁷ of the facility to be constructed. With the release of the 2013 TCP the project lists were updated. Projects completed in 2012 and 2013 were simply included in the Existing Regional Walking and Cycling Networks. This updated database was

¹⁶ To view the full 2012-2021 TCP report, see the 2012 Preliminary Program Budget Book available at: www.regionofwaterloo.ca/en/regionalgovernment/budget.asp (March 14, 2012).

¹⁷ The limits of the active transportation facilities do not necessarily match those of the overall project.

crucial in identifying gaps in the TCP and building the recommended AT network, as discussed in **Section 4.2.4**.

Projects currently planned as part of the Transportation Capital Plan should be expanded to include the additional active transportation tasks identified in the TCP action area of the Walking and Cycling Network Action Plan.

4.2.4 BUILDING THE NETWORK AND IDENTIFYING NETWORK GAPS

Following the TCP review, several other design principles and data sets were drawn from in order to adjust AT projects already in the TCP and to identify the network gaps. The recommended network is made up of nine types of facilities:

• Sidewalks

•

- Boulevard multi-use trails
- Constrained corridors (bike lanes preferred but can be traffic lanes marked with "sharrows")
- Bike lanes, including:
 - Conventional bike lanes
 - Buffered bike lanes
 - Rural bike lanes
 - Segregated bike lanes
- Special Study Areas
- 1m paved edges (improved rural roads but not considered bicycle facilities)

In additional to the listed facility types, routes that provide a local connection of Regional Significance are also identified in the recommended network.

The following approaches were taken in developing the recommended AT network for the Region.

4.2.4.1 IMPROVING PEDESTRIAN AND CYCLIST CONNECTIVITY

It is paramount that proposed cycling or walking facilities link to existing AT facilities, where possible, to support continuous routes throughout the Region. It is particularly important to the Region that walking and cycling facilities make connections feasible between all communities throughout the Region.

Sidewalk infill was a major thrust of the pedestrian network as there are still many arterial and collector roadways that do not have sidewalks on both sides of the street. The *Context Sensitive Regional Transportation Corridor Design Guidelines* indicate that a pedestrian clearway is generally provided on both sides of Regional roads, and is "necessary" for all road classifications, except rural collectors, for which the need is "optional". Note: the pedestrian clearway can be excluded if there is a boulevard multi-use trail in its place.

4.2.4.2 OVERLAP WITH EXTERNAL PLANS

Regional routes identified in the 2004 Cycling Master Plan, in Area Municipal trail and cycling master plans, and the Top 5 Priority Cycling Routes recently identified to the Ministry of Transportation, Ontario were used to locate corridors where on-road cycling facilities would greatly improve network connectivity.



4.2.4.3 OVERCOMING PHYSICAL BARRIERS

Both the Grand River and Highway 401 form major barriers separating Cambridge from Kitchener and Waterloo, with the latter two cities enjoying a more interconnected road network. Highway 85 creates a major barrier between the east and west sides of Kitchener and Waterloo, and Highway 7/8 segments the north and south sections of Kitchener. Where feasible, improvements were recommended for major crossings over/under these and other physical barriers, since such barriers can either be uncomfortable, or impose significant detours on active transportation users. Examples include the special study area identified on Hespeler Road over Highway 401, as well as the many overpass and underpass improvements identified in the Fix-It List.

Back-lotted subdivision design also presents a major barrier to convenient walking or cycling access. This not only makes active trips less attractive but makes connections to transit more difficult. For this reason, connections through back-lotted development are essential and should be encouraged for all future development and redevelopment.

The Region of Waterloo should work with Area Municipalities and senior levels of government to remove physical barriers to active transportation and to design our communities with connections to neighbouring streets, trails and transit.

4.2.4.4 SEEKING PARALLEL OPTIONS

Where traffic capacity is saturated and there is little justification for reconfiguring traffic lanes, parallel routes were sought. Typically, this meant finding parallel routes to major arterial roadways by essentially encouraging Area Municipalities to develop these parallel routes or connections into bicycle boulevards. One example of this is the Regionally Significant route along Wellington Street North and Shirley Avenue / Drive which offers an alternative to Victoria Street North in Kitchener.

4.2.4.5 INCORPORATING RIGHT-OF-WAY CONSTRAINTS

The proposed facilities take into consideration the unique context of each corridor through a basic review of the corridor constraints such as right-of-way limits, building setbacks, above-ground utilities, street trees and the frequency of driveways and intersections.

4.2.4.6 ADDRESSING EXISTING USE AND DEMAND

In order to assess where investments in active transportation infrastructure would have the greatest impact on the number of walking and cycling trips, it is important to focus on the demand for facilities rather than only measures of the existing or planned environment (i.e. supply) and the existing use. Although measures of use on their own provide good insight as to generally where a municipality may want to consider improving conditions for active transportation, it may be that certain areas with high demand are already well served or that interventions in areas poorly served may benefit few people. Thus, it is the disparity between supply and demand that is particularly insightful. For example, an expansive low-density neighbourhood with only residential land uses laid out over a compact grid of city blocks and connected by high-quality bikeways is likely quite bikeable even if demand is low.

A methodology was developed to generate objective walking and cycling supply and demand scores. The purpose was to identify high priority areas (of regional interest) for interventions that support walking or cycling. By visualizing these scores for any given segment in the walking or cycling network, it becomes clearer where there is a poor environment or "supply" and a high demand for walking or cycling. The methodology was developed to simplify the task of identifying and prioritizing areas of need.



EXISTING USE

- Existing cycling use was estimated using bicycle trip density from the 2006 Transportation Tomorrow Survey (TTS).
- Existing pedestrian demand was estimated using a predictive model which incorporated walkability (intersection density, net residential density, commercial floor area ratio and land use mix) and weighted commute times as independent variables.

POTENTIAL DEMAND

- Potential cycling demand was estimated by combining land use mix, 2006 TTS short trips and 2006 population density.
- Potential pedestrian demand was estimated by combining net residential density, land use mix and commercial floor area ratio.

ENVIRONMENT / SUPPLY

- Cycling supply was estimated using cycling network connectivity and existing bikeway adequacy.
- Pedestrian connectivity was estimated using the average net intersection density.

By treating supply and demand independently, city planners can gain insight on the following questions in order to make the difficult decisions of allocating scare resources:

- 1. Where do we currently see many walking or cycling trips and how good are the walking or cycling facilities in these areas?
- 2. If the walking or cycling network perfectly met needs, where would people most likely walk or cycle and how good is the walking or cycling network in these areas?

Put another way, the answers to the above questions provide the following insights:

Demand	Environment	Result		
Low demand / Low existing use	Any environment	Interventions in these areas are not likely to result in any significant increase in use. Some improvements may still be necessary for accessibility and safety		
High existing use	Poor walkability / bikeability (low supply)	Interventions in these areas are likely to provide best results in terms of improving the walking or cycling experience for the most people.		
	Poor walkability / bikeability (low supply)	Interventions in these areas are likely to provide best results in terms of encouraging more walking or cycling.		
High demand	Good walkability / bikeability (high supply)	Interventions in these areas may improve the quality of the walking or cycling experience but are not likely to provide the most benefit per dollar.		

Maps of the above measures of demand, supply and the disparity between the two were then used to inform gap / infill priorities.

The Transportation Capital Plan should be expanded to include new projects to construct the active transportation facilities identified in the Gaps / Infill action area of the Walking and Cycling Network Action Plan.



4.2.5 FIX-IT LOCATIONS

The Fix-it List was developed based on feedback from both the Regions Active Transportation Advisory Committee (ATAC) and the public. The goal when developing the list was to identify spot improvements that would fine-tune the network but not require extensive changes to the overall network.

The Fix-it list contains the issues and opportunities received through public feedback and from ATAC. It identifies local issues and barriers that need to be addressed, public education needs, areas where connections are difficult and more.

Many of the issue raised span more than one jurisdiction. Many have been considered before but no fix has been identified yet. From the Fix-it List, an ongoing program can be developed to prioritize and address the many small things that can make the difference in a great active transportation experience.

The Region of Waterloo should work with Area Municipalities and senior levels of government to address the concerns expressed through the Fix-it List in the Walking and Cycling Network Action Plan.

4.2.6 AREAS FOR FURTHER STUDY

As the network was being developed, several corridors were identified which require more in-depth study to refine a vision and plan for specific improvements. In some cases, these corridors were identified because of challenges integrating with on-going plans that cannot be resolved at this point in time, such as the future Light Rapid Transit corridor. In other cases, they represent challenging connections that can only be assessed through detailed analysis and often such analyses are already underway, such as the Spur Line Trail in Kitchener and Waterloo. These "special study areas" are shown on the Recommended Walking and Cycling Network maps included in **Appendix 4–A** and **Appendix 4–B**, they include:

- 1. Spur Line Trail
- 2. Eagle Street limited width LRT Corridor
- 3. Hespeler Road over Highway 401
- 4. Fisher-Hallman Road over Highway 7/8
- 5. Trail / bridge across Speed River in Preston
- 6. Beverley Street through rail underpass
- 7. Water Street crossing at Churchill Park
- 8. Iron Horse to Hub rail corridor connection
- 9. Steckle Woods multi-use trail connection
- 10. Alpine to Hanson connection
- 11. R&T Park connection to Phillip
- 12. Franklin connection over Hwy 401

The Region of Waterloo should work toward completion of the 12 projects identified as Special Study Areas in the Walking and Cycling Network Action Plan



4.3 THE WALKING AND CYCLING NETWORK

As discussed in Section 4.2.1, the Recommended Regional Walking and Cycling Network revolves around four action areas: the TCP, Gaps / Infill, the Fix-It List, and Special Study Areas.

- The TCP action area includes all current capital projects where active transportation facilities are planned and also recommends some revisions to current TCP projects. For example, some projects may have precluded cycling facilities if they were not previously identified in the 2004 Regional Cycling Master Plan. As well, the TCP action area specifies the type of walking and/or cycling facility for all TCP projects where active transportation facilities are recommended. A complete listing of the TCP action area on its own is provided in Appendix 4–C.
- The Gaps / Infill action area addresses the rest of the network that is not included in the TCP (see Appendix 4–D).
- The Fix-It List is included in the network, as it represents a list of various localized or spot improvements; it is shown on the maps as simply a number. See Appendix 4–E for the list of identified fix-it projects.
- The Special Study Areas are large, iconic, challenging or require unique solutions. Identified over the course of developing the ATMP these special projects require further study or special funding to complete.

As described in Section 9.5: Network Phasing the recommended network is divided into four phases of activity. The first two of these phases would be completed within the time frame of the ten year TCP. These are collectively referred to as the "10 year network". The remaining phases would be completed over the long term and are referred to as the "beyond ten year network". Despite this initial phasing, any project that overlaps with a planned road project should be shifted in timing to align with that project and take advantage of the savings associated with consolidating the work.

The recommended 10 year network would increase the Regional Sidewalk Network by 124 km to a total of 488 km. An additional 122 km of boulevard multi-use trails would bring the total to 139 km. It would also increase the Regional Cycling Network by 418 km to a total of 988 km.

In total, 663 km of additional sidewalks, trails, and cycling facilities would be built through the ten year TCP action area and Gaps / Infill action area. Beyond ten years a further 27 km of sidewalk, 21 km of multi use trails and 308 km of cycling facilities would be added. Despite being in the beyond ten year network, these projects should be constructed at the earliest opportunity.

The length of the existing and recommended network by facility type is summarized in Exhibit 4.4. A map of the Recommended Ten Year Walking Network is provided in Exhibit 4.5, and a map of the Recommended Ten Year Cycling Network is provided in Exhibit 4.6. Maps for each Area Municipality that show the facility types are provided in Appendix 4–A (Ten year Walking and Cycling Networks) and Appendix 4–B (Beyond Ten Year Segments).

The Region would be responsible for most of the funding and the constructing the future network. The cost to implement these facilities would remain largely the responsibility of the Area Municipality, however, the Region can work to support and coordinate with the Area Municipalities as opportunities arise and are agreed upon. Chapter 9 discusses in detail the implementation plan for the network.

The specific facility types recommended in the walking and cycling networks are based on a high level review of the network and the specific corridor. As any individual project is developed the project team may consider facility types that are different than that recommended in the ATMP



networks. However, the continuity, safety, comfort, convenience and connectivity of the facility and adjacent sections must be considered. Any changes to the recommended facility type must be done in consultation with Transportation Planning staff and with detailed justification documented in the project file.

Facility	Regional Network			
T achity	Existing	10 Year	Beyond 10	Future (Total)
Sidewalks along Regional roads (linear km on each side of the street)	365 km	124 km	27 km	515 km
Subtotal: Sidewalk Network	365 km	124 km	27 km	515 km
Boulevard Multi-Use Trail (linear km on each side of the street)	17 km	122 km	21 km	160 km
Subtotal: Trails Network	17 km	122 km	21 km	160 km
Bike lane	117 km	140 km	26 km	283 km
Bike lane in constrained corridor*	0 km	40 km	8 km	48 km
Segregated bike lane	0 km	20 km	0 km	20 km
Rural bike lane	247 km	214 km	274 km	735 km
1.0m paved edge	206 km	3 km	0 km	210 km
Subtotal: Cycling Network	570 km	418 km	308 km	1296 km
Total: All Networks	952 km	663 km	356 km	1971 km

Exhibit 4.4: Length of the Existing and Recommended Regional Walking and Cycling Network

For the 48 km of constrained corridors, bike lanes are preferred but may not be feasible due to the right-of-way constraints. These corridors may be marked shared use with "sharrows" if constraints can not be overcome.















Appendix 4–A: Ten Year Walking and Cycling Networks by Area Municipality



Recommended Cambridge Walking Network





Recommended Cambridge Cycling Network











Recommended Kitchener Cycling Network











Recommended North Dumfries Cycling Network







Recommended Waterloo Walking Network


Recommended Waterloo Cycling Network





Recommended Wellesley Walking Network





Recommended Wellesley Cycling Network





Recommended Wilmot Walking Network





Recommended Wilmot Cycling Network











Recommended Woolwich Cycling Network





Appendix 4–B: Beyond Ten Year Walking and Cycling Networks by Area Municipality





Beyond Ten Year Cambridge Walking and Cycling Network





Beyond Ten Year Kitchener Walking and Cycling Network





Beyond Ten Year North Dumfries Walking and Cycling Network





Beyond Ten Year Waterloo Walking and Cycling Network











Beyond Ten Year Wilmot Walking and Cycling Network









Appendix 4–C: Transportation Capital Program Action Area



Acronym	Meaning
BL	The recommended cycling facility is a Bike Lane
CC	The recommended cycling facility is a Constrained Corridor; bike lanes are preferred; shared use lanes may be used if determined to be appropriate at the project team level
SBL	The recommended cycling facility is a Segregated Bike Lane
SW	The recommended walking facility is a sidewalk
BMUT	The recommended facility is a Boulevard Multi-use Trail
1M	A 1m paved edge is planned to be constructed

ID	ROAD	FROM	то	YEAR	TYPE	NOTES
Cambridge						
5337	REG. RD. 8 (KING STREET)	EAGLE ST. (RR39)	FOUNTAIN ST. (RR8) AND FOUNTAIN ST KING ST. (RR8) TO SHANTZ HILL (RR8)	2016	BMUT, BL	
5367	REG. RD. 8 (DUNDAS STREET)	ELGIN ST.	HESPELER RD. (RR24)	2016	CC, BL	
5384	REG. RD. 8 (KING STREET)	BISHOP ST. (RR41)	EAGLE ST. (RR39)	2017	BL	
5393	REG. RD. 17 (FOUNTAIN STREET)	KING ST. (RR8)	CHERRY BLOSSOM RD.	2016	SW, BL	
5404	REG. RD. 41 (BISHOP STREET)	CONESTOGA BLVD.	CONCESSION RD.	2015	SW, BL	
5416	REG. RD. 75 (ST. ANDREWS STREET)	CAMBRIDGE BDRY.	GRAND AVE. (RR76)	2016	SW, BL	
5420	REG. RD. 97 (CEDAR STREET)	OSBORNE ST.	CAMBRIDGE BDRY.	2016	SW, CC, BL	
5459	REG. RD. 28 (FOUNTAIN STREET)	PRESTON PKWY.	DICKIE SETTLEMENT RD. (RR71)	2015	BMUT	MUT preferred to connect to area trails. Bike lane may be considered by project team if implementation cost is prohibitive.
5498	REG. RD. 43 (MYERS ROAD)	BRANCHTON RD. (RR43)	WATER ST. (RR24)	2018	SW, BL	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5549	REG. RD. 36 (FRANKLIN BOULEVARD)	MYERS RD. (RR43)	HWY. 401	2014	BMUT	
5572	REG. RD. 24 (HESPELER ROAD)	BISHOP ST. (RR41)	EAGLE ST. N./PINEBUSH RD (RR39).	2013	SBL	
5582	REG. RD. 77 (PARKHILL ROAD)	AINSLIE ST. (RR24)	WATER ST. (RR24)	2015	BL	
5583	REG. RD. 97 (CONCESSIO N STREET)	CHISHOLM ST.	WATER ST. (RR24)	2013	BL	
5617	REG. RD. 39 (EAGLE STREET)	HESPELER RD. (RR24)	CONCESSION RD./SPEEDSV ILLE RD.	2013	SW, BL	
5653	REG. RD. 24 (HESPELER ROAD)	DUNBAR RD.	BISHOP ST. N. (RR41)	2017	SBL	
5684	REG. RD. 8 (CORONATIO N BOULEVARD)	WATER ST. N. (RR24)	HIGHLAND PARK	2020	SW, SBL	
5692	REG. RD. 24 (AINSLIE STREET S)	WALNUT ST.	PARKHILL RD. (RR77)	2016	СС	
5694	REG. RD. 41 (BISHOP STREET N)	CONCESSION RD.	KING ST. E. (RR8)	2021	SW, BL	
5726	REG. RD. 28 (FOUNTAIN STREET)	SHANTZ HILL RD (RR8)	PRESTON PKWY	2016	SW, CC	Alternative BMUT on east side
5760	REG. RD. 24 (HESPELER ROAD)	BROOKLYN RD./NORFOLK AVE.	MUNCH AVE.	2019	BL	
5762	REG. RD. 31 (KOSSUTH ROAD)	WELLINGTON BDRY. E.	BEAVERDALE RD.	2019	BL	
5764	REG. RD. 97 (MAIN STREET E)	FRANKLIN BLVD. (RR36)	DUNDAS ST. (RR8)	2020	SW, BL	
5800	REG. RD. 39 (EAGLE STREET)	CONCESSION RD/SPEEDSVI LLE RD.	KING ST. W. (RR8)	2021	SW	
5827	REG. RD. 41 (BISHOP STREET)	FRANKLIN BLVD (RR36)	50M. E. OF CONESTOGA BLVD.	2021	SW, BL	
5923	REG. RD. 39 (PINEBUSH ROAD)	TOWNLINE RD. (RR33)	FRANKLIN BLVD. (RR36)	2021	SW, BL	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5927	REG. RD. 17 (FOUNTAIN STREET N)	CHERRY BLOSSOM RD.	MAPLE GROVE RD. (RR38)	2018	BMUT	
5928	REG. RD. 97 (CEDAR STREET)	GRAND AVE. S. (RR76)	OSBORNE ST.	2018	CC, BL	
5933	REG. RD. 97 (MAIN STREET E)	DUNDAS ST. (RR8)	CHALMERS ST.	2022	СС	Connect to Cambridge facilities to get around big cut
5940	REG. RD. 24 (AINSLIE STREET N)	PARK HILL RD. E. (RR77)	WATER ST. N. (RR24)	2020	CC	
5943	REG. RD. 33 (TOWNLINE ROAD)	ELLIS RD./SIDEROA D 10 N.	COUNTY RD. 34	2020	BL	
5946	REG. RD. 71 (DICKIE SETTLEMENT ROAD)	CAMBRIDGE/ NORTH DUMFRIES BDRY.	FOUNTAIN ST. S. (RR28)	2020	BL	
5948	REG. RD. 8 (DUNDAS STREET)	FRANKLIN BLVD. (RR36)	ELGIN ST.	2021	BL	
5969	REG. RD. 8 (SHANTZ HILL RD.)	FOUNTAIN ST. (RR 17)	HWY 401 EAST BOUND RAMP	2022	SW	
5976	REG. RD. 97 (CONCESSIO N STREET)	CHALMERS ST.	CHISHOLM ST.	2022	СС	Connect to Cambridge facilities to get around big cut
5984	REG. RD. 27 (SAMUELSON STREET/CLYD E ROAD)	FRANKLIN BLVD	BEVERLY ST	2018	SW, CC	
5985	REG. RD. 27 (BEVERLY STREET)	BEVERLY ST/SAMUELS ON ST	DUNDAS ST	2018	SW	
7116	REG. RD. 38 (MAPLE GROVE ROAD)	SPEEDSVILLE RD.	FOUNTAIN ST.(RR17)	2020	BMUT	
7117	REG. RD. 38 (MAPLE GROVE ROAD)	HESPELER RD.(RR24)	SPEEDSVILLE RD.	2022	BMUT	
7123	REG. RD. 97 (CONCESSIO N STREET)			2013	BL	SP



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
7129	S. BOUNDARY ROAD, FRANKLIN BLVD.(RR36)		DUNDAS ST.(RR8)	2022	BMUT	
7132	REG. RD. 36 (FRANKLIN BOULEVARD)	MYERS RD. (RR43)	CAMBRIDGE S.E. BOUNDARY RD.	2015	BMUT	
7192	S. BOUNDARY ROAD, WATER ST. (RR24)		FRANKLIN BLVD.(RR36)	2015	BMUT	
7194	REG. RD. 80 (CANAMERA PARKWAY)	CONESTOGA BLVD.	FRANKLIN BLVD (RR36)	2020	SW, BMUT	
7303	REG. RD. 17 (FOUNTAIN STREET)	MAPLE GROVE RD.	KOSSUTH RD. (RR31)	2018	BMUT	
Kitchener						
5041	REG. RD. 15 (KING STREET)	VICTORIA ST. (RR55)	CENTRAL MARKET	2014	BMUT	
5163	REG. RD. 4 (OTTAWA STREET N)	HIGHWAY 7 WB RAMP	WEBER ST. E. (RR8)	2018	BL	
5170	REG. RD. 29 (LANCASTER STREET)	UNION ST.	BRIDGEPORT RD.(RR9)	2022	SW, BL	
5183	REG. RD. 52 (BRIDGE STREET)	KIT/WOOL BDRY.	BRIDGEPORT BRIDGE	2014	SW, BL	
5190	REG. RD. 20 (BLOOMINGD ALE ROAD)	KRAFT DR.	BRIDGE ST. (RR52)	2015	SW, BL	
5340	REG. RD. 69 (MANITOU DRIVE)	BLEAMS RD. (RR56)	FAIRWAY RD. (RR53)	2015	SW, BL	
5376	REG. RD. 4 (OTTAWA STREET N)	OLD CHICOPEE DR.	HIGHWAY 7 EB RAMP	2016	SW, BL	
5377	REG. RD. 4 (OTTAWA STREET)	MILL ST.	IMPERIAL DR.	2017	SW, BL	
5487	REG. RD. 8 (KING STREET)	HWY. 401	SPORTSWOR LD DR. (RR38)	2018	SW	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5497	REG. RD. 29 (LANCASTER STREET)	VICTORIA ST. (RR55)	UNION ST.	2022	BL	
5565	REG. RD. 4 (OTTAWA STREET)	WEBER ST. (RR8)	KING ST. (RR15)	2018	BL	
5566	REG. RD. 6 (HIGHLAND ROAD)	FISCHER- HALLMAN RD. (RR58)	HIGHLAND HILLS MALL ENTRANCE	2018	BL	
5579	REG. RD. 69 (MANITOU DRIVE)	HOMER WATSON BLVD. (RR28)	BLEAMS RD. (RR56)	2016	SW, BL	
5612	REG. RD. 6 (FREDERICK STREET)	LANCASTER ST E.	DUKE ST.	2017	BL	
5656	REG. RD. 50 (WESTMOUNT ROAD W)	VICTORIA ST. (RR55)	GLASGOW ST.	2016	BL	
5675	REG. RD. 50 (WESTMOUNT ROAD E)	FISCHER- HALLMAN RD. (RR58)	BLOCKLINE RD.	2022	SW, BL	
5680	REG. RD. 4 (OTTAWA STREET N)	LACKNER BLVD. (RR54)	OLD CHICOPEE DR.	2019	BMUT	
5681	REG. RD. 4 (OTTAWA STREET S)	WESTMOUNT RD. (RR50)	FISCHER- HALLMAN RD. (RR58)	2017	BMUT	
5693	REG. RD. 38 (SPORTSWOR LD DRIVE)	GATEWAY PARK DR.	KING ST. E. (RR8)	2020	BL	
5697	REG. RD. 53 (FAIRWAY ROAD N)	OLD CHICOPEE TR.	KING ST. E. (RR8)	2021	SW, BL	
5700	REG. RD. 55 (VICTORIA STREET N)	FREDERICK ST. (RR6)	BRUCE ST. (RR61)	2017	SW	
5702	REG. RD. 55 (VICTORIA STREET S)	LAWRENCE AVE.	FISCHER- HALLMAN RD. (RR58)	2020	BL	
5703	REG. RD. 56 (BLEAMS ROAD)	MANITOU DR. (RR69)	HOMER WATSON BLVD. (RR28)	2022	BMUT	
5705	REG. RD. 56 (BLEAMS ROAD)	FISCHER- HALLMAN RD. (RR58)	TRUSSLER RD. (RR70)	2021	BMUT	
5715	REG. RD. 8 (WEBER STREET)	WILFRED AVE.	MONTGOMER Y RD.	2014	SW	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5730	REG. RD. 50 (WESTMOUNT ROAD)	UNION BLVD.	FORSYTH DR.	2014	SW, BL	
5743	REG. RD. 64 (CHARLES STREET)	STIRLING AVE. S.	PANDORA AVE.	0	SW	
5750	REG. RD. 53 (COURTLAND AVENUE E)	HAYWARD AVE.	HWY 7/8 EB RAMP	2019	BMUT	
5751	REG. RD. 56 (BLEAMS ROAD)	HOMER WATSON BLVD. (RR28)	STRASBURG RD.	2022	BMUT	
5752	REG. RD. 6 (HIGHLAND ROAD W)	HIGHLAND HILLS MALL ENTRANCE.	TRUSSLER RD. (RR 70)	2018	SW, BL	
5796	REG. RD. 4 (OTTAWA STREET)	STRASBURG RD.	WESTMOUNT RD. (RR50)	2020	BMUT	Hydro poles on south side may make implementation difficult. Project team may consider use of segregated bicycle lane.
5797	REG. RD. 4 (OTTAWA STREET)	FISCHER- HALLMAN RD. (RR58)	WILSONS RD	2021	BMUT	BMUT replaces BL+SW in long term
5924	REG. RD. 4 (OTTAWA STREET S)	ALPINE RD.	STRASBURG RD.	2020	BMUT	
5929	REG. RD. 53 (COURTLAND AVE. E.)	MANITOU DR. (RR69)	SIEBERT AVE.	2021	SW	
5932	REG. RD. 8 (KING STREET E)	SPORTSWOR LD DR. (RR38)	RIVERBANK DR.	2022	SW, BMUT	
5955	REG. RD. 4 (OTTAWA STREET S)	WILSONS RD.	TRUSSLER RD. (RR70)	2021	BMUT	South side long term
5974	REG. RD. 53 (FAIRWAY ROAD SOUTH)	KING ST. (RR8)	HWY 8 SB RAMP	2020	BMUT	BMUT from King St to Fairview Mall driveway / Hydro trail connection / Wabanaki.
5981	REG. RD. 8 (WEBER ST. E.)	HWY 8 ON RAMP.	FERGUS AVE.	2022	SW	
5988	REG. RD. 58 (FISCHER HALLMAN ROAD)	OTTAWA STREET (RR 4)	FOREST HILL DRIVE	2022	SW, BL	
7087	REG. RD. 56 (RIVER ROAD EXTENSION)	KING ST. (RR8)	WILSON AVE.	2017	BMUT	Follow ultimate alignment, provide transitions at BMUT-BL interface, River Road Extension



ID	ROAD	FROM	ТО	YEAR	TYPE	NOTES
7101	REG. RD. 8 (WEBER STREET)	COLLEGE AVE.	GUELPH ST.	2013	SW, BMUT	
7111	REG. RD. 28 (HOMER WATSON BOULEVARD)	DOON SOUTH DR.	CONESTOGA COLLEGE BLVD.	2017	BMUT	Short term priority on north / east side of Homer Watson, long term planning should consider MUT both sides, connect to Budd Park trail and bike lanes at 401
7121	REG. RD. 58 (FISCHER- HALLMAN ROAD)	BLEAMS RD. (RR56)	OTTAWA ST.	2016	BMUT	
7122	REG. RD. 58 (FISCHER- HALLMAN ROAD)	PLAINS RD.	BLEAMS RD.(RR56)	2019	BMUT	Project team may consider segregated bike lanes with sidewalks as an alternative
7134	REG. RD. 56 (BLEAMS ROAD)	WILSON AVE.	MANITOU DR. (RR69)	2017	BMUT	Follow ultimate alignment, provide transitions at BMUT-BL interface,
7258	REG. RD. 56 (BLEAMS ROAD)	STRASBURG RD.	FISCHER- HALLMAN RD. (RR58)	2020	BMUT	
7282	REG. RD. 70 (IRA NEEDLES BOULEVARD)	HIGHVIEW DR.	ERB ST. (RR9)	2014	SW	
7284	REG. RD. 12 (NEW DUNDEE ROAD)	HOMER WATSON BLVD. (RR28)	FISCHER HALLMAN RD. (RR58)	2021	BL	
7294	REG. RD. 4 (OTTAWA STREET)	HOMER WATSON BLVD (RR28)	ALPINE RD.	2015	BMUT	
North Dumfries						
5414	REG. RD. 58 (NORTHUMBE RLAND STREET/STAN LEY STREET)	ST. ANDREWS ST.	CP RAILWAY CROSSING	2016	SW, CC	
5471	REG. RD. 75 (SPRAGUES ROAD)	BRANT/WATE RLOO BDRY.	SHOULDICE SIDE RD.	2014	SW, BL	
5636	REG. RD. 58 (SWAN STREET)	HILLTOP DR.	STANLEY ST.	2016	SW, CC	
5672	REG. RD. 43 (BRANCHTON ROAD)	LOCKIE RD.	MAPLE MANOR RD.	2016	SW, BL	
5673	REG. RD. 46 (ROSEVILLE ROAD)	DICKIE SETTLEMENT RD. (RR71)	DUMFRIES RD. (RR47)	2018	SW, BL	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5674	REG. RD. 49 (WRIGLEY ROAD)	DUMFRIES RD. (RR47)	190 m EAST OF HILLTOP ROAD	2015	SW, BL	
5677	REG. RD. 70 (TRUSSLER ROAD)	CEDAR CREEK RD. (RR97)	NEW DUNDEE RD. (RR12)	2015	BL	
5679	REG. RD. 97 (CEDAR CREEK ROAD)	CAMBRIDGE/ NORTH DUMFRIES BDRY.	EDWORTHY SIDE RD. (RR71)	2018	BL	
5695	REG. RD. 49 (SCOTT ST./MAIN ST./STANLEY ST.)	190 M. E. OF HILLTOP DR.	SWAN ST. (RR58)	2019	SW, CC, BL	
5795	REG. RD. 75 (SPRAGUES ROAD)	SHOULDICE SIDE RD.	CAMBRIDGE/ NORTH DUMFRIES BDRY.	2021	BL	
5930	REG. RD. 70 (TRUSSLER ROAD)	110M N. OF HWY 401	CEDAR CREEK RD. (RR97)	2018	BL	
5931	REG. RD. 70 (TRUSSLER ROAD)	BRANT/WATE RLOO RD.	GREENFIELD RD.	2018	BL	
5942	REG. RD. 27 (CLYDE ROAD)	CAMBRIDGE/ NORTH DUMFRIES BOUNDARY	THE VILLAGE OF CLYDE SETTLEMENT LIMITS	2020	BL	
5986	REG. RD. 46 (ROSEVILLE ROAD)	0.4 KM E. OF FISCHER HALLMAN RD (RR 58)	FISCHER HALLMAN RD (RR 58)	2022	SW	
Waterloo						
5386	REG. RD. 8 (WEBER STREET)	ALBERT ST.	NORTHFIELD DR. (RR 50)	2019	SW, BL	
5387	REG. RD. 8 (WEBER STREET)	COLUMBIA ST.	KING ST. (RR15)	2019	BL	
5389	REG. RD. 9 (ERB STREET)	CAROLINE ST. (RR9)	MENNO ST.	2014	BL	
5390	REG. RD. 9 (ERB STREET)	FISCHER- HALLMAN RD. (RR58)	GATEVIEW DR.	2019	BL	
5391	REG. RD. 15 (KING STREET)	HWY 85 NB. RAMP (WATERLOO)	NORTHFIELD DR. (RR50)	2015	BMUT	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5407	REG. RD. 50 (NORTHFIELD DRIVE)	WATERLOO/S T. JACOBS TRACKS	KING ST. (RR15)	2014	SW, BL	
5489	REG. RD. 8 (WEBER STREET)	KING ST. (RR15)	BLYTHWOOD RD.	2015	SW, BL	
5490	REG. RD. 9 (ERB STREET)	KING ST. (RR15)	CAROLINE ST. (RR9)	2015	SBL	Two way cycle track on north side
5494	REG. RD. 15 (KING STREET)	BRIDGEPORT RD. (RR9)	UNIVERSITY AVE. (RR57)	2019	CC	
5501	REG. RD. 57, (UNIVERSITY AVENUE)	LINCOLN RD.	WEBER ST. (RR8)	2013	BL	
5576	REG. RD. 52 (BRIDGE STREET W.)	WOOLWICH ST.	UNIVERSITY AVE. E. (RR57)	2017	SW, BL	
5633	REG. RD. 15 (KING STREET)	WEBER ST. (RR8)	HWY 85 SB. RAMP	2015	BMUT	
5651	REG. RD. 15 (KING STREET N)	COLUMBIA ST.	WEBER ST. N. (RR8)	2017	CC	
5657	REG. RD. 50 (WESTMOUNT ROAD S)	JOHN ST.	ERB ST. W. (RR9)	2015	BL	
5687	REG. RD. 9 (ERB STREET)	MENNO ST.	WESTMOUNT RD. (RR50)	2018	BL	
5696	REG. RD. 50 (NORTHFIELD DRIVE W)	WEBER ST. N. (RR8)	WATERLOO/S T. JACOBS TRACKS	2020	BL	
5706	REG. RD. 57 (UNIVERSITY AVENUE E)	BRIDGE ST. W. (RR52)	LINCOLN RD.	2020	SW, CC, BL	
5753	REG. RD. 8 (WEBER STREET N)	UNIVERSITY AVE. E. (RR57)	COLUMBIA ST.	2019	BL	
5765	REG. RD. 9 (ERB STREET E)	WEBER ST. (RR8)	REGINA ST.	2019	SBL	Two way cycle track on north side
5788	REG. RD. 9 (ERB STREET E)	MARGARET AVE.	WEBER ST. (RR8)	2020	SBL	Two way cycle track on north side
5798	REG. RD. 22 (NORTHFIELD DRIVE)	KRAUS DR.	DAVENPORT RD.	2015	BL	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5956	REG. RD. 50 (WESTMOUNT ROAD W)	UNION BLVD.	JOHN ST.	2021	BL	
5983	REG. RD. 15 (KING STREET)	NORTHFIELD DR. (RR50)	HWY 85 NB RAMP (WOOLWICH)	2019	SW, BL	
5996	REG. RD. 52 (BRIDGE STREET)	FROM NORTHFIELD DRIVE (RR22)	550M SOUTHERLY	2013	SW, BMUT	
6510	REG. RD. 9 (BRIDGEPORT RD./CAROLIN E ST.)	KING ST. (RR15)	ERB ST. (RR9)	2018	SW, BL	
7221	REG. RD. 58 (FISCHER- HALLMAN ROAD / BEARINGER ROAD)	COLUMBIA ST.	WESTMOUNT RD. (RR50)	2020	SW, BMUT, BL	
7257	REG. RD. 22 (NORTHFIELD DRIVE)	DAVENPORT RD.	UNIVERSITY AVE.	2015	SW, BMUT, BL	
7259	REG. RD. 57 (UNIVERSITY AVENUE)	KEATSWAY	ERB ST. (RR9)	2018	SW	
7297	REG. RD. 9 (ERB STREET)	GATEVIEW DR./BEECHW OOD DR.	ERBSVILLE CT.	2019	SW, BL	
7316	REG. RD. 22 (NORTHFIELD DRIVE)	KING ST (RR 15)	KRAUS DR.	2015	BL	
Wellesley						
5378	REG. RD. 5 (HUTCHISON ROAD)	CROSSHILL S. LIMITS	CROSSHILL W. LIMITS	2016	SW, BL	
5667	REG. RD. 15 (LOBSINGER LINE)	0.8 KM WEST OF HERRGOTT RD. (RR10)	MOSER- YOUNG RD.	2014	BL	
5678	REG. RD. 86 (LINE 86)	HERRGOTT RD. (RR10)	100 M. W. OF SLOMAN LN.	2015	BL	
5682	REG. RD. 5 (NAFZIGER ROAD)	GERBER RD. (RR12)	QUEEN'S BUSH RD. (RR5)	2020	SW, CC	
5683	REG. RD. 5 (QUEENS BUSH ROAD)	FIRELLA CK BRIDGE	HUTCHISON RD. (RR5)	2020	SW, BL	



ID	ROAD	FROM	ТО	YEAR	TYPE	NOTES
5688	REG. RD. 10 (HERRGOTT ROAD)	LOBSINGER LN. (RR15)	ST. CLEMENTS N. LIMITS	2022	SW, CC	
5689	REG. RD. 15 (LOBSINGER LINE)	ANITA ST.	0.8 KM W. OF HERRGOTT RD. (RR10)	2019	SW, CC	
5748	REG. RD. 5 (HUTCHISON ROAD)	WEIMAR LINE	CROSSHILL S. LIMITS	2019	BL	
5749	REG. RD. 5 (QUEEN'S BUSH ROAD)	NAFZIGER RD. (RR5)	FIRELLA CRK BRIDGE	2020	BL	
5758	REG. RD. 10 (HERRGOTT ROAD)	N. LIMITS OF ST. CLEMENTS	AMENT LINE (RR17)	2018	BL	
5791	REG. RD. 86 (LINE 86)	WALLENSTEI N SE LIMITS	HERGOTT RD. (RR10)	2020	SW	
5903	REG. RD. 86 (LINE 86)	MALLOT RD.	WALLENSTEI N SE LIMITS	2020	SW	
5958	REG. RD. 7 (HUTCHISON ROAD)	QUEEN'S BUSH RD. (RR5)	MANSER RD.	2021	BL	
Wilmot						
5425	REG. RD. 5 (NAFZIGER ROAD)	HWY 7/8	WATERLOO ST. (RR1)	2015	BL	
5428	REG. RD. 6 (SNYDERS ROAD)	0.32KM E. OF NOTRE DAME DR. (RR12)	0.23KM W. OF NOTRE DAME DR. (RR12)	2015	SW, SBL	
5493	REG. RD. 12 (NOTRE DAME DRIVE)	HWY. 7/8	CP RAIL - PETERSBURG	2015	SW, SBL, BL	
5584	REG. RD. 6 (SNYDERS ROAD)	TRUSSLER RD. (RR70)	0.32KM E. OF NOTRE DAME DRIVE (RR12)	2013	BL	
5663	REG. RD. 1 (HURON STREET)	WILMOT- EASTHOPE RD.	BENDER BRIDGE	2016	BL	
5664	REG. RD. 5 (NAFZIGER ROAD)	BERLETTS RD.	GERBER RD. (RR12)	2016	SW, BL	
5747	REG. RD. 5 (NAFZIGER ROAD)	0.15KM N. OF ERB'S RD. (RR9)	BERLETTS RD.	2018	BL	
5756	REG. RD. 1 (SNYDER'S ROAD W)	BADEN WATER TOWER ENTRANCE	FOUNDRY ST. (RR51)	2019	СС	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5757	REG. RD. 1 (WILMOT- EASTHOPE ROAD)	HURON RD.	HURON ST.	2019	BL	
5766	REG. RD. 1 (SNYDER'S ROAD E)	FOUNDRY ST. (RR51)	GINGERICH RD. (RR6)	2018	SW, BL	
5793	REG. RD. 12 (QUEEN STREET)	WITMER RD.	BLEAMS RD. (RR4)	2021	BL	
5935	REG. RD. 12 (NOTRE DAME DRIVE)	WILBY RD.	MOSER- YOUNG RD. (RR14)	2021	BL	
5936	REG. RD. 12 (QUEEN STREET)	BLEAMS RD. (RR4)	HWY 7/8 EB	2021	BL	
5937	REG. RD. 12 (QUEEN STREET)	WATER ST.	BETHEL ST.	2020	SW, BL	
5945	REG. RD. 6 (GINGERICH ROAD)	SYNDER'S RD. (RR1)	FOUNDRY ST. (RR51)	2020	BMUT	
5968	REG. RD. 5 (NAFZIGER ROAD)	ERB'S RD.	150 M N. OF ERB'S ROAD (RR9)	2022	BL	
5982	REG. RD. 12 (NOTRE DAME DRIVE)	0.5 KM SOUTH OF ERB'S ROAD	ERB'S ROAD	2018	SW, BL	
Woolwich						
5164	REG. RD. 15 (KING STREET)	RAIL TRACKS	LOBSINGER LN. (RR15)	2015	SW, BL	
5392	REG. RD. 17 (SAWMILL ROAD)	CONESTOGO BRIDGE	MUSSELMAN CR. AND REG. RD. 22 (NORTHFIELD DRIVE)- S.LIMITS OF CONESTOGO TO COUNTRY SPRING WALK	2017	SW, 1M	
5394	REG. RD. 21 (ARTHUR STREET)	SOUTH ST.	ARTHUR ST. BRIDGE	2015	SW, BL	
5417	REG. RD. 86 (CHURCH STREET)	SPRUCE LANE	ARTHUR ST. (RR21)	2016	SW, CC	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5430	REG. RD. 8 (WEBER STREET)	BENJAMIN RD.	KING ST. (RR15)	2015	SW, BL	
5431	REG. RD. 8 (KING STREET)	PRINTERY RD.	SAWMILL RD. (RR17)	2016	SW, CC, BL	
5495	REG. RD. 17 (SAWMILL ROAD)	RIVER ST.	SNYDERS FLATS RD.	2016	SW, CC, BL	
5568	REG. RD. 16 (KRESSLER ROAD)	LOBSINGER LINE (RR15)	APOLLO DR.	2016	SW, CC	
5585	REG. RD. 17 (EBYCREST ROAD)	VICTORIA ST. N (RR55)	BRIDGE ST.	2016	BL	
5603	REG. RD. 17 (SAWMILL ROAD)	KING ST. (RR8)	WATERLOO/S T. JACOBS TRACKS	2018	SW, BL	
5654	REG. RD. 25 (MARYHILL ROAD)	BRIDGE 2501	ST CHARLES ST. W. (RR26)	2016	SW, CC	
5671	REG. RD. 30 (SHANTZ STATION ROAD)	KOSSUTH RD. (RR31)	MENNO ST.	2014	BL	
5690	REG. RD. 21 (ARTHUR STREET S)	WHIPPOORWI LL DR.	FIRST ST.	2017	SW, BL	
5755	REG. RD. 23 (KATHERINE STREET N)	LINE 86 (RR86)	TRIBE RD.	2018	BL	
5759	REG. RD. 21 (ARTHUR STREET N)	SANDY HILLS DR.	WATERLOO/W ELLINGTON BDRY.	2019	BL	
5761	REG. RD. 25 (MARYHILL ROAD)	WATERLOO/W ELLINGTON BDRY.	BRIDGE 2501	2019	BL	
5794	REG. RD. 30 (SHANTZ STATION ROAD)	VICTORIA ST.	ST. CHARLES ST. (RR26)	2021	BL	
5799	REG. RD. 23 (KATHERINE STREET)	LUNDY RD.	BRIDGE #2301 (COX CREEK)	2022	SW, BL	
5855	REG. RD. 86 (CHURCH STREET W)	ARTHUR ST. (RR21)	WEIGEL AVE.	2022	SW, BL	



ID	ROAD	FROM	то	YEAR	TYPE	NOTES
5902	REG. RD. 22 (NORTHFIELD DRIVE)	SCOTCH LINE RD.	LINE 86 (RR86)	2020	BL	
5934	RED. RD. 17 (HAWKESVILL E ROAD)	THREE BRIDGES RD.	AMENT LINE (RR17)/KRESS LER RD. (RR16)	2020	BL	
5938	REG. RD. 17 (EBYCREST ROAD)	BRIDGE ST. E. (RR52)	SAWMILL RD. (RR17)	2020	BL	
5939	REG. RD. 17 (SAWMILL ROAD)	MUSSELMAN CRES.	ARTHUR ST. S. (RR85)	2020	BL	
5951	REG. RD. 86 (LINE 86)	KATHERINE ST. N. (RR23)	COVERED BRIDGE DR./MIDDLEB ROOK RD.	2020	BL	
7131	REG. RD. 17 (FOUNTAIN STREET EXTENSION)	VICTORIA ST. (RR55)	1.0 KM. N. OF VICTORIA ST.(RR55)	2018	BL	Fountain Street realignment with new Hwy 7
7186	REG. RD. 86 (CHURCH STREET)	HEBERT ST.	BARNSWALLO W DR.	2013	SW	



Appendix 4–D: Gaps / Infill Action Area



Acronym	Meaning				
BL	The recommended cycling facility is a Bike Lane				
CC	The recommended cycling facility is a Constrained Corridor; bike lanes are preferred; shared use lanes may be used if determined to be appropriate at the project team level				
SBL	The recommended cycling facility is a Segregated Bike Lane				
SW	The recommended walking facility is a sidewalk				
BMUT	The recommended facility is a Boulevard Multi-use Trail				
1M	A 1m paved edge is planned to be constructed				

ID	ROAD	FROM	то	PHASE	TYPE	NOTES
Cambridge						
CAM-01	Townline Rd	Jamieson Pkwy	Ellis Rd	2	BL	Adjacent resurfacing in 2020 (see Project No. 5943) will include bike lanes Project 5943 Townline Rd, Ellis Rd to County Rd 34 in 2020
CAM-02	Water St S	Myers Rd	South Boundary Rd	1	BL	Connects existing PS on Water to TCP project on South Boundary
CAM-03	Main St			4	SW, BL	
CAM-04	Pinebush Rd	Conestoga Blvd	Hespeler Rd	2	BL	
CAM-05	Hespeler Rd	Munch Ave	Dunbar Rd	2	SBL	Adjacent segregated bike lanes to the north to be built in 2017 (see Project No. 5653)
CAM-06	Maple Grove Rd	Fountain St	Saltsman Dr	1	SW, BL	
CAM-07	Maple Grove Rd			2	SW	
CAM-08	Dundas St S	Champlain Blvd	Branchton Rd	2	SW	
CAM-09	Branchton Rd	Myers Rd / Dundas St	Morrison Rd	2	SW, BL	Connects Myers to South Boundary Road
CAM-10	Coronation Blvd	Highland Park	Bishop St	2	SW, SBL	Replace Parking/BMUT with sidewalk and SBL Adjacent 5684
CAM-11	Water St N			3	CC	
CAM-12	East Boundary Road	Franklin Blvd	Branchton Rd	3	BMUT	New road to be built long term, to include boulevard multi-use trail New road, connecting with planned bikeways
CAM-13	Water St S	Ravine Dr	Ainslie St	1	SW, BMUT	


ID	ROAD	FROM	то	PHASE	TYPE	NOTES
CAM-14	Water St S	South Boundary Rd	Ravine Dr	1	SW	
CAM-15	Eagle St N			3	BMUT	Long term conversion of SW+BL
CAM-25	Fountain St S			2	CC	Alternative BMUT on east side
CAM-26	Ainslie St S	Concession Rd	Walnut St	2	СС	Constrained corridor; bike lanes preferred, marked shared use lane at minimum Need warning signs - watch for pedestrians, sidewalk on either side of the under pass
CAM-27	Clyde Rd	Shellard Rd	Elgin	3	SW, BL	Constrained corridor Elgin to Franklin; bike lanes preferred, marked shared use lanes at minimum. Paved shoulders to be built in Phase 3
CAM-29	Hespeler Rd	Dundas / Coronation	Brooklyne Rd	2	BL	Adjacent resurfacing in 2019 (see Project No. 5760) will include bike lane
CAM-36	Can-Amera Parkway			2	SW	
CAM-37	Can-Amera Parkway			4	SW	
Kitchener						
KIT-01	Ottawa St S	King St	Mill St	3	BL	4 lane widening deferred. Bike lanes to be built in long-term
KIT-02	Charles St E			1	SW	
KIT-03	Charles St E	Ottawa St	Benton St	3	BL	Incomplete sections to be implemented as part of LRT. Plan for long term bike lanes by acquiring property at intersection constraints.
KIT-04	Lancaster St W	Bridgeport St W	Bridge St	2	CC	Important link between planned bikeways, sufficient room on existing pavement
KIT-05	Bridge St E			2	CC	
KIT-06	Courtland Ave E			3	CC, BL	Recently reconstructed without bike lanes. Create link in network at next opportunity.
KIT-07	Lackner Blvd			3	BMUT	
KIT-08	Highland Rd W	Westmount Rd W	Highland Crescent	2	BL	Bike lane on south side poorly defined. Improve pavement markings/facility.
КІТ-09	Benton St			3	СС	Consider long term implementation of sharrows
KIT-10	Ottawa St N			3	BMUT	Long Term
KIT-11	Westmount Rd W			3	BL	
KIT-12	Ottawa St N	Between Hwy 85 Ramps		1	BL	



ID	ROAD	FROM	то	PHASE	TYPE	NOTES
KIT-17	Trussler Rd	Hwy 7/8	Bleams Rd	3	BMUT, BL	
KIT-18	Homer Watson Blvd	Ottawa St	Bleams Rd	2	BMUT	Short term priority on north / east side of Homer Watson, long term planning should consider MUT both sides, connect to Budd Park trail
KIT-19	Future Old Mill Rd	Homer Watson Blvd	New Dundee Rd	3	SW, BL	Bridge over 401
KIT-22	Courtland Ave E	Walton Ave	Mill	2	SW, BMUT	
KIT-23	Courtland Ave E	Siebert Ave	Walton Ave	3	BMUT	No facilities as part of LRT construction. Build BMUT in long term.
KIT-24	Fairway Rd S	Wabanaki Dr	Wilson Ave	1	SW	
KIT-25	Fairway Rd S	King St E	Wilson Ave	1	SW, BMUT	BMUT from King St to Fairview Mall driveway / Hydro trail connection / Wabanaki. Provides connection across highway 8. Adjacent 5974
KIT-27	Westmount Rd W	Glasgow St	Union Blvd	1	BL	Adjacent 5730, 5656
KIT-28	New Dundee Rd	Fischer- Hallman Rd	Trussler Rd	3	BL	Connect to planned and existing bikeways
KIT-29	Victoria St S	Walnut St	King St	3	CC	Constrained corridor; bike lanes preferred, marked shared use lanes at minimum.
KIT-30	Frederick St	East Ave	Lancaster St	3	CC	
KIT-31	Victoria St S	Fischer- Hallman Dr	Eastforest Trail	1	SW	Connect to transit network
KIT-36	Victoria St N	Lackner Blvd	Centennial Road	2	SW	Commercial/Retail area, bus route
KIT-39	King St E	Riverbank Dr	River St	2	BMUT	SW exists over bridge
KIT-62	Lackner Blvd			3	SW, BMUT	
KIT-63	River Rd E			2	SW, BL	
KIT-64	Ira Needles Blvd			1	SW	
North Dumfries						
NDF-01	Cedar Creek Rd			3	BL	
NDF-02	Swan St			4	SW	Extend to Hilltop Stage 2 access
NDF-03	Spragues Rd			3	BL	
NDF-05	Clyde Rd			3	SW	
NDF-11	Fischer- Hallman Rd	Roseville Rd	400m N of Roseville Rd	2	SW	Sidewalk along settled area in Roseville Rural Main St (Roseville)



ID	ROAD	FROM	ТО	PHASE	TYPE	NOTES
NDF-13	Roseville Rd			3	SW, BL	
NDF-14	Roseville Rd			3	SW, BL	
NDF-15	Roseville Rd	Blenheim Rd	Edworthy Side Rd	3	SW, BL	Sidewalk only along settled area in Orr's Lake. Paved shoulders to be built in Phase 3 Outside settled areas: Orr's Lake and at Edworthy
NDF-16	Roseville Rd			3	SW, BL	Sidewalk only along settled area in Roseville. Paved shoulders to be built in long-term Rural resurfacing in on Roseville Rd in 2018
NDF-17	Northumberlan d St	Roseville Rd	Greenfield Rd	3	BL	Verify existing condition
NDF-19	Edworthy Side Rd	Roseville Rd	Cedar Creek Rd	3	BL	
NDF-20	Dickie Settlement Rd	Roseville Rd	Cambridge / North Dumfries Boundary	3	BL	Rural resurfacing (5946) north on Dickie Settlement Rd in 2020
NDF-22	Dumfries Rd			3	BL	
NDF-23	Northumberlan d St			2	SW	East side to Greenfield is priority
Waterloo						
WAT-01	Bearinger Rd			4	SW	
WAT-02	Bridgeport Rd E	Conestoga Pkwy SB Ramp	Bluevale St S	2	BL	Upgrade resurfacing in 2019 and 2020 (see Project No. 5788 and 5765) to build segregated bike lane In conjunction with WAT-04, WAT-03 and WAT-08, *May require road diet
WAT-03	Erb St E	Bluevale St S	Margaret Ave N	2	SBL	BL connections to Bridgeport via Bluevale St S
WAT-04	Erb St E	Conestoga Pkwy Ramp	Bluevale St S	2	SW, BL	
WAT-05	Bridgeport Rd E	Lancaster St W	Conestoga Pkwy SB Ramp	2	SW, BL	Sidewalk on south side east of Lang Crescent. *May require road diet
WAT-06	King St N			3	BMUT	
WAT-07	University Ave E	King St N	Weber St N	1	BL	Include in adjacent reconstruction in 2013 (see Project. No. 5501). *May require road diet Connect existing & planned bikeways
WAT-08	Erb St E	Peppler St	King St S	2	SBL	Connect planned bikeways
WAT-09	University Ave W	Fischer Hallman	Garden Tree Court	2	SW	



ID	ROAD	FROM	то	PHASE	TYPE	NOTES
WAT-10	Westmount Rd N	Erb St	University Ave	1	BL	Restriping with narrow lanes. Adjacent resurfacing in 2014 (see Project. No. 5657) to stripe bike lanes. *May require road diet
WAT-11	Erb St W			4	SW	
WAT-12	King St S	Breithaupt St	Allen St	3	CC, BL	LRT Project doesn't include complete bike lanes. Plan for long term bike lanes by acquiring property at intersection constraints.
WAT-13	King St N	Rail in Uptown	Bridgeport Rd	1	CC	Constrained corridor; bike lanes preferred, marked shared use lanes at a minimum *May require road diet Connect to major destinations, connect planned and existing bikeways
WAT-14	King St N	University Ave	Columbia St	1	СС	Connect existing & planned bikeways, low volume given capacity
WAT-17	Erbsville Rd	200m S Keats Way	Keats Way	1	BMUT	Extend existing boulevard multi-use trail Paved existing dirt trail in boulevard
WAT-19	Westmount Rd N	University Ave	Columbia St	1	SW, BMUT	University Area,
WAT-23	Erbsville Rd	Keats Way	230m N Wideman Rd	2	SW, BMUT	Access to commercial/retails at Laurelwood
WAT-25	Bridge St W	Lexington Dr	Eastbridge Blvd	1	SW	
Wellesley						
WEL-02	Lobsinger Line	Charles St	W Charles St	2	CC	Constrained corridor; bike lanes preferred, marked shared use lane as minimum adjacent 5689
WEL-03	Ament Line	Isabella St	Knarr St	3	CC	Connect existing bikeways
WEL-04	Ament Line	Manser Rd	Isabella St	3	BL	Connect existing bikeways
WEL-05	Hutchison Rd	Queen's Bush Rd	Weimar Line	3	BL	Connect to planned bikeways
WEL-07	Weimar Line			3	SW	
WEL-08	Moser-Young Rd	Weimer Line	200m S Weimer Line	3	SW	Rural Main St. (Bamberg)
WEL-09	Kressler Rd	Apollo Dr	Rhine Meadow Rd	3	SW	Integrate in reconstruction is 2016 (see Project No. 5568) Rural Main St. (Bamberg)
WEL-10	Lobsinger Line	Kressler Rd	230m W Arthur Rd	3	SW	Include sidewalks in reconstruction is 2016 (see Project No. 5568) Rural Main St. (Heidelberg)
WEL-11	Lobsinger Line	Hutchison Rd	190m E Greenwood Hill Rd	1	SW, BL	Include sidewalks in reconstruction on Hutchison on 2015 to include sections of sidewalk on Lobsinger (see Project No. 5378) Rural Main St (Crosshill)



ID	ROAD	FROM	то	PHASE	TYPE	NOTES
WEL-15	Kressler Rd	Benjamin Rd / Hessen Strasse	Lobsinger Line	3	BL	
WEL-16	Herrgott Rd	Crosshill N Limits	Temperance Rd	3	BL	See Project no 5758 Rural resurfacing (5758) in 2018 at Crosshill
WEL-18	Kressler Rd	Rhine Meadow Rd	Hawkesville Rd	3	BL	
WEL-19	Ament Line	Hackbart Rd	Hawkesville Rd	3	BL	
WEL-20	Gerber Rd	Nafziger Rd	Greenwood Hill Rd	2	SW	Other Wellesley sidewalks built as park of capital project. See Project No. 5682
WEL-21	Moser-Young Rd	Gerber Rd	Weimar Line	3	BL	
WEL-22	Weimar Line			3	BL	
Wilmot						
WIL-01	Waterloo St	Waterloo - Oxford DSS	Christner Rd	3	BL	
WIL-02	Notre Dame Dr			3	BL	
WIL-03	Gingerich Rd	Petersburg W Limit	Gingerich Rd	3	BL	No Street View, but aerial appears to suggest there is room for bike lanes
WIL-04	Waterloo St	Christner Rd	Laschinger Dr	3	SW, BL	No Street View, but aerial appears to suggest there is room for bike lanes
WIL-05	Notre Dame Dr	CP Rail - Petersburg	St Agatha S Limits	3	BL	
WIL-06	Erb's Rd	E Limits of St Agatha	W Limits of St Agatha	1	SW, BL	Verify
WIL-07	Notre Dame Dr	St Agatha S Limits	St Agatha N Limits	3	SW, BL	Paved shoulders to be built in Phase 3
WIL-08	Nafziger Rd	Snyder's Rd	015km N of Erb's Rd (RR9)	3	BL	
WIL-09	Huron St	Bleams Ct	Waterloo St	1	SW, CC	Narrow, provincially significant cycling route (assuming on-street parking won't be removed)
WIL-10	Peel St	Hwy 7/8	Boullee St	1	CC	Constrained corridor; bike lanes preferred marked shared use lanes at minimum. Narrow, provincially significant cycling route (assuming on-street parking won't be removed)
WIL-11	Peel St	Boullee St	Seyler St	1	BL	Wide enough for a BL (without removing on-street parking), provincially significant cycling route
WIL-12	Huron St	Waterloo St	Peel St	1	BL	Wide enough for a BL, provincially significant cycling route
WIL-13	Bleams Rd	E of Morningside Cir	Wilmot-centre Rd	3	BL	Rural, provincially significant cycling route



ID	ROAD	FROM	то	PHASE	TYPE	NOTES
WIL-14	Erb's Rd	Sandhills Rd	Nafziger Rd	3	SW, BL	Paved shoulders to be built in Phase 3 Rural Main St. (Phillipsburg)
WIL-15	Waterloo St	New Hamburg Boundary	Hostetler Rd	3	SW	Rural Main St (New Hamburg)
WIL-16	Huron St	New Hamburg Boundary	Bleams Ct	1	SW	Constrained corridor; bike lanes preferred marked shared use lanes at minimum. Rural Main St (New Hamburg)
WIL-17	Bleams Rd			3	SW, BL	
WIL-19	Bridge St	Meadowbrook Crescent	450m E Main St	3	SW, BL	Rural Main St (New Dundee)
WIL-20	Bleams Rd	Knechtel Ct	Trussler Rd	2	SW, BL	Bike lanes and sidewalks west of Knechtel Ct. Paved shoulders east of Knechtel Ct to be built in Phase 3 Rural Main St (Manheim)
WIL-22	Bleams Rd	Hwy 7/8	490m W Holland Mills Rd	2	SW	Extend existing paved shoulder south of Bergey Ct to Hwy 7/8, Rural Main St (New Hamburg)
WIL-27	Bridge St	450m E Main St	Trussler Rd	3	BL	
WIL-28	Queen St	New Dundee N Limits	Witmer Rd	3	BL	Rural resurfacing (5793) in 2020 on Queen at Witmer
WIL-29	Wilmot- Easthope Rd	Concession Rd	Trussler Rd	2	BL	Adjacent Project 5757
WIL-32	Foundry St	Gingerich Rd	Snyder's Rd	3	SW, BL	Infill missing sidewalks on both sides
WIL-33	Foundry St	Bleams Rd	Gingerich Rd	3	BL	
WIL-36	Bleams Rd	W Settlement Extents	Cedarbrook Ct	2	SW	Upgrade resurfacing in 2016 to include sections of sidewalk (see. Project No. 5664)
WIL-37	Wilmot- Easthope Rd	Erb's Rd	ROW Limit	3	BL	
Woolwich						
WOO-01	St Charles St W	Greenwood Rd	Spitzig Rd / Durant Rd	3	BL	Rural, provincially significant route
WOO-02	Sawmill Rd			3	BL	
WOO-03	Arthur St S	First St	South St	2	CC	Constrained corridor; bike lanes preferred, marked shared use lane at minimum. Extend limits of reconstruction in 2017 to include sections of sidewalk and possible bike lanes. (see Project No. 5690). Build paved shoulder in Phase 3 Connect planned bikeway
WOO-04	King St N	Lobsinger Line	Printery St	3	BL	Connect planned bikeways
WOO-05	King St N			3	SW, BL	



ID	ROAD	FROM	то	PHASE	TYPE	NOTES
WOO-06	St Charles St W	Spitzig Rd / Durant Rd	Maryhill East Boundary	3	SW, BL	Upgrade and extend limits of resurfacing in 2016 to include section of sidewalks along settled areas in Maryhill (see Project No. 5654) Rural Main St (Maryhill)
WOO-07	Bloomingdale Rd N	Kraft Dr	Ebycrest Rd / Sawmill Rd	3	BL	Rural, provincially significant route
WOO-12	Floradale Rd	N Limits Floradale	S Limits Floradale	3	SW	Sidewalks along settled areas in Floradale Rural Main St (Floradale)
WOO-13	Church St W	Barnswallow Drive	Eldale Road	3	SW, BL	
WOO-14	Arthur St S	Earl Martin Dr	Whippoorwill Dr	2	SW	Rural Main St (Elmira)
WOO-15	Arthur St N	Arthur St Bridge / Riverside Bridge	Kenning PI	3	SW, BL	Rural Main St (Elmira)
WOO-16	Sawmill Rd	Arthur St	King St N	2	SW	Adjacent 5939
WOO-18	Sawmill Rd			1	SW	
WOO-19	Katherine St N	Short St	Largo Woods Lane	3	SW, BL	Extend limits of reconstruction in 2012 to include section of sidewalk (see Project No. 5799) Rural Main St (Winterbourne)
WOO-20	St Charles St W	Sawmill Rd	Bloomingdale E Limit	1	SW	Sidewalk along settle areas of Bloomingdale Rural Main St (Bloomingdale)
WOO-22	Arthur St N	Kenning PI	Sandy Hill Dr	3	BL	
WOO-23	Katherine St N	Largo Woods Lane	Line 86	3	BL	
WOO-24	Katherine St S	Sawmill Rd	Lundy Rd	3	BL	
WOO-25	Northfield Dr E	Line 86	Waterloo / Wellington Boundary	3	BL	Rural resurfacing (5902) in 2020 at Line 86
WOO-26	Northfield Dr E	Country Squire Rd	Scotch Line Rd	3	BL	
WOO-27	Lobsinger Line	Heidelberg E Limits	Apple Grove Rd	3	BL	
WOO-28	Shantz Station Rd	Menno St	Victoria St	3	BL	
WOO-29	Kressler Rd	Weimar Line	Erbsville Rd	3	BL	
WOO-30	Fountain St N	Menno St	Victoria St	3	BL	
WOO-31	Bridge St E	Kitchener / Woolwich Boundary	Ebycrest Rd	3	BL	



February, 2014

Appendix 4–E: Fix-It List



ID	LOCATION	NOTES
Cambridge		
F01	Fountain St N	Improve crossing conditions (overpass) Bike lanes and sidewalks on both sides planned
F02	George St N	Improve transition from trail to bike lane; Review potential improvement (e.g. curb cuts)
F03	Hespeler Rd	Facilitate intersection crossing for pedestrians and cyclists; Intersection improvement treatments
F04	Shamtaz Hill Rd	Improve crossing conditions (underpass); Sidewalk on both sides recommended in network
F05	St Andrews St	Fill in potholes
F08	Blair St. S	Flooding of boulevard trail near trail entrance
F28	Morningside Dr	Bike route with uneven pavement
Kitchener		
F06	Charles St.	Facilitate crossing across Charles St; Crossing improvement treatments
F07	Benton St. W	Improve comfort and visibility of trail bridge; Sign and clear branches
F10	Forfar Ave	Trail ends with no access to road; Curb cut
F11	Frederick St	Fix potholes
F12	Glasgow St W	Bike lane ends suddenly towards uneven pavement; Install bike lane ends signage, clear branches to avoid debris in bike lanes
F13	Highland Rd	Improve trail connection from NE to SW quadrant; Cross ride treatments at intersection and Highland Hills Mall north driveway
F14	Highland Rd	Low visibility along Highland near Ira Needles; Investigate potential to add street lighting
F15	Highland Rd	Improve access to transit stops between Ira Needles Blvd & Fisher-Hallman Rd; Sidewalks on both sides and bike lanes recommended in network
F16	Homer Watson Blvd	Increase pedestrian crossing time; Adjust signal timing
F18	Ira Needles Blvd	How-to-use education for roundabout; Signage for pedestrians, cyclists and/or motorists
F23	King St	Improve crossing conditions (underpass); Sidewalks on both sides planned in Capital Program
F24	Lancaster St	Uncomfortable walking conditions due to speeding on narrow road with curbside sidewalks; Park and children playing signs present. Recommend to City of Kitchener for potential traffic calming
F25	Manitou Dr	Improve access to transit stops
F26	Maple Groove	Add jersey barriers for pedestrians and cyclists
F27	Mill Park Dr.	Fix pedestrian/cycling bridge on trail; Replacement or reinforcment of existing structure
F29	Ottawa St.	Improve crossing conditions (overpass); Bike lanes recommended in network
F30	Peter St W	Improve comfort and visibility of trail bridge; Sign and clear branches



-		
F31	Queen's Blvd	Curb cut and refuge island needed
F32	OFF ROAD	Safety upgrades needed for trails crossing rail road; Signage
F33	Victoria St	Improve crossing conditions (overpass)
F34	Victoria St	Improve trail crossing; Add refuge island
F35	Victoria St	Improve access to transit stops
F36	Louisa St	Improve crossing conditions across Weber St; Signage and extend trail crossing to Louisa St
F37	Wellington St	Improve crossing conditions (overpass)
F38	Wilson Ave	Pave dirt trail at end of Wilson Ave to connect to existing trail
F39	DUKE ST	Connect Duke to Spur Line Trail at bend; Trail connection
F43	Bridge St	Turning cars cut into sidewalk corner ; Reduce turning radius, provide more space for crossing pedestrians
F44	Bridge St	Improve trail connection across Bridge St for the Grand River Trail
F45	Bridgeport Rd	Improve intersection crossing conditions; Intersection askew, shorten crosswalks, reduce turning radii, paint high visibility and bike detection markings/signage
F61	Lackner Blvd	Bike lane ends on one side
F62	King St E	Improve crossing conditions (underpass);
North Dumfries		
F40	Trussler Rd	Improve connections to Trussler Rd; Paved shoulders recommended on Greenfield Rd and Piper St
F41	OFF ROAD	Unaware of Grand River Trail alignment through North Dumfries; Invetigate providing parking and signage to mark trail
Waterloo		
F09	King St	Facilitate crossing across King St; Crossing improvement treatments
F19	University Ave	Connect trail along Seagram into University campus; Potential intersection secton treatment (e.g. repaint high visibility crosswalks, scramble or bike boxes)
F20	University Ave	Improve crossing conditions (overpass), trail crossing need to connect trails in NW to SE quadrant of interchange; Bike lanes along University Ave recommended in network
F21	University Ave	Wait for red light to cross is too long for trail users crossing University Ave; Adjust signal timing and reaction to pedestian crossing request
F22	University Ave	Short crossing time for left turns from Philips; Adjust signal timing
F42	Benjamin Rd	Improve trail connections on Benjamin Rd; Bike lanes recently constructed (2012)
F46	Brighton St	Bridge or trail connection to Bridgeport Plaza; Investigate cost-sharing initiative with plaza owners
F47	Columbia St	Wait for red light to enter Columbia St is too long for cyclists; Adjust signate timing
F48	Davenport Rd	Investigate potential to paint bike boxes with colour fill; Recomment to the City of Waterloo for consideration
F49	East Bridge Blvd	Loose gravel difficult to cycle; Recommend to the City of Waterloo for packing
F50	Caroline St	Improve trail crossing, connection to facility on Caroline St



F51	ERB St E	Poor visibility of upcoming ramp; Signage, design recommended bike lane to position cyclists away from ramp
F52	Erbsville Rd	Wait for red light to cross Erbsville Rd is too long for pedestrians; Adjust signal timing
F53	University Ave/ Lexington St	Loose gravel difficult to cycle; Recommend to the City of Waterloo for packing
F54	Regina St	Facilitate crossing across Regina St; Crossing improvement treatments
F55	King St	Improve crossing conditions (overpass); Boulevard multi-use trail recommended on both sides
F58	Lexington Rd	Improve crossing conditions (overpass); Recommended as a cycling route in City of Waterloo TMP
F59	Northfield Dr	Improve crossing conditions (overpass); Continuous bike lanes and sidewalks on south side recommended in network
F60	Northfield Dr	Connect pedestrians to RIM Park campus, across Northfield Dr; Boulevard multi- use trail recommended on south sides. Consider refuge island or other crossing treatments
Wilmot		
F17	Waterloo St	Recently constructed side walk
Woolwich		
F56	King St	Pedestrian crossing needed along King St. for all-day; Investigate warrant for crosswalk at Cedar St, existing crossing guard
F57	King St	Facilitate crossing to boulevard multi-use trail on west side of King St and to Rapid Transit Station; Crossing improvement treatments



5 STRATEGIC SIGNAGE ACTION PLAN

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5.1 DEVELOPING A STRATEGIC SIGNAGE ACTION PLAN

Way-finding signage is important for guiding and providing information to cyclists. As described by the Transportation Association of Canada's Bikeway Traffic Control Guidelines for Canada, guide and informational signage is intended to help cyclists find their way in unfamiliar areas and provide insight into the coherence of a network of bike routes. Thus, way-finding signage should perform two basic functions enabling users to

- Find and follow a route (along trails and/or along roads).
- Find and understand the distance to key destinations.

Typical signage for motorists on its own does not fulfill cyclists' needs for several reasons, including:

- Some cycling routes may be designed to avoid traffic or to follow scenic routes, thus they may make turns and take short cuts not intended for motorists.
- Cyclists exert their own energy and therefore far prefer direct routes and travelling shorter distances. Cycling routes need to lead to building entrances or property frontages. Cyclists are also sensitive to time and distance, and this information should be conveyed.
- Advanced signage is needed so that cyclists can position themselves in the approaching intersection as needed.

The following sections present recommendations for a signage system to be implemented throughout the Region of Waterloo. Several of the Area Municipalities have developed way-finding signage for specific corridors and are starting to evaluate possible city-wide signage guidelines. It is not the intent of these recommendations to replace these efforts, but rather to work with the Area Municipalities to develop broad regional way-finding signage guidelines that complement the work that is already underway locally. In order to provide some regional consistency, it is strongly recommended that the Region of Waterloo and Area Municipalities apply these signage guidelines to their specific signage implementation. The Area Municipalities are supportive of this direction. Specific recommendations for sample Regional Road signage, regional routes and regional trails are provided below.

5.2 REFERENCES

In addition to these guidelines, the following traffic control guidelines should be referenced for additional information on regulatory, warning and information signs for bikeways and pedestrian facilities.

ONTARIO TRAFFIC MANUAL BOOK 15: PEDESTRIAN CROSSING FACILITIES, QUEEN'S PRINTER FOR ONTARIO, 2010

The Ministry of Transportation, Ontario publishes a series of Ontario Traffic Manuals to provide information and guidance to transportation practitioners in the design, application and operation of traffic control systems in Ontario. Book 15 provides guidance on the planning, design and operation of pedestrian roadway crossings. It outlines the legal requirements, specifically the rules of the road that govern motorists' and pedestrians' movements at controlled and uncontrolled crossings, and presents the devices, physically separated facilities and accessibility considerations. Available online at http://www.library.mto.gov.on.ca (March 2012).



ONTARIO TRAFFIC MANUAL BOOK 18: BICYCLE FACILITIES, PENDING

Book 18 of the Ministry of Transportation, Ontario's series of Ontario Traffic Manuals will provide guidance on legal requirements, and the justification, planning, design, timing and operation of bicycle facilities and control measures. It is expected to be published in 2013 and will be available on-line at <u>http://www.library.mto.gov.on.ca</u>.

BIKEWAY TRAFFIC CONTROL GUIDELINES FOR CANADA (2ND EDITION), TRANSPORTATION ASSOCIATION OF CANADA (TAC), 2012

This guide covers regulatory, warning and information signage, and pavement markings for on-road bikeways and where trails intersect roadways. It was recently updated to include innovative pavement markings such as shared lane markings ("sharrows"), bicycle boxes and bike lanes at roundabouts. Order on-line at <u>https://vws3.primus.ca/dev.tac-</u>

atc.ca/english/bookstore/products.cfm?catid=12&subcatid=21&prodid=63 (March 2012).

5.3 SIGNAGE TYPES

The signage strategy is intended to provide guidance on promoting uniformity of essential information for way-finding along the walking and cycling network and to regional destinations. There are five primary components to the proposed regional signage system:

- Way-finding on trails
- On-street cycling facility signage
- Signing regional routes
- Destination signing
- Linkage signs

In addition to the above components, there may be other components to the signage system such as trailhead signage and maps, regulatory or warning signs (for example prohibition of motorized vehicles, stop signs, steep grade ahead, etc), tourism information, cultural and heritage interpretation, public art. These additional components would enhance, supplement or provide information that is separate from the primary way-finding components. Agencies and Area Municipalities are encouraged to exchange and co-ordinate guidelines on these additional components.

The Region of Waterloo should work with Area Municipalities to exchange and coordinate guidelines on additional components to the signage system such as trailhead signage and maps, regulatory or warning signs, tourism information, cultural and heritage interpretation or public art.

5.4 WAY-FINDING ON TRAILS

For trails, it is important to include signage at all access points and road crossings. Signage at the road crossings is critical to help locate the trail for those wanting to access it from a cross street. Similarly, for those on the trail, it is important that street name signs be placed at all trail crossings so that trail users can locate a particular cross street that they may want to access from the trail. Some arrow signs may be needed where there is a jog in the trail or where two or more trails meet.



Examples of some of the trail names and logos currently used within the Region are provided in **Exhibit 5.1**.



Exhibit 5.1: Sample Trail Names and Logos from throughout the Region of Waterloo

5.4.1 TRAIL IDENTIFICATION AND DIRECTION SIGN GUIDELINES

- Use trail name or logo signs at the entry to the trail, and every 500 m or less along the trail for route confirmation; see sample **Exhibit 5.2**.
- Where needed, include way-finding arrow signs at jogs in the trail or where two or more trails intersect; see sample **Exhibit 5.2**.
- Where two or more trails coincide, the logo or name for the high-order, regional or longer trail, should be placed on top, with the local trail logo or name below. For example, "Trans Canada Trail" logo would be placed on top of "Cambridge Trails" logo; see sample **Exhibit 5.2**.
- Provide street name signs at all trail / road intersections.
- Add begins or ends tab sign below the bicycle route sign at the beginning or end of the route; see sample **Exhibit 5.2**.









The higher-order, regional or longer trail name / logo is included at the top wherever it coincides with local trails.

Size: 120 mm diameter

Use existing Area Municipal trail names or logos.

Size: 120 mm diameter or width

Use way-finding arrow signs at jogs in the trail or where two or more trails intersect.

Circular arrow signs can be easily oriented in any direction with 8 pre-drilled mounting holes.

Size: 120 mm diameter

Add begins tab below the trail sign at the beginning of a trail route.

Size: 120 mm high by 180 mm wide



BEGINS

Add ends tab below the trail sign at the end of a trail route.

Size: 120 mm high by 180 mm wide

The Region of Waterloo should work with Area Municipalities to implement a trail wayfinding system based on branding logos and simple directional arrows as described in the Strategic Signage Action Plan.



5.5 WAY-FINDING FOR ON-ROAD CYCLING FACILITIES

Rather than creating a separate system of named bike routes on existing roads, it is recommended that way-finding signage for on-road cycling facilities be incorporated into existing street name signs. This strategy is in use in the City of Vancouver, as illustrated in **Exhibit 5.3**. It dramatically reduces the number of signs needed to be maintained and incorporates way-finding into signage that road users are already in the habit of looking for. It also reduces the need for advance signing, since street name signs are positioned and sized such that they are typically visible in advance.



Exhibit 5.3: Examples of On-street Cycling Facility Signage in Vancouver, BC

To further improve the visibility of on-street bicycle signage, particularly for local connectors, signage can also be supplemented by pavement markings associated with the various cycling facility types. Occasionally a bicycle route sign and arrow will also be needed at jogs in the route. These devices working together (i.e., street name sign with bicycle logo, local bicycle street pavement marking, and bicycle route and arrow sign) are illustrated in **Exhibit 5.4**.

On-road markings require additional maintenance and are un-tested in the Region. The use of pavement markings for way-finding should be reviewed and piloted on an appropriate project. This follows the approach for design treatments outline in Part 2: Green Chapter Design Guide.





Exhibit 5.4: Complementary Signs and Pavement Markings in Vancouver, BC

5.5.1 ON-ROAD CYCLING FACILITY IDENTIFICATION AND DIRECTION SIGN GUIDELINES

- Use street name signs with bicycle logos along the section of roadways with cycling facilities; see sample Exhibit 5.5.
- The colour, size, font and border on the street name sign with bicycle logo should match the street name sign currently used by the Region when the cycling facility is on a Regional road, and match the street name signs used by the Area Municipalities for cycling facilities on their streets.
- Bicycle logos should appear to the left of the street name to ensure it is the first symbol read.
- Placement of sign should be consistent with best practices for street name sign placement, i.e., placed on diagonally opposite corners at an intersection and parallel to the street.
- Where a cycling facility ends, include the street name sign and bicycle logo on the side of the street where the cycling facility exists only.
- Pavement markings for cycling facilities should comply with the type of facility (e.g., bike lane, marked shared-use lane ("sharrow"), etc.), and may incorporate arrows at jogs in the cycling facility route.
- Bicycle route signs and arrow tab sign may be required in some locations where there is a jog in the route; see Exhibit 5.5.
- Add begins or ends tab sign below the bicycle route sign at the beginning or end of the route; see sample in Exhibit 5.5.

The Region of Waterloo should work with Area Municipalities to include a bicycle logo on all street name blades for streets that include dedicated bicycle facilities and to provide supplemental way-finding signs and pavement markings as described in the Strategic Signage Action Plan.



Exhibit 5.5: Sample of On-road Cycling Facility Route Identification and Direction Signs

Bicycle logo on left side of street name.

♂ Street^{®D}

Colour, size, font and border to match local practice by individual jurisdiction.

Typical sizes:

- 150 mm high by variable width to suit name for local streets
- 200 mm high by variable width to suit name for arterial streets



Add bicycle route with arrow tab sign where there is a jog in the on-road cycling facility route (TAC signs IB-23, IS-5L, IS-5R, IS-6L, IS-6R, IS-7, IS-8L, IS-8R, IS-9L, IS-9R).

Size:

- Bicycle Route Sign 450 mm high by 450 mm wide
- Arrow Tab Sign 300 mm high by 450 mm wide

Add begins tab below the bicycle route sign at the beginning of a route.

Size: 300 mm high by 450 mm wide



Add ends tab below the bicycle route sign at the end of a route.

Size:300 mm high by 450 mm wide



5.6 WAY-FINDING FOR REGIONAL CYCLING ROUTES

Currently, the Region has identified five regional routes of provincial significance that are likely to become part of a larger Provincial cycling network, as illustrated in **Exhibit 5.6**. Two are predominantly off-road routes: the Trans Canada Trail and the Kissing Bridge Trail. The other three are predominantly on-road routes. It is recommended that the Region develop a unique set of route signs to enhance the identity of the regional routes for long-distance, touring cyclists and visitors to the Region.

The Trans Canada Trail and the Kissing Bridge Trail are already branded with names and logos. Signage for the off-road sections of these routes would follow the guidelines in Way-finding on Trails.

It is recommended that names and logos be developed for the three on-road routes. The signage of these on-road routes, along with the on-road sections of the Trans Canada Trail and Kissing Bridge Trail would follow the guidelines outlined below.



Exhibit 5.6: Five Regional Routes Identified in the Region of Waterloo

The routes shown above are conceptual representations and may differ from previously established routes. Differences include infrastructure that has been built by municipalities, planned connections, updates to trail designations and conceptual simplifications of routing. Map source: Region of Waterloo



5.6.1 REGIONAL CYCLING ROUTE IDENTIFICATION AND DIRECTION SIGN GUIDELINES

- Develop unique route signs for all regional routes of provincial significance. For the Trans Canada and Kissing Bridge Trails; use the existing logos.
- Locate large route identification signs that include the route logo at all major access points, major intersections and at the Region of Waterloo boundary; see **Exhibit 5.7**.
- Locate small route identification signs that include the route logo every 500 m or less; see **Exhibit 5.7**.
- Use small arrow signs below small route identification signs where there are jogs in the route or two or more routes intersect; see **Exhibit 5.7**.
- Add begins or ends tab sign below the regional route sign at the beginning or end of the route; see sample **Exhibit 5.7**.

The Region of Waterloo should work with Area Municipalities to install way-finding signs along the five regional routes of provincial significance and to develop names and logos for the three on-road routes as described in the Strategic Signage Action Plan.

Exhibit 5.7: Sample of Regional Cycling Route Identification and Direction Signs



Large regional cycling route sign with unique route name / logo (Trans Canada Trail name and logo shown in example).

Size: 450 mm high by 450 mm wide



Add bicycle route with arrow tab sign where there is a jog in the regional cycling route (TAC signs IB-23, IS-5L, IS-5R, IS-6L, IS-6R, IS-7, IS-8L, IS-8R, IS-9L, IS-9R).

Size: 300 mm high by 450 mm wide



Add begins tab below the bicycle route sign at the beginning of a route.

Size: 300 mm high by 450 mm wide



Add ends tab below the bicycle route sign at the end of a route.

Size:300 mm high by 450 mm wide



Small regional cycling route sign showing route name / logo (Trans Canada Trail logo shown in example).

Size: 120 mm diameter



Use arrow signs at jogs in the route or where two or more regional routes intersect.

Circular arrow signs can be easily oriented in any direction with 8 pre-drilled mounting holes.

Size: 120 mm diameter



5.7 **DESTINATION SIGNING**

Regional destinations should be signed at key decision points for cyclists and pedestrians. It is proposed that these regional destinations would include the following land uses:

- Downtown areas / districts, City Halls
- Regional trails
- LRT Stations
- Major parks, community facilities (recreation centres and major libraries)
- Regional shopping centres
- · Hospitals, high schools and major post-secondary schools

Regional destination signs should indicate both the distance and travel time by bicycle and, for shorter distances, on foot. The intention of these signs is to help cyclists and pedestrians who are unfamiliar with the area find their way to key destinations. Furthermore, they can help encourage more trips by helping new or existing active transportation users realize that many destinations are accessible in a matter of minutes.

The destination signage scheme would primarily serve the off road network. Care would need to be taken to ensure that the on-road destination sign policy is respected and that excess signs are not placed along roadways. However, there may be locations where on-road signage is appropriate and important to providing network wide way-finding. Determining what destination signs would be placed in which locations would need to be established on a case by case basis considering the local context.

The Region of Waterloo should work with Area Municipalities to install a clear and consistent system of destination signs along active transportation facilities and routes throughout the region as described in the Strategic Signage Action Plan.

5.7.1 CYCLING AND TRAIL NETWORK DESTINATION SIGN GUIDELINES

- Base calculations on a conservative travel speed for cyclists of 16 km/h and sign destinations not more than 8 km away (30 minutes.).
- Base calculations on a conservative travel speed for pedestrians of 3 km/h and sign destinations not more than 750 m away (15 minutes.).
- Include an arrow on the sign, locating the arrow on the edge that the arrow points to (left side of sign for left-pointing arrows, right side of sign for right-pointing arrows).
- Locate signs at major decisions points along the on-road cycling and trail network, such as major trail access points, trail / road intersections, trail / trail intersections, major on-road cycling facility intersections, and access points to short-cuts available to cyclists and pedestrians but not motorists.
- Where destination / distance information signs exist for motorists, do not add duplicate cycling and trail destination signs unless they are directing pedestrians and cyclists to an alternate route or short-cut.
- Sign no more than three destinations (three sign boards) at any one location on a single post to limit sign clutter and simplify the directions for cyclists travelling at higher speeds. Destinations can be added along a route as one destination is reached (and dropped from the signage) and another comes into range (within 8 km or less).
- The nearest destination sign is placed at the top and the farthest destination sign at the bottom when there is more than one destination sign on a single post.



Two options for the sign design and layout are recommended for testing to evaluate the overall clarity and comprehension of each.

OPTION 1 SIGN DESIGN

- The bicycle logo is placed before the name of the destination on the sign so that it is clear • that the sign is intended for cyclists, as opposed to motorists; see Exhibit 5.8.
- The distance is placed above the time on the sign since it will be consistent for all users; the • time will vary for each individual user and is placed lower on the sign as secondary information; see Exhibit 5.8.
- Provide distance and time estimates on the signs for cyclists and pedestrians, see • Exhibit 5.8.
- Replace the travel time for cyclists with a pedestrian logo and travel time when the destination is within 750 m (15 minutes. walking).



Exhibit 5.8: Option 1 Sample Regional Destination Signs

- Bicycle logo placed before destination name to indicate the intended user of the information first.
- Sign destinations no more than 8 km away (30 min. bike trip at 16 km/h).
- Size: 150 mm high by variable width
- When destination is 750 m away or less (15 min. walk trip at 3 km/h), add
- Size: 150 mm high by variable width
- Sign no more than three destinations at any one location on a single post.

February, 2014



OPTION 2 SIGN DESIGN

- The distance is placed after the destination name and above the time on the sign since it will be consistent for all users; see sample **Exhibit 5.9**.
- Place the bicycle logo and time estimate, and the pedestrian logo and time estimate when warranted (750 m distance or less) outlined in rectangles below the destination name; see sample **Exhibit 5.9**.



The Region of Waterloo should conduct both an on-line and field test of the two destination sign design options and then implement a pilot project to test the preferred design as described in the Strategic Signage Action Plan

Exhibit 5.9: Option 2 Sample Regional Destination Signs



5.8 LINKAGE SIGNS

Throughout the region there are many way-finding cues already in place for motorists. For example, streets that are named "crescents" or "courts" provide an indication of the shape of the street. Sometimes a sidewalk, path or trail link is provided at the end of dead-end streets, courts or cul-de-sacs so that it continues for cyclists, pedestrians and other trail users even though it may be "no exit" for motorists. Often these links are vital connections in a cycling or trail network and provide convenient short-cuts that give active transportation users an advantage over motorists, making the trip on foot or by bicycle more attractive.

The standard "no exit" sign for motorists in Ontario is the Wa-31. By adding exemption signage for cyclists and pedestrians, it can significantly improve awareness of the important active transportation short-cut or link and help users navigate through a neighbourhood avoiding busier routes.

5.8.1 LINKAGE SIGNS FOR "NO EXIT" STREET SIGN GUIDELINES

- Add sign indicating pedestrian and cyclist connection to all "no exit" signs on roads and streets where public pedestrian or cycling connections exist.
- Where feasible, indicate the roadway or destination that the linkage leads to (i.e. street name, destination name or trail name / logo, on the pedestrian/cyclist exemption sign); see Exhibit 5.10.

Exhibit 5.10: Sample Linkage Sign for MTO's Wa-31 "No Exit" Warning Sign



Ontario "No Exit" warning sign (MTO sign Wa-31).

Bicycle logo (if linkage permits cycling) and pedestrian logo on information sign below "No Exit" sign

Include street name, destination name or trail name / logo that the link connects to.

Size: 450 mm high by 450 mm wide (no exit sign) 550 mm high by 450 mm wide (exception sign)

The Region of Waterloo should work with Area Municipalities to install linkage signs wherever No Exit signs are posted and an active transportation link is provided as described in the Strategic Signage Action Plan.



5.9 MATERIALS AND INSTALLATION GUIDE

Ontario Traffic Manual (OTM) Book 2 provides guidance on sign materials, fabrication and installation that is suitable for outdoor, way-finding signs intended to be seen by a wide variety of users, including pedestrians, cyclists, and, in some cases motorists. Available on-line at <u>http://www.library.mto.gov.on.ca</u> (March 2012). Parts of OTM Book 2 are reproduced below. Where the local context does not allow for these guidelines to be followed other best practices may be substituted.

All way-finding and destination signs produced should follow best practices for fabrication, materials and installation such as those described in OTM Book 2.

ONTARIO TRAFFIC MANUAL BOOK 2: SIGN DESIGN, FABRICATION AND PATTERNS, QUEEN'S PRINTER FOR ONTARIO, 2005

- All sign sheeting (face material) is to be retro-reflective of an engineering grade to ensure that the sign shape, colour and message are retained at night.
- Sign posts for those signs that would be mounted within the right-of-way of roadways adjacent motor vehicle traffic are to meet material and installation specifications for typical road signs.
- Signs that would be mounted along trails can be mounted on typical road sign posts or on other fixed objects such as trail gates, bollards or trailhead signs, as long as they are visible from the direction the information is intended to be viewed, and do not hinder the use of such fixed objects for their intended use.
- Signs are to be mounted generally on the right side of the travel path. In some circumstances, they may be mounted overhead or on the left depending on local context and travel path alignment.
- A second sign can be located on the left side of the travel path to supplement the primary sign if users are failing to see the primary sign.
- Lateral clearance to signs from travel path:
 - Mount nearest edge of sign generally 2 to 4.5 m from the edge of the roadway.
 - If a barrier curb is present, the nearest edge of the sign is placed 0.3 to 2.0 m from the curb face.
 - For trails, paths or sidewalks, mount the nearest edge of the sign not less than 1.0 m from the edge of the trail, path or sidewalk.
- Avoid larger signs protruding into the travel space. Pedestrians with vision impairments using long canes detect objects below 0.7 m in height, but cannot detect objects between 0.7 m and 2 m that do not extend to the ground. Objects that do not extend the full width to the ground should not protrude more than 100 mm into the travel space if mounted less than 2 m above the ground. For vertical placement of signs:
 - Mount larger signs on a post at least 2 m above the travel surface.
 - If mounted less than 2 m above the ground, use a post that extends from the ground to the sign at the full width of the sign.
 - Smaller signs, such as the circular signs 120 mm in diameter, can be mounted at any height but 2 m is preferred.
 - Mount overhead signs a minimum of 4.5 m above the road surface, and 3.0 m above trail surfaces.
- Consider sign orientation with respect to the intended users. Generally place signs at right angles to the travel path of the approaching users. However, place signs on a slight angle away from the travel path of users who are not intended to view the signs.



- Install signs providing direction far enough in advance of a jog, turn or intersection to allow the user to make a decision and adjust their position or direction of travel. This will vary depending on the local context.
- Consider the need for a double-sided sign where the information would be viewed from more than one direction.

5.10 DEVELOPING A COHERENT SIGNAGE SYSTEM

Trail, on-road cycling facility, and regional route identification and direction signs, and destination signs are intended to be combined to reflect a coherent and integrated way-finding sign system for users of the active transportation network. **Exhibit 5.11** is a schematic of identification and direction signs for on-road cycling facilities, and regional and local trails. **Exhibit 5.12** is a schematic of the cycling and trail network regional destination signs based on Option 1 sign design (the location of signs using Option 2 sign design would be the same). The two are shown separately for clarity but are intended to be combined into one way-finding signage strategy.



Exhibit 5.11: Schematic of Cycling and Trail Route Identification and Direction Sign Locations



Exhibit 5.12: Schematic of Cycling and Trail Network Destination Sign Location

The Region of Waterloo should work with Area Municipalities to implement a clear and consistent way-finding signage system for the cycling and trail network as the network is expanded, adding signs with each new route as described in the Strategic Signage Action Plan.



6 WINTER NETWORK ACTION PLAN

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6.1 THE IMPORTANCE OF ADDRESSING WINTER CYCLING

Without a doubt, in Canada's harsh winter climate, cycling levels in the winter will always drop relative to summer levels. Data cited by Pucher suggests that in Ottawa, winter cycling levels were 5% of those in the summer of 2003, and in Montreal only 7% of cyclists continued to cycle in December through March of 2000.¹⁸ However, this data is already 12 years out of date¹⁹ and little is known about how much improved winter maintenance might affect cycling rates. After its first year of implementation, cycling along Ottawa's Laurier Avenue cycle track, which is relatively well maintained over the winter months, was measured in January 2012 at 12% of the 2011 summer peak levels in September. As Ottawa's winter maintenance practices evolve and as cyclists are more accustomed to the facility, this ratio is likely to change. Automated counter data for Bloor Street in Toronto suggests that the average number of cyclists that use this well-established bike lane in January and February is 28% of the number who use it in the peak months of August and September. Research in Sweden, where cycling infrastructure overall tends to be better and more closely maintained and cycling levels tend to be higher than in Canada despite equally harsh winters, indicates that bicycle volumes over the winter are more than a third of the volumes in summer.²⁰

Improved and consistent winter maintenance practices would surely encourage more cycling and research from Sweden suggests we can achieve a dramatic improvement over 2000 levels. For example, even in Sweden, the bicycle flow on bikeways with snow and ice was reduced by half compared to bikeways that had been fully cleared. Similarly bikeways with mixed winter conditions had almost 40% less bicycle flow, when compared to bikeways that had been fully cleared.²⁰ Furthermore, in a Norwegian survey, 53% of winter cyclists indicated they wouldn't cycle when bikeways were not cleared of snow²¹. Often it is not so much the cold that discourages people from walking and cycling in the winter, it is the snow cover and slippery conditions.

Providing the ability to cycle year round is fundamental to a sustainable shift in mode share to cycling. If people only see cycling as a viable alternative for 8 months of the year then they may decide that alternate transportation, including possibly a car, is necessary for the balance of the year. And, as is continually shown through travel statistics, you are much more likely to drive when you have a vehicle at your disposal.

6.2 DEVELOPING AN APPROACH TO WINTER MAINTENANCE

Interestingly, the same Swedish research cited above also highlighted a strong desire from cyclists for snow clearing to be done earlier in the morning to facilitate their commute either to work or to school. Indeed, the research suggests that winter trips by bike are most likely either the commute to school or work. A further concern raised by the surveyed cyclists was that continuous routes be maintained, rather than a piecemeal approach that leaves some sections of the network not cleared. Two important winter maintenance themes surface from this research: the priority should be addressing school and work travel, and a network approach is critical.

¹⁸ Pucher (2005) Cycling trends and policies in Canadian cities. World Transport Policy & Practice, 11 (1). pp. 43 – 53.

Over this period the number of utilitarian cyclists has roughly doubled in Montreal. Vélo Québec (2011) Bicycling in Québec in 2010.
Öberg et al., 1996 as cited in Bergstrom and Magnusson (2003) Potential of transferring car trips to bicycle during winter. Transportation Research Part A, 37. pp. 649-666

²¹ Giæver et al., 1998 as cited in Bergstrom and Magnusson (2003) Potential of transferring car trips to bicycle during winter. Transportation Research Part A, 37. pp. 649-666



The City of Montreal has taken steps in this direction by identifying a 63 km "white" network in 2008 (see **Exhibit 6.1**), of which 30 km were serviced in this initial year and the rest is being gradually phased in. Essentially the City ensures these bikeways are cleared, but the road network is still given priority and typically it takes at least 24 hours after a storm before the white network is cleared.



Exhibit 6.1: Montreal's "Réseau blanc" (white network), 2010

Boul. Berri

Boul. René Lévesque



6.3 CURRENT MAINTENANCE ACTIVITIES

The Region of Waterloo currently contracts out all winter maintenance of Regional roads to the Area Municipalities who, in turn, either manage the winter clearing themselves or contract it out to a third party. Note that the winter maintenance contracts between the Region and the Area Municipalities

only cover the roadway; the Municipal Act indicates that all sidewalks (even along Regional roads) are the responsibility of the Area Municipalities. Similarly, the Region does not assume responsibility for clearing boulevard trails on regional roads. This includes the clearing of snow banks from sidewalk ramps that are the result of clearing the roadway. Generally the Area Municipalities have passed the responsibility of clearing sidewalks to the adjacent property owners through local by-laws²² but they do tend to take responsibility for clearing their trails:

- The City of Kitchener provides winter control for the Iron Horse Trail and back-lotted boulevard trails and sidewalks.
- The City of Waterloo also clears back-lotted boulevard trails, they provide winter maintenance on some key trails and they also do clear an extensive network of sidewalks on arterial and collector roads.
- In Cambridge, all asphalt trails are cleared and the City aims to clear bike lanes as well. However, the City of Cambridge noted having received complaints that the bike lane winter clearing is not meeting the needs of cyclists.

In all three cases, the downtown Business Improvement Areas (BIAs) tend to pay the City to handle the snow clearing for them. Grand River Transit is responsible for clearing out transit shelters, but they also sub-contract this out to the Cities. In the case of Cambridge, this is sub-contracted out to a third party.

Across the Region, the policy is to clear Class 1 roadways first; these tend to be arterial roads. When there is a large storm, plough operators first clear a single lane on Class 1 roadways, then they plough a second lane followed by turn lanes. There are four roadway classifications and they are each dealt with in sequence. Once this is done, plough operators push back the snow as far as possible. In the case of bike lanes, this means trying to "wing" the snow out of the bike lanes and into the boulevard.

Trail clearing is done on a separate schedule and does not adhere to any specific service level. Trail clearing is typically done with articulated trackless vehicles equipped with either ploughs or, in some cases, blowers. Sweepers have not yet been tested.

In some priority areas, if snow accumulation is significant and it affects visibility or parking meter access, the municipalities would resort to "lifting" the snow (trucking away accumulated snow). Typically this is done in downtown areas one to two days after a snow storm. Lifting is also often done in St Jacobs due to tourism interests.

Winter maintenance complaints generally are brought to the attention of the Area Municipalities, particularly in urban areas, so the Region rarely receives feedback from residents on winter maintenance issues.

Following snowfall, Area Municipal staff always carefully watch weather forecasts as it is preferable to allow the snow to melt if possible due to the high costs of ploughing and, especially, lifting.

²² Except for sidewalks adjacent to City-owned buildings.



6.4 CHALLENGES

Bike lanes can be challenging to maintain in the winter since it is difficult to plough close to the curb, especially after long cycles of freezing weather. Winter maintenance practices often end up trading off between pedestrian and cyclist interests. Once plough operators get to the stage of "winging" the snow from the bike lanes, since many sidewalks run adjacent to the curb, this step pushes much of the snow onto the sidewalk, creating snow banks that obstruct views for cyclist and hard ice on the sidewalk, which is a hazard for pedestrians. This also causes the snow removal to become the responsibility of the adjacent property owners (typically).

Although standard winter maintenance procedures suggest cyclists are prioritized, the feeling from stakeholders is that rather than "store" snow on the sidewalk, operators tend to use the bike lanes adjacent to the curb-faced sidewalks as snow storage, perhaps for the sake of pedestrian accessibility and to not cause conflict with the adjacent property owners. There is no simple solution to this problem and the decision as to whether snow can be stored within the roadway or is a high enough priority that it can be lifted will be location specific.

There has been some interest expressed in having some trails also serve cross-country skiers. The City of Madison once tried using flexible delineators to guide plough operators so that they could plough half of the trail, thus allowing skiers to have access to the other half. Each half was roughly 2m wide. However, staff found that the solution did not work well and have now switched to ploughing the entire width. They recommended that any cross-country skiing corridors be specifically dedicated and maintained accordingly.

In terms of clearing snow from the sidewalk, often snow clearing at curb ramps, on medians, on channelizing right-turn islands, and at transit shelters is a challenge because this typically must be done manually and is typically done as a last priority.

Most complaints that the Area Municipalities receive from pedestrians and cyclists with respect to winter trail use relates to limited access to schools and that snow clearing has not been done in time for their commute.

6.5 SUGGESTED MAINTENANCE ACTIVITIES

The Region of Waterloo should consider, and encourage the Area Municipalities to consider, enhanced winter maintenance practices.

6.5.1 SIDEWALKS

- Wherever sidewalks are adjacent to the curb (i.e. there is no boulevard) on Regional roads, the Region should consider adding to its contracts with the Area Municipalities that these sidewalks be cleared by the municipality and that this be done after ploughs have finished the "winging" phase. Where there is no room for snow storage on adjacent properties, the Area Municipalities should be encouraged to lift the snow when there is significant snow build-up.
- Encourage the Area Municipalities to ensure that, while clearing sidewalk ramps and transit shelters, there are regular breaks at least every 25m in the snow banks formed in boulevards



to allow runoff to drain. In most cases, this would simply mean ensuring driveways and sidewalk ramps have all been properly cleared.

- Encourage the Area Municipalities to apply abrasives on all sidewalks they plough in cases where the sidewalk remains slippery once cleared of snow.
- Encourage the Area Municipalities to designate all sidewalks in the Regional Winter Pedestrian Network such that they are clear more quickly and more thoroughly and that they contract operators to begin clearing these sidewalks with dedicated equipment within 6 hours of significant snowfall.

6.5.2 CYCLING ROUTES

- The Region consider prioritizing all bikeways designated on the Regional Winter Cycling Network such that they are clear more quickly and more thoroughly, so that operators begin clearing this network within 6 hours of significant snowfall (note this includes some trails). For bike lanes on the Regional Winter Cycling Network where the combined width of all lanes in one direction is at least 5m wide, they can be cleared by plough operators with wings down such that plough blades cover an initial width of at least 4.5m wide in order to at least allow cyclists use of the ploughed lane without having to take the entire lane. It is encouraged that this additional wing width on the first pass include as much of the bike lane as possible within acceptable tolerances.
- Whenever possible, bikeway snow clearing equipment should use alternatives to ploughs, such as blowers or brushes, in order to avoid unnecessary damage to pavement markings and curbs. The use of abrasives is also encouraged since bikeways are more prone to ice buildup.

6.5.3 WINTER NEWORKS

- A consistent sequence should be established for clearing both Regional Winter Networks so as to help improve the predictability of service and help improve the probability of routes being clear for AM and PM peak travel.
- The Region encourage the Area Municipalities to ensure that pathway links are cleared (for example at the end of cul-de-sacs or on crescents)
- The salt management practices in the Region of Waterloo are among the most progressive in Ontario due to reliance on ground water as the primary source of potable water. It will be important that operators continue to enforce careful application of salts as they can be very corrosive to concrete, bicycles, and even clothing, not to mention the well documented harmful environmental impacts of salt when washed into nearby rivers. Furthermore, salts are typically ineffective for snow accumulations beyond a few centimetres or for temperatures lower than -10°C. In the case of trails, salt can also be harmful to any vegetation next to the trail. If feasible, rather than salt or sand it is generally recommended that abrasives be used, such as a fine aggregate of approximately 5mm diameter.²³

6.5.4 BIKE PARKING

Cyclists riding through the winter will need a place to park their bike. Ensuring that bicycle parking is clear can also improve conditions for pedestrians as it can reduce the number of people parking their bicycle haphazardly to street furniture and obstructing the pedestrian clearway.

- The Region should seek to ensure that all bicycle parking within the right-of-way along the Regional Winter Cycling Network is cleared out, which includes taking care to minimize salt and sand erosion of bike racks.
- The Region should seek to always use galvanized bicycle parking racks. Powder-coated racks should be avoided as they require more intense maintenance efforts.
- Bicycle parking racks should always be mounted on concrete pads, which simplifies winter clearing and also helps cyclists avoid having to step in muddy earth as snow melts.

²³ Vélo Québec (2011) Planning and Design for Pedestrians and Cyclists


6.5.5 TRANSIT STOPS

Clearing transit stops and shelters tends to be done manually and is labour intensive; it can be difficult to deal with this work in a reasonable timeframe. For example, staff at the City of Madison, Wisconsin, tried to introduce an ordinance to have the adjacent property owner clear snow from around transit shelters, but it was not well received. Eventually the City created four new staff positions spread across various departments. During the winter months, all four staff would be responsible for snow clearing, while in summer months, they would work for their respective departments.

Currently the City of Waterloo completes winter maintenance on the bus stops located in Waterloo; the City of Cambridge contracts the work out to a third party and in Kitchener the Region contracts the work out.

In order to avoid the need to clear snow from bus stops once and then again after street and sidewalk clearing, the bus stop clearing starts after the roads and sidewalks have been completed. This typically starts 72 hours after the snow accumulation has ended. Bus stops are cleared to a bare surface.

It is recommended that the Region investigate the feasibility of coordinating sidewalk clearing with transit stop clearing, such that the clearing of transit stops and shelters is conducted at the same time that sidewalks and curb ramps are cleared rather than separately.

6.6 THE WINTER NETWORK

The Regional Winter Network identified in **Exhibit 6.2** was developed taking into account the following:

- Bikeway corridors included in the network are a subset of corridors from the Recommended Regional Cycling Network, and are regionally significant. These corridors are areas of higher cycling demand due to the surrounding land uses and street network. They also tend to be roadways with heavier traffic volumes where it is important to take winter maintenance into account in order to improve the comfort for cyclists on these routes.
- The bikeway corridors to be maintained over the winter aim to address the more popular commuter routes, especially for university/college students since they are more likely to cycle over the winter months.
- 3. The pedestrian corridors to be designated high-priority for winter maintenance focus on serving busy retail corridors as well as higher-order transit.





Exhibit 6.2: Regional Winter Network



6.7 ENHANCED MAINTENANCE PILOT

Many enhanced maintenance policies are recommended for consideration in this chapter and there are significant costs associated with implementing many of these policies, even if only for the identified winter network.

In order to test the recommended policies, it is recommended that a pilot project for enhanced winter maintenance practices be developed over the course of 2014 to be implemented in the 2014-2015 winter season. Development of this pilot would involve:

- Working with the Area Municipalities to identify small sections of the winter network that could be used for the pilot project and would have a reasonable impact on winter walking and cycling.
- Working with the Area Municipalities to determine what enhanced winter maintenance practices are most appropriate for the network sections that are identified and would improve conditions to a meaningful extent.
- Developing a monitoring or survey plan to ensure that any benefits of the enhanced winter maintenance pilot project can be measured.
- Working with the Area Municipalities to determine implementation costs.
- Identifying and securing a source of funding (for example a low cost project may be workable within the normal maintenance budget while a higher cost project would require dedicated funding).
- Balancing the size of the pilot project network, maintenance practices to be used and expected benefits to users against the cost, to ensure that the pilot project would be a feasible and meaningful test of enhanced winter maintenance practices

The Region of Waterloo should work with the Area Municipalities to develop and implement an enhanced winter maintenance pilot project.



7 BEHAVIOURAL SHIFT ACTION PLAN

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7.1 BEHAVIOURAL SHIFT PROGRAMMING

The Region of Waterloo has provided ongoing support for Active Transportation (AT) behavioural programming with a goal of reducing personal car use and encouraging human-powered travel. To achieve this behaviour change in travel choice, the Region has developed and supported initiatives dedicated to changing the automobile-centered mindset of travellers in the Region. Behavioural change strategies support active transportation efforts in the Region of Waterloo through the design and delivery of marketing and outreach programs spanning the regional departments of transportation, public health and police. These programs encourage the use of human-powered modes of transportation while ensuring infrastructure elements provide the benefits desired by residents. Examples of human powered travel include cycling, walking and a mix of walking/cycling with other modes (transit, carshare, etc). Active transportation behavioural change strategies have the ability to benefit the Region of Waterloo by:

- Providing metrics to showcase changes in travel choice while establishing environmental impacts, quantifiable data and value in the community.
- Connecting pedestrians and cyclists to other sustainable modes by developing facilities and services, and by encouraging the use of these modes through education and marketing campaigns.
- Repositioning active transportation in the minds of Waterloo residents as convenient, accessible and safe.

This section of the plan:

- 1. Identifies and reviews existing programs working to increase AT mode choice.
- 2. Analyzes the marketing mix that impacts AT mode choice.
- Provides a series of possible future behavioural shift programs and associated checklist of activities.

Many of the actions recommended in this chapter would involve the coordination and effort of several Regional departments as well as external stakeholders, including the Area Municipalities. The recommendations are provided as a set of actions to consider in future programming related to active transportation.

7.2 RESEARCH

7.2.1 BEHAVIOURAL SHIFT ACTION REVIEW

A comprehensive analysis was conducted to identify existing and planned programs in the Region with direct correlation to AT behaviour shift actions. This document, **Appendix 7–A**, was based on stakeholder feedback, primary research and existing program knowledge.

The program with the most direct relevance to this task is the efforts currently underway by the Region of Waterloo. The Region created and continues to deliver TravelWise, a Transportation Demand Management (TDM) program focusing on changing travel behaviour for commuters and residents. In delivery of these AT-related programs, TravelWise utilizes an intervention strategy called Individualized Marketing (IM). This strategy is built upon proven behaviour change processes such as barrier-analysis, segmentation and informational dissemination. It is also based upon proven behaviour models such as the trans-theoretical behaviour change model. Through these measurable IM campaigns, the Region of Waterloo is able to measure travel behaviour choice prior to an informational and barrier-removal marketing campaign. More specifically, the largest and common



barrier addressed by the Region's IM delivery is the access to information regarding the travel choices available. The marketing campaign segments the audience based on a specific set of behavioural criteria.

TravelWise has also implemented a Transportation Management Association (TMA). This program provides (TDM) services for interested organizations and Area Municipalities in Waterloo Region. The TMA, TravelWise Commute, is a public-private partnership between the Region of Waterloo, the Area Municipalities and several employers throughout Waterloo Region, that provides the services and tools to encourage employees to commute more often on foot, by bike, in carpools or on the bus. Partnered organizations pay a TMA membership fee to the Region in return for access to several TDM services including online carpool matching software, discounted Grand River Transit Corporate Passes and an Emergency Ride Home service. The introduction of these services have helped achieve travel behaviour changes and helped organizations throughout the region find commuting solutions for their employees, with the average measurable decreases in the amount of employees driving to work alone of approximately 4.5%.

During the development of this plan it was discovered that a diverse range of other activities are currently underway or in the planning process to support more active transportation behaviour in the Region of Waterloo. Area Municipalities are currently piloting innovative marketing campaigns such as Kitchener's Bike Challenge and public-private partnerships for rewarding active transportation users. The City of Waterloo has created an online educational tool to help residents discover locations for parks and trails. The Working Centre is a community-based, non-profit organization investigating a potential public bike program. A Joint Cycling Research Study was conducted to identify targeted marketing campaigns to address active transportation safety in all municipalities in the Region. Waterloo Regional Police assist in the organization of Helmets for Kids and bike rodeos in various locations.

These aforementioned relevant programs focus less on behaviour change programming and instead provide individual complimentary assets to behaviour change such as information, promotions, planning, resources or other research. It was through this finding that a Behavioural Marketing Mix Analysis was identified as the next step in reviewing existing and planned efforts.

7.2.2 BEHAVIOURAL MARKETING MIX ANALYSIS

A standard marketing mix analysis will use the "four P's" in identifying core principles that affect business objectives. In marketing, the four P's are commonly known as product, price, promotion and place.

The same strategy can be successfully applied when identifying the core principles affecting AT behaviour change strategies, but in doing so, a subsequent fifth P is typically added to the mix. This fifth P represents the "Policy" that nearly any agency can shape, create, enforce and/or use to affect change in human behaviour. This "five P" analysis was conducted to ensure the Region of Waterloo captures the range of AT programming,

7.2.2.1 **PRODUCT**

For the purposes of the Active Transportation Master Plan, the "product" will be defined as Active Transportation behaviour, including cycling, walking, running or other self-propelled means of utilitarian travel.



7.2.2.2 PRICE

In order to become a social norm, Active Transportation behaviour's price needs to be at an acceptable level for customers. Nothing in our research indicated the monetary cost of AT and or TDM behaviour to be a primary barrier. This is intuitively obvious as walking and cycling are significantly cheaper than motorized modes. However, in the case of travel behaviour change, price is measured not only in dollars, but also in the time it takes, the perceived price of your image/reputation, new information you must garner, and the reduced comfort/ safety in a new AT mode.

7.2.2.3 PLACE

Place takes on two meanings with respect to Active Transportation. Primarily, the place is the location where the behaviour is conducted (for example, bike paths, sidewalks, roads with bike lanes or shared use lane markings ("sharrows"), etc).

Secondly, and with respect to the "product", AT behaviour is promoted in a variety of marketing channels, known as "placement". These placements include electronic, schools, community events and signage.

7.2.2.4 **PROMOTION**

The most significant role the Region of Waterloo can provide in AT behaviour change programming is found within promotion. This includes what is most often thought of as "marketing". Promotion is where more typical buzzwords associated with marketing are found such as: mass marketing, incentives, advertisements and informational brochures.

7.2.2.5 POLICY

Policy is added to the behaviour change marketing mix analysis because of the direct connection it has to human behaviour. Policy governs the enforcement of behavioural laws (e.g. no bike riding on sidewalks), design guidelines (e.g. bike path width), and safety equipment standards (e.g. helmet and bell use). This is an important element, as it is required to create sustainable behaviour change in any context or community.

Our team conducted a comprehensive review of the existing and planned marketing mix analysis with respect to AT behaviour. This document can be found in **Appendix 7–B**. Through this process, it was revealed that a complex and diverse set of stakeholders currently take behaviour change program actions. The highlights of these findings include:

- A large network of diverse organizations exists providing programming and marketing which impacts/discusses active transportation.
- Key audiences have been identified for active transportation marketing based on their level of familiarity and likelihood to use existing and planned infrastructure.
- Health benefits of active transportation are emerging as a strong partner for behaviour change.
- There was value in public-private partnerships in changing behaviour to active modes in local examples such as: the City of Kitchener partnered with a retail shop in their Bike2Work Challenge resulting in 12 free bicycles given to people who wanted to try commuting by bicycle. This value is also found in the newly created Transportation Management Association, TravelWise a program which partners with major employers to provide TDM programming.
- Safety is a major focus of organizations currently involved with marketing efforts for better enforcement of relevant AT travel behaviours (auto, cycle and pedestrian) and is a key issue for stakeholders.



 Measurable behaviour change for active transportation is currently only being executed through a process known as Individualized Marketing, conducted by the Region of Waterloo (TravelWise – workplace intervention - and residential based interventions).

7.3 BEHAVIOURAL SHIFT PROGRAM ACTIONS

Based on the findings described above, a series of goals has been established to guide actions and programs in the implementation of the ATMP. As mentioned in **Section 7.2** and showcased in **Appendix 7–B**, a strong foundation of programs and activities currently exist in the Region of Waterloo and are working towards active transportation behaviour change.

Short term and long term behavioural change actions are recommended based on a review of the Region's active transportation programs, complimentary AT programs, and stakeholder input. These strategies include adjustments to existing programs and the implementation of new pilot programs based on proven behavioural change strategies. These goals are designed to complement existing strategies while filling gaps in program delivery.

- **Goal A: Knowledge Sharing:** The Region of Waterloo will support efficient and effective knowledge sharing amongst the diverse organizations
- **Goal B: Better Enforcement and Increased Safety:** The Region of Waterloo will help facilitate an environment of safe, legal, and courteous active transportation behaviour.
- **Goal C: Increased Measurable AT Behaviour**: The Region of Waterloo will coordinate, collaborate and partner with programs that provide measurable active transportation behaviour change.

Exhibit 7.1 describes the possible program actions best suited to achieve the goals outlined above. This table describes how each action relates to the goals, anticipated lead agencies, which of the 5 P's the action addresses, budgetary considerations, timelines and expected outcomes. Actions are designed to achieve long-term behaviour change and provide measurable assets for social norming.

The Region of Waterloo should consider the 5 P's, Behaviour Shift Goals, and Behaviour Shift Program Actions when developing future programs targeted at increasing walking and cycling rates in our community.



Exhibit 7.1: Recommended Behavioural Shift Program Actions

Recommended Strategy / Action	Goal	P's Addressed (of the 5 P's)	Lead Agency (or Agencies)	Supporting Agencies	Budget Estimate	Projected Timeline	Outcomes
Active Transportation Champion / Stakeholders Summit Conduct an annual workshop with existing local AT stakeholders. This annual working group session will review upcoming AT program efforts, identify opportunities for coordination amongst existing/planned marketing and promotional efforts and plan unique collaborative events/strategies. By facilitating this workshop, the Region will help agencies better allocate resources and prevent duplication of efforts.	Knowledge Sharing Better Enforcement & Increased Safety	Promotion Product Policy	Region of Waterloo Transportation Planning	Region of Waterloo Public Health TravelWise Area Municipalities Waterloo Region Walks Waterloo Bikes Waterloo Cycling Club Waterloo Cycling Club Waterloo Cycling Club The Working Centre Grand River Transit Commuter Challenge Lidz for Kidz Brain Injury Association of Waterloo-Wellington	6,000/year	Annual or every other year event	Calendar of events from partner organizations Network/ collaboration of efforts Coordination of updates to cross-topic materials (Bus/Cycle map) An event and opportunity to build a strategic relationship with policy enforcers such as police and planners.
Phased Individualized Marketing Program Individualized Marketing is a proven behaviour change strategy that segments residents and employees by identifying markets most likely to change their behaviour to active transportation modes. It then uses information and incentives to create the desired behaviours. It is currently utilized in conjunction with the GRT network within the Region of Waterloo for all sustainable modes. As the network of new AT infrastructure is created, the Region should provide support to educate residents and commuters about the new existing modal options through Individualized Marketing. TravelWise, in coordination with GRT, will coordinate future IM campaigns with new AT infrastructure as criteria for neighbourhood selection. Depending on location selection the campaign could be residential or employer based (or a combination).	Increased Measurable AT Behaviour Knowledge Sharing	Placement Promotion Product Price	TravelWise	Region of Waterloo Public Health Area Municipalities Waterloo Region Walks Grand River CarShare Grand River Transit Waterloo Cycling Club CAN BIKE Lidz for Kidz Brain Injury Association of Waterloo-Wellington	In cooperation with existing IM efforts (\$35,000 / year)	Based on newly built AT infrastructure (serving at least 3,000 residents/ commuters)	Strategic comparison of behaviour change with IM for newly built infrastructure vs. existing. Measurable behaviour change for AT.
TravelWise Adopt-a-Stop Funding should be made available to add physical active transportation infrastructure to improve two major transit stations and/or to host an event at two major transit stations every year. This should be regarded as a means of building a sense of community and attraction for active transportation users. These events and infrastructure improvements are meant to raise community awareness of the transit stations and connectivity by bicycle and by foot available at the stations. The events or physical infrastructure (e.g. secure bike parking, morning coffee surprise patrols and pedestrian paths) should focus on the needs and demographics of the surrounding community and businesses to ensure that they are well received and achieve the maximum level of community exposure possible. These efforts, sustained over time, result in quality passenger environments at station areas, safety for cyclists and pedestrians and community awareness of a connected, sustainable transportation service. Time considerations for infrastructure improvements should be considered when tied to IM campaigns.	Increased Measurable AT Behaviour Knowledge Sharing	Placement Product Promotion	TravelWise & Grand River Transit Local Arts Community	Area Municipalities	\$5,000/year	Annually	Improved infrastructure to create a holistic mobility network for AT users. Turn AT network into feeders for transit lines (e.g. bike six blocks to the bus line). Infrastructure or events will provide continued awareness for TravelWise programming. Events/infrastructure can be done in conjunction with planned IM campaigns. Local artists could contribute to the design/promotion of infrastructure elements.



Recommended Strategy / Action	Goal	P's Addressed (of the 5 P's)	Lead Agency (or Agencies)	Supporting Agencies	Budget Estimate	Projected Timeline	Outcomes
Region of Waterloo Police Safety and Enforcement Week This is a weeklong enforcement campaign where Regional Police would dedicate resources to focus on AT laws (both impacting auto-users and pedestrians and cyclists). Strategic locations would be identified to position officers to enforce laws based on the existing infrastructure most likely to impact enforcement. These types of campaigns occur in other municipalities and offer valuable public relations, long-term observance of the laws, and social norming of proper behaviour for cars, cyclists and pedestrians. The efforts could be combined with helmet clinics, child-seat installation clinics, and other relevant travel safety educational opportunities.	Better Enforcement & Increased Safety Knowledge Sharing	Policy Promotion Price	Region of Waterloo Transportation Planning Region of Waterloo Police	TravelWise Region of Waterloo Public Health Area Municipalities Waterloo Region Walks Waterloo Bikes Waterloo Cycling Club Waterloo Cycling Club Grand River Transit Lidz for Kidz Brain Injury Association of Waterloo-Wellington	\$5,000- 15,000/year	Annually	Increased awareness of laws. Increased enforcement of laws. Increased safety awareness. Decreased fatalities and injuries with AT users.
Walk Challenge A month long challenge would be conducted to incentivize residents and area- commuters to monitor and report their daily step count. The campaign would be conducted in October when TravelWise currently does not have another regional event. It also is a month where the weather does not impact walking options. Participants would receive a pedometer, be asked to log their trips on a website, and be eligible for prizes and incentives (incentives could be distance based as a reward rather than random prize draws). Participants would be able to track individual and collective results as the campaign unfolds. This includes time, calories, distance and other interesting metrics. A biking version of this challenge already exists in the Region as part of the Bike to Work Week and Commuter Challenge efforts.	Knowledge Share Increased Measurable AT Behaviour	Placement Product Promotion	TravelWise Waterloo Region Walks Region of Waterloo Public Health	Area Municipalities Waterloo Region Walks Waterloo Region Police Grand River Transit	\$50,000	Annually	Increased awareness of pedestrian network. Increased awareness of health benefits to walking. Measurable participation through a walking step website.
Qualitative Research Focus groups, informal discussion groups and street-interviews should be conducted with audience segments to better inform all actions and strategies that impact Active Transportation behaviour. Audience segments could include various levels of current AT users, preferred demographics for behaviour change, and residents/employees of target IM campaigns. They could also include the newest user group: children. An example of this strategy is currently underway with focus groups/surveys of employees at the Lovell Industrial Park to identify current travel choice barriers and opportunities. This research could also include analysing how shade relates to user enjoyment or choice of facilities. This action will identify the barriers to entry, increased usage and maintenance of current users.	Knowledge Share Better Enforcement and Increased Safety Increased Measurable AT Behaviour	Policy Placement Product Promotion	TravelWise	Region of Waterloo Public Health	\$10,000- 15,000/year	Annually or bi- annually	Tangible feedback about barrier removal for target audiences. Real life examples of successes and failures for AT behaviour in a local context. Valuable insights to marketing campaigns such as Residential and Employer Individualized Marketing campaigns. Information to assist in better understanding barriers to children using Active Transportation.



Recommended Strategy / Action	Goal	P's Addressed (of the 5 P's)	Lead Agency (or Agencies)	Supporting Agencies	Budget Estimate	Pr Ti
 Monitor Public Bike Systems Similar to car-sharing programs, public bike systems make bikes available to subscribers at strategic locations city-wide. In some systems patrons access a bike with an electronic card, use it as needed and return it to the same or another parking rack when finished. Public bicycle programs have significantly increased the number of trips made by bicycle in cities that have launched major programs. Typically, before implementing a public bike program usage, including a review of the bikeway network to support use, and revenue generation. Anticipated usage — forecast program usage, including a review of the bikeway network to support use, and revenue generation. Economic analysis — true long-term costs, financing models, subscriptions & user fees, general revenues, outdoor advertising rights, sponsorship, and revenue generation. Fare structure and pricing — payment methods, cash, credit card, smart cards, and user accountability. Operating model and impacts for each model — agency to own and operate, agency to own but private company operate, private company owns and operates, etc. Currently there are two bike share programs in the Region: Grand River Public Bike Share (in development) Community Access Bikeshare (early deployment) 	Knowledge Sharing Increased Measurable AT Behaviour	Product Placement Promotion	Grand River Public Bike Share Community Access Bikeshare	TravelWise The Working Centre Grand River Carshare Grand River Transit City of Cambridge City of Kitchener City of Waterloo	none	ongc
Active and Safe Routes to School Active and Safe Routes to School (ASRTS) draws on research to assess the barriers to active school travel and uses this knowledge to develop and implement action plans. ASRTS is a growing movement that promotes and celebrates children's active school travel in Canada. The movement is supported by a large network of Canadian organizations that believe active transportation on the trip to and from school increases health and happiness and creates daily fitness habits for life. Popular programs and activities include school travel planning, walking school buses, active transportation workshops, iWalk, idle free school zones and others. Previous ASRTS programs in Waterloo Region were conducted by Together 4 Health and were comprised of representatives from Region of Waterloo Public Health, Waterloo Region District School Board, Waterloo Catholic District School Board, City of Cambridge, City of Kitchener, City of Waterloo, Ministry of Transportation and Waterloo Region Police Service. It is recommended that the Region create a committee to identify a new host organization and/or internal staff resources to deliver ASRTS programs to the schools in the Region of Waterloo.	Increased Measurable AT Behaviour Better Enforcement & Increased Safety Knowledge Sharing	Placement Promotion Product Price	Region of Waterloo: Transportation Planning	Region of Waterloo Public Health Waterloo Region District School Board Waterloo Catholic District School Board City of Cambridge City of Kitchener City of Waterloo Ministry of Transportation Waterloo Region Police Service.	To Be Determined	To B Dete

Projected Timeline	Outcomes
ongoing	Foster development of public bike systems
⊺o Be Determined	Funding source identification for staff time to deliver ASRTS programs to the local schools.



Appendix 7–A: Behaviour Shift Program Action Review



ORGANIZATION	AT FOCUS/ROLE	AT INTERVENTION NOTES	MARKETING METRICS	IDENTIFIED STAKEHOLDER
Travelwise (Workplace)	TDM for large employers in Waterloo Region	Employer Individualized Marketing (CBSM) strategy for all members	Behaviour change (before and after)	ROW TDM
Travelwise (Residential)	TDM for residents in Waterloo Region	Residential Individualized Marketing (CBSM) strategy for transit proximity communities. 2 interventions a year (1 Spring, 1 Fall), estimated 5k residents per intervention.	Behaviour change (before and after)	ROW TDM
Region of Waterloo TP/AT	Active Transportation policy, promotions, placement	Walk Cycle Waterloo Region Plan: process underway with behaviour analysis component	under development	ROW TDM
City of Kitchener	TDM with interest in bike share, special event TDM, and AT	TBD	TBD	Josh Joseph
Inter-Municipal Cycling Safety Initiative	Collision prevention (cities of Cambridge, Kitchener, Waterloo, and Region)	Educational and enforcement efforts to create new social norms on cycling safety for bike, pedestrian and auto audiences	Collision reductions	ROW TDM
Region of Waterloo Public Health	ASRTS, CAN-Bike, Project Health, Workplace consultations, Healthy Workplace Awards applications	Bridging the role between public health and travel choice. Information and training styles. School travel planning; Consultative support to workplaces to develop comprehensive wellness plans that include awareness raising, skill building, supportive environments and policy develop for physical activity, road safety and active transportation	TBD (website traffic)	Colleen Cooper, Ruth Dyck, Annette Collins
Joint Cycling Research Study	Planning and market segmentation of Bicycle behaviour	Market segmentation information for future interventions	Tracked and plotted trips	Jeff Casello and Kyrylo Rewa
City of Waterloo	Transportation Master Plan calls for AT and TDM coordinator, Pedestrian Charter (2008), etc	TBD. Educational tools include online maps for parks, trails, etc.	TBD	Philip Hewitson (Director of Transportation) Christopher Hodgson (Engineer) John Griffin (Landscape Architect in Parks Division)
City of Cambridge	Bikeway Network Master Plan created in 2008/09	How is this project being communicated/promoted/introduced to the public?	TBD	Shannon Noonan
The Working Centre	Community Support for Bicycle Maintenance and Community Access Bicycles	Product/behaviour maintenance, creation and implementation for behaviour (Bike share, Recycle Cycles, etc).	TBD	Joe Mancini (Founder) and Michael Cheung (Bike share liaison)
Waterloo Regional Police	Bicycle and Pedestrian safety, enforcement (both vehicle and bike/pedestrian), and Bike Rodeos	Enforcement of laws and education of safety to create social norms (both auto and bike/pedestrian).	TBD	TBD
Tour de Grand	Competitive Bike Event for recreation/education/health	http://cambridgetourdegrand.com/	Registrants, sponsors	P Rowe
Active Cambridge	Promotes active lifestyles and creates forum for community members	www.activecambridge.ca, Physical Activity EXPO 2011	тво	TBD
Helmets for Kids	Safety for children and bicycles	Partners with neighbourhood associations, Waterloo Regional Police (bike rodeos), etc.	Fundraising and helmets	Brain Injury Association of Waterloo-Wellington, Patti Lehman BIAWW has free helmets and education program "Lidz on Kidz"
The Active City	Rogers Public Broadcasting for Active Lifestyle in Cambridge	Mass marketing for active lifestyles.	Viewers and Episodes	Andy Hourahine
Commuter Challenge	Promotion of TDM action for one week	Try-it, pledge style behaviour change	Participants	ROW TDM
Grand River Carshare	Behavioural supportive product	Location specific product to support AT lifestyle	Members, cars/locations, engagement	Jason Hammond
Waterloo Cycling Club	Recreational/competitive bicycle club	Over 500 members, 45 years old, informative website, events, clinics (maintenance), etc	Members, events, etc	Brent Ellis (President)
Parks and Recreation/Leisure Services	Provide the destination (parks, golf courses, ball fields, etc) and sometimes the products (trails, parks, etc) for many AT users	TBD, City of Waterloo example: "Plant Some Shade"	Not required	Not required
Conestoga Mall Walkers	"Walking for exercise in safe controlled environment"	Community group promoting and enabling active seniors.	Not required	Not required
Waterloo Region Walks	Increase community awareness of local walking opportunities, resources and supports. Advocacy for safe walking. Increase number of people in community who walk for health, transportation and recreation.	Facebook presence to engage and educate followers on walking events as well as walking for health, transportation and recreation. Pedometer lending partnership with local library system to encourage walking and the utilization of the region's built environment.	Facebook page likes and pedometer partnership lending stats	Muriel Vandepol
StepWhere.com (walking/running forum)	Online forum for recreational AT in Waterloo Region	Online forum for user-generated walking and jogging routes. http://www.stepwhere.com/listpaths/country/43/region/37/city/3488	Activity on forum	Not required
Waterloo Region Active Living Network	Physical activity (including AT) access to recreation and policy/advocacy	Report "Blueprint for Physical Activity Action in Waterloo Region"; advocacy for adoption of a physical activity charter in Waterloo Region. Website and sponsorship of learning/networking events	твр	Elba Martell (Public Health link to the group)
Waterloo Region Healthy Communities Partnership	Physical Activity (including AT) one of three priority areas identified by community	Policy reports and recommendations related to healthy eating, physical activity (including AT) and mental health	TBD	Katherine Pigott (ROW Public Health)



Appendix 7–B: Behavioural Marketing Mix Analysis



				Muni	icipal				Community Based									Special interest or other					
Organizations • - Partially Responsible/Implementing • - Significantly Responsible/Implementing	ROW Transportation Planning	ROW Public Health	City of Waterloo	City of Cambridge	City of Kitchener	Inter-Municipal Cycling Safety Initiative	Waterloo Regional Police	Provincial	TravelWise (Residents)	TravelWise (Employers)	Commuter Challenge	The Working Centre	Waterloo Region Walks	Waterloo Cycling Club	Grand River Carshare	Together 4Health	Bicycle/Shoe Stores	Helmets for Kids	CAN Bike	Conestoga Mall Walkers (seniors)	Tour de Grand	Waterloo Bikes	StepWhere.com
TARGET AT AUDIENCES																							
Children	•	•	•	•	•	0	•	0	0				•			•	•	•					
University Students	•	0	-			•	•	0					•			-	•				•		
Residents/Households	•	•	•	•	•	•	•	0	•			•	•	•	•	•	•	0	•		•		•
Employers/Employees	•	0			•		•	0		•	•	0	•		•		•						
Seniors	•	0					•	0	0				•				•			•			
PRODUCTS	1																I						
Walk log Skateboard Pollerblade																							
Sidewalk/trails for pedestrian facilities/ networks			•	•	•			0															
Showers/lockers at worksites	•		•		• •					0													
Skateboard parks			•	•	•																		
Walking Clubs																				•			
Shoes and other AT equipment (pedometers, running																				-			
gear, etc)																	•	0			•		
Cause-related/organized walks and runs							0										0	0					
Running clubs																							
Bicycle																							•
Bicycle lanes, boxes, and sharrows	•		•	•	•																		
Bike Park				0	•																		
Bike share program	0											0											
Secure bicycle parking	•		•	•	٠					0													
Showers/Lockers at worksites										0													
Bicycles							0										•						
Safety equipment (helmets, bike lights, reflective gear)																	•	•				0	
Bicvcle maintenance									0	0		•					•						
Cause-related bicycle events							0																
Bicycle clubs, competitions, races, and community												-											
groups												•		•				•					
POLICY																							
Bike/Pedestrian Behaviour Enforcement							•																
Auto-related Behaviour Enforcement							•																
Bike/Pedestrian Behaviour Rules/Regulations							•	•															
Infrastructure Design/Requirements	•		•	•	•																		
Helmet Requirements (bike, skateboard, etc)			•	•	•		•	•									0		•				
PROMOTION	·		·		:	:						: 			·				:	·			
Mass Marketing for AT		•							0	0			•	•	0	•	0						
Individualized Marketing (CBSM) for AT		-							•	•			-	-	, , , , , , , , , , , , , , , , , , ,	-	Ŭ						
Enforcement/education Promots (signage, rules, etc.)	•		•	•	•	•	0	•	-	-													
AT Behaviour Education	1	•	•			•	0					•	•	•		•	0		•				



				Mun	icipal				Community Based									Special interest or other							
Organizations ○ - Partially Responsible/Implementing ● - Significantly Responsible/Implementing	ROW Transportation Planning	ROW Public Health	City of Waterloo	City of Cambridge	City of Kitchener	Inter-Municipal Cycling Safety Initiative	Waterloo Regional Police	Provincial	TravelWise (Residents)	TravelWise (Employers)	Commuter Challenge	The Working Centre	Waterloo Region Walks	Waterloo Cycling Club	Grand River Carshare	Together 4Health	Bicycle/Shoe Stores	Helmets for Kids	CAN Bike	Conestoga Mall Walkers (seniors)	Tour de Grand	Waterloo Bikes	StepWhere.com		
AT Behaviour Disincentives							•																		
AT Behaviour Incentives									•	•	•														
Trail, cycling, and walking maps (printed & electronic)	0		•	•	•				•	•															
Advocacy for Bike/Pedestrian in the community		•					0						•	0	0	•	0		0			•			
Training for legal AT behaviour							0						•						•						
Promotion of benefits to encourage behaviour	0	•	0	0	0	0			0	0	0	•		0	•	•	0	0	0	0		•			
PLACEMENT																									
Electronic	0	0	0	0	0				•	•	•	•		•	•	•	0					•			
Schools		0	•																						
Universities		0												0	•		0								
Community Outreach		•	•						•	•	0	•		0	•	0			•			•			
Community Forums (blogs, online communities, etc)		0												•	•	0									
Brick and Mortar												•			•		•								
Signage and other visual prompts	•	0	•	•	•																				
PRICE																									
Behaviour enforcement and consequences							•																		
Customer Price (image, reputation, safety, convenience, comfort, fuel costs)									•	•	•				•				•						
Fuel price								•																	





8 PERFORMANCE MONITORING ACTION PLAN

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8.1 DEVELOPING A MONITORING AND EVALUATION STRATEGY

Many transportation plans end up becoming obsolete soon after they are approved: external conditions change, action plans evolve, revenues fall or costs rise, and early active transportation master plan initiatives can change circumstances for the later ones. Given this reality, one way to provide decision makers with continuously relevant guidance is to follow a rigorous performance measurement process. Decision-makers need tangible tools to support policy implementation — to move from ideas to execution. Such tools should assist with implementation and facilitate adapting to changing circumstances without losing sight of the policy goals. Successful strategies for monitoring implementation focus on actions and the progress made toward strategic objectives (both qualitative and quantitative), while also considering changes in analytical assumptions, shifts in social or economic circumstances, and changing fiscal realities.

A process is required to monitor progress, evaluate deficiencies and strengths and report on actions related to this plan. Reporting is a key aspect of performance measurement, since the knowledge resulting from monitoring and analysis is only useful if decision makers and stakeholders are aware of it. Reports presenting information in a way that effectively communicates successes and ongoing challenges can capture the attention of community groups and the media, helping to raise public awareness of results achieved and the need for continued action.

In the case of the Region of Waterloo, data collection activities are already conducted regularly by various agencies, such as the TTS survey and intersection counts. It is recommended that, where feasible, the Region seek to adjust these on-going data collection efforts so that they incorporate active transportation in a way that allows them to monitor the Walk Cycle Waterloo Region (ATMP) goals. In some cases, additional resources would be required. The following sections present a strategy for monitoring and evaluating the impacts of the Region's active transportation initiatives based on the goals of Walk Cycle Waterloo Region. They also address reporting the results back to key stakeholders to highlight solutions that work best in the Region of Waterloo and to inform future revisions of Walk Cycle Waterloo Region.

The recommended process of monitoring and evaluating follows the flow chart shown below:



Exhibit 8.1: Monitoring and Evaluating Process



8.2 INDICATORS TO MEASURE PROGRESS

In order to measure progress and help guide the next steps in planning the Region's AT network, it is important to define indicators that fully describe the performance of the system. Indicators should be consistent with Walk Cycle Waterloo Region's vision and goals, while being measurable and easily understood by the public and decision-makers.

The Region should consider the availability of data, the cost and time to collect data, and the quality of the resulting data in developing a reasonable list of performance indicators. The data for the indicators and measures should not be difficult to collect, and it is generally recommended that the Region use the technology and resources that are already available. The best indicators are:

- 'Forecastable', in the sense that reasonable future targets can be estimated.
- Clear to professionals, policy makers and the public.
- Useful and applicable to the Region's goals.
- Able to provide a direct way to diagnose problems.
- Comparable across time.
- Relevant to the Region's planning and budgeting processes²⁴.

The main source of input to developing the indicators is observed data, such as traffic counts or surveys. Stakeholder consultation can complement these hard data by providing anecdotal and qualitative insights on current conditions or on the expected impacts of enhancements. It is **recommended that the Region monitor the suggested indicators listed in Exhibit 8.2**; these align with the objectives and indicators presented for the overall transportation system as presented in the *Regional Transportation Master Plan* (RTMP, 2011).

The Region of Waterloo should develop an active transportation monitoring program targeted at tracking the indicators recommended in the Performance Monitoring Action Plan.

²⁴Transportation Association of Canada, 2006; Tate-Glass, M. J., Bostrum, R, & Witt, G, 2007

Performance Objectives	Performance Indicators	Sample Period	Location	Source	Sample Frequency	Target		
		Goal: Foster	a Stronger Eco	nomy				
Safe, Efficient, and Reliable Transportation System (RTMP)	Average daily reported collisions with pedestrians per 10,000 residents (or per 1,000 cyclists on key screenlines)	Annual	-	Region of Waterloo Police Services (serious or fatal accidents involving pedestrians), Canadian Census (or manual count data)	Annual	T.B.D.		
	Average daily reported collisions with cyclists per 10,000 residents (or per 1,000 cyclists on key screenlines)	Annual	-	Region of Waterloo Police Services (serious or fatal accidents involving cyclists), Canadian Census (or manual count data)	Annual	T.B.D.		
Goal: Support Sustainable Development								
Balance Transportatio n Choice (RTMP)	Capital budget allocation by mode	Year	-	Annual budgets	Annual	10% by 2016 (ATMP)		
	Proportion of Municipal & Regional buildings with bike parking	Year	-	Region of Waterloo, Area Municipalities	Annual	100%		
	Total supply of public bike parking installed and maintained the Region and Area Municipalities at municipal buildings and in the public right- of-way	-	All publicly owned bicycle parking in the Region	Region of Waterloo, Area Municipalities	Annual	T.B.D.		
Improve Air Quality (RTMP)	Greenhouse gas emissions from passenger travel (kg per capita in the study area)	1 "typical" fall day	-	TTS & Emissions Model (e.g. UTEC)	5 years	T.B.D.		
	NOx emissions from passenger travel (kg per capita in the study area)	1 "typical" fall day	-	TTS & Emissions Model (e.g. UTEC)	5 years	T.B.D.		

Exhibit 8.2: Recommended Region of Waterloo AT Performance Indicators



Performance Objectives	Performance Indicators	Sample Period	Location	Source	Sample Frequency	Target		
Goal: Promote Transportation Choice								
Increase Active Transportation Share and Enhance Facilities	Cycling mode share (% of all trips)	6am to 9pm	Key screenlines	Region of Waterloo manual counts	Annual	T.B.D.		
		1 "typical" fall day (24	-	TTS, Canadian Census	5 years	3% by 2031 (RTMP)		
(RTMP) Promote		nours)				Cambridg e: 1.9% by 2031		
Mode Choice and Integrate Different Modes						Kitchener : 2.7% by 2031		
(RTMP)						Waterloo: 4.5% by 2031		
						Rural: 1.4% by 2031		
	Walking mode share (% of all trips)	6am to 9pm	Key screenlines	Region of Waterloo manual counts	Annual	T.B.D.		
		1 "typical" fall day (24 hours)	-	TTS, Canadian Census	5 years	9% by 2031 (RTMP)		
						Cambridg e: 8% by 2031		
						Kitchener : 9.2% by 2031		
						Waterloo: 10.7% by 2031		
						Rural: 4.7% by 2031		
Increase in Amount of Active Transportation Facilities	Kilometers of cycling facilities constructed	-	-	Region of Waterloo, Area Municipalities Infrastructure Tracking	Annual	T.B.D.		
(RTMP) Building the Walking and Cycling	Kilometers of accessible sidewalk and boulevard multi- use trails constructed	-	-	Region of Waterloo, Area Municipalities' Infrastructure Tracking	Annual	T.B.D.		



Performance Objectives	Performance Indicators	Sample Period	Location	Source	Sample Frequency	Target			
	Goal: Promote Transportation Choice								
Network (ATMP)	Kilometers of existing cycling facilities to date as % of total planned	-	-	Region of Waterloo, Area Municipalities' Infrastructure Tracking	Annual	T.B.D.			
	Kilometers of existing accessible sidewalks and boulevard multi- use trails to date as % of total planned	-	-	Region of Waterloo, Area Municipalities' Infrastructure Tracking	Annual	T.B.D.			
Establish and maintain winter level of service standards for active transportation facilities (ATMP)	Kilometers of cycling facilities with minimum service standards included in contracts with Area Municipalities	-	-	Region of Waterloo	Annual	T.B.D.			

8.3 EXPANDED DATA COLLECTION ACTIVITIES FOR THE REGION

In order to monitor the above indicators, some new data collection efforts by the Region would be required. These recommendations are made with the understanding that some new data collection efforts can be executed efficiently and do not represent major increases in either operational or capital spending or in staff time. However, others will require increased budget. Any expansion of the current data collection program would be subject to budget approval by Council.

As part of the ongoing data collection program, consideration should be given to collecting environmental variables, such as include precipitation type and intensity, surface condition, temperature, wind speed and UV index. This data could be used to help understand the influence of environmental factors on active mode choice and could inform both shade and winter policies for active transportation facilities.

8.3.1 CONDUCTING MANUAL COUNTS

The Region now consistently collects cycling and pedestrian volumes for all intersection counts. Intersection counts are contracted to private suppliers. There is an opportunity to update the count program to include new data requirements when the Request for Proposals is re-issued, generally every three years.

Cyclist counts at intersections only include totals for the eight hour period of the count and lack directional information. For the purpose of modelling mode shifts and sensitivity to policy changes, this may be sufficient. However, as is done with other modes, cyclist counts disaggregated into 15 minute increments would allow a better understanding of existing and changing cycling travel patterns relative to other modes.



The Region of Waterloo should investigate the feasibility and costs of adding turning movement counts for cyclists in 15 minute intervals to standard regional counts as part of preparing the next count program terms of reference.

Screenlines are imaginary lines that typically follow natural barriers or divide defined areas. They are used to understand large scale patterns. For example, "How many people are crossing the Grand River" or "How many people are travelling between Cambridge and Kitchener?" By counting activity along a screenline these questions can be answered. Intersection counts are typically conducted every 3 years and then supplemented with localized counts for special studies.

The Region of Waterloo should establish a set of screenlines on key corridors where all modes will be counted annually.

These screenlines need not be large-scale and can simply be placed mid-block. In some locations, screenlines may only span a single right-of-way, such as Coronation Boulevard between Preston and Galt or possibly the University Avenue Bridge over the Conestoga Parkway. In order to track annual mode shares in these key locations, it is recommended that all modes be counted and transit vehicle occupancy be approximated. The Region should aim to conduct counts at these key locations over a longer time period, such as 24 hours or at least 6 a.m. to 9 p.m. to help assess which corridors tend to serve peak travel, when peak cycling demand tends to occur and where, the scale of peak demand versus off-peak demand, and whether the standard eight hour timeframe of the current intersection counts is adequate to capture the information needed to assess performance.

Simple but important pedestrian and cyclist characteristics could be added to these key screenline counts. For example, the number of cyclists riding on the sidewalk versus the road, was raised many times in public consultation and in collision reviews, and tends to improve significantly with the introduction of dedicated cycling facilities.

The Region of Waterloo should investigate the feasibility and costs of adding pedestrian and cyclist characteristics to the recommended annual screenline counts.

To ensure consistent count records, counting cyclists and pedestrians may require modifications to surveyor training, especially if additional characteristics related to cyclists and pedestrians are being collected. The Region of Waterloo can provide direction to the contractor undertaking the counts but is not responsible for their surveyor training. It may be necessary to clarify the inclusion of special types of pedestrians and cyclists (e.g. people in wheelchairs or cyclists riding on the sidewalk). The National Bike and Pedestrian Documentation Project (NBPD) provides a count training presentation²⁵ on their website that describes recommended surveyor equipment for conducting screenline counts and a variety of photos demonstrating how to identify and count pedestrians and cyclists.

²⁵ Alta Planning and Design. Conducting Counts. The National Bike and Pedestrian Documentation Project, accessed at <<u>http://bikepeddocumentation.org</u>> April 4, 2011.



Although traditional count technology (e.g. Gretch boards) are limited in the type of data they can store, new technologies such as traffic counting apps for smart phones or tablets are becoming available and customizable. The recommended count program may benefit from the introduction of new technology.

8.3.2 INSTALLING NEW PERMANENT AUTOMATED COUNTERS

In conjunction with the University of Waterloo, the Region has pilot tested three different automated technologies for counting active transportation users in Uptown Waterloo. It is recommended that, based on the success of this pilot, the Region permanently install at least three automated counters to collect cycling and pedestrian volumes along key corridors.

Permanent automated counters provide the advantage of constant, year-round data that can be aggregated to any time period to observe hourly, daily, weekly, monthly or annual trends. Automated counter data can be used to determine adjustment factors for manual counts, which may be distorted due to weather, holidays, construction zones or other external conditions. Adjustment factors also facilitate conversion between peak period and average daily pedestrian and cyclist volumes. Although automated counters may cost several thousand dollars to install plus fees for data management / retrieval and maintenance, these costs for the rich data they provide would be less than the cost of staffing and organizing manual count programs. In addition, permanent counters can be tied into the Traffic Control System allowing real time data collection and the ability to immediately identify hardware issues, preventing long term data loss.

Automated counting of pedestrians and cyclists is an emerging practice and there are a variety of technology options. Some examples include passive and active infrared sensors, piezometric (pressure-sensitive) tubes, strips and pads, video imaging software, and magnetic loop detectors. All of these technologies differ in cost, function, and the settings where they can be implemented. Multiple detectors are often used to increase accuracy. Operation and maintenance activities for permanent counters consist mainly of data retrieval, battery replacement, periodic inspection of the equipment and, if necessary, repair or replacement of system components. Examples of some of the automated counters that are currently in use are shown in **Exhibit 8.3**.

Exhibit 8.3: Examples of Automated Counters for Pedestrians and Cyclists

Bicycle induction loop counter being installed in a bike lane in Ajax, ON



Bicycle tube counter in Vancouver BC



Pyro-sensor box installed on a trail in London ON





The Region of Waterloo should install permanent bicycle or active mode counters in at least three locations. These locations could include the King-Victoria Multi-Modal Hub, the Iron Horse Trial, and/or the Cambridge-Paris Rail Trail.

These locations were chosen to represent overall pedestrian and cycling activity in these key corridors, and likely have high enough pedestrian and cycling activity to support meaningful analysis.

When specific locations for the permanent counters are being chosen, it is important that the Region take into account the following technical criteria. The permanent counters should:

- Not interfere with pedestrian or cyclist traffic.
- Not be highly visible to discourage vandalism.
- Avoid parking lots and bus stops (vehicles may block sensors from pedestrians and/or cyclists).
- Avoid very wide pathways or open spaces where direction is difficult to determine.
- Easy to access (to extract data).
- Located on public property.

8.3.2.1 OPTIONAL PUBLIC COUNT DISPLAYS

It is recommended that the Region consider installing the permanent counters in conjunction with public count displays as a means to promote active transportation and to communicate the positive impacts of projects while also encouraging friendly competition between municipalities. These displays are effective public awareness tools that can be integrated with street furniture and public art. Typical displays show the current daily counts and year-to-date counts or total counts since installation. Other information can include date, time, temperature and rainfall depending on the vendor. Examples of public display counters by Veksø and another by EcoCounter are shown in **Exhibit 8.4**.

The number and location of public displays vary depending on the objective of the display and the data that is being collected. Since the principal aim of these installations is promotion and awareness of active transportation, the count displays are usually placed in high profile, busy areas. General public awareness is a common objective, however sometimes more specific goals can influence the installation, such as educating motorists on cycling traffic. Typical locations include city centres or at bikeways along busy bridges. Examples of public display counters can be found in several cities in Denmark, Sweden, the United Kingdom and Ireland. In Copenhagen, free air pumps



are usually installed beside the displays to encourage interaction between the display and cyclists, see **Exhibit 8.5**.

Exhibit 8.4: Examples of Public Display Bicycle Counters

Veksø public display counter



Schematics of the EcoCounter public display counter to be installed in Portland, Seattle and Montreal



Exhibit 8.5: Free Public Air Pump in Mölndal, Sweden near Public Display Bicycle Counter



The cost for a single bike counter display, excluding installation, ranges from about \$20,000 to \$35,000 USD²⁶ depending on the model and features required. Additional costs can add between \$1,000 and \$40,000, depending on a range of installation variables, such as costs associated with

²⁶ Jean-François Rheault. Eco-counters, Canada English distributor.



routing power to the display. Since costs are relatively high, it is recommended that automatic counters be considered in high volume and high visibility areas, such as near mobility hubs.

The Region currently has an illuminated signs policy that does not allow illuminated signs on Regional road allowances. As such, if a public display counter were installed it would need to be located outside of the road allowance, for example, in a courtyard or plaza adjacent a high use cycling facility.

The Region of Waterloo should consider installing a public count displays in a highly visible location equipped with a permanent counter.

8.3.3 MAINTAIN ACCURATE UP-TO-DATE GIS INVENTORY OF WALKING AND CYCLING FACILITIES

Beyond simply tracking travel demand patterns, evaluating progress on active transportation initiatives would also require that progress on the provision of active transportation facilities be monitored. As the walking and cycling networks expand, this should include not only collecting data regarding facilities within the Region's jurisdiction, but also keeping track of all existing and new facilities under Area Municipal jurisdiction, as is currently compiled in GIS by the Region. For cycling facilities, it is recommended that the definitions of different facility types reflect those included in Part 2: Green Chapter Design Guide for consistency. For example, the Region could only consider rural bike lanes if they meet the minimum widths specified. Area Municipalities would likely have their own system of categorizing and organizing this data and some work would be required to cross-check and consolidate these different sources.

The Region of Waterloo should work with the Area Municipalities to maintain an accurate and up to date database of walking and cycling facilities across the region.

It is recommended that the Region of Waterloo encourage the Area Municipalities to collect accessibility criteria in their provincially legislated Minimum Maintenance Standards (MMS) annual sidewalk inspection surveys. Such criteria should reflect the proposed Design of Public Spaces Standards under the Accessibility for Ontarians with Disabilities Act (AODA), such as the presence or absence of curb ramps and tactile walking surface indicators, clear width, and maximum running and cross slope. Such information would allow the creation of customizable accessibility information and mapping of accessible sidewalks and street crossings.

The Region of Waterloo should encourage the Area Municipalities to collect accessibility criteria in their provincially legislated Minimum Maintenance Standards (MMS) annual sidewalk inspection surveys.



8.3.4 MONITORING BICYCLE AND PEDESTRIAN COLLISIONS

The main challenge with cyclist or pedestrian collision data is assessing the collisions against some measure of exposure to risk. That is, in a given year one intersection may present more pedestrian collisions than another, but this does not necessarily mean it is more dangerous since it may simply be that more pedestrians crossed the intersection in that year. This is a typical problem when comparing more suburban locations to downtown locations since the latter simply has more active transportation users. The collision rates and collision severity at downtown locations, however, tend to be much lower. It is difficult to assess absolute changes in cycling and pedestrian activity. The collision indicators recommended in **Exhibit 8.2** use population as a basis, which helps to moderate collision frequency against population growth, but do not help compare collision rates in one area to those in another. The additional data collection activities suggested above would help to close this gap.

Another approach would be to improve the collision data itself. The Pedestrian and Bicycle Crash Analysis Tool (PBCAT) software application has been developed by the U.S. Federal Highway Administration (FHWA) as a means of better organizing data related to collisions between motor vehicles and pedestrians or bicyclists. An important element of this data is a crash typology, which describes actions prior to the collision. Using its collision database, PBCAT provides a standard interface for users to analyze the crash data and produce reports. The software also identifies countermeasures that are likely to help address the problems identified. Example screen captures from the PBCAT are shown in **Exhibit 8.6**. Since the Region of Waterloo already collects collision reports electronically and analyses them on an annual basis, it is recommended that the PBCAT system be evaluated to determine if incorporating it would provide a benefit to the current collision reporting and analysis process. For example, the system has been used in Boulder, CO, where City staff analyze collision reports every six months.²⁷ Staff in Boulder have indicated that this effort required 0.25 FTE hours to enter the data into the PBCAT system, and they also spend 0.25 FTE hours on campaigns to address the findings.

The Region of Waterloo should evaluate collision reporting and analysis tools, such as the PBCAT system, to determine if incorporating them would provide a benefit to the current collision reporting and analysis process.

²⁷ Typically an intern is able to do the data entry based on the police records and then the results are cross-tabulated for professional staff to analyze and performance quality control checks.



Exhibit 8.6: Screen Captures from the Pedestrian and Bicycle Crash Analysis Tool (PBCAT)

Location Data





Countermeasures Description

Bicycle Lanes:

View Other Roadway Design Treatments 💌

Bike lanes indicate a preferential or exclusive space for bicycle travel along an arterial street. Bike lanes have been found to provide more consistent separation between bicyclists and passing motorists. Marking bicycle lanes can also benefit pedestrians—as turning motorist slow and yield more to bicyclists, they will also be doing so for pedestrians.

Bike lanes are typically designated by striping and/or signing. Colored pavement (e.g., blue or red surfaces) is also used in some locations, although it is not yet an accepted MUTCD standard. If the addition of bike lanes results in fewer motor vehicle lanes, safety may be enhanced for pedestrians crossing the street. Bicycle lanes also provide a buffer between motor vehicle traffic and pedestrians when sidewalks are immediately adjacent to the curb. On high-speed, high-volume roads, it may be more appropriate to provide a multi-use path to physically separate both bicyclists and pedestrians from motor vehicle traffic. However, the application of this treatment requires that care be taken to minimize the conflicts between bicyclists and pedestrians.



- view considerations
- view estimated cost
- view case studies



Typical optional word and symbol pavement markings for bicycle lanes. Adapted from MUTCD



- Create on-street travel facilities for bicyclists.
- Narrow the roadway to encourage lower motor vehicle speeds.
- Provide additional separation between pedestrians and motor vehicles.
- Adding on-street bike lanes reduces the distance
- pedestrians must travel to cross automobile lanes.

top of page

Considerations

All roads should be evaluated for on-street bicycle facilities.
 Provide adequate space between the bike lane and parked cars so that open doors do not create a hazard for bicyclists.

top of page

Estimated Cost

The cost of installing a bike lane is approximately \$3,100 to \$31,000 per kilometer (\$5,000 to \$50,000 per mile), depending on the condition of the pavement, the need to remove and repaint the lane lines, the need to adjust signalization, and other factors. It is most cost efficient to create bicycle lanes during street reconstruction, street resurfacing, or at the time of original construction.

top of page

🔲 Case Studies

Boulder, CO Allegheny County, PA Grand Junction, CO Tempe, AZ University Place, WA Portland, OR





8.4 EVALUATION AND REPORTING

Each year of active transportation data collection could be accompanied by a report that analyses the year's data and historical trends. With reference to the Walk Cycle Waterloo Region goals, the annual reports could include recommendations for improving the success of on-going initiatives and also general recommendations for adjustments to Walk Cycle Waterloo Region priorities, paying particular attention to budget recommendations. Furthermore, the report may suggest that some goals are either too aggressive or have been achieved sooner than expected. As such, the report should establish new goals for the subsequent year where appropriate.

The audience for these reports is intended to primarily be decision-makers, civil servants, professionals working in the field, and other engaged stakeholders. The tone of these reports is intended to be one of helping evolve current practices and learning from on-going experience. At the time of writing, it is understood that the Region's RTMP will also involve publishing a monitoring report (the Transportation Perspectives Report). The results of the Walk Cycle Waterloo Region monitoring reports should be folded into this larger RTMP report when it is published every five years.

8.4.1 REPORTING TO THE PUBLIC

In addition to reporting to decision-makers, it is recommended that results be communicated to the public on a regular basis. The Region should consider developing a concise performance monitoring "report card", to be released in conjunction with the more detailed report.

The report card should be concise, with an engaging layout to draw attention to progress on key active transportation goals and achievements, as it is intended to act as a promotion piece,. Generally a short summary with only a few pages is ideal to quickly communicate impacts. Exhibit 8.7 and Exhibit 8.8 show some strong examples of cycling plan "report cards" used in other jurisdictions, which refer back to project goals, provide grades based on the assessment of progress towards these goals (and specific targets), and use an engaging layout and graphics.

Currently, pedestrian and cycling collision data is reviewed and reported through the Region's annual Collision Report. This report details information on where pedestrian and cycling collisions occurred, what the action taken by those involved was, and other characteristics of the circumstances and people involved in the collisions.

The Region of Waterloo should consider establishing a detailed annual Active Transportation report and a corresponding public "report card".



Exhibit 8.7: The 2010 Report Card of Cycling in Cincinnati (page 13)

Report Card Results

CINCINNATI AS A CITY FOR BICYCLING

For the second year in a row, bicyclists gave Cincinnati a C grade in the overall "Cincinnati as a City for Bicycling" category. This consistency is not surprising. While much progress was made this year, the impact of 2010 improvements on the overall bicycle network was still small. It likely will take several years of steady progress before substantive change will be felt by cyclists citywide.

CITY'S EFFORT/PROGRESS OVER THE LAST 12 MONTHS

A new category was added this year, to measure cyclists' perception of the city's efforts and progress over the last 12 months. While we recognize that cyclist satisfaction with overall network connectivity and the city's bicycle friendliness will be slow to increase, we wanted to know if cyclists felt that the city was on the right track. We are honored to have received a B+ in this category for 2010.





New Question in 2010

COMPLETENESS OF THE BICYCLE NETWORK

The Bicycle Transportation Plan was approved in June, and by December five new sets of bike lanes had been installed. It will be some time before true connectivity is achieved, but every segment of bike lane or sharrows installed brings the network that much closer to completeness. This year, cyclists gave "Completeness of the Bicycle Network" a C-, an improvement over 2009.



REPORT CARD ON BICYCLING



Exhibit 8.8: The 2008 Report Card on Bicycling in San Francisco (page 4)

BICYCLING IN SAN FRANCISCO

Our April 2008 survey of 1803 San Francisco bicyclists developed a fresh sampling of cyclist opinion and experience, and the following pages lay out that account along with data and statistics from other sources, to provide a portrait by the numbers of this bicycling city.

Overall, our survey respondents still regard San Francisco as a B- city for bicycling, no change from 2006.

And their opinions of important and irritating things held steady from two years ago. We learned that the most important areas to improve the bicycling environment are by adding more bike lanes, improving the street pavement quality, reducing cars overall in the city, and encouraging better behavior among motorists.

San Francisco's Bike Route Network cruised along on a flat grade C rating from respondents, 87% of whom said they prefer cycling on streets with bike lanes to riding on those without. (See p, 8)

Pavement quality satisfaction among cyclists, already poor, has slipped a bit. A potholed, broken street can be annoying to a transit rider and a nuisance to a motorist, but to a cyclist a nasty pothole can be deadly. It's no surprise that pavement quality satisfaction is still the lowest grade in the report card, falling from D+ to D. (See p. 10)

4 REPORT CARD ON BICYCLING, SAN FRANCISCO 2008

Respondents feel moderately safe biking on San Francisco streets and moderately well respected by motorists, earning a C grade for both sense of safety and sense of respect. (See p. 12)

There's some good news on bike theft experience: 19% of respondents reported having a bicycle stolen in the past two years, down from 25% in 2006. But traffic crash experience is unchanged from 2006: 27% of respondents reported having been in a collision with a motor vehicle in the past two years, and almost half of them (12%) told us they'd been injured in the crash. Once again, police response to both issues rated a D+. [See p. 13]

Transit-bicycle connectivity questions show Caltrain service holding its respectable B, and Muni and BART service both renewing their middling C grades. (See p. 14)

Based on these results, the San Francisco Bicycle Coalition urges the city's leaders, planners, and the bicycle community to amplify our efforts to upgrade San Francisco to a worldclass A+ biking city. (See p. 15)

Attaining this goal will result in a cleaner environment, a healthier populace, a more affordable transportation system, safer streets, and more livable neighborhoods. The San Francisco Bicycle Coalition is committed to these end results and eager for this Report Card to serve as an important tool toward progress.





9 DELIVERING THE PLAN

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9.1 COSTS OF THE NETWORK

The total estimated cost to implement the recommended Regional Ten Year Walking and Cycling Network is \$90.3 M (2012 Dollars) based on the estimated unit costs of construction presented in **Exhibit 9.1**. This cost includes both the TCP and Gaps / Infill action areas as described below. The new funding required to support the recommended ten year network is \$47.8 M.

- The **TCP** action area includes opportunities to build walking and cycling facilities as part of other TCP projects. The total estimated cost of active transportation facilities that overlap with the TCP is \$69.9 M. There is \$42.5 M worth of active transportation tasks in the 2013 TCP. This means that \$27.5 M of new funding would need to be added to existing TCP projects to cover the portion of the ten year network covered by the TCP action area.
- The Gaps / Infill action area includes walking and cycling facilities that would complete the Regional network and are not part of the TCP action area. The total estimated cost of active transportation facilities in the Gaps / Infill action area is \$55.9 M. This includes \$35.5 M for beyond ten year projects including rural bike lanes that would be constructed as the road becomes a candidate for rural resurfacing beyond the current 10-year TCP planning horizon and other projects that are only necessary as area development occurs. This leaves \$20.4 M that would be needed to fund the portion of the ten year network covered by the Gaps / Infill action area.

The Region of Waterloo should work to identify funding to support the estimated \$47.8 M worth of new funding required for the recommended ten year Walking and Cycling Network.

In addition to the recommended network, there are 12 special study areas that have been identified in this plan... It is estimated that \$14.0 M will be required to complete the infrastructure needed to address active transportation issues in these area.

The Region of Waterloo should work to identify funding to support the estimated \$14.0 M cost of the 12 Special Study Areas.

In addition to the costs of the ten year network and the special study areas identified above there are an estimated \$35.5 M worth of network improvements that would occur beyond ten years.

The total cost of the complete active transportation network identified in this plan (including existing TCP funding, special study areas, the ten year network and the beyond ten year network, but not the annual Fix-it and Signage programs) is \$139.8 M. The cost breakdown for the implementation of the Regional Walking and Cycling network by type of active transportation facility is provided in **Exhibit 9.2**.

Exhibit 9.1: Estimated Unit Costs for Constructing Active Transportation Facilities in Waterloo Region (2012 Dollars)

Active Transportation Facility Type	Estimated Unit Cost (\$ per linear metre)		
	ТСР	Gaps / Infill	
Sidewalk Network			
SIDEWALK (assume 2.1m one side of roadway)	\$220	\$300	
Trails Network			
BOULEVARD MULTI-USE TRAIL (one side of roadway)	\$210	\$290	
Cycling Network			
BIKE LANE (each side of roadway)			
Bike lane on urban roadways (TCP project) [-\$20 for low speed roads]	\$120	-	
Bike lanes on urban roadway (Infill project, assume requirement for road widening) [-\$40 for low speed roads]	\$390	\$390	
Infill/Gap bike lanes on urban roadways; re-allocate and stripe existing roadway (possible road diet or reallocate wide lanes)	-	\$20	
Constrained corridor; bike lanes preferred (assume average cost of bike lanes)	\$120	\$120	
Rural bike lanes (additional 0.5 m width of pavement beyond the standard 1 m wide paved shoulder)	\$40	\$40	
SEGREGATED BIKE LANE (both sides of roadway)	\$250	\$250	

Eacility	Length (linear km)			Estimated Cost of Construction (\$ 000's)		
raciity	ТСР	Gaps / Infill	Total	ТСР	Gaps / Infill	Total
Sidewalk Network						
Sidewalks along Regional roads (linear km on each side of the street)	91	33	124	\$20,043	\$9,798	\$29,841
Trails Network						
Boulevard Multi-Use Trail (linear km on each side of the street)	108	14	122	\$22,545	\$4,022	\$26,567
Cycling Network						
Bike lane	122	18	140	\$12,186	\$4,013	\$16,199
Bike lane in constrained corridor	29	11	40	\$2,998	\$1,110	\$4,108
Segregated bike lane	15	5	20	\$3,764	\$1,291	\$5,055
Rural bike lane	210	4	214	\$8,405	\$154	\$8,559
Total	576	84	658	\$69,941	\$20,389	\$90,330
9.2 COSTS OF THE FIX-IT LIST

The **Fix-it List** (localized or "spot" improvements that fine-tune existing or planned facilities, but do not alter the overall network): It is recommended that the Region pursue these Fix-It List projects based on an annual budget of \$80,000. This annual budget would be sufficient to cover a number of smaller projects, such as a dozen crossing improvements, or a larger project over 2 years, such as interchange enhancements.

The Region of Waterloo should work to establish an annual budget of \$80,000 to implement the Fix-it List action area.

9.3 COSTS OF THE STRATEGIC SIGNAGE ACTION PLAN

The cost for the way-finding signs should be incorporated into the overall cost to implement new facilities. The implementation and co-ordination of the Strategic Signage Action Plan would become the responsibility of the Transportation Engineering Division within Transportation and Environmental Services.

For the existing network, it is recommended that the signage strategy be implemented by considering popular routes or high-priority destinations such as rapid transit stations. A signage plan can be developed for specific corridors and destinations, or for a wider network, in collaboration with the Area Municipalities. It can be implemented on an incremental basis with annual funding, recommended in the amount of \$40,000. This would allow the Region of Waterloo to plan, design and install about 50 to 100 signs annually, equivalent to signing generally one existing route that traverses an Area Municipality.

9.3.1 REGIONAL CYCLING ROUTE WAY-FINDING PILOT PROJECT

The Region of Waterloo and Area Municipalities are working together to test trail, street name and destination signs along the Trans Canada Trail as a pilot project. The Trans Canada Trail currently provides a connection from the northern edge of Woolwich, through Waterloo, Kitchener, Cambridge and North Dumfries following the Grand River. There are many key crossings along this expansive route. Signing the connection between Waterloo and Cambridge was selected as an example for an initial cycling route signage plan. The plan would detail the type and location of signs, and installation details.

The Region of Waterloo should work to establish an annual budget of \$40,000 to implement the Strategic Signage Action Plan.

9.4 FUNDING THE NETWORK

9.4.1 SUMMARY OF COSTS

The costs of all the ATMP components discussed above are summarized in Exhibit 9.3 below. This summary shows that when all elements that fall within the 10 year horizon are considered a \$55.5 M increase in funding for active transportation improvements is required. Much of this (\$25.6 M) is



expected to be eligible for Regional Development Charges. The remaining \$29.9 M, or roughly \$3 M per year would need to be made up through taxes or other funding sources.



Exhibit 9.3: Cost Summary



9.4.2 ATMP IMPLEMENTATION PLAN

A long term funding strategy for the Regional Walking and Cycling Network is currently under development. This strategy would form part of an ATMP Implementation Plan completed over the course of 2014 and would be subject to Regional Council approval. The ATMP Implementation Plan would present a variety of funding options to build to the annual budget required to construct the network identified in Walk Cycle Waterloo Region.

In addition to funding the ATMP Implementation Plan would also identify specific assignments to be incorporated into the work plan of the various Regional divisions that will take the lead on the ATMP recommendations.

The Region of Waterloo should develop an ATMP Implementation Plan to identify a preferred strategy for prioritizing and funding Walk Cycle Waterloo Region and identify specific assignments to implement the ATMP recommendations.

9.5 NETWORK PHASING

Four phases of activity are recommended for implementing the Regional Walking and Cycling Network. **Exhibit 9.4** shows the estimated expenditures of delivering the Regional Walking and Cycling Network that are associated with each of the four phases. **Appendix 9–A** contains phasing maps for the recommended Walking Network and Cycling Network in each of the seven Area Municipalities. Below, several sections outline how phases were assigned to each project in the TCP action area and Gaps / Infill action area.

The four phases are:

- 1. Short Term: All projects that fall within the first five years of the TCP and the highest priority infill projects.
- 2. Medium Term: All projects that fall within the second five years of the TCP and the next highest priority infill projects.
- 3. Long Term: Includes projects that are not financially feasible on their own and need to wait for a road project to complete, projects on roads that have recently been (re)constructed, and upcoming projects where there is no opportunity to incorporate AT elements.
- 4. As development occurs: There are several projects, including some that overlap with TCP projects, which are not needed in the short term as there is no local demand. In these cases care should be taken to ensure that AT facilities can be added easily in the long term as development occurs.

The Region of Waterloo should monitor the phasing of projects and advance or defer those where an implementation opportunity presents itself. All projects should be constructed at the earliest opportunity regardless of phasing.



Exhibit 9.4: Breakdown of the Network Phasing Strategy

	Length (km)			Total Expenditure (\$000's)		
Facility	ТСР	Gaps / Infill	Total	ТСР	Gaps / Infill	Total
Phase 1: Short Term (TCP 1-5)	242	28	270	\$34,082	\$6,066	\$40,148
Sidewalks along Regional roads (linear km on each side of the street)	50	11	61	\$11,031	\$3,300	\$14,331
Boulevard Multi-Use Trail (linear km on each side of the street)	52	2	55	\$10,827	\$701	\$11,528
Bike lane	61	7	69	\$6,369	\$1,404	\$7,773
Bike lane in constrained corridor	14	6	20	\$1,456	\$613	\$2,069
Segregated bike lane	9	0	9	\$2,172	\$0	\$2,172
Rural bike lane	56	1	57	\$2,227	\$48	\$2,275
Phase 2: Medium Term (TCP 6-10)	333	57	390	\$35,859	\$14,323	\$50,182
Sidewalks along Regional roads (linear km on each side of the street)	41	22	63	\$9,011	\$6,499	\$15,510
Boulevard Multi-Use Trail (linear km on each side of the street)	56	11	67	\$11,718	\$3,321	\$15,040
Bike lane	61	11	72	\$5,817	\$2,609	\$8,426
Bike lane in constrained corridor	15	5	20	\$1,542	\$497	\$2,039
Segregated bike lane	6	5	12	\$1,592	\$1,291	\$2,883
Rural bike lane	154	3	157	\$6,178	\$106	\$6,284
Phase 3: Long Term (Beyond Ten Year)	0	346	346	\$0	\$32,375	\$32,375
Sidewalks along Regional roads (linear km on each side of the street)	0	20	20	\$0	\$5,914	\$5,914
Boulevard Multi-Use Trail (linear km on each side of the street)	0	21	21	\$0	\$6,025	\$6,025
Bike lane	0	24	24	\$0	\$8,627	\$8,627
Bike lane in constrained corridor	0	8	8	\$0	\$849	\$849
Segregated bike lane	0	0	0	\$0	\$0	\$0
Rural bike lane	0	274	274	\$0	\$10,959	\$10,959
Phase 4: As development occurs	0	10	10	\$0	\$3,151	\$3,151
Sidewalks along Regional roads (linear km on each side of the street)	0	7	7	\$0	\$2,198	\$2,198
Boulevard Multi-Use Trail (linear km on each side of the street)	0	0	0	\$0	\$0	\$0
Bike lane	0	2	2	\$0	\$953	\$953
Bike lane in constrained corridor	0	0	0	\$0	\$0	\$0
Segregated bike lane	0	0	0	\$0	\$0	\$0
Rural bike lane	0	0	0	\$0	\$0	\$0

9.5.1 PHASING OF THE TRANSPORTATION CAPITAL PROGRAM ACTION AREA

For active transportation facilities recommended to be implemented as part of larger transportation projects in the Transportation Capital Program (TCP), phasing would be tied to their designated construction year, as shown in **Appendix 4–C**. All TCP projects would be constructed during Phase 1 and 2 since they are linked with the 10-year TCP. The TCP is reviewed and adjusted annually and generally guided by the Regional Transportation Master Plan and road asset management.

9.5.2 PHASING OF THE GAPS / INFILL ACTION AREA

For the walking network, projects with sidewalks and boulevard multi-use trails were assessed together. In both the walking and cycling networks, coordination with existing projects in the Transportation Capital Program was considered along with the criteria described below.

- The Region currently has an annual sidewalk program which prioritizes the installation of new sidewalks based on a system of weighted criteria. Missing sidewalks are ranked based on scores that account for the frequency of pedestrian collisions, proximity to Grand River Transit (GRT) routes and stops, proximity to schools, and lighting. The most recently available results were from 2011. The Region's sidewalk prioritization scheme was included as a factor in determining the phasing for the Gaps / Infill Walking Network.
- A dominant objective of this action area is to deliver a network that would increase walking and cycling mode share. Mode share targets were also considered (and their disparity from existing mode shares); the targets differ among the each of the tri-cities and for the rural townships.
- Other factors for the walking network are the existing walkability and potential for increased walking demand based on future land use. An analysis was conducted by Urban Design 4 Health based on their models mapping the probability of walking and the predicted number of walking trips. The analysis included disparity maps highlighting areas of high walking potential and low connectivity in the walking network. In general, the walking potential model relies on several variables at the postal code level, including residential density, intersection density (connectivity), retail floor area, land use mix and walkability.

Combining the 2011 sidewalk prioritization results, mode share considerations, results of the walking potential analysis, and coordination with the Transportation Capital Program action area, Gaps / Infill project phasing for the Walking Network was determined.

For the Cycling Network, phasing for the Gaps / Infill boulevard multi-use trails was also assessed along with bike lanes, segregated bike lanes, constrained corridors and marked shared use lanes.²⁸

The 2004 Cycling Master Plan highlighted a core network centred on the tri-city area. It was recommended in that plan that prioritization be developed internally and applied by Regional staff led by a TDM Planner. To date, no separate prioritization is available for cycling facilities and implementation of the cycling network has been through the Transportation Capital Program. Therefore, phasing for the Gaps / Infill Cycling Network was conducted similarly to the process described above except for two variations:

- There is no separate cycling prioritization process currently in place at the Region.
- The cycling potential demand was conducted by IBI Group (described in Section 4.2.4.6).

Phasing is shown in the "Phase" column of **Appendix 4–D** for the Gaps / Infill action area.

²⁸ Keeping in mind that rural bike lanes in the Gaps / Infill Action Plan will be constructed as the road becomes a candidate for rural resurfacing.



9.5.3 PHASING FOR THE FIX-IT LIST

No fixed phasing structure is provided for the Fix-It List. It is recommended that prioritization be conducted internally within the well-established Intersection Annual Improvement Program, with input from Transportation Planning and other Regional departments. To accomplish this, it is recommended that a designated \$80,000 annual budget be established to provide for the implementation of the Fix-It projects. An annual budget eliminates the dependence on other delivery mechanisms, such as the TCP, which may delay implementation of these critical projects. The Fix-It List represents a collection of smaller scale projects with less focus on major, linear construction projects. These projects are intended to enhance the comfort, safety and convenience of the walking and cycling network and provide high value improvements.

The Fix-It List is intended to be dynamic and may be updated as the Walking and Cycling Network is constructed or as projects are delegated to other departments or jurisdictions. This flexible structure provides the Region with a tool to address localized concerns with the walking and cycling network from various stakeholders such as other departments, the Active Transportation Advisory Committee and the public. As a result, no firm rules are provided regarding the selection and prioritization of the Fix-It List projects.

Discretion to implement the Fix-It List also allows for flexibility to reassess the priority projects and stay within the allotted budget. To implement the Fix-It List in a cost-effective and efficient manner, the Region should consider conducting similar projects together or at the same time. For example, the Region may choose to address all curb cuts needed or interchange improvements²⁹ on the Fix-It list in one year, target key neighbourhoods each year or select a fixed number of projects (a few per neighbourhood) each year. On-going reviews of the effectiveness and budget for the Fix-It List are recommended as more projects are added to the list.

²⁹ Improvements along interchanges will require coordination with and approval from the Ministry of Transportation, Ontario, and perhaps with other Capital projects.



Appendix 9–A: Phasing of Walking and Cycling Networks by Area Municipality





Phasing of Cambridge Walking Network





Phasing of Cambridge Cycling Network





Phasing of Kitchener Walking Network





Phasing of Kitchener Cycling Network





Phasing of North Dumfries Walking Network











Phasing of Waterloo Walking Network





Phasing of Waterloo Cycling Network















Phasing of Wilmot Walking Network





Phasing of Wilmot Cycling Network

















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10.1 NEW POLICY DIRECTIONS

Walk Cycle Waterloo Region is organized into a series of Action Plans. In addition to these Action Plans that address elements of the walking and cycling network along with behavioural shift programming, there are additional policy recommendations to help the Region of Waterloo reach their long-range target for trips by walking and cycling. These recommendations stem from the need to harmonize the vision and objectives of the Walk Cycle Waterloo Region plan with existing policies, recommendations approved in previous plans and any outstanding issues.

Existing relevant policies and plans include the following:

- Regional Transportation Master Plan (RTMP) approved by Council in 2011
- Sidewalks on Regional Roads Policy approved by Council, August 2007 and effective January 2008
- *Region of Waterloo Cycling Master Plan* (CMP) approved by Council in 2004, updating the 1994 Region of Waterloo Cycling Policy Master Plan

10.2 RTMP APPROVED ACTIVE TRANSPORTATION POLICIES

The *Regional Transportation Master Plan* (RTMP), approved in 2010, includes recommendations for all modes of transportation that use the Regional road network. Walk Cycling Waterloo Region is the Region's response to one of the key action items identified in the RTMP:

Update the Cycling Master Plan and develop a Pedestrian Master Plan to create an Active Transportation Master Plan.

Other active transportation policies and recommendation in the RTMP are listed in **Exhibit 10.1** and were reviewed and updated to fit within the Walk Cycle Waterloo Region plan.

2011 RTMP Recommendation	How it applies to Walk Cycle Waterloo Region	
Over time, increase funding for active transportation modes as a share of overall transportation funding to a level commensurate with the target of 12%	Still Applicable — The current share of transportation funding spent on walking and cycling infrastructure is 4.8% of the \$893.2 M budget over a period of 10-years.	
Use Travelwise to encourage employees to walk and cycle and provide comfortable pedestrian and cycling infrastructure at all municipal work sites;	Still Applicable — Chapter 7: Behavioural Shift Action Plan: outlines actions to continue and expand upon education and outreach to promote walking and cycling.	
Aim to ensure that workplaces are designed to support those who walk and cycle to work and develop an incentive program to encourage more employees to cycle or walk to work at least one day per week;		

Exhibit 10.1: RTMP	Active 1	Fransportation	Policy	Recommendations

2011 RTMP Recommendation	How it applies to Walk Cycle Waterloo Region
Continue and expand the program to distribute active transportation and TDM information packages available to developers, large employers, property owners and the general public, with information on the Region's and Area Municipal programs, tips to change travel behaviours, and initiatives that can be implemented at a small scale to promote active transportation	
Continue to promote and install bike racks on buses	Still Applicable
Connections between Regional streets, local streets and neighbourhood parks, schools, natural corridors and other open space areas should be provided in all new subdivision development plans.	Still Applicable

10.3 UPDATES TO THE SIDEWALK POLICY

The Municipal Act assigns the responsibility for the construction and maintenance of sidewalks in the boulevard along Regional roads to the lower tier municipalities unless other agreements are made. The Region's policy for sidewalks is such an agreement and addresses cost-sharing policies between the Region and Area Municipalities for sidewalks and multi-use trails along Regional roads. The policy is summarised in Exhibit 10.2.

Regional Responsibilities	Area Municipalities' Responsibilities
The capital cost of installing new (i.e. initial) sidewalks on Regional Roads will be the responsibility of the Region (includes any in-fill or gap areas). There will be no transfer of funds between the Area Municipalities and the Region to accommodate this policy change. Where a new multi-use trail is to be implemented by the Area Municipality, if a sidewalk does not exist, the Region will put the cost of constructing a sidewalk towards the multi-use trail.	The Area Municipality will continue to be responsible for the ownership and maintenance responsibilities of sidewalks on Regional roads—as is the case in the present policy. As additional sidewalks are installed by the Region on Regional Roads, there will need to be a proportional increase by the Area Municipalities in their maintenance budgets. Where a new multi-use trail is to be implemented by the Area Municipality, and there already is an existing on-road cycling facility or one proposed, then the Region will not fund any of the multi-use facility, assuming a sidewalk already exists. The maintenance of multi-use trails will remain the Area Municipalities' responsibility.
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Exhibit 10.2: Previously Approved Policy for Sidewalks on Regional Roads

Design Standards

The design standards (e.g. width, depth, etc.) for sidewalks on Regional Roads will generally be the same as those used by the Area Municipality on their roads.

Where a Regional Road passes through an Area Municipally-owned industrial subdivision, the Regional Road will be designed and built to Regional standards (typically an urban cross-section including curb and gutters).

Sidewalks will be constructed on one or both sides of Regional Roads where the existing or expected pedestrian activity meets specified warrants. The warrants are currently being developed.

Based on the objectives of the Walk Cycle Waterloo Region plan, the capital costs of installing new sidewalks on Regional Roads would continue to be the responsibility of the Region. However, the policy with respect to funding for multi-use trails and the location of new sidewalks would require



updates to support other recommendations in the plan. For boulevard multi-use trails on Regional Roads, it is recommended that the Region pay the full capital cost of any new multi-use trail.

In addition to this funding change it is recommended that the design of all active mode infrastructure along Regional rights-of-way be designed to the Regional standard. This would ensure that facilities are built that are consistent and accessible and will consider the guidance of national and international best practice.

In the longer term the possibility of modifying sidewalk and multi-use trail responsibilities should be discussed. These discussions would need to be coordinated between the Region and all Area Municipalities and would consider issues such as:

- Responsibility for winter maintenance: Many public comments have been received expressing an interest in having local governments assuming responsibility for winter maintenance rather than adjacent property owners.
- Responsibility for ongoing maintenance: Uploading ongoing maintenance responsibilities to the Region would simplify the various responsibilities of Regional road maintenance.
- Ownership of sidewalks: Transferring ownership of sidewalks on Regional roads to the Region would further consolidate road related responsibilities,
- Responsibilities for facilities that do not fall within Region road rights-of-way.

The two recommendations made above, along with some minor editorial changes to the sidewalk policy are incorporated into the recommended sidewalk policy below. This policy would supersede the previous sidewalk policy.

The Region of Waterloo should update the Sidewalk Policy to fund multi-use trails, promote Regional standards and clarify the text by adopting the Recommended Sidewalk Policy as written in Section 10.3.1.

10.3.1 RECOMMENDED SIDEWALK POLICY

SIDEWALKS

Sidewalks will be constructed on both sides of Regional roads, except on Rural Connectors or where it is demonstrated that there are significant barriers to construction. Where significant barriers exist, a sidewalk will be constructed on one side of the road unless precluded by said barriers.

MULTI-USE TRAILS

Construction of a multi-use trail will substitute or be in addition to the construction of sidewalks and cycling facilities based on local context and the overall active transportation network. Generally, the Region will not construct multi-use trails and cycling lanes simultaneously on both sides of a Regional road. Similarly, a sidewalk and a multi-use trail will generally not be constructed on the same side of a Regional Road.

GENERAL RULES

For the purpose of the following rules, "pedestrian facilities" is taken to mean both sidewalks and multi-use trails.



Initial Capital Costs	The capital cost of constructing new pedestrian facilities on Regional Roads, where none existed previously, will be the responsibility of the Region.		
Design	The Region will be responsible for the design of pedestrian facilities along Regional Roads.		
Maintenance Costs	Area Municipalities will own and be responsible for all maintenance on the full width of pedestrian facilities along Regional Roads.		
Replacement Costs	 Where an existing pedestrian facility on a Regional Road is to be replaced: Due to age, safety or condition, the Area Municipality will be responsible for the replacement cost. Due to grade changes, road widening or other construction events related to Regional project needs, the Region will be responsible for the replacement cost. Due to excavations for sanitary sewer replacements or other construction events related to project needs of the Area Municipality, the Area Municipality will be responsible for the replacement costs. Where a multi-use trail replaces a sidewalk, the equivalent cost of replacing the sidewalk will be assigned based on the preceding rules. Any additional capital costs related to building the multi-use trail will be the responsibility of the Region. 		

10.4 SIDEWALK PRIORITIZATION

The Region of Waterloo developed a Sidewalk Prioritization methodology to determine specific warrants for where sidewalks should be located along Regional roads; it is based on five criteria:

- Frequency of pedestrian collisions.
- Proximity to Grand River Transit routes.
- Proximity to Grand River Transit stops.
- Proximity to schools.
- Presence of lighting.

The Recommended Walking Network can be used to inform where sidewalks and boulevard multiuse trails will be built along specific segments of Regional roads, as indicated on the maps and the related tables in the Walking and Cycling Network Action Plan. The Recommended Walking Network was developed considering this prioritization method as one factor together with connecting areas of high existing or potential demand for walking, coordinating construction with the Transportation Capital Program, and public input. Annual phasing is provided for projects in the Transportation Capital Program. However, phasing of infill projects is grouped into bins of 0-5 years, 5-10 years and beyond 10 years. The Sidewalk Prioritization methodology can be used to further refine the phasing.

The Region of Waterloo's should update the sidewalk prioritization methodology to include boulevard multi-use trails as well as additional considerations related to increasing walking mode share and implementing a complete sidewalk network.



An updated sidewalk prioritization methodology would include some or all of the following considerations:

- The current criteria in the methodology, which ranks missing sidewalks based on scores related to the frequency of pedestrian collisions, proximity to Grand River Transit (GRT) routes and stops, proximity to schools, and lighting.
- Other criteria used to develop the Regional Walking Network such as the:
 - Ability to support localized mode share targets in the Regional Transportation Master Plan.
 - Ability to address high existing or potential walking demand, as outlined in the Walking and Cycling Action Plan (Chapter 4).
- Opportunities to coordinate with other projects recommended in the Walking and Cycling Network Action Plan (Chapter 4).

10.5 UPDATES TO THE CYCLING MASTER PLAN POLICIES

The *Cycling Master Plan* (CMP) approved in 2004 included nine policies for the Region of Waterloo to pursue. These policies are listed in **Exhibit 10.3** and were reviewed and updated to fit within the Walk Cycle Waterloo Region plan.

The Region of Waterloo should update the Cycling Policies in the previous Cycling Master Plan to by adopting the Recommended Cycling Policies as presented in Exhibit 10.3.

2004 CMP Approved Policy	How it applies to Walk Cycle Waterloo Region
Cycling will be viewed as a viable and desired mode of transportation	Still Applicable — The 2011 Transportation Master Plan (TMP) further updates and sets the priority framework for different modes of transportation. The TMP has a Region-wide mode share target of 9% for walking and 3% for cycling. The target is further broken down between Cambridge, Kitchener, Waterloo and the rural Townships.
On-road cycling is based on the principle of "vehicular cycling".	Recommended Update — This plan recognizes that bicycles on the road are considered vehicles under the Highway Traffic Act. Walk Cycle Water Region is based on the principle of attracting and encouraging a variety of cyclist types from the "interested, but concerned group", to the "enthused and confident" to the "strong and experienced". As such, design strategies must expand beyond the provision of conventional travel lanes and intersection treatments for all vehicles, and recognize the need for treatments that improve on the comfort, convenience and safety of cyclists. These designs treatments are outlined in Part 2: "Green Chapter" Design Guide of the Walk Cycle Waterloo Region plan.

Exhibit 10.3: Recommended Cycling Policies



2004 CMP Approved Policy	How it applies to Walk Cycle Waterloo Region
The Regional Cycling Network will be phased in over time. The Core Network, which serves as a trunk system that connects many of the most significant destinations, will be implemented over the next 10 years. The Long Term Network, which improves network density and expands to areas where demand is less, will be built over the next 20 plus years.	Not Applicable — This plan does not separate the cycling network into a Core and Long Term Network. Instead, the Recommended Cycling Network implementation is tied to the 10-Year Transportation Capital Program plus infill projects and the "fix-it list". The recommended cycling network and phasing are presented in the Walking and Cycling Network Action Plan.
Prevailing guidelines will be used in the design of facilities as recommended in the CMP or deemed acceptable within the industry in Canada. In certain situations, when practical application may be difficult to achieve, two options will be explored: an examination of the viability of the route, including possible alternative routes, and/or; alternative design strategies that are considered reasonable.	Still Applicable and Updated — Prevailing guidelines must continue to be used in the design of cycling facilities. Walk Cycle Waterloo Region provides design strategies in Part 2: "Green Chapter" Design Guide including an initial cycling facilities selection tool that complements and updates the Context Sensitive Regional Transportation Corridor Design Guidelines. Regional and Area Municipal plans, community input and local context are to be used to refine cycling facility recommendations for a particular corridor. In some Regional corridors, it may be desirable to construct cycling facilities to a higher standard than those recommended in the "Green Chapter" Design Guide to enhance the quality of the cycling trip and user comfort; or a narrower cycling facility may be required where the right-of-way is narrow or where utilities, street trees, and other fixed objects may conflict with the preferred facility and are too costly to modify. The type of cycling facility would be guided by the Walking and Cycling Network Action Plan and further refined during the planning, environmental assessment and detail design phases of individual projects.
The Region and Area Municipalities will work cooperatively in the planning, construction and maintenance of the Regional Cycling Network in order to minimize duplication and to implement Regional and local cycling networks that feed each other. Construction and maintenance of cycling routes on local roads will be based on shared funding with the Area Municipalities and other potential stakeholders, where financially viable and agreed upon by both parties.	Recommended Update — The recommended Walking and Cycling Network recognizes Local Connections of Regional Significance where gaps or constraints along Regional roads are overcome on local streets or trails. However, the cost to implement the Walking and Cycling Network in the plan is based on implementing the active transportation facilities along Regional roads only. The Region of Waterloo would assist the Area Municipalities in identifying cost-effective implementation strategies and funding but would not direct Region of Waterloo revenues to local connections at this time.
A variety of supporting initiatives will be introduced through the co-operative efforts of the Region and other potential stakeholders.	Still Applicable and Updated — Thirteen supporting initiatives were included in the CMP; ten of which relate to education and outreach programs. These are updated in the Behavioural Shift Action Plan. The other three supporting initiatives not address in other Action Plans are discussed in Section 10.5.1.
The Region will maintain the RCAC whose role is to provide advice and assistance to staff regarding network implementation priorities and support programming. Operation and membership of the Committee will be in accordance with the most current Terms of Reference.	Updated — The RCAC was replaced with the Active Transportation Advisory Committee (ATAC), which was formed to advise staff on matters related both to pedestrians and cyclists. The ATAC membership and operation is as per the Committee's Terms of Reference as approved by Council.
Retired road and railway rights-of-way will be considered for their usefulness as part of the Regional Cycling Network before being sold.	Still Applicable — Update to include the Walking Network.

2004 CMP Approved Policy	How it applies to Walk Cycle Waterloo Region
As part of the routine accommodation for cyclists, features such as bike-friendly grates, pothole repair and actuated traffic signals that detect the presence of a bicycle will be pursued on all Regional roads.	Recommended Update — The Walking and Cycling Network Action Plan includes a Fix-It List designed to address localized improvements that are not addressed specifically through implementation of the recommended network. It is intended to address, through an annual program, localized hazards, issues or problems that require physical or operational repairs. It is outlined in detail in the Walking and Cycling Network Action Plan.

10.5.1 UPDATES TO SUPPORTING INITIATIVES

Most supporting initiatives proposed in the 2004 Cycling Master Plan relate to education and outreach programming; these supporting initiatives are considered in Chapter 7: Behavioural Shift Action Plan. Others are addressed in the Network Action Plan, the Winter Network Action Plan, the Performance Monitoring Action Plan, or in Section 10.6.

10.6 NEW RECOMMENDED POLICIES

Other issues raised by the Project Team during the Walk Cycle Waterloo Region study requiring policy direction are: e-bike use on trails, mode conflicts on multi-use trails, trip planning for active transportation modes and pilot projects to test new design ideas.

10.6.1 E-BIKE USE ON MULTI-USE TRAILS

E-bikes, also defined as power-assisted bicycles, are permitted on roads by the Ministry of Transportation (MTO) where conventional bicycles are currently allowed. However, clarity is required regarding the use of e-bikes on multi-use trails.

MTO evaluates whether new vehicles can or cannot legally operate on public roads in Ontario and the safety requirements that must be met. With respect to active transportation, vehicles that can operate on Ontario roads without a license or vehicle registration include bicycles, electric bicycles or e-bikes (resembling conventional bicycles or motor scooters), and Segway Human Transporters (undergoing pilot testing). These "vehicles" must follow the rules of the road, as set out in the Highway Traffic Act, which currently apply to cyclists. Persons operating Personal Mobility Devices (motorized wheelchairs and medical scooters) are treated in the same way as pedestrians. Motor-Assisted Bicycles (mopeds) require a restricted class license and vehicle registration to operate on Ontario roads. Maximum operating speed for mopeds is 50 km/h, and for e-bikes is 32 km/h. Any municipal by-law prohibiting bicycles from highways under their jurisdiction will apply. Municipalities have the authority to pass by-laws specific to bicycles, e-bikes and Segways that prohibit them from municipal roads, sidewalks, paths or trails, and bike lanes under their jurisdiction.

The Region of Waterloo should work with the Area Municipalities to review and coordinate updating of municipal by-laws, as required, pertaining to permitted users of the Walking and Cycling Network, having regard to Provincial regulations on e-bikes and other new vehicles. The by-laws should reflect and complement the existing MTO regulations on new "active transportation vehicles".



10.6.2 CONFLICTS ON MULTI-USE TRAILS

Multi-use paths can be attractive, comfortable and convenient facilities for a wide variety of nonmotorized users such as cyclists of all ages, abilities and types of bicycles, in-line skaters, skateboarders, kick scooters and pedestrians of all ages and abilities including walkers, runners, and people with mobility aids, with a baby-stroller or walking a dog. As the popularity of trails grows, conflicts between these users arise that accentuate the differences in their speed, space they occupy and predictability of their travel route.

The level of service or quality of the experience on the trail is directly related to the design of the trail to accommodate the users' characteristics and volumes. Of particular importance is the width of the trail that is needed to accommodate the type and volume of users. Conflicts and complaints are often blamed on users who are being discourteous; however, they typically are a result of the trail being busy (operating at or near capacity). This can be mitigated by:

- Upgrading the design of the trail to increase the width, improve the sight distance, etc.
- In areas where a trail is extremely heavily used, segregating pedestrians from wheeled users may be appropriate, constructing alternate routes or separate trail facilities for each group.

General design guidance and reference guidelines are provided in Part 2: "Green Chapter" Design Guide.

Popular and well-used multi-use trails that cannot be upgraded may benefit from campaigns to encourage faster users to yield to slower users. It may be desirable to reduce the speed differential for the comfort and safety of all trail users. Options to consider include:

- Posting a maximum speed on segments of trails that are experiencing user conflicts, or a region-wide maximum speed for all multi-use trails. In order to be effective, enforcement will be required, but is likely constrained by the lack of enforcement resources in the communities, or competition for enforcement around other community issues. It is also difficult to set an upper limit that would be appropriate for both pedestrians and cyclists since it is normal for cyclists to travel 20 to 30 km/h or more on trails. Further, many cyclists may not be able to accurately judge their own speed at any given point in time.
- Posting an advisory speed or suggested maximum speed on segments of trails that are experiencing user conflicts. Advisory speeds are often ignored because they are not enforceable. Again, it is difficult to set an upper limit that is appropriate for pedestrians and cyclists and many cyclists may not be able to accurately judge their own speed at any given point in time.
- Introducing design elements to slow users' speeds without introducing hazards along the trails. This may include stripping a dashed centreline along straighter sections of trails and informing users to "keep right", "pass left", or a solid line approaching sharp curves, intersections or through areas where sight distance is restricted and passing is discouraged. The responsibility of faster users to yield to slower users would need to be communicated. Curvilinear alignment at the entrances to trails or approaching narrow sections may also slow users. Bollards, gates, and other fixed objects are not recommended to slow users since these are hazards in themselves.
- Install signage such as "Shared Pathway", "Yield to Pedestrians", "Keep Right Pass Left" and other simple messages that clearly identify appropriate trail etiquette.



The Region of Waterloo should work with the Area Municipalities to determine strategies to address conflicts along trails arising from use approaching capacity when the trails cannot be upgraded (widened), placing priority on those multi-use trails that form part of the Recommended Walking and Cycling Network.

10.6.3 BIKE SHARE

There is a growing public interest in the provision of a bike sharing system in Waterloo Region. Bike sharing systems help create opportunities for short and medium distance cycling trips by providing free or affordable access to bikes at convenient locations. Systems operate in a similar way to car sharing where individuals purchase bike share memberships that give them access to short-term bicycle rentals. Bike sharing systems are known to increase transit ridership by expanding the catchment area of higher-order transit and providing more travel options for users.

Two organizations are currently interested in operating public bike sharing systems in the Region: Community Access Bikeshare and Grand River Public Bike Share. Community Access Bikeshare has recently launched following a pilot system in the City of Kitchener. The City of Kitchener has awarded a grant to Community Access Bikeshare to purchase bikes and is supporting the organization with project planning. Grand River Public Bike Share is preparing to launch a new system in the City of Waterloo. The City of Waterloo is developing an approval process to facilitate the implementation of bike sharing programs.

Bike sharing in the Region can help build transit ridership and supports active transportation. The Region supports the implementation of bike sharing systems that demonstrate the best practices of successful systems, offer affordable and convenient access for users and provide connections to the Region's downtowns and transit system.

The Region of Waterloo should work with the Area Municipalities and local organizations to support the development of public bike sharing systems in the region.

10.6.4 END-OF-TRIP FACILITIES

An important factor in providing a well-connected and convenient cycling network is the provision of end-of-trip facilities. A report from Transport Canada highlights the importance of these facilities in encouraging the use of cycling as a mode of transportation by making it more convenient and attractive.³⁰ This report provides a simple listing of key end-of-trip facilities which include a variety of different types of infrastructure:

- Bicycle parking infrastructure:
 - Short term parking (stands or racks) that is in a highly visible location and provides a free, easy place to lock a bike.
 - Long term parking (shelters or enclosures) that protect a bike from vandalism, theft and the elements while parked for a day or more.
- Complementary infrastructure:

³⁰ Transport Canada; "Bicycle End-of-Trip Facilities", April 2010, <u>http://www.tc.gc.ca/media/documents/programs/betf.pdf</u>, Accessed November 2012



- Lockers for helmets, clothing or other personal belongings.
- Change rooms and showers.
- Air pumps.

The Context Sensitive Regional Transportation Corridor Design Guidelines recommend a Landscape and Site Furnishing Zone; this zone falls between the curb and the pedestrian clearway. For most Regional Roads this zone is recommended to be a minimum of 1m wide and a preferred width of 2m to 4m depending on the type of road. This zone provides a buffer between pedestrians and vehicles and gives an opportunity to provide amenities such as benches, bicycle parking and transit shelters.

The Region of Waterloo should consider the provision of bicycle parking within the Landscape and Site Furnishing Zone as part of every Regional road project where an existing or potential demand is identified.

Provision of shade at end-of-trip facilities and rest areas can be a key factor in the comfort of users. On projects that the Region reviews or participates in, consideration should be given to the opportunity to include appropriate shade at end-of-trip and rest areas. The Shade Audit Information Guide + Tool developed by the Shade Working Group in the fall of 2012 provides information on designing and planning for appropriate shade.

The Region has developed a method to incorporate Transportation Demand Management (TDM) into the site development process. This method, in part, provides guidance to developers on the provision of end-of-trip facilities and recommends transportation impact reductions associated with these improvements. For example, the method recommends up to a 4% reduction in the minimum parking requirement based on the provision of walking and cycling facilities. As parking requirements fall within the jurisdiction of Area Municipalities, it is important that the Region continue to work closely with the Area Municipalities on this project.

The Region of Waterloo should continue to encourage TDM supportive changes to development applications and work closely with Area Municipalities to establish the necessary policies at both municipal tiers.

This TDM aspect of the development review process is a requirement of the Transportation Impact Study (TIS) report that accompanies most significant land development applications. An evaluation of the need for end-of-trip facilities based on land use and local context forms part of a thorough review of cycling not currently required as part of each TIS. However, the jurisdiction to require that facilities be provided lies with the Area Municipalities and zoning or site plan control policies would need to be updated to add this type of requirement.

The Region of Waterloo should support and encourage Area Municipalities to require adequate end-of-trip facilities as part of their zoning and site plan control policies.

10.6.5 ACTIVE TRANSPORTATION TRIP PLANNING

The Region will continue to support, promote and implement actions that improve the link between cycling and transit. Integrated access for pedestrians and cyclists was considered in the development of the Recommended Walking and Cycling Network. The GRT bus 'n' bike map is an example of how this initiative is supported through education and outreach programs. The Region should continue with this initiative as opportunities present themselves.

Planning a trip on foot or by bicycle is currently facilitated in the Region of Waterloo by the Grand River Transit (GRT) Transit Route Map that shows cycling facilities and trails along with the transit routes (available in an electronic pdf format or hard copy), and electronically using the Google Maps trip planning tools. The amount of information required on the Transit Route Map to support transit trips overwhelms the information on cycling and trails and makes it difficult for active transportation users to interpret.

Consideration should be given to highlighting areas where facilities are well shaded and end-of-trip facilities or rest areas with adequate shade are available in the development of the map. The final mapping resource could include a sun safety message to educate users on sun protection measures they can employ in their travels (e.g., checking the daily UV index, wearing hats, sunscreen, sunglasses, etc).

The Region of Waterloo should work with the Area Municipalities to develop a regionwide walking and cycling map separate from the GRT Transit Route Map that can illustrate the variety of facilities available for active transportation and recreation, promote services available in the region for cyclists and pedestrians and incorporate basic safety and promotional messages.

10.6.6 PILOT PROJECTS

The terms of reference for the Walk Cycle Waterloo Region study included identifying a highly visible and symbolic location for an active transportation demonstration project in consultation with the Region and stakeholders. The project was intended to demonstrate the Region's commitment to this plan, engage community interest, highlight or resolve a design challenge, showcase a new design idea and provide visible action. Several preliminary ideas for pilot projects were identified by the consultant team by reviewing ideas, issues and interests of staff, public and the Active Transportation Advisory Committee (ATAC), along with knowledge of new approaches to designs being tried elsewhere in North America.

Tactile walking surface (yellow, cast-iron, truncated dome plates) on curb ramps at the intersection of Frederick and Edna Streets were installed in 2012.



Candidate pilot projects presented to the Project Team are outlined in **Exhibit 10.4**. The tactile walking surface on curb ramps project was chosen and installed at the intersection of Frederick and Edna Streets using yellow, cast-iron truncated dome plates installed at the bottom of the curb ramp

on all four corners of the intersection. The Region of Waterloo will monitor the effectiveness and durability of the plates over time.

The Region of Waterloo Transportation Planning, Design & Construction and Transportation Engineering, Operations and Maintenance staff should work together to implement new and emerging design practices. Consideration should be given to the experience of other jurisdictions and to risk management. If a practice is found to be appropriate, the Region of Waterloo should implement a pilot project. The pilot would be monitored and followed by an analysis to determine if continued use of the practice is justified. For those practices that differ from those regulated by Ontario's Highway Traffic Act or are prohibited by the Act, the Region of Waterloo can pursue a "pilot project" under the Act to research, test or evaluate those matters as has been done in other jurisdictions.

The pilot projects identified in **Exhibit 10.4** may be considered for implementation or other new design practices as presented in **Part 2: Green Chapter Design Guide**.

Type of Pilot Project	Rationale	Potential Locations	Design Ideas
Interchange Improvement Project	Freeway interchanges have been identified as very challenging areas to walk and bike by the ATAC and the public. It is recommended that this project be located near and/or connecting to existing AT facilities. The project would be designed to improve the comfort and safety of existing pedestrian and cyclists. Through improved conditions, this project would also aim to increase walking and cycling along the corridor and open it to a broader range of users.	Highway 7/8 at Fisher- Hallman Road — The Region of Waterloo and the Ministry of Transportation, Ontario (MTO) coordinated to provide bike lanes across this interchange (2012). However, pavement markings and signage are still to be implemented. Highway 85 at University Avenue — bike lanes are planned on either side of the interchange but do not exist now. Future treatment will be informed by improvements to Highway 7/8 at Fisher- Hallman Road. Highway 401 at Franklin Boulevard — The City of Cambridge has jurisdiction over Franklin Boulevard north of Highway 401 and is planning on implementing bike lanes. MTO is considering replacement of the existing Highway 401 bridge or a separate pedestrian bridge in this location.	Pavement markings such as green colour, "sharrows" or guide lines for conflict areas, signage, treatments to reduce speeds and improve awareness among users along the Regional road within the interchange area.

Exhibit 10.4: Candidate Pilot Projects



Type of Pilot Project	Rationale	Potential Locations	Design Ideas
Innovative Bikeway Intersection Treatments Project	Large intersections and facilities like bike lanes that are discontinuous at intersections have been mentioned by the public as difficult areas to negotiate. Bicycle detection and bike boxes have been previously discussed at a staff level as possible solutions. New design treatments for cyclists at arterial intersections are being tried throughout North America. It may be challenging to implement alternatives where the Region has less familiarity applying these treatments. With a Pilot Project, the Region has the opportunity to refine an application to a specific location, and consider performance monitoring before accepting as new practice.	Caroline Street at Erb Street and the Iron Horse Trail — High collision location for pedestrians and cyclists and of concern to the public and ATAC. The design and operation of the intersection will be affected by the LRT project.	Advance bike box, two-stage left bike box, bicycle lay-by, signal phasing, bicycle detection.
Trail Crossing Enhancement Project	The need for improved trail crossings has been noted by both the ATAC and the public. Trails in the Region service both purposeful and leisure trips. However, pedestrians and cyclists are sometimes inconvenienced, delayed or confused when the trail crossing is directed to the closest signalized intersection or along sidewalks.	Iron Horse Trail at Victoria Road — The crossing is setback from the traffic signals at the intersection. A median refuge island is likely required and would require reconstruction of the roadway. The Region of Waterloo already includes median refuge islands in their design practices. Iron Horse Trail at Courtland / Stirling Avenues — Under construction in 2012. Moffat Creek at Water Street — A median refuge island is likely required and would require reconstruction of the roadway. The Region of Waterloo already includes median refuge islands in their design practices. Laurel Creek Trail at Weber Street — The crossing is setback from the traffic signals and pedestrian crosswalk. The City of Waterloo is undertaking upgrades to this section of the trail and will work with the Region of Waterloo to improve the trail crossing alignment.	Speed and volume of traffic will influence the type of enhancements. Multiple elements integrating visibility and way-finding signage, crossing treatments, improved routing along the sidewalk, signal detection, etc.


Type of Pilot Project	Rationale	Potential Locations	Design Ideas
Cycle Track or Buffered Bike Lane Project	The public and the ATAC have expressed a desire for greater comfort and separation from general traffic along busy roadways. Cycling facilities along Regional roads currently consist of bike lanes, paved shoulders, boulevard multi- use trails, and unmarked wide curb lanes. Cities in North America are trying more segregated designs widely used in Western Europe such as cycle tracks and buffered bike lanes to address comfort and separation. The design at driveways and intersections needs to be well thought-out. Sweeping and snow clearing practices will influence the type of segregation.	Striped buffer between on street parking and shared lane along King Street in St. Jacobs — Under design (2012). Bridgeport / Erb Streets in Uptown Waterloo. University Avenue bike lane upgrades.	Convert travel lane or narrow travel lanes to create space, locate adjacent travel lanes, on-street parking or in boulevard, various types of segregation (painted buffer, flexible delineators, planters, etc.), various driveway and intersection treatments.
Boulevard Multi- use Trail Terminus / Integration with On-road Cycling Facility Project	A number of boulevard multi- use trails exist throughout the Region and more are being pursued. However, the terminus can result in cyclists riding the wrong-way on the road as they exit or enter the trail, and the integration of a trail facility on one side of the road with on-road facilities on both sides of the road can be difficult.	Can-Amera Parkway — The City of Cambridge will implement changes to the intersection at Conestoga Boulevard.	Convert travel lane or narrow travel lanes to create space, locate adjacent travel lanes, on-street parking or in boulevard, various types of segregation (painted buffer, flexible delineators, planters, etc.), various driveway and intersection treatments.
Boulevard Multi- use Trail Treatments at Driveway and Intersections Project	Boulevard multi-use trails are preferred by some members of the public because of their separation from traffic. Riding a bicycle in a cross- walk is illegal in Ontario. Safety issues at driveway and intersections along boulevard trails have been well documented. A number of new design manuals and ones from outside North America consider various treatments to mitigate the crossing conflicts.	Franklin Boulevard (proposed boulevard multi-use trail) — Under design (2012)	Pavement markings and signage treatments, trail alignment treatments (Dutch "bending-in" or "bending-out" alignments)



Type of Pilot Project	Rationale	Potential Locations	Design Ideas
Tactile Walking Surface Indicators and Curb Ramps	The standards for the Accessibility for Ontarians with Disabilities Act (AODA) will require incorporating tactile walking surface indicators at the bottom of curb ramps to indicate to pedestrians with visual impairments that they are entering the street. The current Ontario Provincial Standard Drawing for curb ramps includes grooves tooled into the ramp that are not detectable under foot, only by some canes used by the visually impaired. New indicators have been tested in the US; only truncated domes are permitted.	This pilot has been implemented at the intersection of Frederick Street and Edna Street in Kitchener. Based on this experience and upcoming AODA requirements future flush curbs will include unpainted tactile warning indicators.	Consider the various configurations for crosswalk alignment and curb ramps to balance crosswalk length, setback and ramp placement. Test the installation and maintenance of cast iron truncated dome plates previously tested and recommended by the Vermont Agency of Transportation.



11 SUMMARY OF RECOMMENDATIONS

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11.1 INTRODUCTION

Walk Cycle Waterloo Region is the Region of Waterloo's plan for making it safer, more comfortable and more convenient to walk and bike in our community. It consists of five Action Plans, plus new policy directions and a design guide intended to help the Region of Waterloo achieve the vision and goal of increasing the PM peak hour mode share for walking and cycling trips to 12% by 2031. The recommendations from each chapter of the plan are presented below.

11.2 ACTIVE MODE FACILITIES: CONSIDERATIONS AND CRITERIA

This chapter reviewed some of the background information and criteria that are important to consider when developing a master plan active transportation. The content of this chapter influences much of the rest of Walk Cycle Waterloo Region and includes a few key recommendations:

- 1 The Region of Waterloo should continue to be committed to implementing accessible pedestrian facilities that meet the regulations of the AODA, and advance best practices to make walking safe, comfortable and convenient.
- 2 The Region of Waterloo should focus on providing cycling facilities that serve the majority of residents and visitors to make cycling safe, comfortable and convenient.
- **3** The "General Suitability of Cycling Facilities by Regional Road Classification" table should be used to inform the facility selection process on Regional Roads.

11.3 NETWORK ACTION PLAN

The recommended 10 year network would increase the Regional Sidewalk Network by 124 km to a total of 488 km. An additional 122 km of boulevard multi-use trails would bring the total to 139 km. It would also increase the Regional Cycling Network by 418 km to a total of 988 km. The walking and cycling network is supported by five recommendations:

- 1 Projects currently planned as part of the Transportation Capital Plan should be expanded to include the additional active transportation tasks identified in the TCP action area of the Walking and Cycling Network Action Plan.
- 2 The Region of Waterloo should work with Area Municipalities and senior levels of government to remove physical barriers to active transportation and to design our communities with connections to neighbouring streets, trails and transit.
- **3** The Transportation Capital Plan should be expanded to include new projects to construct the active transportation facilities identified in the Gaps / Infill action area of the Walking and Cycling Network Action Plan.
- 4 The Region of Waterloo should work with Area Municipalities and senior levels of government to address the concerns expressed through the Fix-it List in the Walking and Cycling Network Action Plan.



5 The Region of Waterloo should work toward completion of the 12 projects identified as Special Study Areas in the Walking and Cycling Network Action Plan

The specific facility types recommended in the walking and cycling networks are based on a high level review of the network and the specific corridor. As any individual project is developed the project team may consider facility types that are different than that recommended in the ATMP networks. However, the continuity, safety, comfort, convenience and connectivity of the facility and adjacent sections must be considered. Any changes to the recommended facility type must be done in consultation with Transportation Planning staff and with detailed justification documented in the project file.

11.4 STRATEGIC SIGNAGE ACTION PLAN

Way-finding and destination signage is important for guiding and providing information to cyclists and pedestrians. The signage strategy is intended to provide guidance to promote uniformity of essential information for way-finding along the walking and cycling network and to regional destinations. Recommendations related to several signage applications are made:

- 1 The Region of Waterloo should work with Area Municipalities to exchange and co-ordinate guidelines on additional components to the signage system such as trailhead signage and maps, regulatory or warning signs, tourism information, cultural and heritage interpretation or public art.
- 2 The Region of Waterloo should work with Area Municipalities to implement a trail way-finding system based on branding logos and simple directional arrows as described in the Strategic Signage Action Plan.
- 3 The Region of Waterloo should work with Area Municipalities to include a bicycle logo on all street name blades for streets that include dedicated bicycle facilities and to provide supplemental way-finding signs and pavement markings as described in the Strategic Signage Action Plan.
- 4 The Region of Waterloo should work with Area Municipalities to install way-finding signs along the five regional routes of provincial significance and to develop names and logos for the three on-road routes as described in the Strategic Signage Action Plan.
- **5** The Region of Waterloo should work with Area Municipalities to install a clear and consistent system of destination signs along active transportation facilities and routes throughout the region as described in the Strategic Signage Action Plan.
- 6 The Region of Waterloo should conduct both an on-line and field test of the two destination sign design options and then implement a pilot project to test the preferred design as described in the Strategic Signage Action Plan
- 7 The Region of Waterloo should work with Area Municipalities to install linkage signs wherever No Exit signs are posted and an active transportation link is provided as described in the Strategic Signage Action Plan.
- 8 All way-finding and destination signs produced should follow best practices for fabrication, materials and installation such as those described in OTM Book 2.



9 The Region of Waterloo should work with Area Municipalities to implement a clear and consistent way-finding signage system for the cycling and trail network as the network is expanded, adding signs with each new route as described in the Strategic Signage Action Plan.

11.5 WINTER NETWORK ACTION PLAN

Poor weather conditions can make travel by walking or cycling more difficult, in particular when active transportation corridors are not maintained during these times. In order for active transportation to be a good choice for residents in this Region during all seasons, it is important that additional maintenance be performed. The following recommendations should help to develop an enhanced winter maintenance program:

- **1** The Region of Waterloo should consider, and encourage the Area Municipalities to consider, enhanced winter maintenance practices.
- 2 The Region of Waterloo should work with the Area Municipalities to develop and implement an enhanced winter maintenance pilot project.

11.6 BEHAVIOURAL SHIFT ACTION PLAN

Behaviour change strategies support active transportation efforts in the Region of Waterloo through the design and delivery of marketing and outreach programs spanning regional departments. Ongoing reference to several considerations and suggested programs is recommended:

1 The Region of Waterloo should consider the 5 P's, Behaviour Shift Goals, and Behaviour Shift Program Actions when developing future programs targeted at increasing walking and cycling rates in our community.

11.7 PERFORMANCE MONITORING ACTION PLAN

Performance measurement used to monitor progress toward planning goals along with a reporting strategy are key principles of sustainable transportation planning as identified by the Transportation Association of Canada. A successful performance monitoring program can be informed by the following recommendations:

- 1 The Region of Waterloo should develop an active transportation monitoring program targeted at tracking the indicators recommended in the Performance Monitoring Action Plan.
- 2 The Region of Waterloo should investigate the feasibility and costs of adding turning movement counts for cyclists in 15 minute intervals to standard regional counts as part of preparing the next count program terms of reference.
- **3** The Region of Waterloo should establish a set of screenlines on key corridors where all modes will be counted annually.
- 4 The Region of Waterloo should investigate the feasibility and costs of adding pedestrian and cyclist characteristics to the recommended annual screenline counts.



- 5 The Region of Waterloo should install permanent bicycle or active mode counters in at least three locations. These locations could include the King-Victoria Multi-Modal Hub, the Iron Horse Trial, and/or the Cambridge-Paris Rail Trail.
- **6** The Region of Waterloo should consider installing a public count displays in a highly visible location equipped with a permanent counter.
- 7 The Region of Waterloo should work with the Area Municipalities to maintain an accurate and up to date database of walking and cycling facilities across the region.
- 8 The Region of Waterloo should encourage the Area Municipalities to collect accessibility criteria in their provincially legislated Minimum Maintenance Standards (MMS) annual sidewalk inspection surveys.
- **9** The Region of Waterloo should evaluate collision reporting and analysis tools, such as the PBCAT system, to determine if incorporating them would provide a benefit to the current collision reporting and analysis process.
- **10** The Region of Waterloo should consider establishing a detailed annual Active Transportation report and a corresponding public "report card".

11.8 DELIVERING THE PLAN

Delivering the recommended Regional Walking and Cycling Network will require significant investment and careful phasing to maximize the impact of the projects completed. The following set of recommendations will inform the delivery of the ATMP:

- 1 The Region of Waterloo should work to identify funding to support the estimated \$47.8 M worth of new funding required for the recommended ten year Walking and Cycling Network.
- **2** The Region of Waterloo should work to identify funding to support the estimated \$14.0 M cost of the 12 Special Study Areas.
- **3** The Region of Waterloo should work to establish an annual budget of \$80,000 to implement the Fix-it List action area.
- **4** The Region of Waterloo should work to establish an annual budget of \$40,000 to implement the Strategic Signage Action Plan.
- **5** The Region of Waterloo should develop an ATMP Implementation Plan to identify a preferred strategy for prioritizing and funding Walk Cycle Waterloo Region and identify specific assignments to implement the ATMP recommendations.
- 6 The Region of Waterloo should monitor the phasing of projects and advance or defer those where an implementation opportunity presents itself. All projects should be constructed at the earliest opportunity regardless of phasing.



11.9 ADDITIONAL POLICY DIRECTION

The Walk Cycling Waterloo Region plan aligns with recommended policies outlined in the Regional Transportation Master Plan, approved by Council in 2010. Updated or new policies that expand on the approved policies for Sidewalks along Regional Roads and the Cycling Master Plan are provided below. Refer to previous sections for a full listing of previously approved policies that are still applicable.

- 1 The Region of Waterloo should update the Sidewalk Policy to fund multi-use trails, promote Regional standards and clarify the text by adopting the Recommended Sidewalk Policy as written in Section 10.3.1.
- 2 The Region of Waterloo's should update the sidewalk prioritization methodology to include boulevard multi-use trails as well as additional considerations related to increasing walking mode share and implementing a complete sidewalk network.
- **3** The Region of Waterloo should update the Cycling Policies in the previous Cycling Master Plan to by adopting the Recommended Cycling Policies as presented in Exhibit 10.3.
- 4 The Region of Waterloo should work with the Area Municipalities to review and co-ordinate updating of municipal by-laws, as required, pertaining to permitted users of the Walking and Cycling Network, having regard to Provincial regulations on e-bikes and other new vehicles. The by-laws should reflect and complement the existing MTO regulations on new "active transportation vehicles".
- 5 The Region of Waterloo should work with the Area Municipalities to determine strategies to address conflicts along trails arising from use approaching capacity when the trails cannot be upgraded (widened), placing priority on those multi-use trails that form part of the Recommended Walking and Cycling Network.
- **6** The Region of Waterloo should work with the Area Municipalities and local organizations to support the development of public bike sharing systems in the region.
- 7 The Region of Waterloo should consider the provision of bicycle parking within the Landscape and Site Furnishing Zone as part of every Regional road project where an existing or potential demand is identified.
- 8 The Region of Waterloo should continue to encourage TDM supportive changes to development applications and work closely with Area Municipalities to establish the necessary policies at both municipal tiers.
- **9** The Region of Waterloo should support and encourage Area Municipalities to require adequate end-of-trip facilities as part of their zoning and site plan control policies.
- **10** The Region of Waterloo should work with the Area Municipalities to develop a region-wide walking and cycling map separate from the GRT Transit Route Map that can illustrate the variety of facilities available for active transportation and recreation, promote services available in the region for cyclists and pedestrians and incorporate basic safety and promotional messages.
- **11** The Region of Waterloo Transportation Planning, Design & Construction and Transportation Engineering, Operations and Maintenance staff should work together to implement new and



emerging design practices. Consideration should be given to the experience of other jurisdictions and to risk management. If a practice is found to be appropriate, the Region of Waterloo should implement a pilot project. The pilot would be monitored and followed by an analysis to determine if continued use of the practice is justified. For those practices that differ from those regulated by Ontario's Highway Traffic Act or are prohibited by the Act, the Region of Waterloo can pursue a "pilot project" under the Act to research, test or evaluate those matters as has been done in other jurisdictions.

11.10 PART 2: GREEN CHAPTER DESIGN GUIDE

The "*Green Chapter*" *Design Guide* provides planning and design guidance for creating safe, convenient and comfortable space for pedestrians, cyclists, and other active transportation modes along Regional roads throughout the Region of Waterloo. In addition to general design guidance several key recommendations are made:

- 1 Part 2: Green Chapter Design Guide should be amended through approval at the Region's Transportation Program Review Committee rather than requiring Regional Council approval of evolving design guidelines.
- 2 The Region of Waterloo should consider land use types, densities and building form, landscaping and other elements that will influence the pedestrian trip as the Recommended Walking Network is implemented and in other Regional Policies.
- 3 Wide lanes are not recommended for new construction / reconstruction due to the higher speeds they induce, and insufficient lateral clearance between passing motorists and cyclists. Other cycling facilities that provide separate space for cyclists, or design elements that induce lower operating speeds so travel space can be shared are preferred over wide lanes.
- 4 It is recommended that the Region of Waterloo designate paved shoulders meeting the recommended widths to accommodate cyclists as rural bike lanes, and erect the corresponding bike lane regulatory signs.



PART 2: GREEN CHAPTER DESIGN GUIDE

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1 INTRODUCTION

Part 2: Green Chapter Design Guide provides planning and design guidance for creating safe, convenient and comfortable space for pedestrians, cyclists, and other active transportation modes along Regional roads throughout the Region of Waterloo. Recommendations expand on and supersede planning and design practices provided in:

- Context Sensitive Regional Transportation Corridor Design Guidelines, Region of Waterloo, Final Report, June 2010
- The Blue Book: Region of Waterloo Draft Transportation Engineering Practice, Region of Waterloo, (updated regularly)

Part 1: Walk Cycle Waterloo Region is a policy document that will remain relatively stable over time. Changes to it would require an amendment approved by Regional Council. However, **Part 2: Green Chapter Design Guide** is separate and intended to be a living document that deals with the design detail of the facilities described in the policy. It would be updated as new best practices develop in the industry and pilot projects are evaluated within the Region. It is recommended that Part 2: Green Chapter Design Guide be amended through approval at the Region's Transportation Program Review Committee. This committee of transportation staff from several Regional divisions regularly considers and makes recommendations on transportation issues and challenges faced by the Region.

Part 2: Green Chapter Design Guide should be amended through approval at the Region's Transportation Program Review Committee rather than requiring Regional Council approval of evolving design guidelines.

1.1 REFERENCES FOR PLANNING AND DESIGN

Active transportation infrastructure includes a number of different types of facilities to accommodate the wide range of abilities, skills and experience of pedestrians, in-line skaters, cyclists, pedestrians with mobility devices, visual, hearing or cognitive impairments, boarders, etc. The three basic facilities are:

- Sidewalks
- Multi-use trails that essentially accommodate all active transportation modes
- Bikeways

A selected bibliography of planning and design guides is provided in Appendix A and is based on current design guidelines available in North America. Essential North American guidelines are presented below. Guidelines that are free are marked: **FREE**

1.1.1 PEDESTRIANS AND CYCLISTS

PLANNING AND DESIGN FOR PEDESTRIANS AND CYCLISTS: A TECHNICAL GUIDE, VÉLO QUÉBEC ASSOCIATION (2010)

This is the 3rd edition of Vélo Québec's design handbook expanded to include pedestrian design issues. As the most recently published guidelines in North America, it is a primary source for cycling

and pedestrian planning and design guidance in the Canadian context. This manual summarizes the main characteristics of active transportation, discusses the design characteristics of pedestrians and cyclists, presents ideas on creating walkable and bikeable environments and has a section on planning for active transportation. The design sections cover paths and trails, walkways and bikeways in roadway corridors, ancillary elements such as lighting, signs and pavement markings, street furniture and parking, integration with transit, and maintenance and operation of pedestrian facilities and bikeways. Order on-line at

http://www.velo.qc.ca/velo_quebec/amenagements.php?page=guide (January 2011).

FREE Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, Institute of Transportation Engineers (ITE), 2010

This recommended design practice of the Institute of Transportation Engineers (Washington DC) is a comprehensive guide to the planning and design of major streets in urban areas. It is comprehensive in that it includes all elements of the roadway, whether they are for motorists, pedestrians or cyclists, as they interact to influence the walkability of the corridor. Chapters in the design section include: design controls, and street-side, travel way, and intersection design guidance. Available on-line free to ITE members at http://www.ite.org/emodules/scriptcontent/Orders/ProductDetail.cfm?pc=RP-036A-E (January 2011).

PROMOTING SUSTAINABLE TRANSPORTATION THROUGH SITE DESIGN: AN ITE RECOMMENDED PRACTICE, INSTITUTE OF TRANSPORTATION ENGINEERS (ITE), 2010

This report recommends site design practices that can be applied through the site development process to promote the use of more sustainable modes of transportation, such as walking, cycling and transit. Its primary purpose is to assist policymakers and professionals involved in the preparation, review and approval of non-residential or mixed-use development proposals to identify and incorporate features that make sites more accessible to travel modes other than the single-occupant vehicle (SOV). Order on-line at

http://www.ite.org/emodules/scriptcontent/Orders/ProductDetail.cfm?pc=RP-035A (February 2011)

1.1.2 PEDESTRIANS

FREE Part IV.1 of the Accessibility for Ontarians with Disabilities Act, 2005 (Ontario Regulation 191/11): Design of Public Spaces Standards (Accessibility Standards for the Built Environment).

The goal of the Accessibility Standards for the Built Environment is to remove barriers in public spaces and buildings. The standards for public spaces will only apply to new construction and planned redevelopment. The built environment includes Recreational Trails and Beach Access Routes, Outdoor Public Use Eating Areas, Outdoor Play Spaces, Exterior Paths of Travel (outdoor sidewalks or walkways), Accessible Parking, Obtaining Services, and Maintenance. Available on-line at: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_110191_e.htm#BK92 (April 2013).

Guide for the Planning, Design and Operation of Pedestrian Facilities, American Association of State Highway and Transportation Officials (AASHTO), 2004

This particular AASHTO guide covers characteristics of pedestrians, planning strategies, and facility design, operation, and maintenance. It is a reputable source, with a broad discussion of both planning and design issues around streets and street crossings. Order on-line at https://bookstore.transportation.org/item_details.aspx?id=119 (January 2011).



FREE Accessible Sidewalks and Street Crossings—An Informational Guide, Federal Highway Administration (FHWA), 2003

This FHWA manual acts as an abridged version of the design details for U.S. accessibility legislation are contained in the Public Rights-of-Way Accessibility Guidelines (PROWAG). The guide provides a succinct summary on making sidewalk and street crossings accessible. It covers understanding users, sidewalk corridors, sidewalk grades and cross slopes, sidewalk surfaces, protruding objects, driveway crossings, curb ramps, providing information to pedestrians, accessible pedestrian signals and pedestrian crossings. A checklist is also provided. Available on-line at: http://www.bikewalk.org/pdfs/sopada fhwa.pdf (January 2011).

1.1.3 BIKEWAYS

Guide for the Development of Bicycle Facilities, 4th Edition, American Association of State Highway and Transportation Officials (AASHTO), 2012

This AASHTO guide spans the planning, design, operation and maintenance of bikeways and bicycle parking facilities for the US. Sections include guidance for on-road facilities and shared-use paths. This edition updates earlier versions with details on shared roadways, rumble strips, cautionary use of wide outside lanes due to the higher speeds they induce, strategies for retrofitting bicycle facilities to streets, bicycle boulevards, traffic signal considerations, bicycle travel through interchanges and roundabouts, and addressing conflicts associated with shared-use paths along roadways. Order on-line at: <u>http://www.techstreet.com/standards/aashto/gbf_4?product_id=1833609</u> (August 2013).

FREE URBAN BIKEWAY DESIGN GUIDE, NATIONAL ASSOCIATION OF CITY TRANSPORTATION OFFICIALS (NACTO), 2011

NACTO developed this guide as part of their Cities for Cycling initiative to provide cities with state-ofthe-practice solutions to crate complete streets that are safe and enjoyable for cyclists. It includes descriptions, benefits, applications, design guidance, renderings, images and case studies for bike lanes, cycle tracks (segregated bike lanes), intersections, bicycle signals, and signing and marking. Most of the treatments are not directly referenced in the AASHTO guide or the US Manual for Uniform Traffic Control Devices. An on-line and downloadable version of the guide is available at: <u>http://nacto.org/cities-for-cycling/design-guide/</u> (September 2011). An updated version expanding information on intersection treatments, bicycle boulevards and pavement materials was published September 2012.

1.1.4 TRAFFIC CONTROL

FREE ONTARIO TRAFFIC MANUAL BOOK 15: PEDESTRIAN CROSSING FACILITIES, QUEEN'S PRINTER FOR ONTARIO, 2010

The Ministry of Transportation, Ontario publishes a series of Ontario Traffic Manuals to provide information and guidance to transportation practitioners in the design, application and operation of traffic control systems in Ontario. Book 15 provides guidance on the planning, design and operation of pedestrian roadway crossings. It outlines the legal requirements, specifically the rules of the road that govern motorists' and pedestrians' movements at controlled and uncontrolled crossings, and presents the devices, physically separated facilities and accessibility considerations. Available on-line at http://www.library.mto.gov.on.ca/webopac/zoomrecord.asp?recordkey=fa5caef1-9963-4786-b3c9-4b5e50e70321&TemplateGUID=26c8336a-34a4-4079-8514-

<u>5cf60c65e6eb&passport=87f6d2d0-c4f3-4b3d-951e-87f1526e37a3&data_dictionary=e874677c-f03d-4504-87f7-</u>

bc805da1e255&CommandQuery=+%28Title+%25+%27book+15%27+%29&SearchButton=Comma nd&SearchTemplate=&page=1&RootTemplateGUID=f1273652-1c89-4feb-b4ed<u>aa5525c2792b&rpt_session_guid=&hpp=25&searchmode=basic&ParentTemplateGUID=&CurSortC</u> <u>ol=&CurSort=0&LinkGUID=&mode=search&hide=1</u> (March 2012).

BIKEWAY TRAFFIC CONTROL GUIDELINES FOR CANADA (2ND EDITION), TRANSPORTATION ASSOCIATION OF CANADA (TAC), 2012

This guide covers regulatory, warning and information signage, and pavement markings for on-road bikeways and where trails intersection roadways. It was recently updated to include innovative pavement markings such as shared lane markings ("sharrows"), bicycle boxes and bike lanes at roundabouts. Order on-line at <u>https://vws3.primus.ca/dev.tac-</u>

atc.ca/english/bookstore/products.cfm?catid=12&subcatid=21&prodid=63 (March 2012).

1.1.5 BICYCLE PARKING

BICYCLE PARKING GUIDELINES, 2ND EDITION, ASSOCIATION OF PEDESTRIAN AND BICYCLE PROFESSIONALS (APBP), 2010

In the spring of 2002, the APBP published Bicycle Parking Guidelines, a basic guide to the selection and placement of bicycle racks specifically for short-term parking (available online at https://apbp.site-ym.com/?page=Publications (January 2011). This second edition updates the original guide and adds material on long-term and sheltered parking, as well as event parking, instreet bicycle parking, and bicycle transit centers. It includes sample site plans and diagrams to help avoid blunders in rack and locker placement, sample quantity requirements for bicycle parking to meet need by land use, and a worksheet for programming bicycle parking for a building or cluster of buildings. Order on-line at https://apbp.site-ym.com/store/view_product.asp?id=502098 (January 2011).

1.1.6 MULTI-USE TRAILS

TRAIL PLANNING, DESIGN AND DEVELOPMENT GUIDELINES, MINNESOTA DEPARTMENT OF NATURAL RESOURCES (MN DNR), 2006

This manual contains guidelines for creating both motorized and non-motorized trails. It is a best practices guide for government agencies or private organizations and includes sections on planning, design principles, ecological sustainability, trail classifications, shared-use paved trails and sustainable natural trails. Order on-line at

http://www.comm.media.state.mn.us/bookstore/mnbookstore.asp?page=viewbook&BookID=69276& stocknum=323 (January 2011).

2 CHARACTERISTICS THAT GUIDE FACILITY DESIGN

Similar to the design of roadways for motorists, the design of active transportation facilities requires an understanding of the space occupied by the users when in motion and the buffer space required to ensure comfort and allow reaction time in response to other users. The operating space, buffer space, length and operating speed for various users are illustrated in.





Exhibit 1: Design Characteristics of Active Transportation Users

This design guide outlines some of the practices used to meet basic pedestrian needs, such as sidewalk width, accessibility requirements and convenient crossings. Land use types, densities and building form, landscaping and other elements will influence the pedestrian trip. The Region of Waterloo is encouraged to consider these broader elements that influence the walking trip as the Walking Network is implemented.



3 PEDESTRIAN FACILITIES

The Context Sensitive Regional Transportation Corridor Design Guidelines includes the following elements that affect pedestrian travel:

- Pedestrian clearway—accessible sidewalks are discussed in detail in this guide in **Section 3.1**
- Buffer zone—the area immediately behind the curb providing clearance to the roadway and boulevard elements
- Land-use transitions—the area between the pedestrian clearway and the building front or private property line
- Transit facilities—transit stops and stations
- Multi-use trails—discussed in detail in this guide in Section 4.2.6
- Decorative lighting
- Landscape and site furnishing zone
- Site furnishing—including seating, parking metres, bicycle racks, newspaper boxes, waste receptacles, transit shelters, planter boxes and mail boxes
- Mid-block medians for refuge—where pedestrians can wait when crossing opposing directions of traffic
- Medians and landscaping—to add character to a streetscape

The Blue Book: Region of Waterloo Draft Transportation Engineering Practice provides guidance on the following elements related to pedestrian travel:

- Warrants for intersection / midblock pedestrian signals
- Pedestrian countdown signals
- Instructions for a pedestrian at a roundabout; pedestrian safety at a roundabout and supplemental signs
- Illumination including pedestrian level illumination (responsibility of the Area Municipality)
- Corner Radius
- Channelized right-turn lanes (new design for pedestrians)
- Sidewalks and multi-use trails—discussed in detail in this guide in Section 3.1
- Special crosswalks treatments—high visibility ladder crosswalks
- Street tree planting
- Pedestrian refuge islands—including warrant for locations requiring road widening to accommodate the island
- Median, boulevard and roundabout landscaping and streetscaping

Additional design guidance for the accessibility of public spaces for those with mobility or visual impairments is presented in this guide. It is based on Part IV.1 of the Accessibility for Ontarians with Disabilities Act, 2005 (Ontario regulation 191/11) which is titled "Design of Public Spaces Standards (Accessibility Standards for the Built Environment)". It applies to public spaces that are new or redeveloped by designated public sector organizations with the requirements to be met by January 1, 2016. Exceptions are permitted when it is not practicable to comply with some or all of the requirements because of existing physical or site constraints that prohibit modification or addition of elements; or they would erode the heritage attributes of a property defined under the Ontario Heritage Act.

Best practices in accessibility from the United States are also presented when additional guidance or clarification is warranted.



Many of the design considerations for sidewalks and street crossings presented in this chapter are applicable to the design of pedestrian facilities at modern roundabouts. However, experience has shown that special consideration at roundabouts is required. Consultation and evaluation of treatments to accommodate pedestrians at roundabouts is ongoing at the Region of Waterloo.

Providing "Yield to Pedestrian" signage has proven beneficial. The Region also supports the adoption of a new type of pedestrian crossing: a "Type 2 PXO" (pedestrian cross over). This type of crossing would be applicable at roundabouts and provide a legislated right of way to pedestrians crossing the road. As the area of crossings at modern roundabouts is relatively new in Ontario, they are not specifically addressed in the ATMP at this time.

Strategically placed trees on the boulevard can provide shade coverage for pedestrians depending on the positioning of the sidewalk in reference to the boulevard. All projects with sidewalks should consider the opportunity to include shade trees. The Shade Audit Information Guide + Tool developed by the Shade Working Group in fall 2012 can help to understand and plan for appropriate shade.

The Region of Waterloo should consider land use types, densities and building form, landscaping and other elements that will influence the pedestrian trip as the Recommended Walking Network is implemented and in other Regional Policies.

3.1 SIDEWALKS

Recommendations on the pedestrian clearway are presented in *the Context Sensitive Regional Transportation Corridor Design Guidelines* and The Blue Book and include the following design criteria. A full description of the various elements in the boulevard that are part of the pedestrian realm is also contained in the *Context Sensitive Regional Transportation Corridor Design Guidelines*.

Whenever a sidewalk needs to be replaced it would be sized based on the *Context Sensitive Regional Transportation Corridor Design Guidelines.* In addition to these requirements, the width should be reviewed in the context of the expected pedestrian activity in the area. Areas with high expected pedestrian activity may justify additional width beyond the preferred width in the guidelines.

BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Minimum width of 1.8 m with wider sidewalks adjacent shops, institutions and public areas with moderate to high existing or anticipated pedestrian volumes:
- Provide on both sides of Regional transportation corridors unless an alternate pedestrian route such as a multi-use trail is provided
- Preferred material: poured in-place, broom-finished concrete, towelling to create more distinct sidewalk panels is not necessary and can be uncomfortable to people using a wheeled device
- Continuous through driveways
- Landscaping, sign boards, and street furnishings to remain outside pedestrian clearway at all times, i.e., locate in the buffer or furniture zones



ADDITIONAL ACCESSIBLE DESIGN CRITERIA

Additional design guidance from Ontario's Design of Public Spaces (Accessibility Standards for the Built Environment) is presented below:

- Min. sidewalk width 1.5 m
- May reduce sidewalk width to 1.2 m where it connects to curb ramps
- Preferred max. running slope 5%; can be greater than 5% but not steeper than slope of the adjacent roadway
- Max. cross slope 2%
- At changes in level:
 - Between 6 and 13 mm—bevel at 50% slope
 - Between 14 and 74 mm—include 10% to 12.5% slope
 - Between 75 mm and 200 mm—include 81/3% to 10% slope
 - Greater than 200mm—include ramp (see curb ramp)
- Gates, bollards and other entrance designs must provide a min. clear opening of 0.85 m (see also clear opening for multi-use trails) a 1.2 m minimum clear opening is preferred
- Catch basins within the clearway should be avoided
- Openings in the surface must not allow passage of an object that has a dia. Of more than 13 mm, and elongated openings such as grating must be oriented approximately perpendicular to the direction of travel
- When the head room clearance is less than 2.1 m, a rail or barrier edge that is cane detectable must be provided around the object that is obstructing the head room clearance
- Colour and tonal contrast (difference 70%: light on dark, or dark on light) may be used to distinguish edges and from vehicular routes (U.S. guidance)

3.1.1 SIDEWALKS THROUGH DRIVEWAYS

Accessible sidewalks through driveways require a level pedestrian access route a minimum of 1.2 m wide and with maximum cross slope of 2%. There are various options for providing continuous, accessible sidewalks through driveways that take into consideration sidewalk width, boulevard width, curb height and available right-of-way, as illustrated in **Exhibit 2**.



Exhibit 2: Accessible Sidewalk Driveway Options

Best Solution

Boulevard between sidewalk and roadway allows for a level (max. 2% cross slope), uninterrupted sidewalk

Elevation change for driveway occurs in the boulevard













3.2 ACCESSIBLE STREET CROSSINGS

Accessible street crossings are required where sidewalks or trails intersect with roadways at pedestrian crossings and crosswalks. Elements of an accessible street crossing include crosswalk placement (when crosswalks are permitted under the regulations of the Highway Traffic Act), ramps to bring the sidewalk to street level, and hazard indicators built into the walking surface to warn the visual impaired of hazards such as entering a roadway.

3.2.1 CURB RAMPS

It is important to consider the variety of users when designing accessible street crossings. Users include people with mobility devices such as walkers and wheelchairs, with strollers, delivery carts,



or rolling luggage, children cycling and more. It is important to realize that the curb ramp not only provides access to the street, but also provides access from the street to the trail or sidewalk. Not providing a curb ramp and associated curb cut may slow users from entering the street but will also trap users in the street unable to access the sidewalk or trail.

There are five basic types of curb ramps:

- Perpendicular—two per corner with flares or returned curbs
- Diagonal—one located at the corner of an intersection: NOT RECOMMENDED
- Parallel—two per corner; require less right-of-way than perpendicular ramps
- Combined parallel and perpendicular
- Depressed corners

When designing street crossings accessible to visually impaired persons, the alignment of the curb ramp with the required direction of travel is fundamentally important. A visually impaired person may use the angle of approach to a curb ramp, the slope of the ramp or the orientation of tactile cues to assist with aligning their crossing to the other side of the street. A ramp on the radius of a corner may unintentionally direct a visually impaired person into an intersection rather than on to the crosswalk. The AODA requires that curb ramps are aligned with the direction of travel.

Optimal and acceptable designs for the different types of recommended curb ramps and their placement are illustrated in **Exhibit 3**.



Exhibit 3: General Recommended Curb Ramp Design and Placement





In practice, the design and construction of curb ramps can be complicated based on the layout of the sidewalk or trail leading to the crossing, the roadway or intersection configuration, the presence of other elements in the boulevard such as poles, street furniture, signs, etc. and the terrain. Some of the issues that are commonly encountered are described in **Exhibit 4**.



Exhibit 4: Common Issues Associated with Curb Ramp Design and Placement

Curb ramps aligned with crosswalks are effective in orientating users to the crossing

Grade breaks on curb ramps must be perpendicular to the ramp slope direction in order to be useable by wheelchairs. Otherwise, the user must negotiate the changing grades and changing cross-slope simultaneously and turn at the grade transition. This requires changing direction at the grade transition AND can result in one wheel lifting off the ground, de-stabilizing or stopping the user.













Good Design

Flare on one side adjacent concrete, and curb return on other side adjacent grass boulevard

3.2.1.1 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Align with the direction of travel
- Perpendicular to curb face (U.S. guidance):
- Min. clear width 1.2 m (exclusive of flares)
- Running slope:
 - 10% to 12.5% when elevation is less than 75 mm
 - 81/3% to 10% when elevation is between 75 mm and 200 mm
- Max. cross slope on ramp: 2%
- Max. cross slope on flare: 10%
- Max. counter slope at gutter / roadway: 5% (U.S. guidance)
- Transition area (or level landing): 1.2 m by 1.2 m at level of vehicular route and level of sidewalk (U.S. guidance)

3.2.2 TACTILE WALKING SURFACE INDICATORS

Curbs identify the boundary between the sidewalk and the street; tactile walking surface indicators (known as detectable warnings in the U.S.) at curb ramps and other street transitions replace that cue (the curb) for pedestrians with visual impairments. Ontario's Design of Public Spaces requires the tactile walking surface indicators at the bottom of the curb ramp. They are also necessary at refuge medians islands, raised crosswalks, depressed corners, multi-use trail crossings or other locations were the pedestrian way is at the same level as the vehicular way

The Vermont Agency of Transportation has tested a number of tactile walking surface indicator products under installation and winter control conditions and specifies the use of cast iron panels or plates to be set in place in freshly poured concrete.





3.2.2.1 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Locate at the bottom of the curb ramp set back between 150 mm to 200 mm from the curb edge
- Extend the full width of the curb ramp
- Min. depth: 610 mm
- Surface of truncated domes: height of 5 mm; base diameter of 23 mm; organized in a regular pattern 60 mm on centre (U.S. guidance)
- Not more than 3 mm above or below the surrounding surface (U.S. guidance)
- Colour and tonal contrast between curb ramp and tactile walking surface indicator desirable: difference 70%: light on dark, or dark on light (U.S. guidance)

3.2.3 PEDESTRIAN CROSSWALK

The Region of Waterloo's The Blue Book Draft Transportation Engineering Practice, Section 22 (2009) provides guidance on crosswalks. As noted in these guidelines, Ontario's Highway Traffic Act permits marking crosswalks where pedestrians can be given right-of-way over motorists due to traffic control, i.e. at traffic control signals, stop signs, yield signs, or signed school crossings with school crossing guards.

For accessibility, the locations of the pedestrian crosswalk considers the alignment of the crosswalk with the sidewalk and curb ramps, and the provision of a level landing at the bottom of the curb ramp within the crosswalk. Crosswalk placement requires balancing crosswalk length, setback and ramp placement, as illustrated in **Exhibit 5**.



Exhibit 5: Considerations for Crosswalk Placement





3.2.3.1 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Min. width 2.5 m; typically 3 to 4 m in urban areas; outer edge typically 1.0 m from stop bar
- Edge markings min. 300 mm wide, with colour / tonal contrast (difference 70%: light on dark, or dark on light) and surface texture distinguishing it from the vehicular route / roadway
- Location:
 - Line up with sidewalks and dropped curbs
 - Inner edge min. 0.5 m from through edge of pavement of the parallel roadway for posted speed under 80 km/h
 - Path of travel perpendicular to vehicular route where possible
 - Desirable 2.0 m separation at curb radii between inner edge lines of the two crosswalks
- At skewed intersection, inner edge of crosswalks can intersect at curb (not cross in roadway)
- Should not force pedestrians with mobility devices outside the crosswalk lines due to angle of curb ramps
- As short as possible without compromising other design factors

3.2.4 ACCESSIBLE PEDESTRIAN SIGNALS

Accessible pedestrian signals (APS) are technologies that supplement conventional traffic control signal technology to assist pedestrians with vision impairments in their road crossings. These technologies provide audible AND vibro-tactile indications that act as the "walk" signal. The Transportation Association of Canada produced Guidelines for Understanding Use and Implementation of Accessible Pedestrian Signals (2008). It provides guidance on establishing APS installation priorities, the preferred means of operating APS, design criteria considered desirable for the effective operation of APS, installation procedures, and operational adjustments, monitoring and maintenance requirements.

The AODA requires that new pedestrian signals being installed at pedestrian street crossings or existing pedestrian signals being replaced to be pushbutton-integrated accessible pedestrian signals.

Currently, the Region works with the Canadian National Institute for the Blind (CNIB) to identify locations where an APS is required. Accessible pedestrian signals will continue to be installed at key locations in consultation with the CNIB or other interested parties. The Region is also in the process of updating all APS with locator tones. New APS installations will all include locator tones and vibro-tactile walk indicators.

3.2.4.1 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Include both audible and vibro-tactile indicators for indicating the walk phase
- Locator tone to find pushbutton must be distinct from a walk indicator tone
- Pushbutton must have tactile arrow that aligns with the direction of the crossing
- Install the pushbutton within 1.5 m of the edge of the curb, mounted 1.1 m above ground level
- Where two pushbuttons are installed on the same corner, must be a min. 3.0 m apart
- Two pushbuttons can be assembled on one single post if spacing is limited by site constraints; must include a verbal announcement clearing stating which crossing is active
- Pushbutton should be placed adjacent to and accessible from a hard surface treatment

3.3 CONVENIENT PEDESTRIAN STREET CROSSINGS

In order to make walking a viable mode of transportation, pedestrians need to be able to safely and conveniently access the destinations. This means creating safe, convenient and easy to use pedestrian crossings of Regional roads at signalized intersections and non-signalized locations. Consistency in design of street crossings is particularly important for accessibility.

Pedestrian safety countermeasures at street crossings typically focus on the speed of motorists. Speed affects:

- Drivers' field of vision and ability to see pedestrians: drivers focus less on surroundings at higher speeds
- Drivers' ability to react and avoid a crash: the reaction and stopping distances required are longer
- Crash severity: high speeds lead to a greater chance of pedestrian serious injury and death



These effects are illustrated in **Exhibit 6**, **Exhibit 7** and **Exhibit 8**. These diagrams demonstrate these effects when travelling straight ahead. The effects may be worsened when making turns or cornering.



Exhibit 6: Effect of Speed on Field of Vision

At 20 km/h nearby pedestrians are within field of vision

At 50 km/h nearby pedestrians are outside field of vision





High speeds equate to longer reaction plus stopping distance

Exhibit 8: Effect of Speed on Crash Severity

High speeds lead to a greater chance of serious injury and death Source: *Killing Speed and Saving Lives*, Department of Transportation (United Kingdom)





3.3.1 PEDESTRIAN CROSSINGS AT SIGNALIZED INTERSECTIONS

Pedestrian-friendly signalized intersections are tight, simple, square, operate at slow speeds, are easy to understand, and avoid free-flow vehicular movements. Complex intersections can be simplified by breaking the pedestrian crossings into smaller steps.

Signalized intersections can be improved for pedestrian safety by:

- Using good geometric design
- Placing islands to break up complex crossings
- Placing crosswalks in logical locations
- Improving the convenience and ease of use of pedestrian pushbuttons and signals
- Using techniques to reduce conflicts with turning vehicles

Examples of these types of improvements are illustrated in **Exhibit 9**.



Exhibit 9: Examples of Improvements for Pedestrian Crossings at Signalized Intersections

Smaller Curb Radius

Reduce crossing distance, make curb ramp and crosswalk location easier, and reduce speed of turning vehicles. Larger vehicles can still be accommodated at slow speeds and making use of the full width of the receiving roadway / lanes. Choose the smallest of the large vehicles expected on an hourly basis as the design vehicle for turning.







Curb Extensions

Reduce crossing distance, improve visibility for motorists and pedestrians at the crossing, calm traffic and provide space for street furniture and landscaping. Applications are typically limited to where there is on-street parking.

Cambridge ON

24



Channelizing Islands

At free-flow right-turn slip lanes (see Region of Waterloo's The Blue Book: Draft Transportation Engineering Practice, Section 19 (2009)): separates conflicts and decisions points, reduces crossing distance, improves traffic signal timing / capacity, reduces crashes.



Kitchener ON: Before and After

High Visibility Crosswalks

Visible to drivers at a lower driver eye height than pedestrian eye height(see Region of Waterloo's the Blue Book: Draft Transportation Engineering Practice, Section 22 (2009))



Pedestrian pushbutton placement

On side of traffic signal pole or at top of ramp adjacent accessible sidewalk (see TAC Guidelines for Understanding Use and Implementation of Accessible Pedestrian Signals (2008))



Also ensure that snow clearing is performed around poles to allow access.



Preferably aligned with the middle of the crosswalk, but acceptable close to the crosswalk, visible to pedestrians (not behind other poles, signs or vegetation),



3.3.2 TRAFFIC CONTROL SIGNAL PHASING / TIMING IMPROVEMENTS FOR PEDESTRIANS

Motorists' turning movements account for most pedestrian crashes at signalized intersections. Traffic control signal phasing can improve the convenience and safety of pedestrians crossing at the intersection. Techniques include the following:

- **Short cycle length**: long wait times for pedestrians causes queueing. Pedestrians will wait in the street and will cross against the signal. The Region currently uses some shorter cycle lengths in city cores.
- **Recall to walk**: walk phase comes up automatically. At high-use crosswalks, pedestrians should receive the walk signal with every signal cycle. Set the recall to "walk" when the major street is set to recall to "green". The Region currently uses this practice at all signals with fixed timing.
- **Turning vehicles yield to pedestrians signs**: remind motorists to yield to pedestrians where there are a higher than expected number of collisions between right-turning traffic and pedestrians. The Region has installed these signs at some key locations.
- **Protected left-turn phase**: Allow left-turns by motorists on a protected phase that does not allow the pedestrians to cross the conflicting crosswalk during that phase. Pedestrians cross after the permissive left-turn phase. The Collision Reduction Factor for converting permissive left-turns (left-turns allowed during the "green" through phase) to protected is 70% for all



crashes. Alternatively, allow protected – permissive left-turn phasing but revert to protected phasing when the pedestrian pushbutton is activated or during higher pedestrian times of day. A new phasing being considered is the flashing amber left-turn arrow during the green permissive phase that reminds motorists to yield to pedestrians and on-coming vehicles (not in use in Ontario yet). The Region currently uses fully protected left turn phases at a number of locations.

Left turn phases can improve pedestrian safety by limiting conflicts but also inconvenience pedestrians by adding delay to their crossings. Care should be taken to ensure that left turn phases are not added arbitrarily and that walk indications are provided during left turn phases on non conflicting movements.

- **Restrict right-turns on "red"**: Consider no right turns during the red phase when sight distance is poor between motorists and pedestrians; when there have been a higher than expected number of pedestrian crashes with turns on red, or there is an exclusive pedestrian phase or a leading pedestrian phase (see below). A new phasing / signal head used in the US is a changeable message sign stating "no turn on red" when a pedestrian activates the pedestrian phase. At "the Delta" in Cambridge, the Region uses a red right turn arrow that stays on when a pedestrian uses the push button before crossing.
- Exclusive pedestrian phase (also known as pedestrian scramble or Barnes Dance): All motorists stop and pedestrians can cross in any direction. Right-turns on red must be prohibited. Delay for pedestrians is higher for they must wait through the phasing for both directions of traffic before receiving the exclusive pedestrian phase. The Collision Modification Factor is 34%, but the efficiency of the intersection is decreased. Use only where there are a high number of pedestrians and turning motorists. Should be coupled with Accessible Pedestrian Signals since pedestrians with vision impairments usually rely on the sound of motorists moving to start across the crosswalk.
- Leading pedestrian interval: The pedestrian walk phase comes on at least 3 sec prior to the parallel green signal for motorists allowing pedestrians to enter the crosswalk before turning vehicles. The Collision Modification Factor is 5%. Should be coupled with Accessible Pedestrian Signals since pedestrians with vision impairments usually rely on the sound of motorists moving to start across the crosswalk.
- Walk speed for pedestrian crossing times: The Ontario Traffic Manual (Book 12 Traffic Signals) recommends a minimum Walk phase of 7.0 sec. It also recommends that the Flashing Don't Walk phase be calculated based on a normal walking speed of 1.2 m/s, and 1.0 m/s if the crossing is frequented by young children, seniors or special needs persons, along with the curb to curb crosswalk distance. This practice is followed by the Region when designing signals. As an alternative, the Ontario Traffic Manual method can be tested against using a 0.9 m/s walking speed to cross starting at the location of the pushbutton (or 2 m from the curb if no pushbutton) to the curb on the other side, as illustrated in **Exhibit 10**.
- **Pedestrian activated hot response**: At signalized, mid-block pedestrian crossings with low to moderate volumes, once a pedestrian activates the signal, if there is a delay in providing the pedestrian phase, they may choose to cross during a gap in traffic. Then once the pedestrian phase comes on, the motorist is faced with stopping even though the pedestrian has already crossed. This can lead to frustration for both users. A "hot" response will eliminate this frustration and is unlikely to affect overall capacity at these locations. This hot response is currently used by the Region at all mid-block and intersection pedestrian signals outside of peak traffic hours. A hot response should also be considered during peak hours at locations where signal coordination is not critical.


Exhibit 10: Test for Slower Walking Speed for Pedestrian Phase at Traffic Control Signals

Ontario Traffic Manual Book 12 method	Test for Slower Walking Speed
Example 1:	Example 1:
18 m wide crosswalk (curb to curb) Walk speed 1.2 m/s Walk phase = 7.0 sec Flashing Don't Walk phase = 18 m ÷ 1.2 m/s = 15 s Total Walk plus Flashing Don't Walk = 22 s	18 m wide crosswalk (curb to curb) plus 2 m for starting from pushbutton location Walk speed 0.9 m/s Total Walk plus Flashing Don't Walk = 20 m ÷ 0.9 m/s = 22 s PASSES TEST!
Example 2:	Example 2:
22 m wide crosswalk (curb to curb) Walk speed 1.2 m/s Walk phase = 7.0 sec Flashing Don't Walk phase = 22 m ÷ 1.2 m/s = 18 s Total Walk plus Flashing Don't Walk = 25 s	22 m wide crosswalk (curb to curb) plus 2 m for starting from pushbutton location Walk speed 0.9 m/s Total Walk plus Flashing Don't Walk = 24 m ÷ 0.9 m/s = 27 s FAILS TEST! Add 2 additional seconds to Walk phase

3.3.3 PEDESTRIAN CROSSINGS AT NON-SIGNALIZED INTERSECTIONS

Pedestrian crosswalks can be provided at locations other than signalized intersections: stop signs, yield signs, or signed school crossings with school crossing guards. New devices permitted in the US but not yet permitted in Ontario that can improve the visibility of the pedestrian crossing to motorists and improve yielding behaviour include:

• **Pedestrian Hybrid Beacon** (High Intensity Activated crosswalk or "HAWK"): Motorists face the hybrid beacon; pedestrians face a conventional pedestrian signal. Motorist and pedestrian compliance with HAWK signals in the US has been similar to mid-block signals, over 95%. This beacon is not currently permitted under Ontario's Highway Traffic Act (HTA) because the signal indications differ from those defined for conventional traffic control signals in the HTA. Use of this beacon may be explored once allowed under the HTA.





• **Rectangular Rapid Flash Beacon:** The LED, typically solar-powered beacon is yellow with a rapid "wig-wag" flash. The beacon is activated when pedestrians want to cross either through a push-button or passive pedestrian detection. After it is activated, the yellow beacons flash indicating to motorists that a pedestrian is waiting to cross and they must yield to them. There is no signal indication for the pedestrian, as with the HAWK; they cross once traffic has yielded. This beacon is not currently permitted under Ontario's Highway Traffic Act (HTA) because the signal indications differ from those defined for conventional traffic control signals in the HTA.



• Raised Crosswalks: A raised crosswalk can improve the pedestrian environment by prioritizing pedestrians over vehicle traffic. Both a traditional raised crosswalk and a more recent example with a long platform and gentler return slope. As with traffic calming measures that incorporate vertical deflection, this type of crossing may create an issue for emergency and transit operations. As such, the problems and benefits of a raised crosswalk should be carefully evaluated before any use on Regional roads.





3.3.4 PEDESTRIANS MID-BLOCK CROSSINGS

Mid-block crossings provide convenient locations for pedestrians to cross major roadways in areas where there are infrequent intersection crossings or where the nearest intersection crossing creates substantial out-of-direction travel. Pedestrians will expose themselves to traffic to cross where necessary to get to their destination conveniently and directly. Installing mid-block crossings can help channel pedestrians to the safest location, provide visual cues to motorists to anticipate pedestrian activity and provide pedestrians with reasonable opportunities to cross heavy traffic. The Region of Waterloo's Draft Transportation Engineering



Practice, Section 2.4 and Section 41 (2009) provide guidance on mid-block pedestrian signals and pedestrian refuge islands, the two main devices used for mid-block crossings of Regional roads.

3.3.4.1 Basic Considerations and Design Criteria

- Min. width 1.75 m; preferred width 3.0 m
- Preferred length: 4 m
- Provide a dropped concrete pathway for pedestrian with tactile walking surface indicators (one on each end of the median pathway). Current Blue Book design recommends that the pathway align on a diagonal from the direction of travel such that pedestrians face traffic. This design should be monitored to determine how the diagonal alignment is interpreted by the visually impaired; it may result in crossing the travel lane on a diagonal and missing the entry to the pedestrian facility on the opposite side from the island.
- Design tapers and signage as per Ontario Traffic Manual Books
- Install Wait for Gap (Wc-28) and Pedestrian Ahead (Wc-7) signs when warranted as per the Ontario Traffic Books (shown below)
- Paint the vertical face of the median island yellow
- Provide illumination on both sides of the unmarked pedestrian crossing 6 to 8 m in advance of the crossing for approaching traffic
- Do not paint a crosswalk of any type
- Do not include railings because of the hazards to road users if struck
- Refer to the Region of Waterloo's The Blue Book: Draft Transportation Engineering Practice, Section 41.2 and 41.3 (2007) for warrants for locations that require road widening and locations that do not require road widening



February, 2014





4 CYCLING FACILITIES

The Context Sensitive Regional Transportation Corridor Design Guidelines includes the following on cycling facilities:

- Cycling facilities include bike lanes, paved shoulders, shared bicycle / parking lanes, wide curb lanes, multi-use off-road trails and shared bicycle / motor vehicle lanes as per the *Cycling Master Plan*—discussed in detail in this guide in **Section 4.2**
- Multi-use trails—discussed in detail in this guide in Section 4.2.6

The *Blue Book: Region of Waterloo Draft Transportation Engineering Practice* provides guidance on the following elements related to cycling facilities:

- Cycling facilities: reserved and non-reserved—standards and implementation guidance for by-laws, signage and pavement markings; standards should be updated with guidance provided in this guide in **Section 4.2** and referenced guidelines
- Bicycle loops in bike lanes for actuating traffic signals
- Multi-use trails—discussed in detail in this guide in Section 4.2.6
- Detour signing for cycling lanes including the use of Bicycle Lane Closed sign, and Bicycle Lane Detour Marker signs if an adequate reserved bike lane on an adjacent roadway provides an alternate detour route
- Bike box and left-turn installations—justification for installing marked cyclist left-turn lane, 1stage bike box and 2-stage bike box

Bikeways to accommodate the travel of cyclists can be divided into three main categories:

- Shared space indicates a street where cyclists and motorists use the same road space. Thus these routes typically have low motor vehicle volumes or low motorists' speeds, making it possible for cyclists to comfortably share them with motorists. Such bikeways include signed routes, traffic-calmed local streets (or what are known as "bicycle boulevards", local cycling streets or bicycle priority streets), marked shared-use lanes ("sharrows"), and advisory lanes. Only marked shared-use lanes are applicable to some Regional roads and then only for short segments to overcome constraints; the other shared roadways are typically applicable for Area Municipal streets.
- **Separate space** or dedicated on-road bike lanes are those that provide space on the road intended for use by cyclists only. They are generally adjacent to motor vehicle lanes and defined by pavement markings. They consist of:
 - Bike lanes on urban roads with curbs and gutters or on rural roads with paved shoulders (no curb) demarcated by a painted line.
 - Buffered bike lanes on urban roads demarcated by a painted line and painted buffered. The buffer can be between the bike lane and the general purpose travel lane, of between the bike lane and on-street parking.
- **Segregated space** on roads or in the boulevard is physically separated from the motor vehicle lanes and on-street parking. These consist of:
 - Segregated bikeways (or what are known as cycle tracks in Western Europe) separated from traffic by more than just a painted line.
 - Multi-use trails are routes reserved for non-motorized users such as pedestrians, inline skaters, joggers, boarders and a wide range of cyclists from child, youth, adults and seniors. They can be located within the boulevards of roadways or in corridors or spaces independent of road rights-of-way.

Wide lanes, typically 4.0 to 4.3 m wide for cyclists and motorists to share, are no longer recommended as a cycling facility for road construction and reconstruction projects. Widths between



4.0 to 4.3 m were considered in older bikeway design guidelines wide enough for motorists to pass cyclists without encroaching significantly on the adjacent travel lane. However, these widths do not really provide sufficient lateral clearance, generally induce higher motorists' travel speeds, and are preferred for heavy vehicles to narrower inside lanes. These operating characteristics result in the decrease in the level of service and comfort of cyclists.

Wide lanes are not recommended for new construction / reconstruction due to the higher speeds they induce, and insufficient lateral clearance between passing motorists and cyclists. Other cycling facilities that provide separate space for cyclists, or design elements that induce lower operating speeds so travel space can be shared are preferred over wide lanes.

Strategically placed trees on the boulevard can provide shade coverage for cyclists depending on the positioning of the cycling facility in reference to the boulevard. All projects with cycling facilities should consider the opportunity to include shade trees. The Shade Audit Information Guide + Tool developed by the Shade Working Group in fall 2012 can help to understand and plan for appropriate shade.

4.1 CYCLING FACILITIES SELECTION

In order to reach the Regional Transportation Master Plan target of 12% of trips by active transportation, a cycling network made up of a variety of different types of cycling facilities suitable for different users (experienced, confident and casual cyclists) and fitting local context is necessary. The different types of cycling facilities recommended for rural and urban Regional roads are illustrated in **Exhibit 11**. Additional descriptions of the types of cycling facilities and general design criteria are presented in **Section 4.2**. Documents presented in **Section 1.1**, may be referenced for additional details.

Regional and Area Municipal plans, community input and local context are to be used to refine facility recommendations for any particular corridor. In some Regional corridors, it may be desirable to construct cycling facilities to improve (i.e., lessen) interaction between cyclists and motorists than those recommended in the Walk Cycle Waterloo Region Plan to enhance the quality of the cycling trip and user comfort. Or, the minimum cycling facility width may be required where the right-of-way is narrow and where utilities, street trees, etc. conflict with the preferred width and are too costly to modify. Separate or segregated space for cyclists on Regional roads is generally desirable due to the higher volume and speed of traffic. Shared space is only applicable on Regional roads in lower speed environments such as downtown districts. Suburban settings may accommodate shared-use with pedestrians on multi-use trails where user volumes are lower; not warranting the higher cost of providing segregated on-road cycling facilities and sidewalks. Segregated bike lanes are more desirable where moderate to high use is anticipated that justify the additional cost of segregation and maintenance.

Exhibit 11: General Suitability of Cycling Facilities by Regional Road Classification



Segregated Space		
ed Bike Lane	Boulevard Multi-use Trail	
ition: delineators, median, ble, semi-mountable or Locate adjacent travel street parking, in	Suitable for back-lotted, suburban corridors with few driveways and side- street intersections. Locate on one or both sides of road	
70 km/h	≤70 km/h	
12.0 m wide bike lane passing within the lane ion width varies	Minimum 3.0 m to 4.0 m (preferred) wide trail Minimum 0.6 m wide separation to back of curb of roadway: 1.0 m preferred	
prevent motorists from on cyclists' space reatments required to icts at intersections and s to turn left to / from / ed where the density of d side-street is low (< 1 per 300 m) regated bike lanes on to-way streets are not d (on one-way street are intenance effort or	 Cyclists share with pedestrians and other modes of active transportation Intersection crossing treatments required to mitigate conflicts at intersections and permit cyclists to cross without dismounting in crosswalks Recommended where the density of driveways and side-street intersections is low (< 1 per 300 m) Additional maintenance effort required compared to narrower sidewalks 	



4.2 CYCLING FACILITY DESIGN CRITERIA

4.2.1 PAVED SHOULDERS DESIGNATED AS RURAL BIKE LANES

Ontario's Highway Traffic Act (HTA) defines "roadway" as "that part of the highway that is improved, designed or ordinarily used for vehicular traffic, but does not include the shoulder" (Section 1). Thus any regulation that refers to driving, overtaking or turning on the "roadway" exclude the use of the shoulder to do so.

HTA Section 151 permits by regulation designating the use of a paved shoulder under prescribed conditions and circumstances, including prescribing the classes or types of vehicles or drivers. Such a regulation is to include the types of signs and pavement markings. Section 151 also requires the signs to be in place before the designation of the use of the paved shoulder is effective. Section 152 indicates that the use of the paved shoulder can be designated by by-law of a municipality. Thus, the Region of Waterloo can designate the use of paved shoulders on Regional roads that are wide enough to comfortably accommodate cyclists as bike lanes by municipal by-law. The by-law would allow Region of Waterloo Police to enforce the use of the paved shoulder; however, the appropriate regulatory bike lane signs must be erected before the by-law is effective.

It is recommended that the Region of Waterloo designate paved shoulders meeting the recommended widths to accommodate cyclists as rural bike lanes, and erect the corresponding bike lane regulatory signs.

A summary of paved shoulder widths to accommodate cyclists from North American design guidelines are summarized in **Exhibit 12**. These guides recommended a minimum width of 1.2 to 1.5 m, and wider as speeds and volumes increase. This minimum width reflects the cyclist's operating space of 1.0 m plus lateral clearance to one side of 0.25 m (see **Exhibit 1**). The MTO guide, currently being updated, recommends a 1.0 m wide paved shoulder only when speeds are below 75 km/h and volumes are less than 3,000 AADT. The more recent Vélo Québec guide recommends a paved shoulder width of 1.0 m only when speeds are 50 km/h or less or traffic volumes are less than 2,000 vehicles per day (vpd) in the summer.

Guideline	Volume	Posted Speed	Width
Ministry of	< 400 AADT per lane	NA	0
Transportation, Ontario	400 to 2,000 AADT per lane	< 75 km/h	1.0 m
(MTO), Ontario Bikeways Planning and Design Guidelines (March 1996) See note for Vélo Québec guide on shoulders wider than 1.75 m	2,000 to 3,000 AADT per lane and < 12% trucks	< 75 km/h	1.0 to 1.5 m
	2,000 to 3,000 AADT per lane and > 12% trucks	< 75 km/h	1.5 m
	3,000 to 10,000 AADT per lane and < 12% trucks	< 75 km/h	1.5 m
	3,000 to 10,000 AADT per lane and > 12% trucks	< 75 km/h	1.5 to 2.0 m
	> 10,000 AADT per lane and < 12% trucks	< 75 km/h	1.5 to 2.0 m
	> 10,000 AADT per lane and > 12% trucks	< 75 km/h	2.0 to 2.5 m
	400 to 1,000 AADT per lane and < 6% trucks	≥ 75 km/h	1.0 m
	400 to 1,000 AADT per lane and 6% to 12% trucks	≥ 75 km/h	1.0 to 1.5 m
	400 to 1,000 AADT per lane and > 12% trucks	≥ 75 km/h	1.5 m
	1,000 to 2,000 AADT per lane and < 6% trucks	≥ 75 km/h	1.5 m

Exhibit 12: North American Guidelines for Width of Rural Bike Lanes



Guideline	Volume	Posted Speed	Width
1,000 to 2,000 AADT per lane and 6% to 12% trucks		≥ 75 km/h	1.5 to 2.0 m
	1,000 to 2,000 AADT per lane and > 12% trucks		2.0 m
	3,000 to 10,000 AADT per lane and < 6% trucks	≥ 75 km/h	2.5 m
	3,000 to 10,000 AADT per lane and 6% to 12% trucks	≥ 75 km/h	2.5 to 3.0 m
	3,000 to 10,000 AADT per lane and > 12% trucks	≥ 75 km/h	3.0 m
	> 10,000 AADT per lane	≥ 75 km/h	3.0 m
Transportation Association of Canada (TAC), Geometric	< 6,000 vpd	NA	1.5 m
Canadian Roads, Chapter 3.4 Bikeways (September 1999)	> 6,000 vpd or > 10% trucks	NA	2.0 m
American Association of State Highway and Transportation Officials (AASHTO), Guide for the Development of Bicycle Facilities (2012)	Any	≤ 80 km/h	Min. 1.2 m
	Any (Adjacent roadside barrier, guide rail, etc.)	NA	1.5 m
	High bicycle use expected, or Use by heavy truck, bus or recreational vehicles (determine width from BLOS model)	> 80 km/h	> 1.2 m
Vélo Québec, Planning and Design forNAPedestrians and Cyclists: A Technical Guide (2010)< 2,000 vpd (summer > 2,000 vpd (summer 	NA	≤ 50 km/h	1.0 m
	< 2,000 vpd (summer)	50 to 70 km/h	1.0 m
	> 2,000 vpd (summer)	50 to 70 km/h	1.5 m
	< 2,000 vpd (summer)	> 70 km/h	1.5 m
	> 2,000 vpd (summer)	> 70 km/h	1.75 m

The recommended width of additional pavement on Regional roads to accommodate cyclists is shown in **Exhibit 13**. These basic recommendations provide input to the cycling network proposed in rural areas. To operate as a bike lane a minimum 1.2 m must be provided. A 1.0m paved edge may be provided for maintenance purposes on roads where vehicle / cyclist conflicts are less likely. These 1.0m paved edges are not considered cycling facilities or bike lanes.

Exhibit 13: Recommended	Additional Pavement Width	for Rural Regional Roads
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AADT (vehicles per day)	Posted Speed	Additional Pavement Width	Facility Designation
< 2,000	any speed	1.0 m	Paved Shoulder
> 2,000	≤ 70 km/h	Min. 1.2 m, Preferred 1.5 m	Rural Bike Lane
> 2,000	> 70 km/h	1.5 m	Rural Bike Lane

Notes: Horse and buggy shoulder width requirements may be different

4.2.2 MARKED SHARED LANES WITH "SHARROW"

4.2.2.1 DESCRIPTION

Shared lanes can be considered when retrofitting low speed roadways (50 km/h or less operating speed) where there is insufficient right-of-way width for dedicated cycling facilities. These lanes are marked with a "shared–use" marking or "sharrow". In general these should be used to closed short network gaps or locations with localized constraints. They should not be used for extended sections where a bicycle can not (or will not want to) maintain a speed similar to a private vehicle on that segment. However, if the local context dictates that dedicated facilities are not possible a "shared single file" or "shared side by side" designation using sharrows is better than nothing.

The pavement markings are intended to raise the awareness for both cyclists and motorists of the correct position to ride in the lane, as well as showing that the street is part of a larger cycling network. This application can be used to encourage cyclists to ride out from the "door zone" of onstreet parked cars to avoid hitting the door if it is swung open.

In wider lanes, this application also encourages cyclists to ride away from the curb and drainage grates at the edge of the travel lane, while encouraging motorists to pass cyclists by encroaching slightly on the adjacent lane. In narrow lanes, sharrows can encourage cyclists to ride in the centre of the lane while encouraging motorists to change lanes to pass. Sharrows and/or share the road signs may also be used where a bike lane is dropped because the road narrows, such as at a narrow bridge or intersection, to indicate the correct position of cyclists through the area.





4.2.2.2 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Sharrow" pavement markings (TAC):
 - Space every 75 m or at the beginning, middle and end of the block, whichever is less
 - Where there is on-street parking to encourage cyclists to ride out from the "door zone", centre the sharrow marking a minimum of 3.4 m from the curb edge of the parking lane
 - Where bike lanes are discontinuous—because a roadway narrows approaching an intersection, across narrow structures, through constrained rights-of-ways such as downtown districts—centre the sharrow marking in the middle of the travel lane if the travel lane is less than 4.0 m wide
 - Where there are existing wide lanes but they are too narrow to stripe bike lanes (4.0 to 4.5 m) — centre the sharrow marking a minimum of 0.75 m, 1.0 m preferred from the curb edge of the wide travel lane. Note that new construction should not include wide lanes with "sharrows" because of the higher motorists' speeds they induce. Provide separated or segregated cycling facilities instead.
- Warning signs:
 - Share the Road sign (TAC WC-19 and WC-19s or OTM equivalent) if "sharrow" is applied near on-street parking or edge of lane—install after every intersection
 - Shared Use Single File sign (TAC WC-20 and WC-20S or OTM equivalent) if "sharrow" is applied near edge of wide lane—install after every intersection
 - Share the Road signs can be used (choose based on lane width) where a bike lane ends to indicate the correct positioning of a cyclist in the general traffic stream, this can be applied with or without an accompanying sharrow marking



4.2.3 ENHANCED MARKED SHARED LANES WITH "SHARROW AND ADVISORY BIKE LANE"

4.2.3.1 DESCRIPTION

On longer sections of roadway, with lower operating speeds and high volumes such that there are few gaps in traffic to allow motorists to pass cyclists, the "sharrow" can be supplemented with "advisory lane" markings in the middle of the lane. These are sometimes referred to as "super sharrows" or "enhanced sharrows". A low speed differential between the cyclists and the motorists is paramount when implementing these on two-lane roadways (or one-lane if operating one-way). Dashed white lane lines or green pavement markings are used to indicate the cyclists riding position in the middle of the lane and the lateral space they need to operate comfortably. Essentially, an advisory (as opposed to dedicated) bike lane is marked continuous or intermitted within the travel lane. They enhance the motorists' awareness of the need to allow cyclists to ride in the middle of the lane, and legitimize cyclists using the full lane.

Example of shared lane marked with a "sharrow" and green lane, Salt Lake City UT, "advisory lane", Madison WI and "sharrow" and green lane Long Beach CA; and example of Shared Use Singe File sign, Vancouver BC





4.2.3.2 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- "Sharrow and advisory bike lane" pavement markings:
- Space "sharrow" every 75 m or at the beginning, middle and end of the block, whichever is less
- Where there is higher density, mixed use districts and a moderate amount of cycling is already or will potentially occur, or there is heavy use of the sidewalk by cyclists and operating speeds are preferably 40 km/h or less, and travel lanes are narrower (<4.0 m), centre the "sharrow" marking in the middle of the travel lane; mark 1.5 m wide advisory dashed or green pavement in middle of the travel lane. (Note that if the lane is 4.0 m or wider, the "sharrow" is placed near the curb)
- 1.5 m wide advisory dashed or green pavement in middle of the travel lane can be continuous between intersections or applied at the "sharrows" (intermittent)
- Warning signs: Shared Use Single File sign (TAC WC-20 and WC-20S)



4.2.4 BIKE LANES WITH OR WITHOUT PAINTED BUFFER

4.2.4.1 DESCRIPTION

Bike lanes on urban roadways provide space for cyclists to ride in their own reserved lane, increasing their comfort particularly on higher speed and higher volume roads with truck and transit traffic. A wider, painted buffer can be being applied on major roadways with higher traffic volumes, speeds, truck or transit volumes, or high-turnover on-street parking to increase the separation of the cyclists from parked cars and / or travel lanes.

Regulations, signs and accompanying by-laws are used to reserve the lane for use by cyclists only. Motorists travelling, parking and stopping in the lane must be strictly prohibited (currently by by-law until such time Ontario Regulation 615 is updated to include the designated bike lane sign), with the exception of emergency vehicles, authorized maintenance vehicles and public transit buses.



Examples of Reserved Bike Lane signs, Toronto ON and Burlington ON.





4.2.4.2 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Bicycle lane line (white 100 mm wide) pavement marking (width does not include curb and gutter) (TAC):
 - Where there is no on-street parking—minimum width of 1.2 m for speeds of 50 km/h or less; preferred width of 1.5 m
 - Where there is on-street parking—minimum width of 1.6 m adjacent to 2.1 to 2.5 m wide parking lane (2.4 m preferred to accommodate opening door of parked car)
- Bicycle symbol and diamond pavement markings (TAC):
 - Space every 200 m or at the beginning and middle of the block, whichever is less
- Buffer lane line (white 200 mm wide) and diagonal line (white 100 mm wide) pavement markings (NACTO, OTM Book 11):
 - Paint buffer 0.5 m to 1.0 m wide to separate cyclists from high-turnover on-street parking, or high volume, mix of traffic in the adjacent travel lane
 - Diagonal lines at 45 degrees angling downstream from bike lane towards travel lane or parking lane spaced 3 to 6 m
 - Double solid white lines (buffer lane line and bike lane line) indicate where crossing is discouraged; dashed lane lines (one or both) indicate where crossing is permitted, i.e. adjacent on-street parking
- On intersection approaches with no dedicated right-turn only lane the buffer markings should transition to a conventional dashed line (NACTO)
- Adjacent on street parking bike lanes should be provided with a 0.5m to 1.0m painted buffer
- Regulatory signs (TAC):
 - Reserved Bike Lane Signs (TAC RB-90, RB-91 or RB-92) install after every intersection
 - In conflict zones Turning Vehicles Yield to Bicycles sign (TAC RB-37)
- Retrofit bike lanes:
 - To existing roadways by narrowing general purpose travel lane widths to 3.0 to 3.35 m (The Transportation Association of Canada's Geometric Design Guide for Canadian Roads (1999) provides a range in lane width for arterials of 3.5 to 3.7 m. Since 1999, studies have shown that under interrupted-flow conditions (roads with traffic signals) operating at lower speeds (70 km/h or less) narrower lane widths are normally quite adequate and have some advantages. The American Association of Highway and Transportation Official's Green Book (2004) provides a range in lane width of 3.0 to 3.65 m for arterials).
 - To existing 4-lane roadways with less than 20,000 vehicles/day by changing to 2 general purpose travel lanes, 1 centre two-way left-turn lane, and 2 bikes lanes. This strategy may apply to higher volume roadways depending on local context and traffic operational studies.



4.2.5 SEGREGATED BIKE LANES (CYCLE TRACKS)

4.2.5.1 DESCRIPTION

Segregated bike lanes that provide some form of physical segregation between cyclists and motorists encourage non-cyclists or casual cyclists to ride because they increase their sense of comfort. They can also reduce the stress of cyclists generally when riding in traffic and negotiating for space with motorists. Research in North America shows that the overwhelming majority of people who would like to cycle but are afraid to do so on urban streets, as well as many current cyclists, would prefer to be segregated from vehicular traffic. The provision of segregated bicycle lanes can therefore remove an important barrier to bicycle use, especially for less experienced cyclists. If designed properly, cycle tracks can also increase cyclists' safety and convenience.

4.2.5.2 TYPE OF SEGREGATION

Cycle tracks can take many forms:

- Raised bicycle lane elevated several centimeters above the adjacent traffic lanes; preferable at a different level than adjacent sidewalk so pedestrians do not use it
- Segregated on-street bicycle lane, separated from other traffic lanes by a physical barrier such as a median, delineators, planters or parked cars

Greater separation or barriers increase the level of comfort, separation from traffic, and also reduce the possibility of stopping / parking cars and delivery trucks encroaching into the bikeway. For bikeways without physical barriers, this type of encroachment is frequent on busy commercial streets or high-rise residential areas, where drivers are likely to stop on-street or double-park to save a few minutes. Simpler barriers, such as flexible delineators or raised cycle tracks, will limit this illegal stopping and parking, while stronger physical separators can completely eliminate it. Stronger barriers, however, will require more space not only for the barrier itself, but also to allow for cyclists to pass one another and avoid sudden obstacles as they will no longer be able to easily ride across the margins of the segregated bike lane. They may also introduce complications with drainage and access at intersections. The use of shade trees as a buffer can greatly improve the UV protection, aesthetics and separation from vehicle traffic of a segregated facility.

The effectiveness of separation from encroachment depends on the type of separator used:

- A painted median with delineator posts is likely the least effective, because cars and small trucks can sneak between posts
- Separation by on-street parking is very effective provided that the parking is well used
- A concrete median, mountable curb or elevated curb can be effective but, while they are unlikely to straddle it, cars and trucks can still park with two wheels on top of the median or curb
- A higher barrier or planters completely prevent encroachment into the path

Intersections are the critical point when designing segregated facilities and the design should take into account the many different possible movements of cyclists. The segregation means that cyclists are positioned in a fixed location; they typically cannot merge across barriers to turn left, and motorists cannot merge to the right of through cyclists to make a right-turn. Specific treatments are presented in **Section 4.3**.



Examples of various types of segregation for cycle tracks



Grassed boulevard, Vancouver BC



Raised median concrete island (or planters), Montreal PQ, note use of bicycle symbol, diamond and arrow in the bike lane.



Concrete curb with intermittent bollards, Ottawa ON (photo by cycleseven.com)



Flexible delineators, Washington DC



Mountable curb and gutter, Guelph ON



Painted buffer, curb and parking, Long Beach CA



4.2.5.3 SEPARATOR / BARRIER DESIGN

The design of the separator or barrier must take into account local conditions or needs for:

- Transit stops and passenger boarding and alighting, including those with mobility devices—The separator can sometimes be designed as the passenger waiting area with the cycle track traversing behind it; or must permit transit vehicles to cross it to the curb-side waiting area. Low-floor buses in Canada typically require a barrier curb for passengers to board / alight.
- Street cleaning and winter control equipment and practices—Segregated cycling facilities
 may have to be removed if the separator is removable, or left unmaintained or closed during
 the winter season if current equipment cannot clear them of snow and ice. Maintenance may
 require specialized equipment.



Examples of bus stop integrated with segregated bike lanes



Vancouver BC



bus crossing mountable curb and gutter at bus stop in Guelph ON

streetcar stop integrated with cycle track in the Netherlands



segregated bike lane (mountable curb and gutter) condition after snow event in March with snow piled adjacent boulevard in Guelph ON



Example of bicycle logo, diamond and Reserve Bike Lane sign Guelph ON; and TAC's Turning Vehicles Yield to Bicycles sign (sign should be modified to reflect the type of cyclist facility present in the conflict zone)





4.2.5.4 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Preferred width of 2.0 m allows cyclists to pass each other within the segregated lane; 1.5 m allowable for single file, at pinch points and at intersections if necessary
- Bicycle symbol and diamond pavement markings (TAC): After every intersection and
 major driveway. Arrows may be added to reinforce the correct direction of travel of cyclists
- Regulatory signs (TAC):
 - Reserved Bike Lane Signs (TAC RB-90, RB-91 or RB-92) install after every intersection
 - In conflict zones Turning Vehicles Yield to Bicycles sign (TAC RB-37)
- Separator / barrier types—select based on debris sweeping and winter control equipment and practices, and transit stop location and transit vehicle operation (accessible (low floor) buses require a barrier curb for passenger pick-up):
 - Painted buffer / median with delineator posts or bollards
 - On-street parking (segregated bike lane is located between parking and sidewalk / boulevard); buffer width of 1.0 m required to allow for opening parked car doors (minimum 0.5 m if highly constrained)
 - Mountable, semi-mountable or barrier curb
 - Raised concrete median
 - Planters; planter and vegetation height less than 0.75 m; and lower within 30 m of intersections
- Cross-fall towards street for drainage in adjacent roadway
- Location:
 - Adjacent travel lane
 - Between parking and sidewalk / boulevard; buffer width of 1.0 m required to allow for opening parked car doors (minimum 0.5 m if highly constrained)
 - In boulevard between road and sidewalk, preferably at a different elevation from the sidewalk when pedestrian volumes are moderate to high to discourage pedestrians walking in the bikeway. Sidewalks or other pedestrian facilities should not be narrowed or eliminated to provide cycle tracks as pedestrians will likely walk on the cycle track if sidewalk capacity is reduced or if sidewalk conditions are poor.
- Because of the difficulty and danger of allowing other traffic to cross the cycle track, not recommended on streets where there are many major and closely spaced intersections
- Two-way cycle tracks or segregated bike lanes on one side of two-way streets are not recommended unless distances between intersections / major driveways are long (more than 300 m), or other local conditions reduce or eliminate the volume and speed of traffic turning left across the bikeway
- Major intersection treatments:
 - If speeds are greater than 50 km/h, provide intersection treatments to limit speeds



- Provide two-stage queue boxes to accommodate cyclists' left-turns from the segregated bikeway
- Bend the segregated bikeway "in" towards the travel lane approaching major intersections to improve motorists and cyclists visibility of each other
- Mark approach and / or departure at intersection with green colour or "sharrows"; green on the approach has been found to improve safety
- Mark path through intersection with green colour, "sharrows" or dashed guidelines or combination of these in the conflict areas
- Consider banning right-turns on red signal phase to reduce potential conflicts
- Consider restricting left-turns from the parallel main road to a protected signal phase only or eliminate left-turns altogether
- Consider provide a leading bicycle and pedestrian phase to reduce the conflicts with turning motorists
- Minor intersection treatments:
 - Consider raising the bikeway and sidewalk through driveways creating an incline that serves as a speed hump for motorists
 - Mark with green colour, "sharrows", dashed guidelines, yield symbols or combination of these in the conflict area
 - Bend the segregated bikeway "out" towards the sidewalk and crosswalk approaching minor intersections and driveways so that motorists cross the crosswalk and bikeway in a separate action from entering or exiting the major street traffic. Space is provided between the bikeway crossing and the crosswalk for motorists to yield without blocking the crossing.
- For two-way cycle tracks or segregated bike lanes on one-way streets, several measures are encouraged to address intersection risks:
 - Use pavement markings in the road crossings to highlight the presence of the cycle track (guide lane lines, "sharrows" and / or green colour)
 - Restrict turns (left turns if left-side segregated bike lane, right turns if on the rightside) from the parallel main road to a protected signal phase only or eliminate turns altogether
 - Eliminate parking near the intersection and at driveways to improve sightlines
 - Incorporate protected traffic signal phasing for cyclists to cross major intersections
 - Design the intersection for low-speed right-turns

4.2.6 BOULEVARD MULTI-USE TRAILS

4.2.6.1 DESCRIPTION

A multi-use trail located within the boulevard of a roadway and generally parallel to the road is separated by a grass or landscaped buffer. Children often are encouraged to ride on boulevard trails and they are often preferred by cyclists and non-cyclists because they provide separation from motor vehicles. When the number of users is reasonable for the width of the facility (i.e. conflicts between users is low), and there are few driveways and intersections, a boulevard multi-use trail can provide a safe and comfortable space to travel without being in traffic.

There are various elements to be aware of when placing multi-use trails in roadway boulevards:



- The lack of traffic control at intersections does not currently give cyclists the right-of-way which decreases their comfort, and the functionality of the path compared to on-road bikeways. It is anticipated that the adoption of cross-rides into the HTA will eliminate this issue.
- If the multi-use trail is only built on only one side of the street it reduces their accessibility to residents and destinations on the opposite side of the street. The idea of riding along the trails gives a sense of comfort. Trying to access the trail or leave the trail from across the street is problematic, leading to mid-block crossings, cycling the wrong way on the road, and cycling on the sidewalk.
- The risk to the cyclist going unnoticed by motorists turning in and out of side streets and driveways is a safety concern particularly as the number of cyclists (exposure) increases (similar safety concerns apply to a bi-directional bike lane or two-way segregated bike lane on one side of a two-way street). For example, a motorist turning left or right out of a driveway or side street may notice the cyclist coming towards them on their left, but will generally not notice the cyclist approaching from the right (the motorists is generally looking forward or left to find a gap in traffic). The motorist turning left from the main street into the side street or driveway is looking forward to accept a gap in opposing traffic. As they accelerate to cross opposing traffic, a motorist will not see cyclists, particularly ones on their left approaching from behind. The speed at which the motorist is trying to cross opposing traffic increases risk. This is further complicated by the lack of experience and understanding of the risk by less experienced cyclists who choose to ride on these multi-use trails.
- The beginning / end of the trail needs to be designed to allow users to transition to other bikeways and pedestrian facilities such that cyclists do not end up riding on sidewalks or riding the wrong-way on the road against traffic.
- In areas with moderate to high pedestrian volumes, the higher speed cyclists will decrease their comfort and safety. U.S. Federal Highway Administration's (FHWA) Shared-use Path LOS (SUPLOS) calculator³¹ suggests that a 3.0 m wide, multi-use, asphalt trail without a centreline can accommodate about 20 persons per hour in each direction (per/hr/dir) at level of service (LOS) A; about 70 per/hr/dir at LOS B, and about 130 per/hr/dir at LOS C. This particular calculation assumes the FHWA "default" mix of users consisting of 55% adult cyclists, 20% pedestrians, 10% runners, 10% in-line skaters, and 5% child cyclists.

³¹ U.S. Department of Transportation, Federal Highway Administration, Shared-Use Path Level of Service Calculator, <u>http://www.fhwa.dot.gov/publications/research/safety/pedbike/05138/</u> (July 2011).



Challenges at intersections are further explained in Exhibit 14.



Exhibit 14: Crossing Challenges at Multi-use Boulevard Trails and Intersections / Driveways

(A) Left-turning motorist is focused on gap selection. Accelerating through the turn, the driver is then faced with the unexpected trail crossing. While the driver was waiting to make the turn, a fast-moving right-to-left cyclist outside the driver's field of view may overtake arriving in the crossing. Slowing or stopping for trail users, this left turning motorist may interfere with through traffic on the parallel roadway.

(B) Left-to-right trail users are out of the field of view of higher speed right-turning motorists

(C) Right-turning motorists are looking left while turning right; right-to-left trail users are out of their field of view. They may also obstruct the trail crossing.

(D) Through motorists may obstruct the trail crossing or obscure the view of right-turning motorists and of left-to-right trail users.

(E) Motorists crossing the road at a signal need a clearance interval that is long enough to allow them to cross the trail before the signal changes providing the trail right-of-way.

4.2.6.2 TRAIL PAVEMENT MARKINGS AND SIGNAGE

When conflicts occur between users on multi-use trails, it is typically an indication that the width of the trail is inadequate for the mix and volume of users it attracts. Striping a centreline is one way to separate opposing directions of travel to reduce conflicts when the width of the trail cannot be modified. Research has found that the presence of a centerline stripe results in a reduction in the bicycle level of service of a path³². It appears that cyclists may feel less comfortable making a same-direction passing movement when a centerline stripe is present. While this finding might appear initially to mean that a centerline stripe should not be used, it is important to note that there may be other valid reasons for providing a centerline stripe, particularly on crowded trails, on curves with limited sight distance, and in other appropriate circumstances.

The centreline strip should be yellow; dashed where passing is allowed and solid where passing is discouraged. A solid centreline stripe is typically applied where there is heavy use, on curves with restricted sight distance or design speeds of less than 25 km/h, and approaching intersections.

Segregating 3.0 m wide multi-use trails into one half for pedestrians and one half for cyclists does not provide sufficient width for cyclists or wheelchair users to remain on their side and pass each other travelling in the same direction. This can result in both sets of users being frustrated as others

³² Ibid.



encroach on their space. The shared-use of the trail can be reinforced instead with logos of pedestrians and cyclists with arrows in the "lanes" showing the direction of travel. Signs can also be added messaging "keep right, pass left", "cyclists yield to pedestrians", and "give warning before passing". Pavement marking and signage examples are illustrated in **Exhibit 15**.

Exhibit 15: Pavement Marking and Sign Examples for Boulevard Multi-use Trails

Example of yellow centreline striping (1 m solid, 1 m gap) with bicycle and pedestrian logos and arrows reinforcing shared-use and the direction of travel.



Examples of sign options that encourage courteous sharing of multi-use trails. The "Yield to Pedestrians" sign (RB-39) is included in TAC's Bikeway Traffic Control Guidelines for Canada (2012).



4.2.6.3 SIDE STREET INTERSECTION PAVEMENT MARKINGS AND SIGNAGE

As previously discussed, operational and safety issues associated with multi-use boulevard trails include the lack of traffic control for users at side street intersection crossings, the law prohibiting cyclists to ride through crosswalks, and cyclists going unnoticed by motorists turning in and out of side streets. Where a multi-use boulevard trail is being proposed in place of on-road cycling facilities, there is a need to address these issues.

At intersections, the greatest concern is for trail users being in conflict with right and left-turning vehicles. At signalized intersections, trail users should have the right-of-way when crossing with the pedestrian and green phase for that direction. At unsignalized intersections, they should also have right-of-way over side street vehicles at stop signs and motorists turning from the main street as long as they enter the crossing in time for the motorist to yield. However, Ontario's Highway Traffic Act (HTA) only covers these situations for pedestrians on a sidewalk at a crosswalk (marked or unmarked). In absence of clear rules of the road, it is prudent to consider a "pilot project" defined under the HTA as a project for research into or the testing or evaluation of any matter governed by the Act or relevant to highway traffic, including matters that are prohibited or regulated by the Act. Alternatively, the municipality can create a by-law to address the situation as long as the by-law does not contradict anything in the HTA. Then appropriate signage and pavement markings recognized in national or provincial guidelines can be installed to communicate to all users the rules and expectations

Two signs are included in TAC's Bikeway Traffic Control Guidelines for Canada (2012) that can be applied to this situation: "Yield to Bicycles and Pedestrians" sign (RB-38) and "Bicycle Trail Crossing Side Street Sign" (WC-44R or L and WC-44T). The former is used in exceptional cases when the basic right-of-way rule does not provide for safe and efficient movement of vehicles, cyclists and pedestrians. The later is used when the distance between the intersection and the trail crossing is insufficient to erect a "Bicycle Crossing Ahead" sign. Examples of these signs are shown in **Exhibit 16**.

The situation is further complicated by the prohibition of cyclists riding in crosswalks at traffic control signals in Ontario's Highway Traffic Act:



Riding in crosswalks prohibited: No person shall ride a bicycle across a roadway within or along a crosswalk at an intersection or at a location other than an intersection which location is controlled by a traffic control signal system. R.S.O. 1990, c. H.8, s. 144 (29)

In recognition of this, TAC employed the "elephant's feet" pavement marking published in the Bikeway Traffic Control Guidelines for Canada (2012) to mark a bicycle crossing. The City of Mississauga requested permission from the Ministry of Transportation, Ontario to test elephant's feet, or "crossrides", first at unsignalized and then at signalized boulevard multi-use trail crossings. An example of the markings is provided in **Exhibit 16**. Elephant's feet are being implemented elsewhere in Canada in association with other types of cycling facilities to mark where they cross through intersections.

Note that it is unreasonable to expect cyclists to dismount to walk through crosswalks. It takes energy to dismount, the cyclists can become de-stabilized during dismounting and it is more difficult to control the bicycle while walking beside it especially if it is loaded or heavy.

Bicycle / pedestrian symbols and/or green pavement markings are being used to mark driveway crossings. These are intended to increase the motorist's awareness of the trail users so that they will give them the right-of-way.

Additional guidance on multi-use trail signalization is expected to be published soon by TAC in Traffic Signal Guidelines for Bicycles.



Exhibit 16: Examples of Signage and Pavement Markings at Multi-use Trail Crossings

Examples of sign options regarding the operation of boulevard multi-use trails at side street intersections. Both are included in TAC's Bikeway Traffic Control Guidelines for Canada (2012). "Yield to Bicycles and Pedestrians" sign (RB-38) "Bicycle Trail Crossing Side Street Sign" (WC-44L and WC-44T)



TRAIL

Elephant's feet bicycle crossings at boulevard multi-use trails in Mississauga ON and Toronto ON



Draft Book 18 sample mixed cross-ride.





4.2.6.4 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Not recommended along roadways unless distances between intersections / major driveways are long (more than 300 m), or other local conditions reduce or eliminate the volume and speed of traffic turning left across the trail
- Intersection treatments to reduce risks:
 - Pilot the use of pavement markings in the road crossings to highlight the presence of the bicycle and pedestrian crossing
 - Restrict left turns from the parallel main road at traffic signals to a protected signal phase only or eliminate left-turns altogether
 - Eliminate parking near the intersection / driveways to improve sightlines
 - Incorporate protected traffic signal phasing for trail users to cross major intersections
 - Design the intersection for low-speed right-turns
 - Eliminate right-turn only lanes if volumes do not warrant them
 - Setback stop lines on the side streets / driveways so traffic does not block the trail crossing
- Minimum width of 3.0 m allows:
 - Three pedestrians to walk side-by-side
 - Two cyclist to ride side-by-side
 - A cyclist to pass two pedestrians walking side-by-side
 - An in-line skater in motion to pass a pedestrian but cannot pass a cyclist without slowing down
- Enhanced width of 4.0 m allows:
 - Four pedestrians to walk side-by-side
 - Three cyclist to ride side-by-side
 - Two in-line skaters to skate side-by-side
 - Two cyclists riding side-by-side to pass two pedestrians walking side-by-side
 - An in-line skater in motion to pass two pedestrians walking side-by-side or one cyclist
- Consider piloting side street crossing treatments so cyclists do not have to ride illegally in crosswalks:
 - Book 18 Mixed Crossride: Elephant's feet (white 400 mm squares spaced 0.4 m with cycle, pedestrian and arrow symbols inside along path of travel.
 - TAC Crossride: Elephant's feet (white 400 mm squares spaced 0.4 m, TAC) bordering the pedestrian crosswalk markings both sides and placed min. 1.2 m to 1.8 m from the crosswalk markings
- Consider centreline pavement marking (yellow 100 mm wide):
 - Broken line where passing is permitted, 1 m solid by 1 m gap
 - Solid centreline where passing is discouraged such as where sightlines are limited, approaching intersections or other locations where there are potential conflicts between users or the number of users exceeds the capacity of the trail
- Consider piloting regulatory and warning signs (TAC):
 - In conflict zones Yield to Bicycles and Pedestrians (TAC RB-38)
 - On main road in advance of side street crossing Bicycle Trail Crossing Side Street Sign (TAC WC-44L or R and WC-44T)
- When pedestrian and cyclists use exceeds the capacity of the trail and there are conflicts among users, consider one or all of the following:
 - Yield to Pedestrians (TAC RB-39)
 - "Keep Right, Pass Left"
 - "Give Warning Before Passing" signs
- Alternate materials to encourage users to travel at lower speeds. Concrete, which will have a longer life cycle than asphalt, is perceived as more conducive to slower modes. Reduce bumps in concrete surface by providing expansion joints every 30 m and saw-cut contraction joints every 2.5 m with no tooling



4.3 INTERSECTION TREATMENTS FOR CYCLISTS

The planning and design of cycling facilities has focused in the past on what type of facility should be implemented on which roads. A cycling facility will serve many origins and destinations. Some cyclists will ride the entire route, while others will get on and off at many mid-point locations. As with roadway design for motorists, thoughtful consideration is needed to plan and design intersections for cyclists. Various designs are being implemented in North America to improve cyclists' comfort, safety and accessibility at intersections.

Some of the more popular intersection treatments are listed below. Examples are shown in **Exhibit 17**. The NACTO guide is the most recent publication in North America with information on the more innovative intersection treatments.

- **Bicycle detection:** pavement markings at the "sweet spot", push-buttons within reach to trigger actuated traffic signals or other active cyclists' detection (video, infrared, etc.) —see Region of Waterloo's *The Blue Book: Draft Transportation Engineering Practice*, Section 20.6 (2009)
- **Bike lane markings approaching and departing intersections:** green colour, "sharrow", and / or chevrons approaching and / or departing intersections to raise the awareness of motorists who may be merging or crossing the cyclists' path. Green colour in the bike lane on the approach has been found to improve safety
- **Bicycle routing marked through intersections:** green colour, bicycle symbols, chevrons, and / or dashed guide lines in part or all of the route within the intersection where motorists may be crossing the cyclists' path
- Bicycle left-turn pocket: adjacent motorists left-turn lanes or on its own at a trail
 access—refer to the Region of Waterloo's *The Blue Book: Draft Transportation Engineering Practice*, Section 20.6 (2012)
- Bicycle lay-by for left-turns at T-intersections
- Bike box or advance stop bar (one-stage bike box): set-back stop bar and bicycle symbol, with or without green colour to reduce "right-hook" incidents or provide cyclists access to the left lane on a two-lane approach at a traffic signal. Requires bike lane on the approach to the intersection to provide access to the bike box—refer to the Region of Waterloo's *The Blue Book: Draft Transportation Engineering Practice*, Section 20.6 (2012) for justification one-stage box boxes that accommodate left-turns, and design criteria below.
- Left-turn queue box: waiting area with bicycle symbol with or without green colour for cyclists making a "pedestrian-type", two-stage left-turn at a traffic signal—refer to the Region of Waterloo's *The Blue Book: Draft Transportation Engineering Practice*, Section 20.6 (2012) for justification, and design criteria below.

Region of Waterloo and City of Waterloo completed a review of facilities that accommodate cyclists left turns at intersections in 2011 and subsequently updated *The Blue Book: Draft Transportation Engineering Practice*, Section 20.6 (2012) with justification criteria.



Exhibit 17: Examples of Intersection Treatments for Cyclists

Bicycle detection: push-button in reach, Vancouver BC



Bicycle detection: pavement marking in "sweet spot" of loop detector, Vancouver BC (photo credit: Richard Drdul)



Bike lane marking approaching and through a signalized intersection: green on the approach, bike box for reducing "right-hook" incidents, and green with guide lines through the intersection, Portland OR

Bicycle lay-by at signalized T-intersection with pushbutton within reach, Vancouver BC



Bicycle route marked through intersections: "sharrow" bicycle symbol and chevrons, Montreal PQ





Bicycle route marked through intersections: "sharrow" bicycle symbol and chevrons, Chicago IL (photo credit: www.NACTO.org)





Bicycle left-turn pocket: adjacent motorists' left-turn lane, Vancouver BC



Bicycle scramble or Barnes Dance phase connecting multi-use trail to street, Portland OR



Bicycle left-turn pocket: at trail access, Victoria BC





4.3.1 ONE-STAGE BIKE BOX

4.3.1.1 DESCRIPTION

Bike box or advance stop bar (one-stage bike box) consists of a set-back stop bar and bicycle symbol, with or without green colour to provide cyclists access to the left lane on a two-lane approach at a traffic signal. Bike boxes require an ingress bike lane on the approach to the intersection to provide access to the bike box. The left-turn by the cyclist is completed in one stage: moving into the bike box and progressing left through the intersection on the appropriate signal indication (green or green left-turn arrow).

4.3.1.2 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Refer to Region of Waterloo's *The Blue Book: Draft Transportation Engineering Practice*, Section 20.6 (2012) for justification criteria
- Suitable for not more than two-lanes on the approach at signalized intersections
- Bicycle detection required if signal is actuated
- Prohibition of right-turns on red recommended (install OTM Book 5 No Right on Red sign, Rb-79R)
- Depth of bike box (separation space between crosswalk and vehicle stop bar): min. 2.75 m; 4.0 m recommended, max. 7 m
- Provide ingress bicycle lane (if bicycle lane not present) to guarantee cyclists' access to bike box, min. 7 m long or as long as the through traffic queue length
- One bicycle symbol for each approach lane centred in bike box and in front of approach lane
- Install Stop Here on Red Signal sign (OTM Book 5 Rb-78) with Except Bicycles Tab sign (TAC RB-9S) at stop bar for motorists
- Optional green colour in box and ingress bicycle lane
- Optional "Wait Here" pavement marking behind stop bar for motorists

4.3.2 LEFT-TURN QUEUE BOX

4.3.2.1 DESCRIPTION

A left-turn queue box is a waiting area with bicycle symbol with or without green colour for cyclists making a "pedestrian-type", two-stage left-turn at a traffic signal. Cyclists make the left turn by progressing straight through the intersection on the green phase, wait in the bike box on the far side of the intersection during the cross street red phase, and then progress straight through on the cross street during the green phase, completing their turn in two stages. Various locations are possible for the bike box depending on the configuration of the intersection, i.e., location of the crosswalk, curb radii, presence or



absence of on-street parking and right-turn lane, configuration of the bikeways on each leg of the intersection, etc. Two-stage queue boxes may increase cyclists comfort in making left-turns, but also increase their delay due to the need to receive tow green signals before proceeding.



4.3.2.2 BASIC CONSIDERATIONS AND DESIGN CRITERIA

- Refer to Region of Waterloo's *The Blue Book: Draft Transportation Engineering Practice*, Section 20.6 (2012) for justification criteria
- Suitable for multi-lane approaches at signalized intersections
- Locate in a protected area such as shadowed by downstream on-street parking, between the bike lane and crosswalk, etc. Not recommended on far side of parallel crosswalk requiring cyclists to ride across crosswalk to access bike box.
- Bicycle detection required if signal is actuated
- Prohibition of right-turns on red recommended (install OTM Book 5 No Right on Red sign, Rb-79R)
- Size of bike box preferably 1.2 m wide by 3.0 m long
- One bicycle symbol and left-turn arrow pavement marking centred in bike box outlined by 100 to 200 mm wide white line
- Optional green colour in box

4.3.3 INTERSECTION DESIGN FOR SEGREGATED CYCLING FACILITIES

4.3.3.1 DESCRIPTION

Intersections are the critical point when designing segregated cycling facilities and the design should take into account the many different possible movements of cyclists. Those going straight should have priority over turning cars and they should also not be impeded by pedestrians. Cyclists turning right may have to wait for pedestrians. With a 2.0 m wide path, other cyclists can pass them while they wait, but with a narrower path other cyclists will be forced to queue.

With a segregated cycling facility, left-turning cyclists cannot move into a left-turn lane in advance of the intersection (see **Exhibit 18**). Accommodating left-turning cyclists at signalized intersections can be done as follows:

- Provide a separate traffic signal phase that protects left-turning cyclists
- Consider bike signal improvements where there is a need and under the guidance of OTM Book 18 and Book 12 as allowed under the HTA
- Provide a two-stage left bike box so that cyclists cross to the far-side of the intersection during the main street green signal phase, wait in the designated area (bike box), and then cross to the side street during the side street green signal phase
- Terminate the segregation approaching the intersection and provide a (one-stage) bike box (if the approach is 2-lanes wide or less)

It is strongly recommended that on-street segregation be maintained right up the stop bar at a signalized intersection if cyclists' left turns can be accommodated as noted above. In terms of cyclist comfort and protection from traffic, the approach to the intersection is where segregation is the most valuable. Designs for mixing zones where there are high volumes of traffic crossing the segregated bike lanes are being tried. Concepts are illustrated in **Exhibit 18**.

Segregated bike lanes or cycle tracks require extra care in design to assure good visibility at intersections. An important measure to this effect is prohibiting parking between the bikeway and the adjacent traffic lanes at intersections. The Vélo Québec design manual suggests that any barriers and planters between the bicycle path and traffic lanes should be less than 75 cm tall so that lights on bicycles remain visible at night. The use of higher vegetation should be restricted to mid-block areas and avoided for at least 30 m before an intersection or driveway entrance.



Exhibit 18: Examples of Intersection Treatments for Segregated Bike Lanes (Cycle Tracks)

Conventional bike lane transition to segregated bike lane far side of intersection, Richmond BC



Green pavement in segregated bike lane across driveway, Long Beach CA



Left-turn queue box: for cyclists making "pedestriantype" left turn at a traffic signal, and green bike lane through intersection on segregated bike lane, Ottawa ON (photo credit: Citizen Cycle by Ottawa Citizen)



Segregated bike lane "bending in" at intersection with red bike box, Vancouver BC



Green pavement in segregated bike lane across driveway, Vancouver BC



Green pavement, bicycle symbols, elephant's feet and bicycle signals at signalized intersection on a two-way segregated bike lane on a one-way street, Vancouver BC





Signalized intersection with left-turn turn lane, bicycle signals, and segregated bike lane on a oneway street, Long Beach CA



"Begin right-turn lane, yield to bikes" sign at beginning of segregated bike lane / left-turn lane weave on a one-way street, Long Beach CA



Buffered bike lane adjacent left-turn lane at unsignalized intersection on a one-way street, Long Beach CA



Bicycle signal phase on one-way segregated bike lane / street, Long Beach CA



Green segregated bike lane at weave to left-turn lane at an unsignalized intersection on a one-way street, Long Beach CA



Bicycle signal head at signalized intersection on a two-way segregated bike lane on a one-way street, Vancouver BC





February, 2014

Appendix A: Selected Bibliography of Additional Design Guides



This appendix supplements Section References for Planning and Design1.1 by provided brief descriptions of other available design resources.

CANADIAN GUIDE TO NEIGHBOURHOOD TRAFFIC CALMING, TRANSPORTATION ASSOCIATION OF CANADA (TAC), 1998

This is a common reference for guidance on traffic calming elements such as curb extensions, refuge islands, and other devices that slow traffic and advantage pedestrians and cyclists. Although generally not applicable to arterial roadways, some of the design ideas such as curb extensions and median refuge islands have broader applications in moderate speed environments. Order on-line at https://vws3.primus.ca/dev.tac-

atc.ca/english/bookstore/products.cfm?catid=12&subcatid=21&prodid=64 (January 2011).

ALTERNATIVE TREATMENTS FOR AT-GRADE PEDESTRIAN CROSSINGS, INSTITUTE OF TRANSPORTATION ENGINEERS (ITE), 2001

The report summarizes studies on pedestrian crossings and assembles in a single document the various treatments currently in use by local agencies in the U.S., Canada, Europe, New Zealand and Australia to improve crossing safety for pedestrians at locations where at-grade, marked crosswalks are provided. The report also summarizes the results of various studies conducted by public agencies on pedestrian-related collisions, including those documenting the results of removing crosswalk markings at uncontrolled locations. The appendix includes policies of specific agencies on where crosswalks are provided as well as typical crosswalk signing and striping plans. Order on-line at http://www.ite.org/emodules/scriptcontent/Orders/ProductDetail.cfm?pc=LP-629 (January 2011).

CHAPTER 3.4—BIKEWAYS, GEOMETRIC DESIGN GUIDE FOR CANADIAN ROADS, TRANSPORTATION ASSOCIATION OF CANADA (TAC), SEPTEMBER 1999

The TAC Geometric Design Guide provides guidance for the planning and design of roads in Canadian; however, the chapter on bikeways has not changed significantly since initial publication in 1995. Vélo Québec's Planning and Design for Pedestrians and Cyclists, noted in Section 2.1.1, page 1, is the preferred guideline since it is more recently updated and comprehensive. Order on-line at https://vws3.primus.ca/dev.tac-

atc.ca/english/bookstore/products.cfm?catid=9&subcatid=18&prodid=54 (February 2011)

EUROPEAN BIKEWAYS (INCLUDES SEGREGATED BIKE LANES)

The following guidelines are referenced in particular for the planning and design of segregated bike lanes, or cycle tracks, including cross-sectional criteria, side street / driveway layouts, and strategies for intersections.

Design Manual for Bicycle Traffic, Record 25, Centre For Research and Standardisation in Civil and Traffic Engineering (CROW), 2007. Order on-line at

http://www.crow.nl/shop/productDetail.aspx?id=889&category=90 (January 2011).

London Cycling Design Standards, Transport for London (TfL), 2010. Available on-line at: http://www.tfl.gov.uk/businessandpartners/publications/2766.aspx (January 2011).

Collection of Cycle Concepts, Danish Road Directorate, 2000. Available on-line at: http://www.vejdirektoratet.dk/pdf/cykelrapport/999Complete.pdf (January 2011).

Guidelines for Understanding Use and Implementation of Accessible Pedestrian Signals, Transportation Association of Canada, 2008

These national guidelines are intended to provide deploying agencies with practical information on public liaison, accessible pedestrian signals installation prioritization and design, installation,


operations and maintenance. Order on-line at https://vws3.primus.ca/dev.tacatc.ca/english/bookstore/products.cfm?catid=12&subcatid=21&prodid=213 (February 2011)

ONTARIO TRAFFIC MANUAL BOOK 18: BICYCLE FACILITIES, IN PROGRESS

The Ontario Traffic Council and Ministry of Transportation, Ontario are developing Book 18 of the Ontario Traffic Manuals regarding traffic control for bicycle facilities. It is expected to be published in 2013.

VOLUME V - TRAFFIC CONTROL DEVICES, MINISTÈRE DES TRANSPORTS QUÉBEC

The Province of Quebec's traffic control device manual includes Chapter 7 on bicycle facilities. Quebec allows the use of the bicycle traffic signals and also includes a section on bikeway way-finding destination / distance signage that is currently not included in the Ontario Traffic Books. Order on-line in English at http://www.publicationsduquebec.gouv.qc.ca/fre/products/38418 (April 2012).

GREEN LIGHTS FOR BIKES: PROVIDING FOR BIKE RIDERS AT TRAFFIC SIGNALS, SINCLAIR/KNIGHT/MERZ, 2010

Prepared for the State of Victoria, Australia, this report deals with material directly related to traffic signals implemented in Australia and New Zealand. It is an excellent summary of innovative approaches to signals to accommodate cyclists, including detection; start, during and clearance phasing; and other techniques such as the "green wave" synchronization for cyclists. Each traffic signal technique is described along with potential applications, benefits and disadvantages. Available on-line at: http://www.bv.com.au/general/bike-futures/41329/ (January 2011).

BICYCLE END-OF-TRIP FACILITIES: A GUIDE FOR CANADIAN MUNICIPALITIES AND EMPLOYERS, TRANSPORT CANADA, 2010

This guide is intended to help municipalities create appropriate and attractive bicycle parking and related facilities that will encourage bicycle use; and determine where, how much, and what type of bicycle parking and related facilities to provide, and how to best design them; and create incentives and regulations that will encourage the provision of bicycle parking and related facilities in the private realm. For employers, it is a useful resource for designing attractive long-term bicycle parking facilities that will encourage employees to commute by bicycle; and designing accessible short-term bicycle parking facilities that will attract cyclist clients. Available on-line at http://www.tc.gc.ca/eng/programs/environment-urban-menu-eng-1887.htm (April 2012)

GUIDELINES FOR THE DESIGN AND MANAGEMENT OF BICYCLE PARKING FACILITIES, CITY OF TORONTO, 2008

This is an excellent resource intended to improve the quality of bicycle parking that is secured through the development approval process. The guidelines provide planners, developers and property managers with information to support the design, construction and management of high quality bicycle parking facilities. Although aimed at new developments, the Bicycle Parking Guidelines can also be applied to existing developments looking to improve bicycle parking facilities. Available on-line at: www.toronto.ca/planning/bicycle_parking_guide.htm (January 2011).

"How-to Guide: Bicycle Parking", Vélo Québec

A concise four-page leaflet on bicycle parking including six good reasons to provide bicycle parking facilities; and five simple steps to set up parking facilities. Available on-line in English at: www.velo.qc.ca/documents/OVB08_stationnement_e.pdf.



"INSTALLING BICYCLE PARKING", CITY OF PORTLAND, 2011

This web resource covers the basics of what makes a good rack and a good location. The guide is intended to help property owners save money by installing bicycle parking facilities that work, whether they are required or volunteering to install bicycle parking. Note, the guide suggests that "if you see bicycles locked to trees, posts or other stationary objects nearby, you probably need bicycle parking. If you have bicycle parking that is rarely used it may be poorly located or of a type that offers little security." Available on-line at:

http://www.portlandonline.com/transportation/index.cfm?c=34813&a=58409 (January 2011).

ONTARIO'S BEST TRAILS: GUIDELINES AND BEST PRACTICES FOR THE DESIGN, CONSTRUCTION AND MAINTENANCE OF SUSTAINABLE TRAILS FOR ALL ONTARIANS, TRAILS FOR ALL ONTARIANS COLLABORATIVE (TAOC), 2006

The objective of the TAOC guide is to provide design guidelines for trails that protect and preserve outdoor environments that are universally designed to include people of diverse abilities. The guide provides information about trail design, construction, user amenities, signage and maintenance. Available on-line at http://www.abilitiescentre.org/trails/ (February 2011)

TRAIL INTERSECTION DESIGN HANDBOOK, UNIVERSITY OF NORTH CAROLINA'S HIGHWAY SAFETY RESEARCH CENTER (HSRC) FOR FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT)

This handbook discusses design processes and principles of designing trail/roadway intersections. A discussion of risks at trail intersections is provided. It includes information on various crossing types, regulating traffic and site design. It also reviews some European trail crossing guidelines. Guidelines from the Netherlands and development of a bicycle crossing time equation are included in the appendices. Available on-line at:

http://www.dot.state.fl.us/safety/ped_bike/handbooks_and_research/TRAILINT.PDF (January 2011).

DESIGNING TRAIL TERMINI, UNIVERSITY OF NORTH CAROLINA'S HIGHWAY SAFETY RESEARCH CENTER (HSRC) FOR FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT)

When a trail ends at a roadway junction, trail users must be transitioned back onto the roadway and sidewalk system. This document discusses how to accomplish this transition and provide case studies. Available on-line at:

http://www.dot.state.fl.us/safety/ped_bike/handbooks_and_research/termini.pdf (January 2011).

OTHER REFERENCES

There is a considerable body of pedestrian and bikeway design guidance in related literature such as neo-traditional development; transit-oriented development (TOD); traffic calming; roundabouts; streetscaping; urban design; and documentation on specific case studies such as road diets, or pedestrian crossings. Many of these can be found through the Pedestrian and Bicycle Information Center (PBIC), the US national clearinghouse for information about health and safety, engineering, advocacy, education, enforcement, access, and mobility for pedestrians (including transit users) and bicyclists; see www.pedbikeinfo.org, www.walkinginfo.org, www.bicyclinginfo.org and www.saferoutesinfo.org (information on safe routes to school policy and programs) (January 2011). Another good source for documents on worldwide cycling policy is Fietsberaad with a web site in Dutch, German, French, English and Spanish, see www.fietsberaad.nl (January 2011).



This program is part of the Region of Waterloo's Big Shift Toolbox

"The Big Shift" is a series of economic, environmental and social changes happening in our community that are fundamentally "shifting" how we need to plan and manage growth to maintain Waterloo Region's prosperity and accommodate a growing population.

The Big Shift Toolbox is designed to make it easier for the community and prospective investors to find information about available Regional (and Area Municipal) planning, infrastructure and financial tools.

Please visit us at www.regionofwaterloo.ca/bigshift.